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Abstract

This article highlights the security impact of oil nationalization, develops and analyzes four energy security scenarios, and suggests options to reduce the potential negative impact of oil nationalization. In addition to the use of oil as a weapon, nationalization of oil can also lead to competition for scarce resources among states, facilitate the funding of terrorists or insurgents, contribute to destabilizing regional arms races, influence intra-state conflict, and sustain antagonistic political agendas.

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Abstract

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Introduction

The security impact of oil nationalization has garnered much attention among politicians, policy analysts, economists, energy companies, and other interested observers in recent years. Nationalization of oil is the process by which states de-privatize operations or exploit previously undeveloped resources via a state-controlled oil company. The nationalization process often occurs in an ad hoc fashion, and the private companies that formerly owned the assets rarely receive fair market value for their assets or reserves. Oil export restrictions are often associated with nationalization. Given the finite nature of oil reserves, nationalization of

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oil industry operations can be a potent geopolitical weapon enabling countries to use their oil exports as a tool to influence the behavior of dependent importer states.¹ The use of the oil weapon is one of the primary ways that oil nationalization can negatively influence security. As this article will demonstrate, oil nationalization can be destabilizing at the local, regional, and global levels. To consider how nationalization might influence security in the future, it is useful to analyze the problem through an alternate futures methodology.

This article will highlight the security impact of oil nationalization, develop and analyze four energy security scenarios, and suggest options to reduce the potential negative impact of oil nationalization. In addition to the use of oil as a weapon, nationalization of oil can also lead to competition for scarce resources between states, facilitate the funding of terrorists or insurgents, contribute to destabilizing regional arms races, influence intra-state conflict, and sustain antagonistic political agendas.

The four energy security scenarios developed in this article answer the focal question: What impact might nationalization of oil reserves and industry assets have on global security in ten years? They cover the spectrum of potential futures from the most malign to the most benign. The scenarios are entitled *Conflicted World*, *Muddling Along*, *Smooth Sailing*, and *Crisis Management*.

For the purposes of this article, *security* is defined as the condition of a state's being free from threat against its sovereign territory, its institutions, its critical infrastructure, its economic interests, and the interests of its citizens. This broader understanding of security was chosen, rather than energy security alone, because nationalization of energy assets affects more than just energy security, as explained below. Energy security can be defined broadly as the condition of having sufficient, affordable, reliable, and safe energy resources to conduct the economic, political, security, social, health, and welfare activities necessary for the functioning of a state.

This article will outline the scenario methodology used and then explain the focal issue. It will then analyze the contemporary and potential future influence of nationalization on security, as understanding the impact of oil nationalization is necessary to appreciate how it could influence the different scenarios. These sections will be followed by the determination of the two factors most relevant to the scenario development: the critical uncertainties. This will be followed by the development of the scenarios and an examination of their implications and indicators. The article will finish with a brief concluding section.

Methodology

A quadrant projection model was used to devise the scenario set for this article.² This method is less bounded by current thinking than linear projection techniques and thus can facilitate unbiased development of scenarios. The quadrant model used for this paper was developed as follows:

1. Identify the focal issue.
2. Describe the contemporary experience to determine current factors.
3. Determine future factors.
4. Rank the factors to determine the two most critical uncertainties.
5. Define the scenarios and determine their stories.
6. Determine the implications.
7. Determine the indicators.

The Focal Issue

Determination of a focal issue is crucial for successful scenario development. The issue helps to maintain the purpose of the process and determine the factors that form the critical uncertainties.³ As noted above, the focal issue for this set of four scenarios is: What impact might nationalization of oil reserves and industry assets have on global security in ten years?

Contemporary Experience and Current Factors

The decision to nationalize oil assets has often been linked to price trends. In sustained periods of high prices, states tend to nationalize extractive industries more frequently. This is because profits are higher during these periods, so even though Nationalized Oil Companies (NOCs) tend to operate less effectively, they are still profitable. When prices drop for a sustained period, governments that have nationalized resource industries sometimes permit International Oil Companies (IOCs) to return because they generally possess the technical expertise to exploit the reserves profitably at lower prices.⁴ However, this is risky for the IOCs since the host country may unilaterally change the terms of the contract. This occurred recently in Russia where Shell, Total, BP, and other international compa-

nies were stripped of their controlling shares of operations in a variety of fields including Shtokman, Sakhalin I, Sakhalin II, and Kovytko.⁵ Similar contractual duplicity has occurred in Venezuela where the government has altered contracts with IOCs to give state-owned *Petróleos de Venezuela SA (PDVSA)* a controlling interest in several projects.⁶

Nationalization of oil reserves and facilities can contribute to oil market and economic distortions, the politicization/militarization of oil security, and the use of oil revenue in destabilizing ways. However, when countries that nationalize their assets are genuine liberal democracies with transparent revenue generation streams—including effective taxation regimes—and observant of international diplomatic and trade norms, then the impact of oil nationalization on energy security is neutral. Companies in these countries operate similarly to free market oil companies. Norway, with its state-owned Statoil, is a case in point in that it operates virtually the same as publicly traded IOCs. Yet, most of the nationalized countries listed in Appendix A are non-democratic and have limited transparency. Many of these states lack effective taxation regimes so their leaders often treat oil revenues as a primary source of funding for their agendas. Moreover, as detailed below, some of these states have used oil exports as a political weapon in the past and are likely to continue to do so.

In order to appreciate the level of influence that NOCs exert on global oil security it is necessary to understand their market share. Appendix A lists most of the countries that have nationalized their domestic and overseas oil company operations and indicates that they possessed 92.5% of total global proved reserves and accounted for 81.5% of total global oil production in 2008.⁷ This is not to suggest that all of the production or reserves listed in the appendix were the property of NOCs since, in many cases, IOCs also operate in the listed countries.

Nevertheless, it is noteworthy that the production ratio between IOCs and NOCs has virtually reversed since the 1970s. In 1972, the last year before the first major OPEC-driven oil shock, IOCs produced approximately 93% of global crude oil, whereas NOCs produced roughly 7%. In 2007, by contrast, IOCs accounted for approximately 23% of daily production against roughly 77% for NOCs.⁸ This trend in favor of NOCs will likely continue since much of the IOC production has occurred in non-nationalized regions, such as the United States, where fields are generally older and closer to depletion. Moreover, recent history has witnessed more nationalization, such as those undertaken by the Venezuelan or Ecuadorian Governments.

Nationalization of oil has a negative impact on the market and on the profitability of IOCs by limiting their access to reserves.⁹ Most of the reserves controlled by NOCs are located in places where oil is more easily—and thus more cheaply—extracted, leaving more challenging and less profitable reserves for the IOCs. These companies generally run much more efficiently than NOCs and would possibly increase the global crude supply or develop spare production capacity if they could access reserves held by NOCs.¹⁰ Spare production capacity is vital to reduce the shock of supply disruptions.

Currently, the major oil development opportunities are in the Middle East, Russia, Venezuela, the Canadian oil sands, and offshore Brazil. Of these, only Canada is not a nationalized country and offers access to reserves in a low-risk political environment. The stable political situation in Canada has helped spur investment in oil sands development.¹¹ There has been some speculation that the Arctic might also provide opportunities for IOCs in the near term. However, it seems likely that developments in this region will proceed slowly.¹² Thus, IOCs are struggling to compete in a market saturated by NOCs.

The impact on the global oil supply of dwindling investment opportunities for IOCs is compounded by the trend toward mergers and acquisitions of publicly traded oil and gas companies in recent years. Consequently, the reserves held by IOCs have come under increasingly centralized control. In 1990, the five largest IOCs controlled 60% of total IOC reserves. By 2005 they controlled 84%. These companies have been slow to invest in new production in light of generally high oil prices. Consequently, it may be the case that IOC production will decline somewhat in the near- to mid-term due to decreased competition, possibly leading to a situation where NOCs produce an even larger proportion of the global supply.¹³

Oil market distortions can result from deficiencies in operations by nationalized companies. This is because the diversion of revenue from the oil and gas companies to government coffers reduces infrastructure reinvestment, leading to production declines that reduce global supply.¹⁴ For example, Mexico's crude output has steadily declined from its peak of 3.824 million barrels per day in 2004 to 3.157 million barrels per day in 2008.¹⁵ Some analysts predict that Mexico will become a net importer of oil within a decade. The Mexican Government taxes Pemex, the national oil company, at slightly more than 60% of its gross revenue. Consequently, in the absence of foreign investment, currently forbidden by the Mexican constitution, Pemex must rely on government borrowing to develop infrastructure and maintain operations. This has led to a deterioration of infrastructure that has significantly reduced productivity.

Granted, Mexican reserves are believed to be declining as well, although a major reason for the output decline is inadequate investment in infrastructure.¹⁶

The economies of nationalized states often lack diversification and consequently are extremely sensitive to swings in oil prices. These states often succumb to the so-called "resource curse," characterized by susceptibility to boom and bust cycles; inflation of the value of the state currency, which increases the challenge of developing non-resource related industries because imports become comparatively cheaper;¹⁷ and the generation of resource revenue streams that can feed a culture of greed and corruption facilitated by the lack of transparency. Under these conditions, many citizens lack economic opportunities and become dissatisfied with their government, potentially to the extent that political unrest, sometimes violent, results.¹⁸ The seemingly intractable violence in the Niger Delta serves as a stark example of the resource curse.¹⁹

Some scholars also suggest that the process of democratization can be prevented or distorted in nationalized oil states. They attribute this to the cycle of greed and corruption that characterize some states whose extractive industry developed prior to their contemporary political institutions. When political development occurs in this order, the rulers often rely on resource revenue to fund government programs and operations instead of developing a functional taxation system. In the absence of this system, the normal social contract between a government and the governed does not develop nor does a functional bureaucracy. Factions within the society who might oppose the government are placated through lavish expenditures, paid for through resource rent, or subjugated by the state security apparatus. These two transactions, in turn, necessitate more expenditure of the resource wealth. The bureaucracy becomes a key interface in this climate of greed and corruption. Once entrenched, this political culture is difficult to uproot so the prospects for positive change are meager.²⁰

Oil as a Weapon

Another significant impact of nationalized oil operations is the use of the "oil weapon" by exporting states in order to influence the behavior of, or possibly inflict economic damage on, consumer countries. There are contemporary examples of this, such as Russia's cessation of oil exports to the Czech Republic on the day that Prague agreed to accept a U.S. radar installation on Czech territory as part of the European Ballistic Missile Defense.²¹ Consumer states often lack the ability to quickly change sources of oil supply due to the nature of contracts, the difficulty in shift-

ing refinery processes to handle different grades of crude and, in periods of short supply, the dearth of spare global capacity to replace interrupted petroleum shipments. Yet, exporting states can also suffer from their own use of the oil weapon since they often depend on the revenue they obtain from their exports. If they cannot find new buyers, they must have other sources of revenue or can only afford to disrupt their exports for short periods of time.

There has been considerable debate in recent years regarding the longevity of the oil supply, with some analysts suggesting that global peak oil production has already been reached and others suggesting that it will occur at some point during this century.²² The issue of peak oil is outside of the scope of this article, although it is important to understand that the availability of adequate quantities of oil on the market reduces the impact of supply disruptions. A well-supplied market can lessen the degree and longevity of disruptions better than an inadequately supplied one. It seems logical then that states that have nationalized their oil resources might be reticent to interrupt exports for political reasons if the market is well-supplied. This is because, under this circumstance, countries whose supplies are cut will be more able to find alternative sources. However, this is not guaranteed since converting refineries to handle different crude can take some time; therefore, the impact of supply disruptions will still be felt to a limited degree, even when markets are well-supplied.

Consumer states do have some options to reduce the impact of the use of the oil weapon. The development of strategic petroleum reserves provides some protection against short periods of supply disruption. Indeed, the impetus for creating the International Energy Agency (IEA), with its strategic reserves prerequisite for members who are net-importers, was the 1973 OPEC oil embargo. Another option is to diversify oil suppliers in order to reduce dependencies on particular sources. Switching to alternative sources of energy or reducing consumption through changing habits are also options. Development of new technology and techniques to increase the output of existing oil fields or to extract crude from more challenging reserves can also help to overcome the potential negative energy security impacts of the oil weapon. However, since oil is a finite resource, it will eventually become scarce. Consequently, it is possible that competition among states for access to oil will increase and could become violent during the coming decade.

Oil Arms, Insurgents, and Terrorists

Oil nationalization can have a more direct impact on security when revenues are used in destabilizing ways. In some cases, oil revenues sustain extensive armaments programs that can lead to regional arms races. For example, it has been reported in recent years that Venezuelan expenditures on arms have been far in excess of any amount necessary to safeguard the country. President Chavez spent approximately \$4 billion on arms purchases during 2005 and 2006, leading all other Latin American countries during this period. A portion of this spending went toward the purchase of 100,000 Kalashnikov assault rifles along with the rights to manufacture more of these weapons and their ammunition in Venezuela. Critics point out that Chavez did not consult the National Assembly and has been arming not only the Venezuelan military but also his partisan civilian reserve, suggesting that these measures might protect him should he lose the support of the military.²³ Some other countries in Latin America are alarmed by Venezuela's program and consider it to be destabilizing for the region. Brazil, for example, increased its defense spending from \$1.1 billion in 2007 to \$2.5 billion in 2008, in part because of its concerns over Venezuela's military purchases.²⁴ Given that PDVSA provides a very large share of government revenue, 37.8% in 2007,²⁵ these acquisitions could not be sustained without the oil industry.

Venezuela's neighbors have reason to be concerned about its behavior in light of the 2008 revelation that President Chavez was linked, by captured computer files on a rebel leader's laptop, to a program providing arms, training, and advice to the Revolutionary Armed Forces of Columbia (FARC) and its effort to overthrow Columbia's Government.²⁶ Other reports suggest that Chavez permits FARC, and Columbia's other leftist guerrilla group, the National Liberation Army (ELN), to operate within Venezuela. This has created several problems for Venezuelans since FARC and the ELN partially fund their operations through destabilizing acts, including cocaine trafficking, ransoming hostages, and selling weapons. Chavez has openly lauded FARC in the National Assembly and is alleged to consider FARC and ELN allies against a feared U.S. invasion. It is telling that during the decade of his presidency, the rate of kidnappings in Venezuela has increased tenfold.²⁷ Chavez's use of oil revenues to fund these groups destabilizes Columbia and Venezuela as well as the broader region.

Venezuela is not alone in its use of oil revenue to export instability. Money generated from oil and gas operations has funded radical jihadist movements and has armed insurgencies throughout the world. For example, a 2006 UN report noted that the Islamic Courts Union in Somalia received

shipments of arms and supplies from nationalized oil-producing states helping it to fight the Somali Transitional Federal Government. Iran, Libya, Saudi Arabia, and Yemen were among the countries noted, along with Hizbollah, who is supported by Iran.²⁸ Iran's support for Hizbollah exemplifies another destabilizing use of oil revenue. Hizbollah is not the only terrorist group supported by Tehran, nor is Iran the only nationalized oil producer that offers these groups assistance. Terrorist organizations that receive support from oil-producing countries include al-Qaida, Hizbollah, Hamas, the Palestine Islamic Jihad, the Popular Front for the Liberation of Palestine—General Command, the Popular Front for the Liberation of Palestine, FARC, ELN, and Euskadi Ta Askatasuna (ETA). The oil-producing states identified as providing support for these groups include Iran, Sudan, Syria,²⁹ and as noted above, Venezuela.

Future Factors

This section will examine those factors related to oil nationalization that might be relevant in the future. These include the adequacy of the oil supply, the propensity of states to nationalize the resource, and the degree to which states transition from oil dependence.

Throughout the coming decade inadequate oil supply could lead to frequent price spikes and negatively influence global economic development. Sustained high oil prices will limit global economic activity and the stability of some states—particularly those that experience a decrease in GDP per inhabitant.³⁰ Another possible consequence of a prolonged inadequate oil supply is the increased potential for conflict between states seeking to safeguard their energy security. Some states might augment their ability to project military force in order to protect their oil supply corridors. This could lead to arms races and increased tensions in some areas.

Conversely, if the oil supply proves adequate, the global economy in general could continue to grow and provide opportunities for people in many parts of the world, thereby reducing their level of economic stress. Not only is the level of internal conflict likely to be reduced in a well-supplied world relative to a poorly-supplied one, but also the competition for oil between states can be expected to be reduced. This, in turn, should reduce the potential for inter-state conflicts attributable to oil.

Other influential factors will be the propensity of states to nationalize their oil industries and whether they will opt to treat their resource as a political tool or as a fungible resource. If oil supplies are inadequate over the course of this decade, it seems likely that the proclivity of states to

nationalize their oil industries will increase. Some states that do so might also be more tempted to wield the oil weapon. Even if oil companies are not nationalized, some exporting states may impose restrictions on the amount of oil that IOCs can export in order to safeguard the amount needed for domestic consumption. This would reduce the availability of oil on the market, drive up prices, and increase the potential harm posed by NOCs whose states make use of the oil weapon.

An additional factor that will influence energy security in the future is the degree to which states act to transition their economies away from oil dependency—especially for ground transportation. According to the IEA the percentage of oil consumed by the transportation sector globally has been steadily increasing from 45.5% in 1973 to 60.5% in 2006.³¹ While increasing the efficiency of existing oil-consuming technology might seem another option, it will not have a positive long-term effect, as a transition from oil would. The illusory benefit of efficiency on energy consumption was exposed by British economist William Stanley Jevons who, in the 1860s, developed the theory now known as Jevons' Paradox, noting that when the use of a resource becomes more efficient, its cost decreases leading to increased consumption.³² Thus, improved energy efficiency is unlikely to reduce the dependence on oil and, therefore, is unlikely to reduce the negative security impacts of oil nationalization to a significant degree.

Critical Uncertainties

In order to construct the scenario quadrant, two critical uncertainties must be determined.³³ These are chosen from the factors outlined in the preceding sections that are most influential to the focal issue: What impact might nationalization of oil reserves and industry assets have on global security in 2020? The factors examined above are summarized as follows:

- Democratic state ownership of NOC
- Non-democratic state ownership of NOC
- Efficiency of NOC
- Technical expertise of NOCs in light of more challenging extraction conditions
- Control of reserves by NOCs

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- Economic, political, and social stability in countries operating NOCs
- Propensity of states to use oil exports as a political weapon
- Use of oil revenues to fund arms races and export instability
- Degree of market dominance by NOCs
- Adequacy of oil supply
- Ability of states to reduce the impact of oil supply interruptions
- Rate of transition from the oil-based economy.

In reviewing these factors, it seems that the most influential are the propensity to use oil as a weapon and the rate of the transition from the oil-based economy. While adequacy of oil supply might on first consideration seem more relevant, it is not the case. This is because inadequate supply will not necessarily lead to the use of the oil weapon, although it certainly could influence NOC states to resort to this tactic. Supply shortages could also lead to cooperation among affected states, thereby lessening the negative impact on energy security. For this reason, propensity to use oil exports as a political weapon is considered more influential on the focal issue than adequacy of supply.

The rate of transition from an oil-based economy is also extremely influential since reducing reliance on oil to fuel economic activity also reduces or eliminates the utility of the oil weapon. Moreover, when global oil consumption is reduced, oil-exporting states will lose revenue, and those that finance destabilizing activities will have diminished resources to do so.

In ranking the influence of these factors, the relative market dominance of NOCs versus IOCs could be considered equally relevant to the propensity of states to use oil as a weapon. Indeed, the same logic argues for both factors; that is, if the market were to be dominated by IOCs, then the percentage of supply that could be used as a political weapon would be greatly reduced. Although, in light of the finite resource base, even if IOCs dominate the markets there will be supply shortages in the future due to dwindling reserves. Were the dominance factor used instead of the propensity factor, it is likely that the scenarios would be similar. However, another issue is that the oil market is currently dominated by NOCs, and for the purposes of this scenario set, it is assumed that this dominance will continue. In addition to the subjective consideration of the factors, I

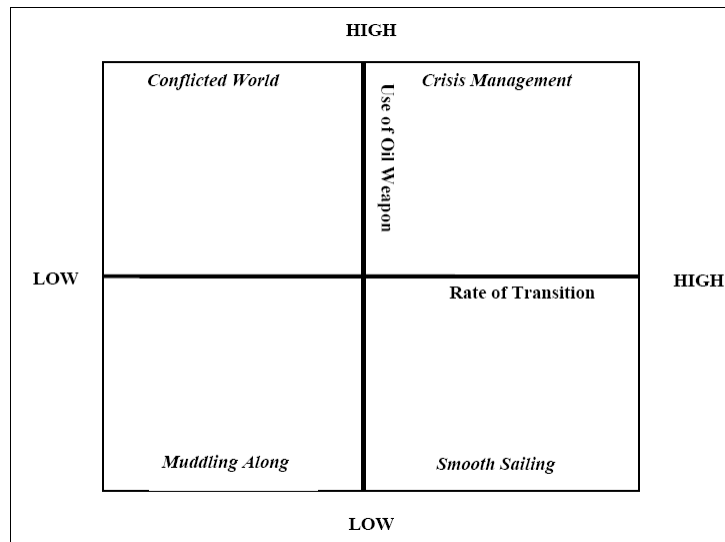
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devised a ranking matrix, Appendix B, and rank-scored the factors. This exercise yielded the same results as the more subjective analysis outlined in this section. The two critical uncertainties chosen are:

- Propensity of states to use oil exports as a political weapon
- Rate of transition from an oil-based economy

These critical uncertainties form the axes of the matrix and provide the underlying logic to the alternate futures scenarios.

Scenario Quadrant



The Scenarios

The ***Conflicted World*** scenario is characterized by a high propensity among NOC countries to use the oil weapon. It is also a world that has not witnessed significant efforts to transition to alternate forms of energy for most economic activity.

This future is the most challenging economically. Given the inadequacy of supply and the inability to generate GDP without it, oil prices will be very high in this scenario. Global annual economic growth rates will be low or negative since the cost of producing and transporting goods and services

will be very high. The pace of technological innovation in this scenario is slowest compared to the other possible worlds since resources are devoted to maintaining the status quo, particularly securing access to oil. Consequently, little is left over for investment in research and development.

The energy security situation of this quadrant is the most unstable since oil supply will endure periodic interruptions, yet states are least prepared to manage the consequences. Use of the oil weapon by states would not be the only interruption to supply unfortunately. It is likely that in this world, terrorist or insurgent groups might strike at the energy infrastructure more frequently than in other scenarios since the ability of states to withstand interruptions would be reduced; thus, the impact of successful attacks would be intensified. Moreover, these terrorists might receive more support in this scenario from NOC states since their oil revenues will be high given the supply scarcity.

The risk of inter-state conflict is high in this scenario since countries are hard-pressed to meet their energy needs. Moreover, tensions are higher since some of the nationalized states continue to use their substantial oil revenue to fund arms programs. These states, already frequently disrupting the oil supply, will likely resort to armed force to achieve their strategic aims. In this world, states dependent on oil imports will need extensive military power projection capacities to defend their access to oil. However, the ability of states to sustain these military capacities over time might decline, given the low or negative GDP growth in this scenario. This economic difficulty would force very hard choices for many governments.

The ***Crisis Management*** world, like the *Conflicted World*, is characterized by a high propensity among NOC countries to use the oil weapon. However, it is a world that is undergoing an energy transition to reduce the use of oil for transportation. Oil is used primarily in the petrochemical industry.

The economy in this scenario is slightly improved over *Conflicted World*, yet it is not without challenges. Since reliance on oil for transportation has been greatly reduced, the economy is less susceptible to the oil weapon. Economic growth will be modest in this potential future because there will be periodic use of the oil weapon. The petrochemical sector will face high oil costs that will reduce profitability and drive up prices for its products. To facilitate the transition from the oil-based economy, many states will be funding research and development; thus, the rate of technological advances will be robust.

The energy security situation of this quadrant will also be slightly improved since oil forms a smaller portion of the energy supply picture. Still, oil supply will endure periodic interruptions, although most states will be better prepared to manage the consequences. Given the improved energy security situation, the proclivity of terrorists or insurgents to target oil infrastructure will be lower than in the *Conflicted World*.

The risk of inter-state conflict is moderate in this scenario. Some of the nationalized states continue to use their substantial oil revenue to fund arms programs and support terrorist and insurgent groups. These states remain willing to use the oil weapon, although the impact is muted because oil is less crucial for transportation. It may be possible that some of these states may perceive their declining power base and might engage in aggressive behavior while they still have the resources to do so. In this world, states dependent on oil imports might be more moderate in their military expenditures since their reliance on oil is not for transportation; rather, it is for petrochemicals. While this is a vital industry, oil-supply interruptions are of lesser consequence.

The ***Smooth Sailing*** scenario is most desirable from the perspective of energy security, economic activity, political development, and global stability. It is characterized by extensive efforts to transition away from oil-based economic activity, particularly with regards to transportation. There is also a significant reduction in the use of the oil weapon by nationalized states, resulting in a generally more positive global security state.

The *Smooth Sailing* economy is defined by positive growth, primarily because the world has overcome its dependence on oil as the primary energy source for ground transportation and economic activity. Significant amounts of money will be invested in research and development globally so innovation would be a characteristic of this future. It is possible that this future would be the most environmentally friendly, given the more pronounced transition from the oil age.

Likewise, energy security will be more stable in this future. To facilitate this transformation, alternative energy use will be extensive, thereby reducing the impact of oil supply disruptions. Some industries will remain dependent on oil, especially the petrochemical industry, but societies will endure oil supply shortages better since they are less dependent on oil for transportation.

The risk of inter-state war attributable to energy security will be very low in this future. Moreover, given the reduced oil-supply concerns, terrorist or insurgent groups will be less likely to attack the oil infrastructure, given

its reduced criticality. Intra-state war in states that rely heavily on oil revenue may be more common in this scenario as GDP declines. These conflicts will be localized and are unlikely to have an impact beyond their immediate regions.

The ***Muddling Along*** world has a more stable security situation than *Conflicted World* and *Crisis Management*. This is primarily because states with nationalized oil industries do not use the oil weapon frequently. While there will not be significant movement away from oil as the primary transportation energy source, it is possible that increased stockpiling might dissuade the nationalized states from disrupting supply for political objectives. As well, better relations between consumer and supplier states will also result in reduced use of the oil weapon. Regime change leading to more stability in key supplier states may also account for the reduced level of disruption.

The economic situation in *Muddling Along* is less robust than in *Smooth Sailing* primarily because the world is still dependent on oil for its economic activity and supply will be constrained. So, oil prices will be extremely high, leading to a trickle-down effect throughout the global economy. Consequently, productivity growth will be low in this scenario. Research and development funding will also be low in this scenario given the "business as usual" approach. Consequently, technological innovation will not be influential in this future.

The failure to significantly increase alternative energy use will leave countries vulnerable to oil supply disruptions and will negatively influence energy security. However, since the use of the oil weapon by supplier states will be infrequent, there will be fewer disruptions.

Given the reduced energy security in this scenario, tensions between states over energy issues will exist. However, in light of the more cooperative arrangements between supplier and consumer states, energy-related inter-state conflicts are unlikely. Similarly, arms programs to safeguard the oil supply are unlikely to characterize this world. Since oil supply interruptions will be more detrimental to global economic prosperity, it is likely that terrorist and insurgent groups will target oil infrastructure frequently. The risk of intra-state conflict is moderate in this scenario, due to the limited economic opportunities, leading some to conclude that they have nothing to lose by resorting to armed conflict to seek change.

Implications of the Four Scenarios

Based on these scenarios, it seems evident that a transition from an oil-based economy will likely improve the future security situation. By reducing or ending the dependence on oil, the impact of the oil weapon will be diminished. This, in turn, will reduce tensions between states attributable to oil supply issues and potentially lower the risk of inter-state conflict attributable to this issue.

Another implication of these scenarios is that steps taken to moderate the behavior of those states that nationalize their oil industries will also improve security. Diplomatic, economic, political, and legal measures can help to maintain positive relations with nationalized states and demonstrate to them that supply interruptions are not in their best interest. This may reduce the likelihood that they will make use of the oil weapon.

Indicators

Another valuable output from the scenario development process is the indicators that can be derived from the scenario stories. Determining the lead indicators from each story can enable warnings that might allow policymakers to better understand how the world is unfolding.³⁴ This might facilitate timely decisions and enable contingency planning. Some indicators, by no means an exhaustive list, from the scenarios in this set are as follows:

Conflicted World

- Increased radicalization of governments in major oil-producing states
- Increased incidents of unilateral contractual alterations or outright nationalization of assets on the part of these governments
- Increased use of or threatened use of the oil weapon
- Frequent supply interruptions
- Frequent terrorist/insurgent attacks on oil infrastructure
- Destabilizing arms programs undertaken by governments that have nationalized their oil industry
- Oil import-dependent states develop extensive military projection capabilities to safeguard their oil transit corridors

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- Inability to engage industry and governments in an energy transition to reduce oil dependence
- Sustained high oil prices
- Frequent use of strategic oil reserves to meet supply shortages
- Inability to adequately stock strategic reserves

Crisis Management

- Increased radicalization of governments in major oil-producing states
- Increased incidents of unilateral contractual alterations or outright nationalization of assets on the part of these governments
- Increased use of or threatened use of the oil weapon
- Frequent supply interruptions
- Frequent terrorist/insurgent attacks on oil infrastructure
- Significant expenditures on arms programs on the part of some nationalized states, yet less on the part of developed states
- High level of political violence and regime change in some nationalized states since their economic situation will be less robust than in some other scenarios
- Robust development of technologies designed to transition from oil dependency
- Moderate spending on R&D to support technological transitions
- Moderate global economic growth
- Maintenance of strategic oil reserves within developed states

Smooth Sailing

- Dramatic de-carbonization of the global economy
- More moderate political behavior on the part of nationalized states
- More cooperative supply contracts and observance of the terms of joint-venture oil developments between IOCs and NOCs

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- Few threats to interrupt oil supplies
- Reduced arms spending globally
- Fewer terrorists/insurgent attacks on oil infrastructure
- Robust global economic growth
- Few incidences of inter-state conflicts
- Possible intra-state conflicts in oil export-dependent states
- Substantial investment in research and development of new technology
- Maintenance of strategic oil reserves, primarily for the petrochemical sector, within developed states

Muddling Along

- More moderate political behavior on the part of nationalized states
- More cooperative supply contracts and observance of the terms of joint-venture oil developments between IOCs and NOCs
- Few threats to interrupt oil supplies
- Reduced arms spending globally
- Fewer terrorist/insurgent attacks on oil infrastructure
- Slight global economic productivity growth—stunted due to oil dependence
- Low level of research and development or technology
- Strategic petroleum reserves are maintained, although with difficulty

Conclusion

Oil nationalization has a negative impact on energy security and also on global security in general. Energy security is reduced primarily because of the inefficiency that characterizes many NOCs as well as the redistribution of oil revenues away from reinvestment, ultimately reducing global supply. Global security can be reduced when some states use their oil exports as a political weapon to influence the behavior of consumer states or to punish them. Nationalization of oil can also have a negative impact

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on security by providing resources to sustain destabilizing arms programs and to fund terrorist or insurgent groups. Domestically it can also feed corruption and contribute to inadequate economic development. These trends, in turn, can reduce opportunities for segments of the population and might engender internal armed conflict and civil war.

In a world lacking adequate oil supply, nationalization of oil assets will have the potential to reduce energy security, slow economic growth, and feed intra- and inter-state tensions—possibly to the point of armed conflict. Yet, there are options that might reduce the impact of, or avoid entirely, these negative outcomes. Key among these will be the degree to which industry and states can insulate their activities and societies from susceptibility to oil supply interruptions. There are a variety of steps that can be taken, such as diversifying supply options, increasing strategic reserves, and transitioning from a heavy dependence on oil for their transportation activities, particularly with regard to economic activities. Reducing the negative impact of supply interruption might reduce the perceived benefit that NOC states will gain by wielding the oil weapon. This may reduce the frequency of interruptions in the future.

Appendix A: Nationalized Countries Oil Production³⁵

Country*	2008 % of Global Production	2008 Proved Reserves (Bil Barrels)	2008 % of Global Proved Reserves	Reserves to Production Ratio (Years)
Algeria	2.2%	12.2	1.0%	16.7
Angola	2.3%	13.5	1.1%	19.7
Azerbaijan	1.1%	7.0	0.6%	20.9
Brazil	2.4%	12.6	1.0%	18.2
Brunei	0.2%	1.1	0.1%	16.9
China	4.8%	15.5	1.2%	11.1
Columbia	0.8%	1.4	0.1%	6.0
Ecuador	0.7%	3.8	0.3%	20.3
Egypt	0.9%	4.3	0.3%	16.4
Equatorial Guinea	0.5%	1.7	0.1%	12.9
Gabon [†]	0.3%	3.2	0.3%	37.0
India	0.9%	5.8	0.5%	20.7
Indonesia	1.2%	3.7	0.3%	10.2
Iran	5.3%	137.6	10.9%	86.9
Iraq	3.0%	115.0	9.1%	>100
Kazakhstan	1.8%	39.8	3.2%	70.0
Kuwait	3.5%	101.5	8.1%	99.6
Libya	2.2%	43.7	3.5%	64.6
Malaysia	0.9%	5.5	0.4%	19.8
Mexico	4.0%	11.9	0.9%	10.3
Nigeria	2.7%	36.2	2.9%	45.6
Norway	2.9%	7.5	0.6%	8.3
Oman	0.9%	5.6	0.4%	20.9

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Country*	2008 % of Global Production	2008 Proved Reserves (Bil Barrels)	2008 % of Global Proved Reserves	Reserves to Production Ratio (Years)
Qatar	1.5%	27.3	2.2%	54.1
Russian Federation	12.4%	79.0	6.3%	21.8
Saudi Arabia	13.1%	264.1	21%	66.5
Tunisia	0.1%	6.7	0.5%	38.1
Uzbekistan	0.1%	3.4	0.3%	6.0
UAE	3.6%	97.8	7.8%	89.7
Vietnam	0.4%	4.7	0.4%	40.8
Venezuela	3.4%	99.4	7.9%	>100
Yemen	0.4%	2.7	0.2%	23.9
Total	80.5%	1175.2	92.5%	
World		1258.0 [‡]		

* This list contains those countries identified in the *BP Statistical Review of World Energy* (June 2009) that have nationalized oil and or gas industries. There may be other countries that have nationalized oil and/or gas industries, although their assets are insufficient to merit their listing in the *Review*.

† Gabon recently announced that it would create a national oil company by end 2010. See "Gabon to Launch National Oil Company," *Reuters*, April 23, 2010, available at: <http://uk.reuters.com/article/idUKLDE63L2ID20100422>.

‡ Note that the total reserves listed in the *BP Statistical Review* do not include oil sands reserves. When these are added in, the global total increases to 1408.7 billion barrels. Likewise, the percentages of reserves on this chart are calculated based on the reserves excluding oil sands.

Appendix B: Factors Scoring Table

Factors	Impact on oil supply	Economic Impact	Domestic Political Impact for NOC State	Potential for Armed Conflict	Total
Factors Affected by NOC States	1–5; 1 is positive* and 5 is negative	1–5; 1 is positive and 5 is negative	1–5; 1 is positive and 5 is negative	1–5; 1 is low and 5 is high	
Democratic state ownership of NOC	1	2	1	1	5
Non-democratic state ownership of NOC	4	4	4	3	15
Inefficient NOC	4	4	4	1	13
Efficient NOC	1	1	1	1	
Technical expertise of NOC and challenging extraction conditions	4	4	4	2	14
Control of reserves by NOCs	4	4	2	3	13
Economic, political, and social stability in NOC state	3	4	4	3	14
Propensity of states to use oil weapon	5	5	4	3	17
Use of oil revenues to fund arms races and export instability	3	4	4	4	15

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Factors	Impact on oil supply	Economic Impact	Domestic Political Impact for NOC State	Potential for Armed Conflict	Total
Degree of market dominance by NOCs	4	3	3	3	13
Adequate oil supply	1	1	2	1	5
Inadequate oil supply	5	5	3	3	16
Mitigation Factors	1-5; 1 is negative and 5 is positive	1-5; 1 is negative and 5 is positive	1-5; 1 is negative and 5 is positive	1-5; 1 is high and 5 is low	
Ability of states to reduce impact of disruptions	3	4	4	4	15
Rate of transition from the oil-based economy (scores are based on a fast transition)	5	5	3	4	17

* The words "positive" and "negative" are used from the perspective of the consumer of oil and also from the perspective of impact on global energy security, not from the perspective of the NOC state. From the perspective of an NOC state, for example, the use of the oil weapon can be a positive thing, whereas for the countries affected and the global energy market, it is not.

About the Author

Since 2000, Peter Johnston has been a Defense Scientist conducting Strategic Analysis for the Centre for Operational Research and Analysis, a part of Defense Research and Development Canada. Previously, he was an infantry officer in the Canadian Forces, gaining experience in operational and non-operational environments. He holds an M.A. in War Studies from the Royal Military College of Canada. He has conducted energy security research for seven years, examining topics including the link between oil and conflict in Africa, nationalization, the threat posed by terrorism on oil and gas infrastructure, Arctic energy geopolitics, and energy security more broadly. Mr. Johnston is leading a three-year project examining contemporary energy security to determine its implications for militaries. He has been published in conference proceedings and journals including *Baltic Rim Economies* and the *Journal of Military and Strategic Studies*. He has presented his research in North America and Europe.

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