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## **A World Agreement on Oil?**

Richard N. Cooper

This paper addresses ways to cope with potential instability in the world oil market, with a view to whether action by the L20 can do anything about it. It is often said that the major geographical source of oil, the “Middle East,” is a highly turbulent and politically unstable area. In fact, there has been remarkable political stability in the region, at least as measured by the longevity of its political leaders and key decision-makers. King Hussein of Jordan came to the throne in 1952, and Asad became president of Syria in 1972. Both have been replaced smoothly in the last few years by their sons. Rulers of Libya, Oman, and the UAE have been around for over 30 years. Saddam Hussein became president of Iraq in 1979 and was a key decision-maker before then; his rule was ended by the United States in 2003. Mubarak became president of Egypt after Sadat’s assassination in 1981, and was just re-elected. Fahd became king of Saudi Arabia in 1982, but as Crown Prince he had been effective ruler for seven years before then; the pattern was repeated when Abdullah became king on Fahd’s death in 2005, after about a decade as effective ruler as Crown Prince. Even the Iranian revolution and its firmly ensconced clerical regime are now 26 years years old. Only Lebanon and the Palestinians have experienced continual turbulence during the past three decades, and neither is directly concerned with production of oil.

It is true that oil supplies have been disrupted three times by political turbulence, in 1979-80 with the Iranian revolution and subsequent invasion of Iran by Iraq; in 1990 with Iraq’s invasion of Kuwait; and in 2003 with the US invasion of Iraq, following a long UN embargo that limited Iraq’s exports of oil. In all cases Saudi Arabia (and others) increased their production of oil to compensate for the shortfall, although not with perfect timing.

Interruptions in flows of oil can originate outside the Middle East as well, as we have learned in recent years with serious disturbances in Nigeria and in Venezuela in 2003, and with the extensive damage to both crude production and especially refinery production by hurricane Katrina on the US Gulf

Coast in 2005. Nonetheless, there are some reasons to be concerned about potential turbulence in the Middle East, for at least three reasons. First, the Israel-Palestinian conflict remains unresolved, and could flare up to a point at which Arab oil suppliers curtail their exports (or more likely limit increases in production) to show sympathy for the Palestinians and to put pressure on the United States to be less solicitous of Israel.

Second, some states have designs on their neighbors, although the removal of Saddam Hussein has probably limited the main threat under this heading. Only Jordan among countries in the region has settled borders; and Iran may desire to destabilize the regimes of neighboring countries if not literally coveting their territory (although it occupies several islands claimed by the UAE). Further afield, Kashmir (between India and Pakistan) and Cyprus (between Turkey and Greece) remain areas of contention, although each is over a thousand miles from Kuwait at the head of the Persian Gulf.

Third, several countries face acute problems of succession after today's long-lived leaders pass away (Libya and Egypt especially come to mind), although as noted recent successions in Jordan, Syria, and Saudi Arabia have been relatively smooth. Islam as a creed for political organization holds leaders accountable to the rule of law as well as to specifically religious injunctions on behavior. So rulers that deviate from acceptable behavior risk religious wrath, and authoritarian regimes provide no peaceful outlet for this dissatisfaction. The clerical regime in Iran faces the age-old tension between Islamic severity and Persian indulgence, as well as tensions with Iranians who wish to be part of the modernizing world.

Nonetheless, the governments of the oil-producing countries have a continuing interest in producing and selling oil, since it is the main source of public revenue in all the oil-producing Middle Eastern countries, and they are unlikely deliberately to disrupt the flow of oil. They may however resist increasing supplies in the interests of raising world oil prices.

The last qualification is highly relevant. The US Department of Energy projects world demand for oil (assuming 3.0 percent growth in the world economy and an oil price of around \$27 a barrel) to grow from 77 mb/d in 2000 to 121 mb/d in 2025. More than half of this growth needs to come from

OPEC, concretely from Venezuela and the Middle East, the only areas of OPEC that can expect to produce substantially more oil than they are now providing. Thus if this 2004 projection comes to pass, world dependence on oil from the Persian Gulf will grow substantially, from 29 percent of the world total in the mid-1990s to nearly half in 2025. To provide this increment of over 25 mb/d, significant investment in exploration and development must occur in the countries of the Persian Gulf, and especially in Saudi Arabia, which allegedly has the largest proven reserves, at around 250 billion barrels, but with Iraq, Iran, Kuwait, and UAE all making significant contributions.

### Vulnerability

For the reasons noted sitting governments are not likely deliberately to disrupt the flow of oil. Disruptions are therefore most likely to arise from internal conflicts between contending claimants to leadership. This could arise either as an inadvertent by-product of the conflict, or deliberately if one faction wanted to deny oil revenue to a competing faction. A succession struggle is likely to be confined to a single country, although factions may enlist tacit or overt support from neighboring countries.

But that still leaves the possibility of disruption by non-state actors – disaffected ethnic, religious, or other political groups – attacking the sitting government or even the system of government; or by a government that perceives it has nothing to lose. How much damage could be done?

There are two sources of exit for Persian Gulf oil: (1) through pipelines to loading terminals in the Gulf, thence into tankers that exit through the Strait of Hormuz to the Arabian Sea and the open ocean; (2) through pipelines to loading terminals on the Red Sea (Saudi Arabia) or the Mediterranean Sea (Iraq through Turkey), thence into tankers destined for distant refiners and distributors. Before reaching the loading terminals the oil must be gathered from disparate oil wells and the gas and other unwanted materials separated from it. Thus there are four potential bottlenecks: gas-oil separators, which are large, expensive pieces of equipment; pipelines to terminals; loading terminals, which are relatively few in number; and the Strait of Hormuz. For oil pumped to the Red Sea, the Suez Canal might seem to be a potential bottleneck. But it was closed for 15 years following 1967, giving great encouragement to supertankers, the largest of which are too large to use even the enlarged Canal, but offer cheap

transportation despite that. In any case, the most rapidly growing markets for oil are in Asia, and tankers can exit the Red Sea to the south.

Pipelines are long and vulnerable, and can be cut without too much difficulty. But they are easy to repair. Gas-oil separators are highly specialized and expensive machines, with long procurement lead times. A loss could be significant, but can be avoided by installing spare capacity and ordering spare machines. Loading terminals are robust and relatively easy to protect physically against raids, except by a well-armed foreign power. Of course, effective protective, preventive, and remedial measures assume that a government is effectively in charge. Civil war or major and persistent guerrilla actions could be highly disruptive.

What about the Strait of Hormuz? Despite its constrictive appearance on a world map, this is not a small body of water. The Strait is about 35 miles wide at its narrowest point (about twice the width of the English Channel), and exceeds 45 meters in depth throughout most of its width, sloping gradually from the Iranian side to over 200 meters deep off the coast of Oman. The two ship channels (one for incoming vessels, one for out-going vessels, each two miles wide with two miles separation between them) lie wholly within the territorial waters of Oman at the Strait's narrowest point. In the mid-1990s traffic averaged about 60 ships a day, roughly one-quarter of which were tankers. This is heavy, but only one-third the traffic through the slightly narrower Strait of Malacca, and somewhat lighter than the traffic through the much narrower Bosphorus.

The Strait of Hormuz is thus much too large and too deep to be blocked, as the Suez Canal was in 1967. Military forces could however attack shipping, and the Strait could be mined by a national power of some means. Iran could do either. It has acquired Kilo-class submarines from Russia and land-based silkworm missiles from China. Its air force has attack planes originally provided by the United States and France. It mined the Persian Gulf during the 1980-88 Iran-Iraq war, especially after Iraqi aircraft bombed its offshore oil-loading terminals, and presumably maintains a large inventory of mines. Of course such actions in the Strait, in the territorial waters of Oman, would be an act of war. Conceivably, Iran could deny responsibility for mine explosions that damaged one or several ships. It could even feign

participation in search for mines. The presence of mines would inhibit commercial shipping, and insurance rates for Gulf-bound vessels would rise substantially, perhaps prohibitively. So some disruption could be caused, but short of war it would be temporary. Even with war, the Strait could be cleared relatively quickly (measured in weeks, not days) if US and allied forces were engaged to do so.

But as noted above, Iran has no interest in preventing oil from being shipped out of the Persian Gulf, or merchant goods from being shipped into the Gulf. Iran is highly dependent on both oil revenues and on imported goods. Thus an attempt by Iran to block the Strait would be an act of desperation, induced by what Iran considered extreme provocation, such as an attempt by its neighbors or the international community to embargo or blockade Iran.

Thus we have two questions: Will the Persian Gulf countries make investments to increase oil production on the required scale? Will the world find it acceptable to be drawing such a high proportion of such a critical product from a single region? These questions in turn suggest two quite different strategies, the first to do what can be done to assure the required investment, the second to diversity energy sources so significantly that the investment will not be required. Both require international collaboration, but of quite different kinds, and involving different parties.

#### First strategy: Assuring Saudi Investment

The first strategy is to persuade the Gulf governments, and especially the government of Saudi Arabia, the key player, to commit to making the extensive investments required, over time, to increase oil production and export by the required amounts to assure a price, say, in the range \$20-25 a barrel (in dollars of 2005). Government commitments are required because all these countries have national oil companies that control the flow of oil, although how Iraq rebuilds its productive capacity remains to be seen, and could involve private companies to an extent not seen in the Gulf since the early 1970s. This assumes, of course, that the Gulf countries can increase their oil production by a factor of roughly two over the next two decades. Matthew Simmons (2005) has recently argued, based on an examination of hundreds of technical papers by petroleum engineers working in the country, that Saudi Arabia is

currently at or even exceeds its optimal economic production, that except for two areas the country has been widely explored, that further large fields are unlikely to be discovered, that the current large fields are being over-exploited (from the perspective of ultimate recovery) and soon will experience declining production. Saudi Arabia will therefore have to struggle to maintain production in the vicinity of ten mb/d; doubling that production on a sustained basis, on this view, would be impossible. The Saudi government, in contrast, has recently suggested that it will increase productive capacity to 13 mb/d, although so far as I know there is no evidence, either in terms of committed funds or exploratory and developmental drilling, to suggest that the process has actually started.

The L20 might provide a forum in which Saudi Arabia could be cajoled to provide much more information than it has traditionally done on its capacity-building plans, and secondly to commit itself to make investments in new capacity against expected growth in world demand for oil (net of increased non-OPEC production), including the construction of spare capacity to help deal with occasional shortages arising elsewhere, as it has in fact done during the past 30 years; and to stock spares of expensive, long-lead time equipment such as gas-oil separators, as insurance against terrorist or other disruptive actions. Such investments would themselves (by agreement) be made more transparent, be monitored, and be the topic of occasional review by the L20 or their deputies. The commitment also might involve the construction of new or enlarged pipelines to the Red Sea, to reduce dependence on the Persian Gulf as a point of exit, although this might be less economic in view of the rapid growth of markets for oil east of Arabia.

Such a commitment by Saudi Arabia would no doubt also stimulate the other Gulf countries to increase their investments in additional production, so long as it could be done economically, so as not to lose market share to Saudi Arabia. The details of allocation of additional investment (including perhaps Venezuela, the other OPEC country with significant known possibilities for expanding production) could and would no doubt be worked out within OPEC.

The other major oil producers within the current list of L20 countries are Russia and Mexico, as well as Canada and the United States. Russia at least in principle allows private exploitation of its oil

reserves, subject to government taxation and other government regulations, although that may change in the coming years. Mexico maintains a national monopoly on oil exploitation, and has (deliberately?) limited its increases in production more or less to incremental domestic needs during the past two decades, although that may be due in part to technical limitations on the ability of Pemex to exploit increasingly deep offshore oil. Both countries would no doubt demonstrate a strong interest in any L20 discussions of oil production, but neither is in a position to make the commitments (assuming Simmons is wrong) that Saudi Arabia is, and the policies of each would very likely be influenced by any prospective commitment by Saudi Arabia, and indeed could be made part of a broad L20 agreement.

This strategy of course implies increasing dependence for oil on OPEC, and on the Persian Gulf in particular, with the vulnerabilities noted above. Furthermore, it would re-enforce the position of Saudi Arabia in the world oil market, and in particular its ability to threaten to withhold oil (explicitly or implicitly) motivated by political or economic considerations. Such a strategy would place heavy weight on continued cooperation by Saudi Arabia over the coming years within an agreed L20 framework.

If these consequences are unacceptable, an alternative strategy is needed.

#### Second strategy: Vigorous Diversification of Energy

The starting point for the alternative strategy is that high and growing dependence on the Persian Gulf for a critical input to modern economies is unacceptable at a fundamental level, particularly when the critical resource is state controlled and sold at a price that is routinely managed through restriction of supply – the situation that has obtained since 1974. This alternative involves an aggressive pursuit of conservation and development of substitute products. To be viable, such a strategy requires agreement on an effective floor below which oil prices would not be allowed to drop, say \$20 a barrel, to prevent Saudi Arabia from undermining alternative investments through occasional bouts of low pricing.

The elements of such a strategy have been outlined in many places: most explicitly by Shultz and Woolsey (2005), but also in Lovins and Datta (2004), and in Lackner and Sachs (2005). New technologies are not required for a serious start, although existing technologies would be improved and

near-proven technologies would be developed more urgently if such a strategy were adopted. The key elements would be: 1) pushing motor fuel conservation hard, especially clean Diesel and hybrid vehicles; 2) high priority work on improved batteries to further (1); 3) pushing ethanol and bio-diesel hard, especially cellulosic biofuel that relies mainly on agricultural and forestry waste products; 4) faster development of Canada's (and perhaps Russia's) tar sands; 5) further development of coal liquefaction.

Hybrid cars – internal combustion combined with electric motor – can double the mileage of automobiles and light trucks. They could be strongly encouraged, either by raising CAFÉ standards or by imposing higher taxes on gasoline and perhaps non-hybrid cars. Of course, people cannot buy more such cars than are being produced, so the automobile firms need to be encouraged strongly to increase their production of improved hybrid vehicles. Clean diesel fuel also significantly increases mileage, so the environmental regulations tilting against diesel should be reviewed in view of improved diesel fuel, as has been done in Europe.

Mileage can be increased further with better, cheaper batteries, which could fuel automobiles on short trips, 10-20 miles, which would cover most household auto use. Batteries could be charged from house current, at rates equivalent to \$1 a gallon. This technology is not yet at hand, but it seems to be close; further work should be accelerated and, if successful, rolled out with the hybrid cars.

Mileage in terms of petroleum can be increased further by mixing gasoline with ethanol or making biodiesel from agricultural products, including waste products. Here the promising new developments are the possibility for using waste agriculture and forestry products, mainly cellulose, to produce liquid fuel through bio-transformation. Even offal from chicken rendering plants, and old tires – indeed almost any organic material – can be used. Automobiles using electricity and biofuels could reach mileages of up to 500 miles per gallon of petroleum product – a huge reduction in oil demand from that at present.

In addition, unconventional oil could be developed more rapidly, including the infrastructure to move it. The Canadian tar sands are said to be economic at \$22 a barrel, and already produce about 1 mb/d. They are abundant – second only to Saudi Arabia in proven reserves – and are being developed,



but could be developed faster and more conspicuously. Venezuela and Russia also have abundant tar sands that could and no doubt under the right conditions would be developed.

Finally, coal liquefaction is a proven technology. Germany used it during the Second World War, and South Africa developed operating plants in response to the economic sanctions that were imposed against that country for many years, and allegedly can produce liquid fuel from coal economically at \$45 a barrel. With a large rollout and larger scale plants, this cost could undoubtedly be reduced, perhaps by fifty percent as suggested by Lackner and Sachs (2005).

The problem with such concerted strategy for reducing demand for petroleum, partly through conservation, partly through substitutes, is that Saudi Arabia (and perhaps others, such as Iran) could undermine any private investment based on an oil price in excess of \$x by selling oil for long enough below \$x to undermine the investment, in effect predatory pricing by a quasi-monopolist. Such a possibility strongly inhibits new investment in both high-cost conventional oil and in alternatives. Thus this strategy would be greatly enhanced by agreement among major users of oil not to accept oil priced below some agreed level, say \$20 a barrel. Such an agreement would be implemented by agreement to impose a variable levy on crude oil from Saudi Arabia or elsewhere priced below \$20, to bring the tariff-inclusive price to the targeted minimum. Such a tariff could be on an MFN basis; but so long as Saudi Arabia is not a member of the WTO it could legally be applied to Saudi oil alone, since that country is the major potential challenger to the strategy.

The main purpose of the strategy would be to reduce dependence on Persian Gulf oil. It would have the effect of weakening the oligopoly power of OPEC, but that would not be its main purpose. This contrasts with the suggestion of Morse and Jaffe (2005), who have proposed that Saudi Arabian oil be discriminated against unless Saudi Arabia opens its territory to private exploration and development. But compliance by Saudi Arabia with the Morse/Jaffe proposal would increase, not reduce dependence on Persian Gulf oil, although it would reduce state influence in oil pricing.

### Composition of the L20

Either of these two strategies requires international cooperation: the first mainly by Saudi Arabia, the second by the major exporters of manufactured products, including China, Brazil, and India, to assure a common cost of oil, a key industrial input. Here is the conundrum: it is difficult to discuss Strategy 1 without the presence of Saudi Arabia, since agreement by that country would be necessary; it is difficult to discuss Strategy 2 in the presence of Saudi Arabia. Thus the composition of the L20 will shape, or at least limit, its agenda. The composition of the group needs to be formulated with an eye on the prospective agenda, and on desired outcomes.

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