

An hourglass-shaped graphic with a globe inside. The top bulb is dark blue, and the bottom bulb is light blue. The globe is centered in the narrow neck of the hourglass. The top bulb has a dark blue cap. The bottom bulb has a light blue cap.

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*Caspian Oil and Gas: Production and Prospects*

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**Abstract.** There is a likelihood of large reserves of crude oil and natural gas in the Caspian Sea region, and a consequent large increase in oil and natural gas production from that area. Because diversity of energy sources is a consideration in Congressional deliberations on energy policy, this prospect could play a role in such discussions. However, there are notable obstacles to increases in Caspian Sea region production of oil and gas that may slow development.

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## CRS Report for Congress

# Caspian Oil and Gas: Production and Prospects

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### Summary

There is a likelihood of relatively large reserves of crude oil and natural gas in the Caspian Sea region, and a consequent large increase in oil and natural gas production from that area. Because diversity of energy sources and energy security are considerations in Congressional deliberations on energy policy, this prospect could play a role in such discussions. However, there are obstacles to increases in Caspian Sea region production of oil and gas that slow some development. This report will be updated as events warrant.

The Caspian Sea is a 700-mile-long body of water in central Asia bordered by Azerbaijan, Iran, Kazakhstan, Russia, and Turkmenistan. Among the five nations, only Iran is a member of the Organization of Petroleum Exporting Countries. Azerbaijan, Kazakhstan, and Turkmenistan became independent when the Soviet Union dissolved in 1991. The Caspian Sea region historically has produced oil and natural gas, but the region is considered to have large resources of oil and gas capable of much greater production.

### Current Production and Proven Reserves

The Caspian Sea region presently is a significant, but not major, supplier of crude oil to world markets, based upon estimates by BP and the Energy Information Administration (EIA), U.S. Department of Energy. The Caspian region produced 1.9 million barrels per day (bbls/day) including natural gas liquids in 2005, or 2% of total world output (**Table 1**).<sup>1</sup> Thirteen non-Caspian region countries each produced more than 1.9 million bbls/day in 2005. Caspian Sea region oil output has been higher, but suffered during the dissolution of the Soviet Union and the years following. Kazakhstan, whose production has risen rapidly since the late 1990s, accounted for 67% and Azerbaijan for 22% of regional crude oil output in 2005.

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<sup>1</sup> EIA. *Caspian Sea Region: Survey of Key Oil and Gas Statistics and Forecasts*, July 2006. The present report does not include Uzbekistan, which does not border the Caspian Sea, in the Caspian Sea region.

Based upon figures published by BP, Caspian Sea region oil production comes from proven (economically recoverable) reserves of 48 billion bbls (**Table 2**). This equals about 4% of total world proven reserves, and much more than BP's figure for U.S. reserves (29 billion bbls). EIA estimates of much larger "possible" reserves suggest a potential for much greater production. However, as indicated by analysis later in this report, there are obstacles to output increases both now and in the future.

The Caspian Sea region's relative contribution to world natural gas supplies is larger than that for oil. Its gas production of 3.0 trillion cubic feet per year (tcf/yr) in 2005 was 3% of world output. As with oil, gas production has been higher, but suffered during the Soviet Union's collapse and the following years. Turkmenistan is the largest producer; with production of 2.0 tcf/yr, it accounts for almost two-thirds of the region's gas output.

**Table 1. Oil and Gas Production in the Caspian Sea Region**

Country	Crude Oil <sup>a</sup> (thousands of barrels per day)				Natural Gas (trillion cubic feet per year)		
	1992	2005	2010		1992	2005	2010
			Low	High			
Azerbaijan	222	440	900	1,290	0.28	0.18	0.70
Kazakhstan	529	1,293	1,900	2,400	0.29	0.84	1.24
Russia <sup>b</sup>	n.a.	n.a.	200		n.a.	n.a.	n.a.
Turkmenistan	110	196	165	450	2.02	1.97	3.50
Total Caspian	861	1,929	2,965	4,140	2.59	2.99	5.44
WORLD	73,935	81,088	91,600		72.195	97.534	116.50 <sup>c</sup>

n.a. - Not available from specified sources.

a. Includes natural gas liquids.

b. Regions near the Caspian Sea.

c. Consumption.

**Sources:** BP Amoco. *BP Statistical Review of World Energy 2001*, June 2001; BP *BP Statistical Review of World Energy June 2006*; Energy Information Administration. *Energy Information Administration. Caspian Sea Region: Survey of Key Oil and Gas Statistics and Forecasts*, July 2006; EIA. *International Energy Outlook 2006*, June 2006, [<http://www.eia.doe.gov/oiaf/ieo/index.html>], viewed September 7, 2006.

Unlike oil, the region's proven reserves of natural gas are a higher proportion of the world total than is its natural gas production. In some instances, exploration efforts hoping to find oil have found gas instead. The estimate of proven reserves of natural gas in the Caspian Sea region for the end of 2005 published by BP — 257 tcf — represents 4% of the world total. Increases in Caspian region gas production face obstacles somewhat similar to those that challenge further oil development and production.

## Resource and Production Prospects

There is a likelihood of much greater additional reserves of crude oil and natural gas being found in the Caspian Sea region. This is supported by the fact that a number of oil companies have large stakes there. Much of the known reserves have not been developed yet, and development usually leads to discovery that prospects are larger than originally

**Table 2. Estimates of Oil and Gas Reserves and Resources**

Region	Country	Proven Reserves, BP, End of 2005		Possible Additional Oil/Gas EIA <sup>a</sup>
		Oil (billions of bbls)	Natural Gas (trillion tcf)	
Caspian Sea Region	Azerbaijan	7.0	48	32/35
	Iran <sup>b</sup>	0.1 <sup>c</sup>	n.a.	15/11
	Kazakhstan	39.6	106	92/88
	Russia <sup>b</sup>	0.3	n.a.	7/n.a.
	Turkmenistan	0.5	102	38/159
	TOTAL	47.5	257	184/293
Reference Areas	United States	29	193	47/271 <sup>d</sup>
	North Sea <sup>e</sup>	13	161	n.a.
	Saudi Arabia	264	244	n.a.
	WORLD	1,201	6,348	n.a.

n.a. - Not available from sources listed below.

a. Excludes proven reserves. Data from various sources compiled by EIA in *Survey* cited below.

b. Only resources near the Caspian Sea are included.

c. Data from EIA.

d. Undiscovered conventional oil and gas.

e. Includes Denmark, Germany, Netherlands, Norway, and United Kingdom.

**Sources:** BP. *BP Statistical Review of World Energy June 2006*; Penwell Publishing Company. *Oil & Gas Journal*, December 18, 2006; Energy Information Administration. *Caspian Sea Region: Survey of Key Oil and Gas Statistics and Forecasts*, July 2006; U.S. Geological Survey. "National Oil & Gas Assessment," at [<http://energy.cr.usgs.gov/oilgas/noga/>], viewed March 1, 2005.

estimated. Moreover, many areas remain unexplored. It is estimated that an *additional* 184 billion barrels of crude oil reserves are possible,<sup>2</sup> which would raise the total to almost five times its present level. This level of proven reserves would nearly equal the amount now held by Saudi Arabia and could come to about 15% of total world reserves. If the high output projection for 2010 in **Table 1** comes to pass, Caspian Sea region oil production would have more than doubled — to 4.1 million bbls/day.

The prospective increase in natural gas proven reserves appears to be much smaller in relative terms than for oil, but still very large. It is estimated that there are between 250 and 300 tcf in *additional* natural gas reserves in the region. Should this be the case, total Caspian region proven reserves in 2010 would put the region's proven gas reserve total at more than twice its present level and far exceed present Saudi Arabian natural gas reserves. Given such expectations, it is estimated that annual Caspian region natural gas production would reach 5.4 tcf by 2010. Any comparison of the volumes of Caspian Sea region oil and natural gas reserves versus those of Saudi Arabia, however, must be tempered by acknowledgment of the considerable advantage of Saudi oil and gas in terms of much lower costs of production and much easier market access. Also, whatever the quantities and the production costs of their energy resources, Caspian countries' ability

<sup>2</sup> *Caspian Sea Region: Survey of Key Oil and Gas Statistics and Forecasts*, July 2006.

to develop and bring them to market could depend to some extent on the ability to establish and maintain relationships with international energy companies.

## Present and Prospective Markets

In view of the above, Caspian Sea region countries potentially are large exporters of oil and gas. Caspian Sea oil and gas has several markets now and a wider variety of potential markets. These include nations trying to meet their economies' demand for energy and those that also wish to reduce their dependence on Persian Gulf energy.

Reflecting Soviet era dictates and infrastructure, much of Caspian region crude oil goes north and/or west — largely via pipeline to and/or through Russia to European markets. Some also goes by tanker through the Bosphorus straits to Western European markets via the Mediterranean. However, as indicated below, the trend is away from Russian and Bosphorus routes. Natural gas transportation, even more than oil, is tied to pipelines going mainly north and/or west through Russia and its monopoly pipeline system — Transneft. This, combined with the fact that Russia itself produces oil and gas, gives Russia the market power to levy transit fees on Caspian energy shipped through its transportation network, and to determine in some cases how much, if any, it is willing to transport. Also, because energy competes on a delivered-cost basis, reflecting transit fees, wellhead prices in the region suffer.

Caspian Sea countries thus have incentives to develop alternatives to routes through Russia — possibly a consortia of routes that would avoid long transits through Russia in reaching European and other markets *and* provide leverage in negotiating transit fees on shipments that do go through the Russian pipeline system. In addition, given Russia's early January 2006 cutting of natural gas supplies through Ukraine, it is likely that Western European countries — already seeking to diversify their sources of gas — will more actively seek non-Russian gas to reduce the effect of feared future cut-offs.

Caspian region energy sources are attractive to Turkey: they are close and offer Turkey an opportunity to offset part of its energy import bill through transit fees for shipments across its territory. Turkey's energy use is growing much faster than its economic output, making it a rapidly growing importer of both oil and gas; it already is a large importer of Russian gas. Also, Turkey has good relations with Caspian countries.

East Asian countries also are potentially attractive markets. Japan already imports a significant quantity of natural gas; and energy consumption in India and Pakistan is growing rapidly. Perhaps most significant, China's proven oil and gas reserves are small compared with the current and potential size of its economy, and the recent steep increases in its oil consumption. This has led, for example, to the building of an oil pipeline from Kazakhstan to China, which was completed and began to be filled in November 2005,<sup>3</sup> and consideration of a Kazakhstan-to-China natural gas pipeline.<sup>4</sup> The prospects of Caspian energy exports to the regions identified above, however, may be

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<sup>3</sup> Martin Clark, "Beijing Triumphs with Inauguration of Kazakhstani Pipe," *FSU Oil & Gas Monitor*, December 21, 2005, p. 2.

<sup>4</sup> "Kazakhstan, China Consider Gas Pipeline Construction," *FSU Oil & Gas Monitor*, December 7, 2005, p. 4.

limited by newly expanding or developing non-Central Asian energy exports to those regions. These developments include expansion of North Africa's gas export capacity and discovery of a large natural gas province in and near Egypt.

## Challenges to Further Development

There are, however, inter-related geographical, political, economic, technological, legal, and psychological obstacles to the further exploration for, and development of, Caspian Sea region energy resources, some with implications for U.S. energy security.

Because the Caspian Sea is landlocked and the region's nations are distant from the largest energy markets, transportation must at least begin by pipeline, followed in many cases by tanker through the shallow and congested Bosphorus straits. Pipelines from the region completed before 1997, except those in northern Iran, were routed to Russia and designed to link the together the states of the former Soviet Union. The several pipelines now transporting Caspian region oil westward, and thus to European and, potentially, to U.S. markets, have sufficient capacity to handle present production (**Table 3**). Completion of the CPC pipeline from Kazakhstan's Tengiz oilfield to Novorossiisk (Russia) on the Black Sea in 2001 and its planned expansion is notable, but the *effective* capacity of the CPC line, and that of others, may be constrained by limits on tanker passage through the Bosphorus, previously noted. The capacity of the BTC pipeline, which has begun delivering oil, plus that of other pipelines transporting oil from the Caspian Sea and surrounding area totals 2.2 million bbls/day.

However, Iran now can compete somewhat with the BTC pipeline through oil "swaps" that ultimately divert Caspian region oil away from Western, including U.S., markets. Iran has enlarged its tanker terminal at Neka on the Caspian Sea coast, enhancing its capacity to deliver Caspian oil to refineries for local consumption, with an equivalent amount of Iranian oil exported through Persian Gulf terminals.

New pipelines to serve east Asian markets have economic potential but could be lengthy, and possibly entail transit through Afghanistan, Iran, and/or Pakistan. A pipeline that avoids these nations is the recently completed Kazakh 620 mile oil export pipeline from Atasu in central Kazakhstan to Alashankou, adjacent to the Xinjiang region of China. With an initial capacity of 400,000 bbls/day, it began delivering oil in May 2006. Routes to east Asian markets via Iran would include shipping through the Persian Gulf.

Complicating the pipeline issues is the fact that potential pipelines could be disrupted by regional conflicts. These include the Armenia-Azerbaijan dispute over Nagorno-Karabakh, longstanding tension between India and Pakistan, continued unsettled conditions in Afghanistan, intermittent military activity in Chechnya, and Chechen rebels' use of Georgia's Pankisi Gorge region as a base and refuge.

Deciding upon pipeline routes that have a reasonable assurance of security and are politically acceptable to parties with influence in the region are major hurdles in the development of Caspian energy resources. On the purely economic side, the longer the pipeline route, the less attractive it is to producers, other things being equal, inasmuch as energy competes on a delivered-cost basis and transit fees (based upon distance) effectively lower the wellhead price received by producers. Because transit fees are a source of revenue to governments, politics as well as economics come into play in

pipeline route selection. Built-in precautions to minimize environmental impacts, particularly in and around the Caspian Sea, also add to pipeline costs.

In addition, much of Caspian Sea energy resources are offshore, requiring special large drilling rigs. Very limited rig production capacity in the relatively isolated region makes the acquisition of rigs expensive and logistically difficult, hampering development of Caspian energy resources. This situation is easing a little as a new rig was added to the fleet recently and another is in the production pipeline.

Full realization of the energy potential of the Caspian region also is impeded by the unresolved legal status of the Caspian Sea. Despite a number of efforts, so far only Azerbaijan, Kazakhstan, and Russia among the littoral states have reached agreement on delineating ownership of the Sea's resources or the rights of development. And this does not prevent disputes between these countries and Iran and Turkmenistan. In addition, Turkmenistan has made much less progress in developing its hydrocarbon resources than Azerbaijan and Kazakhstan.

Despite the obstacles discussed above, energy development in the Caspian Sea region is proceeding and is likely to proceed further given the widely perceived prospect of very large energy resources in the region. The pace of development, however, may be less rapid than might otherwise be the case.

**Table 3. Selected Oil Pipeline Routes from the Caspian Sea Region**

Pipeline	Route	Length (Miles)	Capacity (bbls/day)
Atyrau-Samara	Atyrau, Kazakhstan, to Samara, Russia	432	310,000
Baku-Novorossiysk	Baku, Azerbaijan, via Chechnya, to Novorossiysk, Russia/Black Sea (northern route)	868	100,000
Baku-Novorossiysk	Baku to Novorossiysk via Dagestan, Russia	204	120,000
Baku-Supsa	Baku to Supsa, Georgia/Black Sea	515	100,000
Baku-Ceyhan (BTC)	Baku to Tbilisi, Georgia, to Ceyhan, Turkey/Mediterranean Sea	1,040	1,000,000
Caspian Pipeline Consortium (CPC)	Tengiz oil field, Kazakhstan, to Novorossiysk	980	560,000
Iran Oil Swaps	Neka (Caspian port) to Persian Gulf; oil is swapped for equivalent amount	n.a.	300,000
Kazakhstan-China (being filled)	Atasu (Kazakhstan) to Alashankou (China)	620	400,000

**Sources:** Numerous media sources through mid-2006 supplementing Energy Information Administration (EIA) *Caspian Sea Region Country Analysis Brief*, September 2005, EIA. *Caspian Sea Region: Reserves and Pipelines*, Table 4, July 2002; EIA. *Kazakhstan Country Analysis Brief*, July 2005. For EIA *Country Analysis Briefs* and related data, see [<http://www.eia.doe.gov/emeu/cabs>].

n.a. - Not applicable