

4 Offshore Hydrocarbon Reserves and Resources in the Caspian and Black Seas and the Sea of Azov

The Caspian, Black Sea and the Sea of Azov subsoil needs substantial supplemental exploration. First of all, such exploration is necessary for the Russian sectors of the Black Sea and the Sea of Azov, where until now, exploration has been limited to seismic studies. As a result, estimates of reserves and resources vary widely over time, and can either increase (in most cases) or decrease.

An indirect evidence of poor geological knowledge of the Caspian and Black Sea and the Sea of Azov subsoil is the suspension of many projects due to failure to confirm reserves after exploration drilling (such as Inam in Azerbaijan and Tyub-Karagan, Atash and Kurmangazy in Kazakhstan).

4.1. Caspian Sea

Exploration of the Caspian Sea for hydrocarbons started in the mid-1940s, and was performed mostly in Azerbaijan and Turkmenistan. At the same time, the Middle and Northern Caspian remained unexplored. The main deterrent was a lack of environmentally safe exploration and development methods for offshore fields in highly sensitive ecological systems. In the mid-1970s, the Northern Caspian was designated the status of a preserved area.

Exploration was concentrated mainly in the Southern Caspian until the collapse of the USSR. 2D seismic studies of 225,000 linear kilometers were performed from 1980 to 1992; of this, more than two thirds (149,000 kilometers) covered the Southern Caspian, 51,000 kilometers were in the Middle Caspian, and only 25,000 kilometers were in the Northern Caspian.

After the USSR collapsed, all the Caspian states boosted their activity in the Caspian Sea. Regional exploration had been finished in the Caspian Sea by 1993. More detailed exploration covered only some areas in the Middle and Southern Caspian. As a result, 225 potential hydrocarbon pockets had been found by that time, 47 of which were prepared for exploration drilling. Drilling operations revealed 20 oil and gas fields, predominantly in the Southern Caspian, near the coasts of Azerbaijan and Turkmenistan.

As a result of exploration, estimates of reserves and resources were continuously corrected, and mainly increased as shown in the table below.

Table 4.1. Correction of official and expert estimates of Caspian offshore hydrocarbon resources from 1988 through 2001, billions of toe

Reserves	Sector					
	Azerbaijan	Iran	Kazakhstan	Russia	Turkmenistan	Total: Offshore
Proven recoverable reserves (ABC1C2) – estimates from 1988 to 1991	0.880	-	-	0.247	0.107	1.012
Official estimate of total initial in-place resources (ABC1C2) from 1988 to 1991	2.76	-	2.95	1.15	1.5	8.36
Expert estimate of total initial in-place resources - 2001 estimate by Russian Ministry of Energy and Ministry of Natural Resources (D1+D2)	7.400	1.500	7.500	2.950	2.600	21.950
Expert estimate of total initial in-place resources – 2001 LUKOIL estimate (D1+D2)	3.8	-	8.1	1.7	2.2	15.8

Source : Russian Ministry of Energy, Ministry of Natural Resources and LUKOIL

At present, there is no uniform estimate of hydrocarbon reserves or resources for the offshore Caspian Sea.

According to Western company estimates, Caspian reserves can be anywhere from 26 bn toe to 40 bn toe.

On the other hand, international exchange traders in 2010 used the following estimates for proven reserves, including both offshore and mainland areas:

- Azerbaijan – approximately 9.5 bn tons of oil and 850 bcm of gas
- Turkmenistan - approximately 0.8 bn tons of oil и 7,5 trillion cubic meters of gas
- Kazakhstan – around 4 bn tons of oil and 2.4 trillion cubic meters of gas

4.1.1 Azerbaijan's Sector

According to estimates produced in the first half of 2008, forecast recoverable reserves in Azerbaijan's sector of the Caspian Sea are about 3.7 billion tons of reference fuel.

Exploration in this sector often revises the commercial volumes of initial hydrocarbon reserve forecasts.

For example, in the last 10 years nine international exploration and production consortiums discontinued their activity due to unproven reserves.

In a latest example of this trend, in 2005 ExxonMobil refused to continue exploration drilling in the Nakhichevan structure as it failed to reveal significant oil and gas reserves after drilling the first exploration well. The well cost ExxonMobil nearly \$80 million, and its depth exceeded 6,000 meters. Drilling in the D-222 structure of the Yalama-Samur block and the Inam block had the same result.

Reserves from projects in commercial development, such as Azeri-Chirag-Guneshli (ACG) and Shakh-Deniz, may be estimated with greater accuracy.

ACG's recoverable reserves are about 1 bn tons of crude oil and 140 bcm to 150 bcm of associated gas.

Reserves of deep-seated gas in the ACG fields are estimated at 500 bcm.

Shakh-Deniz's proven reserves are about 1,200 bcm and 280 million tons of gas condensate.

4.1.2 Kazakhstan's Sector

Currently resources in Kazakhstan's sector of the Caspian Sea are forecast at 8 billion tons of reference fuel based on the estimate of the Kazakh government. (See above for the international exchange estimate.)

The most developed project in Kazakhstan's sector of the Caspian is the Northern Caspian project, which includes the Kashagan field. Recoverable reserves of hydrocarbon fluids from this pool (according to a 2010 estimate) are as follows:

- Kashagan – 1.475 bn tons (owned by the government of the Republic of Kazakhstan)
- Kalamkas-Offshore – 57 million tons
- Southwest Kashagan – 6 million tons
- Aktoty – 100 million tons
- Kairan – 56 million tons

Total recoverable oil reserves under the project are estimated at 1.694 bn tons. Inferred gas reserves held by the project fields are estimated at 10 trillion cubic meters.

On the other hand, many projects in the Kazakh sector that had been considered promising were shut down in 2010 and 2011. These include:

- Tyub-Karagan
- Atash
- Kurmangazy
- South Zaburunye

The remaining projects in the Kazakh sector are in varying exploration stages. It is quite likely that their reserve and resource estimates will be revised either upward or downward.

4.1.3 Russian Sector

Over the past years (from 2005 to 2011), the estimate of recoverable resources for the Russian sector of the Caspian has frequently changed. A 2005 estimate by the Russian Ministry of Natural Resources put the initial in-place resources in the Russian Caspian sector at 4.6 percent of Russia's total offshore resources.

More specifically, in 2005 experts (primarily from LUKOIL) estimated these resources at 4.5 billion tons of reference fuel (LUKOIL's share being 42 percent of the total, or 1.93 billion tons).

In the first half of 2008 the estimates changed. Total resources were estimated between 3.5 and 4.0 billion tons of reference fuel (LUKOIL's share being 85 percent of the total, or 2.7 to 3.0 billion tons).

More than 98 percent of all recoverable oil and gas reserves in the Russian sector are in the fields discovered in the Northern block. As for other projects in the Russian sector, only hydrocarbon resources could generally be estimated as of the beginning of autumn 2008.

Based on this, as of the beginning of 2008, recoverable oil and condensate reserves were estimated by categories (A+B+C1) at 34 million tons and C2 reserves were estimated at about 285 million tons, while reserves of free gas were estimated by categories (A+B+C1) at 110 bcm, and C2 reserves were estimated at 380 bcm.

In 2011 the Russian Ministry of Natural Resources published new data on explored reserve estimates for the Russian sector of the Caspian Sea. These estimates put the reserves at 2.95 bn tons of oil and 3.1 trillion cubic meters of gas.

4.1.4 Turkmenistan's Sector

According to the Ministry of the Oil and Gas Industry and Mineral Resources of Turkmenistan, recoverable reserves in Turkmenistan's sector of the Caspian Sea were forecast at 2.2 billion tons of reference fuel as of the beginning of 2008. (See above for international exchange estimates.)

The most reliable data refer to Cheleken and Block 1, where hydrocarbons have already been produced.

Exploration drilling continues in Block 11 and Block 12, which may result in revisions to the reserve estimates.

According to Dragon Oil, the Cheleken fields hold 177.8 million barrels of proven oil reserves (643.4 million barrels of proven and probable reserves) and, according to optimistic forecasts, 40.1 bcm of gas.

According to Petronas estimates based on exploration drilling results, recoverable reserves of Block 1 total at least 1,000 bcm of gas, more than 200 million tons of oil, and more than 300 million tons of gas condensate.

Meanwhile, the two exploration wells drilled in blocks 11 and 12 came up dry. Project operator, Wintershall, has declined to share reserve data on the blocks while the geological exploration program is ongoing.

Reserve data for blocks 21 and 23 may be revised as the geological exploration progresses.

4.2. Black Sea

The Ukrainian sector is the most developed in the Black Sea. Some gas fields near Crimea are entering the stage of declining production, while other fields (near Snake Island) are just about to enter commercial development.

At the same time, exploration (without exploration well drilling) is most typical in the Russian, Georgian and Abkhaz sectors.

4.2.1 Georgia's and Abkhazia's Sectors

Inferred in-place oil reserves in the Georgian sector are estimated at 200 million tons. This estimate was produced without exploration drilling in the Georgian sector of the Black Sea.

Inferred in-place oil reserves in the Abkhaz sector of the Black Sea are estimated at 220 million tons to 270 million tons. This estimate was also produced without exploration drilling in this sector.

4.2.2 Russian Sector

Recoverable oil resources in the sector are forecast between 650 and 700 million tons of oil and 400 MMcm of gas. No exploration drilling has been conducted in the Russian sector of the Black Sea.

The resources are located in the Tuapse depression, in the South-East and North-West areas of the Western Black Sea and Southern Black Sea blocks (including the Shatsky ridge). Exploration drilling is unlikely to start in the Russian sector before 2016. It will commence in areas where the sea depth is 2,000 meters or more.

4.2.3 Ukrainian Sector

According to Ukrainian experts, recoverable resources in the Ukrainian sector of the Black Sea in 2008 were about 1.207 billion tons of reference fuel, including 604 million tons in the northwestern offshore portion of the Black Sea, 346 million tons in the continental slope and abyssal trough, and 257 million tons on the shelf near Kerch.

Recoverable gas reserves in the Chernomorneftegaz (Ukraine) fields are estimated at about 40 bcm.

Commercial reserves of the Subbotinskoye field are put at about 100 million tons of oil. According to Chernomorneftegaz, this figure was confirmed as a result of exploration drilling.

In January 2012 NAK Naftogaz Ukrainy's Chairman of the Board Yevgeni Bakulin made public new data on hydrocarbon reserves of the Ukrainian sector of the Black Sea. Potential hydrocarbon reserves in the shallow portion of the sea were estimated at 1.5 bn tons of reference fuel, while potential reserves in the deep water portion were estimated between three billion tons and six billion tons of reference fuel.

4.3. Sea of Azov

The Ukrainian sector is the most thoroughly explored in the Sea of Azov. Three gas fields are now under development there, and three other fields have been suspended because their project operator – GAO Chernomorneftegaz – does not have sufficient funding. The best explored area in the Russian sector is a portion of the Priazovneft Temryuk-Akhtar project.

4.3.1 Russian Sector

Oil and gas reserves and prospective resources in this sector are concentrated in the Priazovneft Temryuk-Akhtar project area. Currently recoverable oil reserves from the project are about 55 million tons. Estimates of prospective oil and gas resources in that area, according to Priazovneft, are given in the table below.

Table 4.2. Estimates of prospective oil and gas resources of the Temryuk-Akhtar project (as of 2009)

Structure	oil, ,000 tons	dissolved gas, MMcm	free gas, MMcm
Gelendzhik	50,038	10,886	14,589
Pribrezhnaya-more	80,225	60,747	0
Tizard-more	32,226	1,022	0
Aprelskaya	3,796	2,927	0
Zhesterovskaya	4,774	4,544	0
Novaya	7,777	2,512	0
Total:	178,836	82,638	14,589

Source: OAO NK Priazovneft

Note. The table shows estimates as of the beginning of 2009.

4.3.2 Ukrainian Sector

The Ukrainian sector of the Sea of Azov remains the most explored. Six fields, primarily with gas reserves, are located there. Recoverable reserves of developed and suspended gas fields are estimated at 20 bcm.

Recoverable resources in the sector are estimated at 325 million tons of reference fuel, according to GAO Chernomorneftegaz (Ukraine).

5 Principal Companies Involved in Offshore Production in the Caspian and Black Seas and the Sea of Azov

5.1. Caspian Sea

After 1991, the formerly single Soviet sector of the Caspian Sea was split among Russia, Kazakhstan, Turkmenistan and Azerbaijan. Exploration occurs in each of them, and some discoveries are prepared for commercial development. Nevertheless, the countries use different methods to attract developers. Russia focuses on participation by large Russian oil and gas companies in projects, while Azerbaijan, Kazakhstan and Turkmenistan actively co-operate with foreign companies, including Russian companies.

5.1.1 Azerbaijan's sector

The main tendency in Azerbaijan's sector of the Caspian is attracting a broad number of foreign investors to develop oil and gas fields, while the state regulates the situation.

The State Oil Company of the Azerbaijan Republic (SOCAR) is responsible for monitoring and exercising control over project participants. In particular, SOCAR has a 11.60 percent share and a 10 percent share the two largest projects - Azeri-Chirag-Guneshli (ACG) and Shakh-Deniz – respectively.

Attracting large transnational companies solves the problems of investments and technologies in field development, and the PSA regime is often used in Azerbaijan.

The main players in the sector are:

- BP (Azeri-Chirag-Guneshli, Shakh-Deniz)
- Chevron (ACG)
- ExxonMobil (ACG)
- Amerada Hess (ACG)
- Inpex Corp (ACG)
- Itochu Oil (ACG)
- StatoilHydro (ACG, Shakh-Deniz)
- TPAO (ACG, Shakh-Deniz)
- LUKOIL (Shakh-Deniz)
- Total (Shakh-Deniz)
- NICO (Former OIEC, Iran, Shakh-Deniz)

The Inam project, one of participants in which was Royal Dutch/Shell, is currently suspended as drilling failed to confirm hydrocarbon reserves in the contract area.

Devon Energy, one of stakeholders in the ACG project, in 2010 sold its 5.63 percent ownership share to BP (3.29 percent), Chevron (0.99 percent), Inpex (0.96 percent) and Itochu (0.38 percent). Thus, Devon Energy ceased its operations in the Azeri sector of the Caspian Sea.

5.1.2 Kazakhstan's Sector

Currently seven hydrocarbon exploration and production projects are being implemented in Kazakhstan's offshore sector on PSA terms:

- North Caspian
- Zhambai
- Zhemchuzhiny (Pearls)
- Buzachi Neft (North-East Karaturun)
- Project N (Nursultan)
- Zhambyl
- Satpayev

The Kurmangazy, Tyub-Karagan and Atash projects were suspended in 2011 as exploration programs did not confirm commercial hydrocarbon reserves. This resulted in decreased presence of Russia's LUKOIL in the Kazakh sector of the Caspian. The only project where the Russian oil company remains a stakeholder is Zhambai. Rosneft and Zarubezhneft, which only participated in the Kurmangazy project, have effectively left the region.

Foreign companies have been widely used for developing a majority of the above projects. Kazakhstan's authorities closely control their activities. The participation by the state company KazMunayGaz (sometimes through its subsidiary KazMunayTeniz) in the largest projects (North Caspian, Zhemchuzhiny, Zhambai, Project N, Zhambyl and Satpayev) is one method of exerting control.

The international industry leaders - Total, ExxonMobil, Agip, Royal Dutch/Shell, ConocoPhillips, Inpex – participate in the most advanced project, North Caspian. This fact may be explained by the desire to attract foreign investment, and by Kazakhstan's wish to gain access to advanced technologies.

Royal Dutch/Shell and Oman Oil (through their subsidiary companies) participate in the Zhemchuzhiny project. Repsol operates within the framework of the Zhambai project. Korean National Oil Company (KNOC) is involved in the Zhambyl project.

In 2011 Statoil entered Kazakhstan's Sector of the Caspian Sea. The company signed a baseline agreement with KazMunayGaz on the Abai block.

In 2011 India's ONGC Videsh Limited joined the Satpayev project.

The operation of independent TOO Buzachi Neft (not to be confused with Buzachi Operating Ltd.) in the offshore Caspian is an exception to the major trend of attracting large foreign companies.

5.1.3 Russian Sector

The following companies currently operate in the Russian sector of the Caspian Sea:

- LUKOIL
- Rosneft (shareholder of the Caspian Oil Company)
- Gazprom (shareholder of TsentrCaspneftegaz, OOO Caspian Oil Company)
- Gunvor (shareholder of PetroResurs, controlled by Gennadi Timchenko)
- Wintershall (Germany)
- Lundin Petroleum (Sweden, shareholders of PetroResurs)
- Total (Khvalynskoye field)
- GDF Suez (Khvalynskoye field)
- Timan Oil and Gas (registered in the UK, controlled by Alexander Lebedev, owner of National Reserve Bank)

The largest player in the Russian sector of the Caspian Sea is LUKOIL. It achieved the greatest success in developing the Northern block, put the Yu. Korchagin field into commercial development, actively explores the V. Filanovsky field and works on a parity basis with Gazprom in the Central block. Its dominating position in the Russian sector is expected to continue as 85 percent of the sector's forecast resources are concentrated within its licensed blocks.

Currently Rosneft continues to operate in the North Caspian area indirectly through Caspian Oil Company.

The third largest player in the sector is Gazprom, which develops the Central block and the North-Caspian area through its subsidiaries, TsentrCaspneftegaz and OOO Caspian Oil Company.

Timan Oil develops the Izberbashsky and Sulaksky blocks (both owned by Timan Oil).

Lundin Petroleum plans to leave the region since its exploration program failed to demonstrate significant hydrocarbon reserves in the Lagansky block.

5.1.4 Turkmenistan's Sector

On the whole, the situation with investor selection in Turkmenistan's sector of the Caspian Sea is very similar to Azerbaijan's sector: foreign oil companies are attracted for development. These companies are:

- Dragon Oil (Cheleken)

- Petronas Charigali (Block 1)
- Wintershall (Block 11 and Block 12)
- Maersk Oil (Block 11 and Block 12)
- ONGC Mittal Energy Ltd (Block 11 and Block 12)
- RWE (Block 23)
- Itera (Block 21, potentially blocks 29, 30 and 31)
- Zarubezhneft (Block 21, potentially blocks 29, 30 and 31)
- Rosneft (may enter the project for Block 21 and, potentially, blocks 29, 30 and 31)

5.2. Black Sea

The Ukrainian sector of the Black Sea is the most extensively developed – many fields have been developed for a long time and some (for example, Golitsyno gas field) have even reached the stage of declining production. Exploration continues in the Russian sector. At the same time, development in the Georgian sector progresses slowly, and no significant work has started in the Abkhaz sector.

5.2.1 Georgian and Abkhazia's Sectors

A consortium comprised of Anadarko (48 percent), Gruzneft (24.5 percent), Turkish Petroleum (13.5 percent), Unocal (10 percent), and JKC (four percent) conducts operations in the sector (in the offshore area, along the coastline from Adzharia to Poti). No detailed data concerning their results are available.

According to the Georgian oil and gas agency, Anadarko has not left the country and the authorities never refused to extend the company's license. Currently negotiations are ongoing to agree on the second phase of the contract, which involves commencement of exploration and production drilling.

In spring 2009 the Abkhaz authorities and Rosneft signed an agreement under which Rosneft, among other things, will begin operations in the adjacent offshore area. As of the beginning of 2012, however, no work had yet begun.

5.2.2 Russian Sector

The largest player in the Russian sector of the Black Sea is Rosneft, which conducts operations in the Tuapse depression, implements the Western Black Sea project and at the end of 2010 was granted an exploration license for the Southern Black Sea block. In 2011 the company was engaged in negotiations to acquire ZAO Chernomorneftegaz. The transaction, however, was not finalized.

ZAO Chernomorneftegaz (Russia) is another large player, which holds four exploration licenses — two plots in the South-Eastern and North-Western areas of the Black Sea, plus the Paleozoisky and Visokosny blocks in the Sea of Azov. In 2011 reports emerged suggesting that the company's licenses for the South-

Eastern and North-Western areas in the Black Sea may be revoked and then re-issued, without competition, to Rosneft.

5.2.3 Ukrainian Sector

The primary operator in this region is the Ukrainian State Joint-Stock Company (GAO) Chernomorneftegaz (“Chernomornaftogaz” in Ukrainian transliteration, a part of Naftogaz of Ukraine), which specializes in the development and operation of offshore gas and oil fields. The company’s assets include the following:

- An onshore operation base to support offshore operations and field development, including a production facility for steel structures, platforms, sea gas pipeline sections, mechanical repair shops, warehouses, handling facilities, etc.
- The specialized port of Chernomorsk with 1,700 meters of dockage, a well-protected offshore area, a shipyard and a subsea engineering site
- An engineering fleet consisting of 22 waterborne vehicles, including 12 vessels such as crane ships, replenishment ships, rescue and salvage, firefighting, diving and other ships
- Nine fixed offshore gas platforms with processing facilities, control, communication facilities and other equipment
- Two Sivash and Tavrida mobile jack-up drilling rigs, which can drill exploration and production wells up to 6,000 meters deep in areas where the water depth is 70 meters. The Tavrida jack-up drilling rig is equipped with a cantilever mast and can drill production wells from fixed offshore platforms
- The Crimean gas transportation system, connected with the Ukrainian gas transportation system, consisting of more than 1,200 kilometers of gas trunklines including 282 kilometers of offshore pipelines
- Underground gas storage facility with a first-stage capacity of 1 bcm and total capacity of 3 bcm

To drill production wells, Chernomorneftegaz in 2011 purchased a rig capable of operating in 90 m or more water depths. It began operation in the first quarter of 2012 in the Subbotinskoye field. Chernomorneftegaz plans to buy another rig in 2012.

LUKOIL has entered the Ukrainian sector of the Black Sea. In 2010 the Ukrainian Government approved a memorandum on an equitable joint venture (50 percent to be owned by Chernomorneftegaz and 50 percent by LUKOIL), which will develop the Odesskoye, Bezymyannoye and Subbotinskoye fields. In early February 2012 the joint venture constituent agreement was approved by the Ukrainian Ministry of Energy and Mining.

Vanco Energy Company operates at the Prikerchensky block. The company won the bid for development of this block in April 2006. In May 2008 the Ukrainian Cabinet of Ministers unilaterally withdrew from the contract with Vanco. Nevertheless, in late June 2008 the Interagency Working Group tasked with verifying legality of the contract with Vanco ruled the contract legal and valid. In 2011, Ukraine and Vanco signed an amicable settlement agreement through court proceedings.

5.3. Sea of Azov

Fields that have been explored or prepared for development are located in the Ukrainian sector of the Azov Sea, while operators still drill exploration wells in the Russian sector.

5.3.1 Russian Sector

OAO Priazovneft oil company, which is implementing the Temryuk-Akhtar project, is a notable player in the Russian sector. The company's shareholders are Rosneft (57.5 percent) and LUKOIL (42.5 percent).

Another significant player is ZAO Chernomorneftegaz (Russia). The controlling interest in ZAO Chernomorneftegaz is held by Novolipetsky Iron and Steel Works, and minority shareholders include Rosneft and various Russian and foreign individuals. The company holds exploration licenses for the offshore Paleozoisky and Visokosny blocks in the Sea of Azov. In 2011 Rosneft was engaged in negotiations to buy Chernomorneftegaz, but the transaction was never finalized.

5.3.2 Ukrainian Sector

The largest player in this sector of the Sea of Azov is GAO Chernomorneftegaz (Ukraine). It holds licenses for six fields: Strelkovoye, Morskoye, North Kerch, North Kazantip, East Kazantip and North Bulganak. Apart from commercial development in these fields, the company continues with exploration operations.

6 Offshore Exploration and Production Projects in the Caspian and Black Seas and the Sea of Azov

6.1. Caspian Sea

6.1.1 Azerbaijan's Sector

Azeri-Chirag-Guneshli (ACG)

Reserves and Resources

ACG recoverable resources are estimated at one billion tons of oil and 140 bcm to 150 bcm of associated gas. The reserves of deep-seated gas in ACG fields are estimated at 500 bcm.

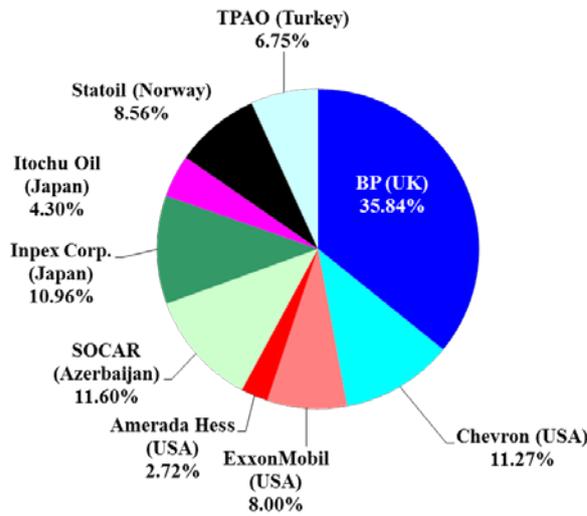
Conditions

The well depth is between 2,500 meters and 3,500 meters, while the water depth is up to 300 meters.

Players (Project Operators)

BP Azerbaijan (BP’s subsidiary) is the exploration and production licensee, and BP is the operator.

Figure 6.1. Azeri-Chirag-Guneshli project participants



Source: company data

Note. In 2010 Devon Energy sold its 5.63 percent ownership share to BP (3.29 percent), Chevron (0.99 percent), Inpex (0.96 percent) and Itochu (0.38 percent).

Exploration Status

The main scope of exploration work in the block has already been completed. The project continues with implementation and in the near future will enter the full-scale development stage.

Production and Drilling

In 2008 the Azneft production association put 15 production wells into operation, including eight oil wells and seven gas wells. The new wells were drilled as a part of the 2006-2008 SOCAR gas program.

As of the beginning of 2012, the ACG field had 84 wells (57 producers and 27 injectors). Current field development plans for this project involve bringing the total number of wells to 312.

Azerbaijan International Operating Company (AIOC) plans to implement the forth stage of Azeri-Chirag-

Guneshli development or, more specifically, to develop the Balakhany productive reservoir throughout the whole contract area. In 2007 ACG produced about 33 million tons of oil. Production totaled 47

million tons in 2008, 40.3 million tons in 2009, 40.6 million in 2010 and 36.9 million tons in 2011. Production of associated gas totaled 12.2 bcm in 2010.

In 2011 KBR (USA) signed an agreement with BP to develop a new production project, Chirag, as part of the Azeri-Chirag-Guneshli development. KBR will design a new platform to be installed at these fields. The new project, Chiragoilproject (COP), is scheduled to begin in 2013.

If successful, the project, which includes installation of a new production platform, will help raise daily production by 100,000 barrels per day. The COP platform will be installed at a water depth of about 170 meters. It is designed to drill 48 wells. The COP project will use existing pipeline infrastructure. The company also plans to build a second platform.

Oil reserves under this project are estimated at 331 million barrels. The first platform, which is expected to be completed in 2013, will drill 28 producers and 17 injectors. First oil will be produced in the third quarter of 2013. To expedite the project, early drilling will take place from the Dede Gorgud floating semi-submersible drilling rig.

Completion of the Chirag platform in 2013 will help produce 100,000 barrels of oil per day and extend the period of stable production by a year. It is expected that construction of a platform at Azeri in 2015 will produce similar results.

Investment Program

In 2008 BP expected to spend \$611 million in operating expenses and \$1.93 billion in project-related capital investments.

In 2009 the project operating expenses totaled \$426 million, while capital expenses totaled \$1.648 bn.

In 2010 the project's operating expenses equaled \$628 million, while capital expenses amounted to \$1.998 bn.

Facilities and Contractors

Production is being performed from the following platforms: Chirag, Central Azeri (CA), Western Azeri (WA), and Eastern Azeri (EA).

The Chirag platform develops 19 wells (13 oil production and six water injection wells), and the CA platform develops 15 wells (12 oil production and three gas injection wells). Nine wells, eight of which are oil producers, are being developed from the WA platform. Currently, oil is produced from seven oil production wells at the EA platform.

In April 2008 production started in the deep-water section of the Guneshli field. Production drilling continued in this area throughout 2008. Well 78 was put on stream here in spring 2009.

The operator uses the Dede Gorgud rig for drilling; the Azerbaijancrane ship and Israfil Guseinov pipe-laying barge provide project support services.

Gas is transported via a subsea gas pipeline, which is over 48 kilometers long. Crude oil is transported via a 178-kilometer pipeline from the Chirag-1 platform to the special terminal built in Sangachaly.

Azneft production association (a SOCAR affiliate) acted as a drilling contractor.

7 Forecast of Exploration and Production Drilling in Offshore Caspian and Black Seas and the Sea of Azov

The forecast exploration and production drilling scopes and forecast production rates in different sectors of the Caspian and Black seas and the Sea of Azov is methodologically based on three scenarios, which differ from each other with respect to the following risks:

- a) inaccurate estimates of reserves / resources in a given license area (geological risk);
- b) unsettled disputes concerning sea border delimitation (political risk);
- c) insufficient financing to implement the projects.

In accordance with the above, the following assumptions were made to create **Scenario 1 (baseline scenario)**:

The following fields will be at the commercial production stage from 2008 through 2020:

- Fields that are completely ready for production (for example, fields located within the Russian northern section of the Caspian Sea)
- Fields that are being developed (e.g. Azeri-Chirag-Guneshli, Azerbaijan)
- Explored fields with reserves proven by successful exploration drilling

Scenario 1 assumes that work will be completed in the exploration drilling stage for those fields where exploration drilling did not reveal any hydrocarbon inflows (for example, the Kurmangazy structure in Kazakhstan's sector of the Caspian Sea, and the Inam project in Azerbaijan).

Scenario 2 (high scenario) assumes that, in addition to the fields specified in **Scenario 1**, the development process will also include those fields for which exploration drilling gave no negative results, and fields where initial exploration drilling is scheduled to start in the next three or four years. It is further assumed that exploitation will continue in new fields resulting in a confirmation of commercial reserves.

Scenario 3 (optimistic scenario) assumes – in addition to **Scenario 2** – that the disputes concerning sea border demarcation and/or subsoil resource sharing will be settled by 2015 or 2017 (this assumption has a high temporal risk). This time period is tentative, as previous experience shows that even negotiations already in process (for example, between Russia and Ukraine, Ukraine and Romania) have often stalled for various reasons.

It is assumed, for analysis purposes, that all projects have sufficient financing.

7.1. Caspian Sea

7.1.1 Azerbaijan's Sector

At the turn of the century, about 140 prospective oil- and gas-bearing structures that could potentially produce commercial hydrocarbon inflows were found in Azerbaijan's sector of the Caspian Sea. Resources estimates in the sector were reduced as a result of subsequent exploration work and, in some cases, exploration drilling (from 1997 through 2002).

In particular, after Chevron explored the Apsheron block in the late 1990s, it conceded that only "insignificant hydrocarbon reserves" had been found there. In September 2011, however, another subsoil user – Total – announced a discovery of a field in Apsheron with considerable hydrocarbons reserves.

Another foreign operator, Agip (Italy), disclosed negative results from drilling an appraisal well in the Kurdish block.

Later, US company ExxonMobil reported an absence of oil in an exploration well drilled in the Bogus littoral zone.

TotalFinaElf (France) refused to drill a second exploration well in the Lenkoran-Tanysh-Deniz block after unsuccessful results from the first well.

Drilling in the Yalama-Samur block did not show any hydrocarbon inflow either. The project has been *de facto* suspended.

In 2009, the operator suspended the Inam project as exploration drilling proved unsuccessful.

Therefore actual operations in this sector are currently focused on two projects:

- Azeri-Chirag-Guneshli (ACG)
- Shakh-Deniz

Development projects in the Apsheron and Umid fields were in a geological exploration phase as of the beginning of 2012.

Another project, which may be revived in the future, is development of the Araz-Alov-Sharg (AAS) Block, which is a subject of territorial disputes between Azerbaijan and Iran).

Scenario 1

According to this scenario, drilling in Azerbaijan's sector is primarily associated with the ACG project, which includes developing new reservoirs. The latest field development plans under the project call for increasing the number of wells to 312.

Shakh-Deniz will move into the second stage of development in 2012 or 2013 to bring annual gas production to 16 bcm.

Two exploration wells each will be drilled in the Apsheron and Umid fields from 2012 through 2020.

The Shakh-Deniz field will enter into the second phase of development in 2012 or 2013, which is expected bring annual gas production to 16 bcm.

Table 7.3. Forecast of the number of wells drilled in Azerbaijan's sector of the Caspian Sea from 2012 through 2020 (Scenario 1)

Block	2012	2013	2014	2015	2016	2017	2018	2019	2020
Azeri-Chirag-Guneshli									
Shakh-Deniz									
Apsheron									
Umid									

Source: Company data, RPI analysis

Note 1. In this table and in the following tables: p means production wells; e means exploration wells.

Note 2. In this table and in the following tables: Injection wells are included in the number of production wells.

Table 7.4. Forecast of exploration and production drilling in Azerbaijan's sector of the Caspian Sea from 2012 through 2020 (Scenario 1)

Block	Exploration wells	Exploration drilling, thousands of meters	Production wells	Production drilling, thousands of meters
Azeri-Chirag-Guneshli				
Shakh-Deniz				
Apsheron				
Umid				
Total:				

Source: Company data, RPI analysis

Scenario 2

Scenario 2 differs from Scenario 1 in that it includes commercial development of the Apsheron field, in which intensive production drilling takes place from 2016 through 2018.

Table 7.3. Forecast number of wells drilled in Azerbaijan's sector of the Caspian Sea from 2012 through 2020 (Scenario 2)

Block	2012	2013	2014	2015	2016	2017	2018	2019	2020
Azeri-Chirag-Guneshli									
Shakh-Deniz									
Apsheron									
Umid									

Source: Company data, RPI analysis

Table 7.4. Forecast exploration and production drilling in Azerbaijan's sector of the Caspian Sea from 2012 through 2020 (Scenario 2)

Block	Exploration wells	Exploration drilling, thousands of meters	Production wells	Production drilling, thousands of meters
Azeri-Chirag-Guneshli				
Shakh-Deniz				
Apsheron				
Umid				
Total:				

Source: Company data, RPI analysis

Scenario 3

This scenario may occur if we assume that the territorial disputes between Azerbaijan and Iran will be settled before 2015 or 2017. In this case, BP will resume exploration drilling in the Araz-Alov-Sharg (AAS) block, which was suspended by the company due to the threat of armed conflict in the early 2000s.

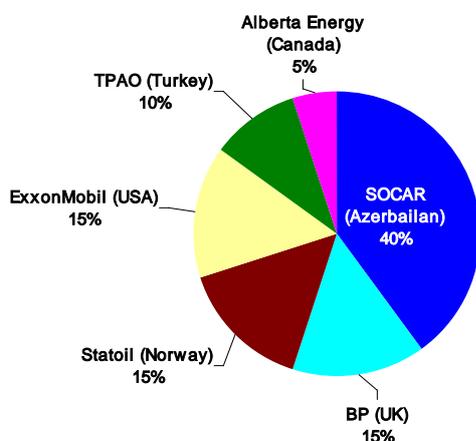
The contract for exploration and development of AAS was signed on July 21, 1998, and ratified by Azerbaijan's parliament on December 18, 1998. The operator for the AAS project is BP.

The Araz structure is located 125 kilometers from the southern coast along Azerbaijan's sector of the Caspian Sea, Alov is 135 kilometers from the coast, and Sharg, 132 kilometers.

The sea depth in the block is between 650 and 700 meters; the hydrocarbon occurrence depth is between 5,200 and 6,000 meters. The block's estimated reserves are about one bcm of natural gas; the total investment required for project implementation is \$9 billion.

About three exploration wells may be drilled from 2015 through 2020, if the work is resumed in the block.

Figure 7.1. Araz-Alov-Sharg project participants



Source: company data

Table 7.5. Forecast of the number of wells drilled in Azerbaijan’s sector of the Caspian Sea from 2012 through 2020 (Scenario 3)

Block	2012	2013	2014	2015	2016	2017	2018	2019	2020
Azeri-Chirag-Guneshli									
Shakh-Deniz									
Apsheron									
Umid									
Araz-Alov-Sharg									

Source: RPI analysis

Table 7.6. Forecast of exploration and production drilling in Azerbaijan’s sector of the Caspian Sea from 2012 through 2020 (Scenario 3)

Block	Exploration wells	Exploration drilling, thousands of meters	Production wells	Production drilling, thousands of meters
Azeri-Chirag-Guneshli				
Shakh-Deniz				
Apsheron				
Umid				
Araz-Alov-Sharg				
Total:				

Source: RPI analysis

10 Appendix 1. List of Companies that Can Supply Drilling Hardware and Platforms for Offshore Field Development in the Caspian and Black Seas and the Sea of Azov

10.1. Azerbaijan

10.1.1 Baku Deepwater Jackets Factory

Its designed capacity of 60,000 tons was established for the following types of products for offshore fixed platforms:

offshore fixed platforms;

- Jackets – 25,000 tons
- Modules – 30,000 tons
- Topsides- 5,000 tons

The Shelfproektstroy production association was created in 1987 as a part of the Baku Deepwater Jackets Factory (BDJF). The new production association was organized to complete oil and gas exploration in the offshore area of the Caspian Sea and produce jackets for deepwater offshore platforms. Apart from BDJF, Shelfproektstroy also encompasses several organizations for construction and assembly, transport, energy, and trade.

The production of H. Aliev BDJF is universal; it may produce jackets of any design as well as their topsides.

The factory is equipped to produce plates, gas-cutting stands and trolleys, plate benders, stands for automatic eclectic and gas pipe welding, and electric-welding equipment. In addition, high-quality welding electrode production, pipe painting and export have been implemented there.

Eleven jackets have been produced there and put afloat. Five of them were installed at Azeri-Chirag-Guneshli.

In July 2011 the company began construction of the substructure for the West Chirag platform for the Chirag Oil Project (COP). Construction is expected to be completed in late 2012. This plant also performed an upgrade of the Guneshli-7 platform in 2011.