

## COUNTRY ANALYSIS BRIEFS

# Saudi Arabia

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## Background

**Saudi Arabia is the biggest oil producer in the Organization of the Petroleum Exporting Countries (OPEC). With one-fifth of the world's proven oil reserves, some of the lowest production costs, and an aggressive energy sector investment initiative, Saudi Arabia is likely to remain the world's largest net oil exporter. From January-November 2006, Saudi Arabia supplied the United States with 1.4 million barrels per day of crude oil, or approximately 14 percent, of U.S. crude oil imports.**

Between mid-2003 and mid-2006, Saudi Arabia showed strong economic performance due to high oil prices, increasing oil production and export earnings, paired with structural reforms, economic diversification, and stable macroeconomic policymaking. Saudi Arabia remains heavily dependent on oil and petroleum-related industries, including petrochemicals and petroleum refining. The IMF reported that in 2005, oil export revenues accounted for around 90 percent of total Saudi export earnings, 70-80 percent of state revenues, and 44 percent of the country's gross domestic product (GDP). In order to defend their most significant source of economic growth, national oil company Saudi Aramco is increasing its oil production capacity to 12.5 million barrels per day (bbl/d), by 2009.



Since the recovery of oil prices in the late 1990's, economic reform has steadily progressed. Such structural reforms paved the way for Saudi Arabia's accession to the World Trade Organization (WTO) on December 11, 2005, twelve years after starting negotiations. Several important sectors, however, remain closed to 100 percent foreign ownership, including: upstream oil, pipelines, media and publishing, insurance, telecommunications, and defense and security. Large parastatal corporations still dominate the Saudi economy, including Saudi Aramco (which has a monopoly on Saudi upstream oil development and controls 98 percent of the country's oil reserves) and the Saudi Basic Industries Corporation (SABIC; now the world's 7th largest petrochemical producer and the largest non-oil company in the Middle East). To date, there has not been a complete sale of state assets to private control, and "privatization" largely has been limited to allowing private firms to take on service functions or offering limited partnerships, particularly foreign investors.

In the context of successfully becoming integrated into the global economy, Saudi Arabia, the largest economy in the Middle East, has emphasized the importance of regional unity among Gulf States -- economically, politically, and militarily. A customs union (with the elimination of tariffs and a common external tariff) among Gulf Cooperation Council (GCC) countries (Bahrain, Kuwait, Oman, Qatar, Saudi Arabia, and the United Arab Emirates) was agreed upon in December 1999, and came into effect in 2003.

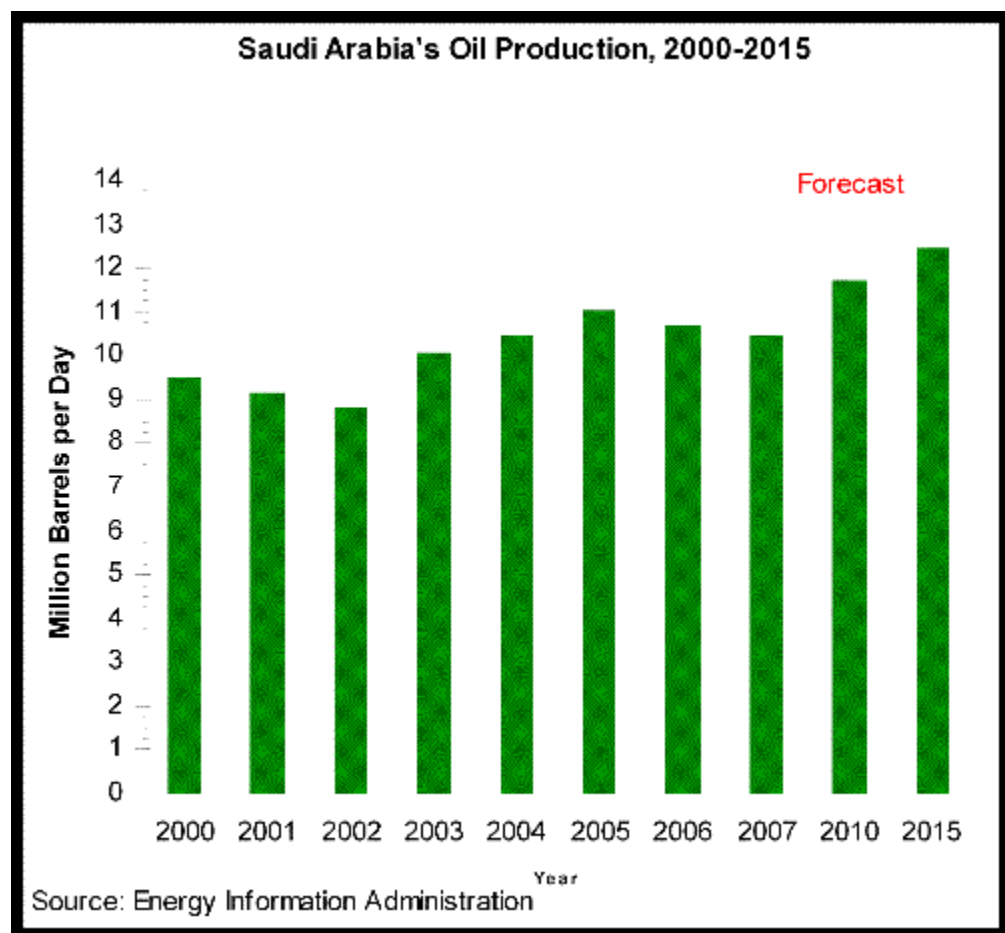
**Saudi Arabia, through its National Oil Company, Saudi Aramco, has announced an ambitious \$70-billion energy investment plan, \$18 billion of which will be directed toward increasing upstream petroleum capacity to an estimated 12.5 million bbl/d by 2009.**

## Oil Reserves

According to the Oil and Gas Journal, Saudi Arabia contains about 260 billion barrels of proven oil reserves (including 2.5 billion barrels in the Saudi-Kuwaiti Divided, or "Neutral" Zone), or around one-fifth of proven, conventional world oil reserves. Around two-thirds of Saudi reserves are considered "light" or "extra light" grades of oil, with the rest either "medium" or "heavy." Although Saudi Arabia has over 100 oil and gas fields (and more than 1,500 wells), over half of its oil reserves are contained in only eight fields, including the giant 1260-sq mile Ghawar (the world's largest oil field, with estimated remaining reserves of 70 billion barrels) and Safaniya, including Khafji and Hout (the world's largest offshore oilfield, with estimated reserves of 25-35 billion barrels). Ghawar's main producing structures are, from north to south: Ain Dar, Shedgum, Uthmaniyah, Hawiya, and Haradh. Ghawar alone accounts for about half of Saudi Arabia's total oil production capacity.

## Production Capacity

Saudi Arabia maintains the world's largest crude oil production capacity, estimated to be around 10.5-11.0 million bbl/d. In May 2006, Saudi Aramco announced the details of an \$18-billion plan to increase capacity to 12.5 million bbl/d by 2009 and 15 million by 2020.



In December 2006, Saudi Aramco announced its 2007 exploration and drilling budget of almost \$4 billion - nearly double the draft budget and full quarter of Aramco's 2007 capital budget. According to *Oil Daily* reports, Aramco plans to drill 427 onshore and offshore crude oil development wells in 2007. Approximately 134 wells will be in or near Ghawar, while 85 will be drilled in Khurais, and some 50 drilled in Khursaniya.

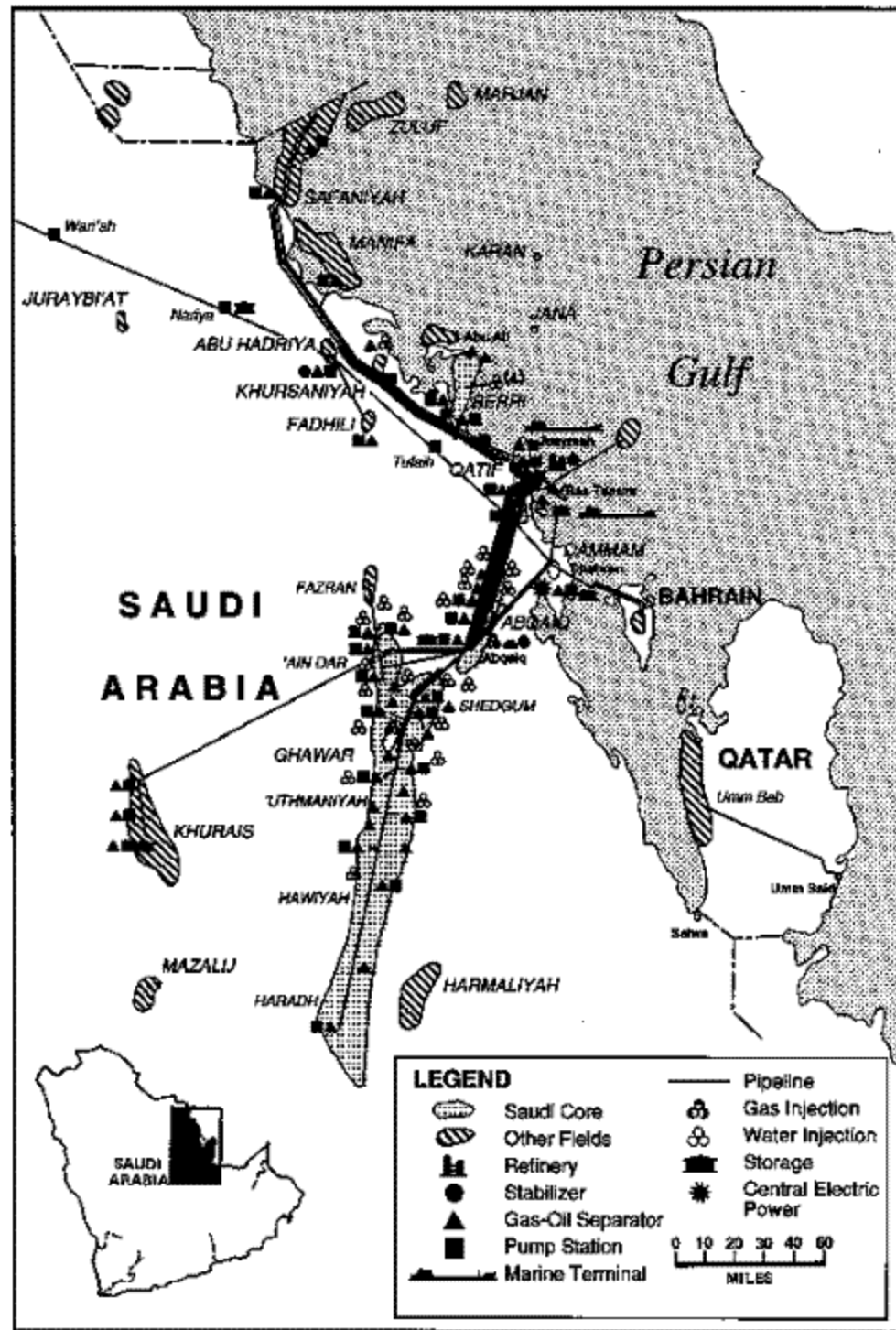
One challenge for the Saudis in achieving their strategic vision to add production capacity is that their existing fields sustain, on average, 6 to 8 percent annual "decline rates" (as reported by *PlattsOilgram*) in existing fields, meaning that the country needs around 700,000 bbl/d in additional

capacity each year just to compensate for natural decline.

Aramco estimates that the average total depletion for Saudi oil fields is 29 percent, with Abqaiq (the oldest) 74 percent depleted, the giant Ghawar field having produced 48 percent of its proven reserves and the younger Shaybah just 5 percent depleted. Aramco also claims that, if anything, Saudi oil reserves are underestimated, not overestimated. Some analysts have disputed Aramco's optimistic assessments of Saudi oil reserves and future production. Minister Al-Naimi has vigorously refuted these arguments, and stated that Saudi Arabia could add as much as 200 billion barrels of oil to proven reserves after the extended period of investment and exploration. In order to stave off decline, wells are undergoing reservoir management and rehabilitation projects, including the installation of "smart well" technologies.

### **Production**

Saudi Arabia produces a range of crude oils, from heavy to super light. Of Saudi Arabia's total oil production capacity, about 65-70 percent is considered light gravity, with the rest either medium or heavy; the country is moving to reduce the share of the latter two grades. Lighter grades generally are produced onshore, while medium and heavy grades come mainly from offshore fields.



Source: National Defense University

For 2006, the U.S. Energy Information Administration estimates that Saudi Arabia produced around 10.7 million bbl/d of total oil -- comprising crude oil, natural gas liquids, and "other liquids" (includes half of the Saudi-Kuwaiti Divided Zone's 600,000 bbl/d). In addition to crude oil, Saudi Arabia produces around 1.5 million bbl/d of natural gas liquids (NGLs) and "other liquids," not subject to OPEC quotas.

The Ghawar field is the main producer of 5 million bbl/d of 34° API Arabian Light crude. Abqaiq (17

billion barrels of proven reserves) produces approximately 400,000 bbl/d 37<sup>o</sup> API Arab Extra Light crude. Since 1994, the Najd fields, which includes the Hawtah field and smaller satellites (Nuayyim, Hazmiyah) south of Riyadh, have been producing around 200,000 bbl/d of 45<sup>o</sup>-50<sup>o</sup> API, 0.06 percent sulphur, Arab Super Light. Offshore production includes Arab Medium crude from the Zuluf (over 500,000 bbl/d capacity) and Marjan (270,000 bbl/d capacity) fields and Arab Heavy crude from the Safaniya field. Most Saudi oil production, except for "extra light" and "super light," is considered "sour," containing relatively high levels of sulfur.

The \$4-billion project, known as the Qatif Producing Facilities Development Program (QPFDP), involved construction of two gas-oil separation plants (GOSPs), as well as gas treatment and oil stabilization facilities, for the Qatif and Abu Saafa oilfields (Abu Saafa is half owned by Bahrain). Additional production from these fields was slated to replace production elsewhere in Saudi Arabia, not to boost overall capacity.

Despite recent OPEC cuts, Saudi Aramco continues aggressive plans to increase capacity; the following is a table of planned production capacity increases through 2011. In addition to these capacity increases, Saudi Aramco has said that it will also conduct additional drilling at existing fields in order to help compensate for the natural declines from the mature fields.

| Aramco Upstream Petroleum Projects (through 2011)      |                                      |                             |        |             |                            |  |
|--|--------------------------------------|-----------------------------|--------|-------------|----------------------------|--|
| Field  | Current Capacity<br>(thousand bbl/d) | Increase<br>(million bbl/d) | Online | Type        | Estimated Cost<br>(USD)    | Notes  |
| Haradh   | 300,000                              | 0.3                         | Apr-06 | Light       | \$1.5 billion              |  |
| Khurais<br>(including Abu Jifan and Mazalij)           | 0                                    | 1.2                         | Jun-09 | Light       | \$11 billion including gas |  |
| Khursaniyah<br>(including Abu Hadriyah and Al-Fadhili) | 50,000                               | 0.5                         | Jun-07 | Light       | \$4 billion                | -Project is a half-year ahead of schedule  |
| Manifa (offshore)                                      | 0                                    | 0.9                         | 2011   | Heavy       | \$7-9 billion              | -Could rise to 1.5 million bbl/d<br>-Two years ahead of schedule.<br>-Largest offshore development undertaken by Aramco. |
| Neutral Zone*  | NA                                   | 0.15                        | 2010   | Medium      | \$400 million (estimate)   |  |
| Nuayyim  | 0                                    | 0.1                         | 2008   | Extra Light | \$350 million              |  |
| Shaybah I  | 555,000                              | 0.25                        | Apr-08 | Extra Light | \$3 billion                | -Associated cogeneration<br>-Project is nearly a year ahead of schedule  |
| Shaybah II, III*                                       | NA                                   | 0.2                         | 2010   | Extra Light | \$800 million (estimate)   |  |
| <b>Total New Capacity</b>                              |                                      | <b>3.6</b>                  |        |             |                            |  |
| * Unconfirmed  |                                      |                             |        |             |                            |  |

*Sources: Reuters, Dow Jones, Oil Daily, Saudi Aramco, Business Middle East, Global Insight*

Saudi Arabia's long-term goal is to further develop its lighter crude reserves including the Shaybah field, located in the remote Empty Quarter (Rub al-Khali) area bordering the United Arab Emirates. (In June 2005, the UAE said it wanted to amend a 1974 border pact which gave the Saudis rights to Shaybah, which lies 80 percent in Saudi territory and 20 percent in UAE). Shaybah contains an estimated 14.3 billion barrels of premium grade 41.6<sup>o</sup> API sweet (nearly sulfur-free) Arab Extra Light crude oil, with production as of November 2006, at around 550,000 bbl/d from 141 wells. It is the largest oil field in the world that has been developed in the past two decades. According to Oil Minister Naimi (October 1999), the development of Shaybah showed that "the cost of adding...capacity - that is, all the infrastructure, producing and transportation facilities - necessary to produce one additional barrel of oil per day in Saudi Arabia is, at most, \$5,000 compared to between \$10,000 and \$20,000 in most areas of the world."

- The Shaybah complex includes three gas/oil separation plants (GOSPs) and a 395-mile pipeline to connect the field to Abqaiq, Saudi Arabia's closest gathering center, for blending with Arab Light crude (Berri and Abqaiq streams). In addition to oil, Shaybah has a large natural gas "cap" (associated gas), with estimated reserves of 25 trillion cubic feet (Tcf). Gas production of 880 million cubic feet per day (MMcf/d) is re-injected. It is reported that possible gas recovery project could be implemented within 5 or 6 years, potentially for use in petrochemical production.
- The Khurais fields (including Abu Jifan and Mazalij) west of Ghawar, will increase Saudi production capacity (of Arab Light) by 1.2 million bbl/d at a cost of \$3 billion. Once online, Saudi Arabia will be the only oil producer to have two "super giant" fields, that which produce more than 1 million bbl/d of crude oil. This is to involve installation of four GOSPs, with a capacity of 200,000 bbl/d each, at Khurais, which first came online in the 1963, but was mothballed by Aramco some three-decades later. Aramco plans to drill at least 300 exploration wells with 23 rigs.
- Several other fields -- Abu Hadriya (1.8-2.0 billion barrels in reserves), Fadhili (1-1.4 billion barrels), Harmaliya, Khursaniya (3.5 billion barrels), and Manifa estimated 10 – 20 billion barrels) -- also mothballed by the Saudis during the 1980s and 1990s, will be brought back online given Saudi desire to maintain spare or "swing" production capacity. In particular, Saudi Aramco is pushing ahead with development of the Abu Hadriya, Fadhili and Khursaniya (AFK) onshore fields. In March 2005, the Saudis awarded eight contracts for work at Khursaniya and also at Hawiya (see below). Production of 500,000 bbl/d (medium, 35<sup>0</sup> API) of Arab Light from the AFK fields in on-track for late 2007. Besides AFK, the Saudis are planning to increase Arab Light production from the 1-billion-barrel Nuayyim onshore field by 100,000 bbl/d in 2009.
- The \$1.5 million Haradh-3 project increased production capacity at the Haradh oil field (which part of Ghawar) to 600,000 bbl/d by in April 2006. The expansion involves adding a third, 300,000-bbl/d GOSP to Haradh (in addition to two other 300,000-bbl/d GOSPs, one of which was inaugurated in January 2004). Haradh also is also producing significant volumes of non-associated natural gas, natural gas condensates and sulfur. The project was carried out by Aramco, along with private partners.
- In their 2005 annual report, Saudi Aramco reported five smaller discoveries, three of which were predominantly oil. The new fields include Du'ayban, with 3,260 bbl/ day of Arabian Super Light, Halfa, with 6,000 bbl/d of Arabian Extra Light; and Muraiqib with 1,079 bb/d Arab Light. Also, Aramco reported a successful extension of reserves outside the booked reserves area at Fadhili, northeast of Riyadh. "According to the report, the discovery could increase reserves by "approximately 700 million barrels of original oil in place, of which...300 million barrels, is recoverable."

### **Saudi-Kuwaiti Neutral Zone; Bahrain**

The Saudi-Kuwait Divided Zone, 2230 sq mi between the borders of Saudi Arabia and Kuwait that was left undefined in 1922, contains an estimated 5 billion barrels of proven oil reserves, divided equally between the two countries. Within the Divided Zone, Japan's Arabian Oil Co. (AOC) traditionally operated two offshore fields (Khafji and Hout) with 300,000 bbl/d in production (now approximately 150,000 bbl/d), but in February 2000, it lost the concession (in January 2003, AOC reached an agreement with Kuwait on the right to purchase at least 100,000 bbl/d of crude for the next 20 years from Khafji). Efforts to negotiate an extension of the operating contract with Saudi authorities failed when Japan refused to commit to investment in development projects desired by the Saudis. Saudi Aramco has taken over operation of the former AOC fields. ChevronTexaco, meanwhile, operates three onshore fields (Wafra, South Fawaris, and South Umm Gudair) in the Divided Zone under a 60-year license that expires in 2009. These fields have 2 billion barrels of proven reserves and total production of about 260,000 bbl/d. Finally, Bahrain and Saudi Arabia share the 300,000 bbl/d production of the Abu Saafa offshore field.





### Refining

According to *Oil and Gas Journal*, Saudi Arabia has seven functioning refineries, with combined crude throughput capacity of around 2.1 million bbl/d, plus around 1.75 million bbl/d of refining capacity overseas, making it the sixth largest oil refiner in the world. The Saudi Aramco development plan calls for a \$20-billion investment, increasing domestic refining capacity to 3 million bbl/d and international holdings by at least 1-2 million bbl/d by 2011, particularly in an effort to meet requirements of the fast-growing Asian market.

Saudi Aramco is also aiming to increase private investment through joint ventures in downstream petroleum activities. In March 2006, France's Total and Saudi Aramco announced plans to build a \$6-billion, 400,000-450,000 bbl/d export-oriented refinery in Jubail. Also in 2006, Aramco signed an MOU with Conoco Philips for a 400,000-bbl/d heavy conversion facility at Yanbu. As part of the privatization program, 30 percent of shares will reportedly be offered to the public. Reportedly, Aramco is considering putting out a tender for a privately-owned refinery at the port-city of Jizan

- Last year Saudi Aramco and Japan's Sumitomo Chemical broke ground on the \$9.8-billion Rabigh Refining and Petrochemical joint venture (PETRORabigh) - one of the biggest projects of its kind. Rabigh will be upgraded to 825,000 bbl/d (from 400,000 bbl/d), while shifting the product mix away from low-value heavy products towards gasoline and kerosene, while integrating the site with a new petrochemicals plan. The refinery will come online in 2008. At the same time, Aramco announced 100,000 bbl/d expansion and integration with neighboring petrochemical plants upgrades for Ras Tanura and Yanbu by 2010 to 2012.
- Overseas, Saudi Arabia has interests in refineries in the US, South Korea, Japan and the Phillippeans. In July 2005, a new, \$3.6 -billion 160,000 bbl/d refinery and petrochemical plant complex was inaugurated in Fujian, China. The facility is a joint venture between Sinopec (50 percent), ExxonMobil (25 percent), and Saudi Aramco (25 percent). Crude oil for the plant is to be supplied by Saudi Arabia under a long-term agreement, and will come online in 2007/2008. Aramco reports that capacity will be increased to 230,000 in the next few year. Aramco is also in talks with Sinopec to participate in the ongoing construction of a second facility in the northern province of Shandong (Qingdao). Both plants are expected to be able to handle high sulphur ("sour") oils, as there is a dearth of such capacity worldwide.
- In July 2004, Aramco signed an agreement with Shell to purchase a 15 percent share in Showa Shell Group, a refining and marketing company based in Japan. Under the deal, Aramco will supply Showa Shell with 300,000 bbl/d of crude oil. Saudi Arabia also owns a 7.9 percent share in AOC Holdings, which operates the 192,000 b/d Sodegaura refinery in Japan through a subsidiary, Fuji Oil.
- In the Philippines, Aramco is conducting preliminary studies on a new \$5-billion refinery at



Mindanao, which will supply East Asia and the US West Coast. Aramco is also a 40 percent shareholder in Philippine Petron, which runs a 180,000 b/d refinery on the island.

- In March 2005, Saudi Arabia and India signed an agreement on oil cooperation; with the Saudis reportedly interested in acquiring a stake in India Oil Company's expansion of the 180,000-bbl/d Paradip refinery (it will reach 300,000-bbl/d by 2008). Saudi Aramco is reportedly considering taking a stake in Hindustan Petroleum Corporation Limited's (HPCL) Vishakhapatnam refinery (165,000 bbl/d capacity), which will be doubled in capacity by 2010-11.
- In the United States, Aramco and partner Royal Dutch/Shell are planning an expansion of at least one of their three Motiva joint-venture refineries in Louisiana and Texas. The three facilities have a total capacity of around 745,000, approximately 5 percent of the US refining market. There are detailed plans to expand the 290,000 b/d Port Arthur, Texas facility to 325,000 bbl/d by 2010. According to Aramco, however, future expansion plans will increase total capacity by 600,000 bbl/d. Saudi Aramco owns 50 percent of Motiva though their subsidiary, Saudi Refining.
- Aramco also has reported interests in South Korea's Sangyong Oil Refining Company and Motor Oil (Hellas) in Greece.

### Security Issues

The Saudi petroleum pipeline and export network (and energy sector in general) remains a terrorism target. In February 2006, Saudi security prevented an attempted suicide bomb attack at the Abqaiq petroleum processing facility, after Al-Qaeda leadership called for renewed attacks against the country's economic backbone.

Nevertheless, energy infrastructure remains well-protected. Following the February incident, the government increased the National Guard and military security force to approximately 20,000, in addition to the 5000 guards employed directly by Aramco. Reportedly, security spending has been ramped up since a series of attacks against energy infrastructure and foreign nationals were carried out in 2004.

In addition to direct security, Saudi Arabia is known to ensure export security by maintaining "redundancy" (i.e., multiple options for transportation and export) in its oil system, in part as a form of indirect security against any one facility being disabled.

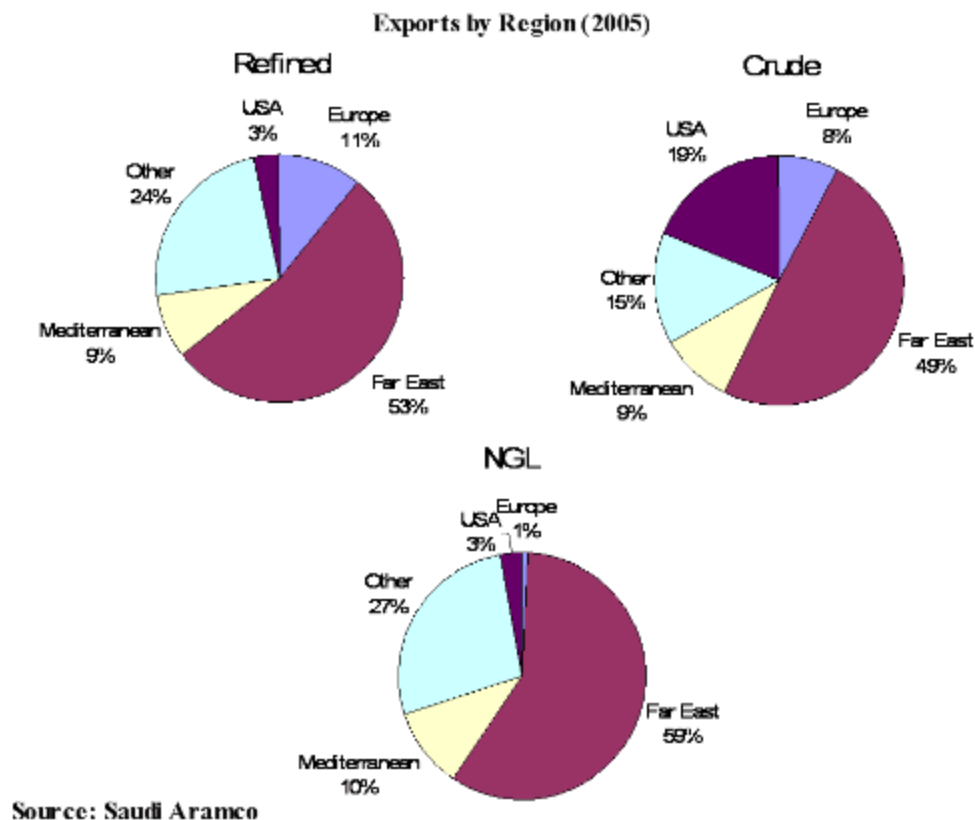
## Oil Exports and Shipping

### Exports

Saudi Arabia is a key oil supplier to the United States, Europe and Asia. In 2005, Saudi Arabia exported an estimated 8.6 million bbl/d of petroleum liquids, of which 7.2 million bbl/d were crude, 553,000 were refined product and 793,000 bbl/d NGLs. According to press reports, in 2006, Saudi had a marginal increase in exports based on long-term contracts to export just under 7 million bbl/d of crude worldwide. Asia, including Japan, South Korea, China and India, now receives an estimated 50 percent of Saudi Arabia's crude oil exports, as well as the majority of its refined petroleum product and NLG exports. Japan remains the single largest importer of Saudi crude in Asia. In 2005, According to the IEA, Japan imported an estimated 1.5 million bbl/d on average.

According to industry sources, South Korea's imports from Saudi decreased from 835,000 bbl/d in 2005 to between 600,000 and 700,000 bbl/d in 2006. China's imports continue to fluctuate the most widely. In 1995, Saudi Arabia was the 25<sup>th</sup> largest supplier of crude oil to China; while in 2007, Saudi may be China's largest supplier (competing with Iran, Oman and Angola). According to industry reports, China will purchase an additional 44,000 bbl/d in 2007, raising imports to around 510,000 on average.

***Saudi Arabia is the world's largest (net) oil exporter and is a key oil supplier to the United States, Europe and Asia. Saudi Aramco's plans to increase oil production capacity in the medium term hinges on the maintenance and expansion of the petroleum pipeline network, export facilities, and shipping capacity.***



Between January and October 2006, Saudi Arabia exported an average of 1.41 million bbl/d of crude oil to the United States, accounting for 14 percent of U.S. crude oil imports. For this time period, Saudi Arabia ranked third (after Canada, Mexico,) as a source of oil imports to the U.S. In 2005, Saudi surpassed Venezuela as the third largest U.S. supplier of petroleum products. The Saudi Share of imports during this time period was 13.9 percent (compared to 14.4 percent in the same time period in 2005).

### Major Ports

Saudi Arabia's primary oil export terminals are located at

- the Ras Tanura complex (6-plus million bbl/d capacity; and the world's largest offshore oil loading facility), which includes the port at Ras Tanura (2.5 million bbl/d capacity) and
- the Ras al-Ju'aymah facility (3-3.6 million bbl/d,) on the Persian Gulf. More than 75 percent of exports are loaded at Ras Tanura Facility.
- The Yanbu terminal on the Red Sea, from which most of the remaining quarter is exported, has loading capacity of approximately 4.5 million bbl/d crude and 2 million bbl/d for NGL and products. The facility is reportedly not used to full capacity.

These, and a dozen other smaller terminals throughout the country, appear capable of exporting a 14-15 million bbl/d of crude and refined products, around 3.0-3.5 million bbl/d higher than Saudi current crude oil production capacity.

### Major Domestic Petroleum Pipelines

Saudi Aramco operates more than 9000 miles of petroleum pipelines throughout the county, including two major petroleum pipelines. The 745-mile, 5-million-bbl/d East-West Crude Oil Pipeline (Petroline), has been operated by Aramco since 1984 (when it took over from Mobil),and is used mainly to transport Arabian Light and Super Light from Abqaiq refineries in the Eastern Province and to Red Sea terminals (Yanbu) for export to European markets. Reportedly, the Saudis expanded the Petroline in part to maintain Yanbu as a strategic option to Gulf port facilities in the event that exports were blocked from passing through the Straits of Hormuz in the Persian Gulf. The Petroline is utilized at less than half capacity, as shipments from Yanbu add up to five days

roundtrip travel time for tankers through the Bab al-Mandab strait to major customers in Asia. Also built in the 1980s was a 236-mile multi-products between Dhahran in the Eastern Province and Riyadh and a 220-mile smaller multi-product line between Riyadh and Qassim to the north.

Running parallel to the Petroline is the 290,000-bbl/d Abqaiq-Yanbu natural gas liquids (NGL) pipeline, which serves Yanbu's petrochemical plants. A \$500 million contract to install three NGL pipeline loop line on the Shedgum-Yanbu section of the trunk line, when completed in 2008, will increase capacity to 555,000 b/d (SHY-1 expansion). There are also six smaller pipelines that make up the Uthmaniya-Abqaiq pipeline complex.

To support increased export capacity, Aramco has announced the construction of more than a total of more than 830 miles of new oil, natural gas and NGL pipelines of varying sizes and lengths by 2009. The biggest development will extend to the 1.2 million-b/d Khurais redevelopment, which will require a 400 to 500-mile network in the Eastern Province. The Manifa development has a planned installation of 221 miles of pipeline (gas and crude/condensate).

### International Petroleum Pipelines

Saudi Aramco does not operate any major functioning international pipelines. The Trans-Arabian Pipeline (Tapline) from Qaisumah to Sidon, Lebanon, completed in 1974, has been mothballed, in part, since 1984 (the portion to Jordan was closed in 1990, through this has been talk of reopening this portion). Also, a 1.65-million-bbl/d, 48-inch Iraqi Pipeline across Saudi Arabia (IPSA), which runs parallel to the Petroline from pump station #3 (there are 11 pumping stations along the Petroline) to the port of Mu'ajiz, just south of Yanbu, was built in 1989, but closed indefinitely following the August 1990 Iraqi invasion of Kuwait. In June 2001, Saudi Arabia seized ownership of IPSA. Theoretically, IPSA could be used for Saudi oil transport to the Red Sea, although the Saudis have reported that the pipeline has been converted to carry gas as part of the Master Gas System.

The only functioning international crude carrier is a 60-year old complex of four small submarine pipelines carrying Arabian Light crude from the Abu Saafra and Dammam fields to Bahrain. The pipelines range from 207,000 to 250,000 bbl/d capacity. Reportedly, this aging pipeline will be decommissioned after the construction of the "New Arabia" pipeline, a 71-mile, 350,000-450,000-bbl/d capacity feed running between Abqaiq and Bahrain's refinery at Sitra. The pipeline will be built by local contractors, and is expected to come online in 2008. Despite excess pipeline capacity, reportedly the Saudis are planning to conduct a feasibility study on construction of an oil pipeline from the Empty Quarter of southeastern Saudi Arabia through the Hadramaut in Yemen and the Arabian Sea, although details of the proposed project were unavailable.

### Shipping

Aramco's shipping subsidiary Vela International Marine has one of the largest fleets of supertankers in the world, including an estimated 20 VLCCs (very large crude carriers) and several ULCCs (ultra-large crude carriers). Vela also has nearly two-dozen refined products and Liquefied Petroleum Gas (LPG) carriers. Vela's fleet carries a significant proportion of Saudi oil exports. Industry sources report that Vela is expected to commission six additional VLCCs (from South Korea's Daewoo Shipbuilding & Marine Engineering Co ) in 1Q 2007. Delivery of four VLCCs will be in 2008, and the final two ships will be delivered in 2009. The VLCC is designed to transport between 200,000 - 320,000 dead weight tonnage (dwt) or up to two million barrels of crude oil. Generally a ULCC tanker can carry over 320,000 dwt, or up to three million barrels of crude oil.

The National Shipping Co of Saudi Arabia (NSCSA) recently commissioned six VLCCs from Hyundai in early 2006. The deal, costing a reported \$480 million has been partly financed by the Saudi government. NSCSA's fleet has a total of nine VLCC's, totaling, with two vessels to be delivered in 2007. According to industry sources, NSCSA, through its subsidiaries, National Chemical Carriers and Arabian Chemical Carriers, the company owns 14 chemical tankers, plus an extra four container vessels for a total of 27 vessels. NSCSA is a public company, although the Public Investment Fund of the Saudi government holds 28 percent, while the remaining 72 percent is publicly traded.

In addition to tankers, Aramco owns or leases oil storage facilities around the world, in places like Rotterdam, Sidi Kerir (the Sumed pipeline terminal on Egypt's Mediterranean coast), South Korea, the Philippines, the Caribbean, and the United States.

### Natural Gas

*For more than a decade, Saudi*

According to Oil and Gas Journal, Saudi Arabia has the fourth largest proven natural gas reserves

**Aramco, the world's tenth largest natural gas producer, has aggressively explored on and offshore for additional reserves. According to Saudi Aramco forecasts, natural gas demand in the kingdom is expected to nearly triple to 14.5 billion cubic feet per day (Bcf/d) by 2030, up from an estimated 5.5 Bcf/d in 2006. The Saudi domestic natural gas market, traditionally the sole domain of Saudi Aramco, is slowly being opened to private investment both in exploration and distribution, and increasing competition in the market.**

in the world with an estimated at 240 trillion cubic feet (Tcf). Over the last decade, Saudi Aramco has added 72 Tcf of non-associated reserves, including the fields: Mazalij, Manjura, Shaden, Niban, Tinat, Al-Waar, and Fazran in the deep Khuff, Unaizah and Jauf reservoirs. However, around 57 percent of Saudi Arabia's proven natural gas reserves consist of associated gas at the giant onshore Ghawar field and the offshore Safaniya and Zuluf fields. The Ghawar oil field alone accounts for approximately one-third of the country's proven natural gas reserves. Both associated and non-associated natural gas has also been discovered in the country's extreme northwest, at Midyan, and in the Empty Quarter (Rub al Khali) in the country's southeastern desert. The Rub al Khali alone is believed to potentially contain natural gas reserves as high as 300 Tcf, although these are not proven.

| Top 10 Natural Gas Producers |                              |
|------------------------------|------------------------------|
| Country                      | Annual Production (2004) Tcf |
| Russia                       | 22.39                        |
| United States                | 18.76                        |
| Canada                       | 6.48                         |
| United Kingdom               | 3.39                         |
| Netherlands                  | 3.04                         |
| Iran                         | 2.96                         |
| Norway                       | 2.95                         |
| Algeria                      | 2.83                         |
| Indonesia                    | 2.66                         |
| Saudi Arabia                 | 2.32                         |

Source: Energy Information Administration

Despite sizable reserves and increasing demand, natural gas production in Saudi Arabia remains limited (2.32 Tcf in 2004; estimated 2.87 Tcf in 2005). Highly subsidized prices and soaring costs of production, exploration, processing and distribution of gas has squeezed supply, while limiting investment in the sector and constraining other areas of economic and industrial growth. (Traditionally, petrochemicals, steel and more recently, the upstream oil sector, have made up the majority of demand for natural gas in Saudi Arabia. Consumer demand is also growing). The situation is exacerbated by the fact that majority of gas fields in Saudi Arabia are "associated" with petroleum deposits, or found in the same wells as the crude oil, and plans to increase production in this type of gas remains linked to an increase in oil production. The majority of new natural gas discovered in the 1990s has been associated in light crude oil, especially in the Najd region south of Riyadh. For this reason, Saudi Arabia has concentrated efforts to locate non-associated gas pockets onshore and in offshore formations. According to Saudi Aramco only 15 percent of Saudi Arabia has been "adequately explored for gas."

#### Upstream Developments and Strategy

To meet growing domestic needs, in November 2006, the Petroleum Ministry and Saudi Aramco announced in a \$9-billion long-term strategy to add 50 Tcf of reserves by 2016 (an average of 5 Tcf/year). In order to free up petroleum for export, all current and future gas supplies (except natural gas liquids) reportedly remain earmarked for use in domestic industrial consumption and by desalination plants. According to statements made by Aramco, the five-year plan will radically increase the rate of exploration and includes the drilling of 307 new development wells, including 67 exploratory wells primarily in non-associated offshore formations. In comparison, during the period of 1996-2004, just 52 wells were drilled, with an exploration success rate of 44 percent. According to Aramco, exploration and development will also commence in non-producing areas such the Red Sea and the Nafud basin, north of Riyadh.

### *Upstream Activities in the Empty Quarter (Rub Al Khali)*

The backbone of the non-associated gas exploration strategy relies on foreign consortiums exploring for onshore gas in the Rub al-Khali, which officials hope will produce some 2 Bcf/d by 2011.

The South Rub al-Khali Company (SRAK), a consortium of Saudi Aramco, Royal Dutch/Shell and Total, is investing an estimated \$2 billion in exploration of more than 210,000 sq-km in two separate concession blocks (Blocks 5-9 and 82-85). The concessions surround the Shaybah and Kidan oil fields, abutting Oman and the UAE, and the Saudi-Yemeni border respectively. The consortium aims to sell 500 MMcf/d gas to the Ministry starting in 2009. SRAK drilled its first exploration well in July 2006, (Isharat-1, a wildcat) and a second is planned in early 2007, with a total of 7 planned over the next 25 months. Saudi Aramco -- which replaced ConocoPhillips -- and Total have each a 30 percent share in the project, while Shell holds the majority share.

In January 2004, Russia's Lukoil won a tender to explore for and produce non-associated natural gas in the Saudi Empty Quarter in Block A (29,000 sq km), near Ghawar, as part of an 80/20 joint venture with Saudi Aramco, known as Luksar. Luksar drilled two wells and plans a third in 2007. Also in January 2004, China's Sinopec won a tender for gas exploration and production in Block B (38,000 sq km). Sino Saudi Gas, a venture of Sinopec and Aramco, has drilled two wells and reported that there would be another two by year-end 2007. The Eni-Repsol-Aramco consortium, LENIREPSA Gas, was granted a license to operate in Block C (52,000 sq km), and drilled its first well in September 2006. The consortia have some 27 wells planned in total by 2009. The contracts cover a 40-year period, except SRAK, which holds a 25 year contract. Constraints on obtaining rigs have slowed the pace of exploration over the past year.

### *Other Upstream Developments*

Outside of the Empty Quarter, recent non-associated gas finds are promising. The Karan gas field, discovered in April 2006, is the largest gas deposit yet discovered in the offshore Khuff formation, some 100 miles north of Dhahran. The first well (Karan-6) was drilled in September 2006 and second (Karan-7) is currently underway, while Aramco continues to collect seismic data over the 6,250 sq km region. Initial data shows at least eight gas-bearing structures in the Khuff region around the Karan reservoir. Of those, Karan alone is expected to produce some 1 Bcf/d when it comes online sometime between 2009 and 2011. Development plans are underway.

Another large non-associated offshore natural gas field, Dorra (Durra), is located offshore near Khafji oil field in the Saudi-Kuwaiti Neutral Zone. Dorra development has been controversial since the late 1960's, however, because 70 percent is also claimed by Iran (called Arash). In addition, the maritime border between Kuwait and Iran remains un-demarcated. Saudi Arabia reached an agreement with Kuwait in July 2000 to share Dorra output equally, although the Kuwaitis are reportedly trying to purchase the Saudi share. According to Saudi Aramco, the field is estimated to contain non-associated gas reserves of between 35 and 60 Tcf of natural gas, and is to undergo extensive seismic study in 2007. The Kuwaiti Ministry of Oil has reported that the goal is to initially produce 600 MMcf/d from Dorra. In September 2006, it was reported that Kuwait and Iran agreed to jointly develop the field, although production plans remain undisclosed.

Onshore, several discoveries have been made near the Ghawar field in the past year. According to a September 2006, statement by Minister Al-Nuaimi, the Kassab-1 test well in the Jauf reservoir could add 16.2 MMcf/d when developed. Close by, the Zamlah-1 well, part of a deposit discovered in August 2006, tested at 20 MMcf/day and 1400 bbl/d condensate. In addition gas from the Najimaan-1 (Nujayman) well, also near Ghawar, flowed at a rate of 30 MMcf/d, but reportedly has the potential production capacity in excess of 60 MMcf/d, according to Aramco sources.

The Ghazal field, discovered in 2000, has started to produce some 270 MMcf/d from 25 development wells. According to Saudi Aramco, output is expected to increase to 400 MMcf/d by 2008. Production is also set to come on stream from the Midrikah (Madraka-3) well (27 mcf/d, 932 bbl/d condensate), discovered in 2004, that lies adjacent to the Haradh field in the Eastern Province (17 miles south of Ghawar). Finds in Ghazal and Midrika will feed newly expanded South Haradh processing facilities (along with 140 MMcf/d that came online at the Haradh-3 project in April 2006). Most recently, Saudi Aramco announced that approximately 120 MMcf/day of associated gas will be produced from the Manifa field when it comes online in 2011.

### **Pricing**

In addition to facing domestic supply shortages, Saudi has also come under pressure internationally for its highly subsidized prices. As a full member of the WTO, trade partners have protested



supplying highly subsidized gas supplies to Saudi industries and utilities, arguing against alleged unfair and uncompetitive trade practices. However, in an attempt to primarily address distortions in the domestic gas sector, Saudi Arabia recently adopted a new pricing policy that indicates a movement toward a liberalized gas market. Generally, gas prices are set by the ministry at \$0.75 MMBtu, the lowest in the Gulf.

In mid-2006, the local Eastern Gas Company (EGS) was awarded a two-year contract to become Aramco's gas distributor consumers in the Dhahran industrial area. According industry reports, EGC has rights to market 45 MMcf/d of gas a year to 35 industrial consumers. According to press statements, the purchase price from Aramco will be US\$1.12 per MMBtu and a sale price of US\$1.34/MMBtu. In Riyadh, the Natural Gas Distribution Company was granted a license to supply several small-scale manufacturing plants, with a similar pricing structure. For the time being, the price for foreign investors and other consumers remains steady.

### **Downstream Developments - Gas Processing**

Saudi Arabia currently has seven gas processing plants with a total gas production capacity of approximately 8 Bcf/d/d, 1.1 million bbl/d of natural gas liquids (NGLs) and approximately 2,700 tons of sulfur. The newest plant includes Haradh, 120 miles southwest of Dhahran at the southern tip of Ghawar, which came online in the summer of 2004. The \$2-billion plant processes non-associated natural gas (both sweet and sour) from four fields in the Khuff formation (Haradah III expansion became operational in March 2006). Hawiya, which first became operational in 2002, was the first plant process non-associated gas from Khuff and Jauf reservoirs. Hawiya is a \$4 billion, 1.4-Bcf/d gas plant, and is reportedly processing enough natural gas to free up some 260,000 bbl/d of Arabian Light crude oil for export. It is the largest natural gas project undertaken by Aramco in a decade. Uthmaniya is currently the largest plant, with a processing capacity of approximately 2.5 Bcf/d.

According to the 2005 Annual Statistical Report, Saudi Aramco exported 289.5 million barrels of NGLs in 2005, up from 274 million barrels in 2004. Saudi Arabia, a leading world producer of NGLs, has experienced a rise in demand from developing countries, including India (the major export destination), where it is used for cooking and transportation.

According to Saudi Aramco, the country aims to process an estimated 15 Bcf/d by 2009 through additional facilities and capacity expansion. Mega-project plans are currently underway to build or expand facilities at, Khursaniya, Hawiya, Ju'aymah, and Khurais. According to statement made by Saudi Aramco, the \$3-billion Khursaniya plant (KPG), currently in construction, will be located 87 miles northwest of Dhahran, and will have a capacity to process 1 Bcf/d. KGP will be fed by associated gas streams from Berri, Marjan and Safaniya. Reportedly, the KGP may double capacity by 2011 in order to accommodate Karan and Manifa gas. The facility is expected to come online in late 2007. According to Aramco, Khursaniya will also produce 80,000 bbl/d of condensate, 550-600 MMcf/d of sales gas (methane and ethane) and 280,000 bbl/d NGL.

Aramco, though Japanese subcontractor JGC and Spain's Technicas Reunidas) is expanding the Hawiya and Ju'aymah gas processing capacity to 4 Bcf/d while. Additionally, Hawiya will include a natural gas liquids recovery facility located approximately five kilometers east of the existing Hawiya Gas Plant. The new facility will recover 310,000 barrels per day of NGL, beginning in October 2007, and will reportedly be one of the world's largest facility of its kind.

In September 2006, a joint venture between Foster Wheeler Energy Ltd. of Britain and South Korea's Hyundai Engineering and Construction was awarded a \$780 million contract from Saudi Aramco to build a gas processing plant at the Khurais oilfield, 112 miles northwest of Riyadh. The gas processing plant will produce 550 million cubic feet of natural gas and 70,000 barrels of NGLs. The project is scheduled to come online in 2009.

### **Domestic Gas Pipelines**

Domestic demand, particularly the delivery feedstock to petrochemical plants, has driven consistent expansion of the 7.8 MMcf/d Master Gas System (MGS), the domestic gas distribution network in Saudi Arabia. Prior to the MGS, all of Saudi Arabia's natural gas output was flared. The MGS feeds gas to the industrial cities of Yanbu on the Red Sea and Jubail. A key pipeline project was completed in June 2000 to extend the MGS from the Eastern Province (which contains large potential gas and condensate reserves) to the capital in the Central Province. This is part of a broader expansion of the existing gas transmission system in Saudi Arabia, reportedly to include the construction of around 1,200 miles of additional natural gas pipeline capacity (on top of 10,500 miles of oil, gas, and condensate, products, and natural gas liquid pipelines currently in operation).

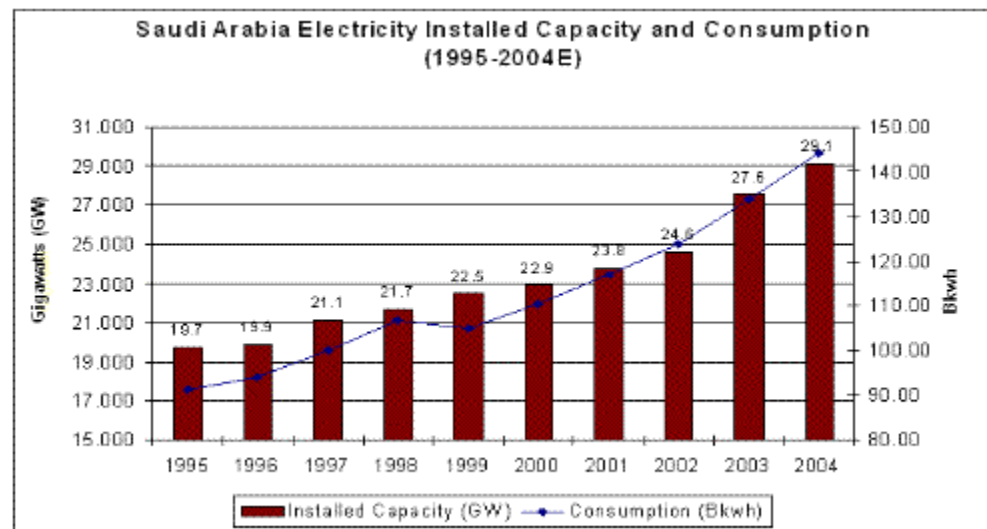
In order to feed the expanded gas processing facilities, several additions to the MGS are in the planning or construction phases. The largest pipeline to be built is the 132-mile conduit to the Rabigh complex and the existing Yanbu NGL processing facility. Installation of two four pipelines, totaling some 62, miles will connect Manifa to KGP and Ras az-Zour for gas processing and raw power production.

Reportedly the Riyadh Chamber of Commerce and Industry is planning a feasibility study with Russia's Sroytransgaz for the construction of another 7 Bcf/d domestic delivery system that will deliver gas from the Empty Quarter to customers in the east, central and western areas, and will include the construction of some 2000 miles of new pipeline. Construction likely hinges on a significant non-associated gas discovery in the Empty Quarter.

## Electricity

**Over the next two decades, Saudi Arabia's electric generation capacity is set to more than double – to 60 gigawatts- roughly equivalent to the current capacity of industrial tiger, South Korea.**

Similar to the situation faced by the natural gas sector, the combination of Saudi Arabia's rapidly expanding population and industrial base, paired with artificially low power tariffs, has increased the demand on electric utilities (averaging 7 percent annual growth). At times, the increased load has lead to shortages, blackouts and power rations in various parts of the country. Saudi Arabia's Water and Electricity Ministry estimates that the country will require up at least 30 Gigawatts (GW) of additional power generating capacity by 2023-25 -- doubling the current installed capacity of 29.1 GW -- at a cost of an estimated \$90-100 billion. In addition, Saudi Arabia's state-owned Saline Water Conversion Corp. (SWCC) has estimated that through 2020, the country will need to spend \$50 billion on water projects, many integrated with new power generation capacity, in order to meet the Kingdom's equally rapidly growing water demand. Most of this money is slated to come from the private sector, including foreign investors.



Feedstock for planned power capacity increases, originally to be natural gas and/or combined cycle, may be crude-oil fired, due to constraints on domestic natural gas supplies. A royal decree issued in the spring of 2006, requires that all future coastal power plants utilize crude feedstock at a set price of \$0.46 per million BTU. Approximately 65 percent of power plants are gas-fed, while 27 percent are steam and 8 percent are oil-powered. Some of the newest and largest facilities include: the \$1.7 billion, 2400-MW Ghazlan II plant north of Dammam, the first power project to be debt-financed; its sister plant, the 1600-MW Ghazlan I; and the 2500-MW Qurayya I and II.

### Independent Water and Power Projects (IWPP)

In July 2002, the Supreme Economic Council passed a resolution setting out a framework for private sector involvement in developing mega-scale integrated Independent Water and Power Projects (IWPPs). Saudi Arabia aims to attract private sector investment for up to 60 percent equity in IWPP projects, with the remainder split between Public Investment Fund (PIF) and the Saudi Electricity Company (SEC). In March 2004, Saudi Arabia announced a plan to launch ten IWPPs by 2016, at a total cost of \$16 billion. The SEC has already approved four such mega-projects, worth more than \$8 billion. The combined production capacity of the four projects will produce more than 7000 MW of power and 600 million gallons of water daily. They will boost the total desalination capacity of the kingdom by 80 percent when they come online between 2008 and 2010. The four



projects are:

- 1) A \$2.43-billion, 917-MW, 195-million-gallons-per-day (MMg/d) crude-fired plant at Shuaibah-3 (Shoaiba-3) on the Red Sea coast, 70 miles southeast of Jeddah. In November 2006, the project was awarded to the Shuaibah Water & Electricity Company and is expected to come online in the second-half of 2009, and supply Mecca, Taif and Jeddah. Shuaibah Water & Electricity is consortium of the Saudi-Malaysia Water & Electricity Company (60%), PIF (32%) and SEC (8%). [Note: The Saudi-Malaysia Water & Electricity itself is an equal joint venture between Arabian Company for Water and Power (ACWA) and the Malaysian Shuaibah Consortium, which in turn comprises Malaysia's Khazanah (40%), Malakoff (40%) and Tenaga Nasional Berhad (20%)].
- 2) An 850-MW, 47-MMg/d plant at Shuqaiq-2 in the far southwest of the kingdom. The project was awarded in November 2006, to the Saudi Water and Electricity Company (WEC), which has selected a consortium comprised of the local ACWA Power Projects, Japan's Mitsubishi Corporation and Kuwait's Gulf Investment Corporation, to carry out the BOT contract to supply consumers in Jizan, Asir and Abha. Shuqaiq-2 will come online in 2008.
- 3) An oil-fired 2,500-MW to 3000 MW, 220-MMg/d plant at RasAz-Zour in the Eastern Province (supplying Riyadh). One of the two largest planned facilities of its kind in the world; project has been has been delayed. Requests for proposals are expected to be solicited in early 2007.
- 4) A \$3.4-billion 2500-2750-MW, 176-MMg/d water plant at Jubail (Al-Jubail 3) offered by the semi-independent Power & Water Utility Company for Jubail and Yanbu (Marafiq). The French/Belgian Suez Tractebel Energy and an international consortium of Gulf Investment Corporation and ACWA won a tender for the BOOT project. Also known as the Marafiq IWPP-Phase 1, it is the only existing IWPP not offered by the SEC. The gas-fired plant will supply consumers in Jubail Industrial City when it comes online in phases between July 2009 and February 2010. Jubail will rival Ras As-Zour as the largest combined desalination and power plant. Extensions (Jubail 4 and 5) are already the planning phases.

Other proposed IWPPs include a light crude-fired 2,400-MW, 150-MMg/d facility (Yanbu-2), first announced in November 2006. Reportedly a second phase IWPP, with up to 2,000-MW and 22 MMg/d of capacity is reportedly being planned by Marafiq in the same region. Also proposed are a 2,400-MW and 150-MMg/d facility at Rabigh(2), and 60-MW, 23-MMg/d Shuqaiq(3) extension.

### Major Independent Power Projects

Throughout the kingdom, independent power projects (IPPs), which are not integrated with desalination facilities, are also being tendered by the SEC, primarily to local contractors. In 2006, an estimated 2500 MW of new generation capacity was tendered via IPPs. The upgrades/construction include Al-Qurayyah-I (850 MW, Phase II - 1900 MW) and the Faras facilities (509 MW); Riyadh Power Plant 8 (PP8, 500 MW, increased to 1000 MW); and the crude-powered al-Jauf (60 MW, online in 2008). Also in the first half of 2006 contracts were awarded to upgrade the 250-MW Tihama facility and to construct a 300-MW facility at Jizan (as well as upgrade existing facility by 60 MW), all of which will come online in 2008, except for Jizan, which will be commissioned in November 2009. A \$960-million, 1200-MW (to 3000-MW total) expansion of PP9 in Riyadh expansion is expected to be partially productive in June 2007, and fully online by August 2008. Several larger scale IPPs are still in the planning phases, include 1,725-MW expansions at Muzahimiyah, Shubuk, and Riyadh-PP10.

### Major Cogeneration Facilities

Separately, Saudi Aramco is building a series of co-generation plants at oil and gas installations throughout the country, in order to reduce drain of the energy sector on the nation grid. Tihama Power Generation Group, one of the largest independent power producers (IPP) in the country, and 60/40 joint venture comprising the UK-based International Power, and Saudi Oger (an affiliate of Aramco), recently completed expansion at four natural gas-fired facilities at Aramco facilities on a BOOT basis. Aramco has installed 1063 MW capacity at a total cost of \$612 million, including 305-MW facilities at Uthmaniyah, Shedgum and Ju'aymah NGL plants, and a 148-MW facility at the Ras Tanura refinery. The power conversion projects came online between March 2006, and September 2006. As part of the Khursaniya and Shaybah mega-project, two cogeneration units with a combined capacity of 300 MW were installed. Finally, an estimated \$1-billion expansion of the Rabigh (I) complex will involve the installation of 16, 16-MW oil-fired units to increase total capacity to nearly 1,000 MW. Rabigh will supply the adjacent Sumitomo/Aramco petrochemical complex.

| <b>Monthly Power Consumption Tariffs</b>        |                                |
|---|--------------------------------|
| <b>Consumer Type / Use</b>                      | <b>Tariff (in Halala/US\$)</b> |
| <b>Industrial</b>                               | H 12 (US                       |
| Any volume of usage                             | \$.032)                        |
| <b>Agricultural</b>                             |                                |
| 1-2,000 KWh per month                           | H 5 (US \$.013)                |
| 2,001-5,000 KWh per month                       | H 10 (US \$.026)               |
| Over 5,000 KWh per month                        | H 12 (US \$.032)               |
| <b>Commercial, Residential and Governmental</b> |                                |
| 2,000 KWh per month                             | H 5 (US \$.013)                |
| 2,001-4,000 KWh per month                       | H 10 (US \$.026)               |
| 4,001-6,000 KWh per month                       | H 12 (US \$.032)               |
| 6,001-7,000 KWh per month                       | H 15 (US \$.040)               |
| 7,001-8,000 KWh per month                       | H 20 (US \$.053)               |
| 8,001-9,000 KWh per month                       | H 22 (US \$.059)               |
| 9,001-10,000 KWh per month                      | H 24 (US \$.064)               |
| Over 10,000 KWh per month                       | H 26 (US \$.070)               |
| Source: SAGIA                                   |                                |

### **Transmission and Interconnection**

Besides generation, Saudi Arabia also requires additional investment in power transmission. At present, around 10 percent of the Kingdom's population has no access to the national power grid. Aramco estimates that creating a unified national grid may require laying more than 20,000 miles of additional power transmission lines on top of the existing 150,000 miles of lines. As of September 2006, *Power Engineering International* listed 65 separate transmission projects planned or in execution in Saudi Arabia.

Saudi Arabia is also taking steps to interconnect their power grids with other Arab countries to

benefit from differences in peak demand. In September 2006, the Saudi Electricity Company and the Egyptian Electricity Holding Company signed an MoU commissioning a \$2.6-million feasibility study of the proposed linkup of the two largest power generators in the Middle East. The project is part of planned interconnection of the power grids throughout the region. The grids of the six Gulf Cooperation Council (GCC) countries are scheduled to be integrated by 2010. Saudi Arabia will take part in a linkup with Kuwait, Bahrain and Qatar by 2008. The US\$1.2-billion first phase will include a marine linkup to Kuwait and overhead transmission infrastructure to Bahrain.

### Non-Conventional Energy

In July 2006, the U.S.-based International Power Group (IPWG) was granted a three-year renewable license to conduct a feasibility study for a waste-to-energy (WTE) facility in the southwestern city of Jizan. Following the study, a US\$300-million plant was commissioned, and is expected to come online in December 2008. According to IPWG, the WTE modules combust up to 180 tons of solid and hazardous waste, while generating 6 MW of electricity and up to 250,000 gallons of distilled water per day.

## Profile

### Country Overview

|                           |   |
|---------------------------|---|
| <b>Head of State</b>      | King Abdullah bin Abd al-Aziz al-Sa'ud (succeeded to throne on August 1, 2005)                                      |
| <b>Crown Prince</b>       | Sultan bin Abdul Aziz (named on August 1, 2005)   |
| <b>Location/Size</b>      | Between the Arabian Gulf and the Red Sea/865,000 square miles (about 1/4 the size of the United States)             |
| <b>Major Cities</b>       | Riyadh (royal capital), Jeddah (administrative capital), Mecca, Medina, Dammam, Jubayl, Buraydah                    |
| <b>Independence</b>       | September 23, 1932 (unification)  |
| <b>Population (2006E)</b> | 24.5 million, including an estimated 6.5 million foreign nationals  |
| <b>Languages</b>          | Arabic  |
| <b>Ethnic Group(s)</b>    | Arab (90%), Afro-Asian (10%)  |
| <b>Religion</b>           | Muslim (100%) - predominantly Sunni, with a minority Shi'ite population mainly concentrated in eastern Saudi Arabia |

### Economic Overview

|  |  |
|--|--|
| <b>Current Account Balance (2005E), (2006E) (2007E)</b>                | \$90.1 billion, \$95.5 billion, \$105 billion  |
| <b>Official Reserves of Foreign Exchange and Gold (October 2006E):</b> | \$26.1 billion (note the country has significantly more in listed as "foreign assets") |

### Energy Overview

|  |   |
|--|---|
| <b>Minister of Petroleum and Mineral Resources:</b>          | Ali bin Ibrahim al-Naimi (since 8/95)   |
| <b>Minister of Water and Electricity</b>                     | Abdallah al-Husayn (since 4/04)   |
| <b>Proven Oil Reserves (January 1, 2007E)</b>                | 259.8 billion barrels (includes half of Divided/"Neutral" Zone)   |
| <b>Total Oil Production – including the NZ (2006E)</b>       | 10.7 million barrels per day (bbl/d), of which 9.2 million bbl/d was crude oil, 1.5 million bbl/d was natural gas liquids (NGLs), and 80,000 bbl/d was "other liquids" (including MTBE) |
| <b>Total Oil Production – including the NZ (2005E)</b>       | 11.1 million barrels per day (bbl/d), of which 9.6 million bbl/d was crude oil, 1.5 million bbl/d was natural gas liquids (NGLs), and 80,000 bbl/d was "other liquids" (including MTBE) |
| <b>OPEC Crude Oil Production Quota (effective 7/01/2005)</b> | 9.099 million bbl/d. OPEC has since assigned Saudi Arabia production (but not quota) cuts of 380,00 bbl/d (effective November 1, 2006) and 158,000 bbl/d (effective February 1, 2007).  |
| <b>Crude Oil Production Capacity (12/06 E)</b>               | 10.5-11.0 million bbl/d   |

|   |   |
|---|---|
| <b>Oil Consumption (2006E)</b>                              | 2.1 million bbl/d   |
| <b>Spare Capacity (12/06E)</b>                              | 1.7-2.2 million bbl/d, to increase on Feb 1   |
| <b>Crude Oil Refining Capacity (January 1, 2007E)</b>       | 2.1 million bbl/d   |
| <b>Net Oil Exports (2003E), (2004E), (2005E), (2006E)</b>   | 7.7 million bbl/d, 8.1 million bbl/d, 8.6 million bbl/d, 8.8 million bbl/d  |
| <b>Major Oil Importers (2005E, approximate net exports)</b> | United States (1.5 million bbl/d); OECD Europe (1.4 million bbl/d); Japan (1.5 million bbl/d – OPEC says differently); South Korea (835,000 bbl/d); India (around 350,000-400,000 bbl/d); China (over 410,000 bbl/d) –; Taiwan (over 200,000 bbl/d) |
| <b>Proven Natural Gas Reserves (January 1, 2007E)</b>       | 240 trillion cubic feet (Tcf) (includes half of NZ)   |
| <b>Natural Gas Production/Consumption (2004E)</b>           | 2.32 Tcf  |
| <b>Electricity Installed Capacity (2004E)</b>               | 29.1 Gigawatts (all thermal)  |
| <b>Electricity Generation (2004E)</b>                       | 155.3 billion kilowatt-hours (Bkwh)   |
| <b>Electricity Consumption (2003E)</b>                      | 144.4 billion kilowatt-hours (Bkwh)   |
| <b>Total Energy Production (2004E)</b>                      | 21.2 quadrillion Btu* (5.5% of world total energy production).  |
| <b>Total Energy Consumption (2004E)</b>                     | 6.1 quadrillion Btu* (1.4% of world total energy consumption)   |
| <b>Total Per Capita Energy Consumption (2004E)</b>          | 236.5 million Btu (vs. U.S. value of 342.7 million Btu)   |
| <b>Energy Intensity (2004E)</b>                             | 17,554 Btu/\$ -- PPP (vs U.S. value of 9,336 Btu/\$)**  |

## Environmental Overview

|  |  |
|--|--|
| <b>Energy-Related Carbon Dioxide Emissions (2003E)</b>             | 365.1 million metric tons (1.3% of world carbon dioxide emissions)   |
| <b>Per-Capita, Energy-Related Carbon Dioxide Emissions (2003E)</b> | 14.2 metric tons (vs. U.S. value of 20.2 metric tons of carbon dioxide)  |
| <b>Carbon Dioxide Intensity (2003E)</b>                            | 1.05 metric tons/thousand \$ -- PPP (vs U.S. value of 0.55 metric tons/thousand \$)**  |
| <b>Environmental Issues</b>  | Desertification; depletion of underground water resources; the lack of perennial rivers or permanent water bodies has prompted the development of extensive seawater desalination facilities; coastal pollution from oil spills.   |
| <b>Major Environmental Agreements</b>                              | A Non-Annex I country, party to United Nations Framework Convention on Climate Change (ratified December 28th, 1994), Desertification, Endangered Species, Hazardous Wastes, Law of the Sea and Ozone Layer Protection. Ratified the Kyoto Protocol on December 21, 2004.. |

## Oil and Gas Industry

|                                |  |
|--------------------------------|--|
| <b>Organization</b>            | The Supreme Petroleum Council governs the nationalized oil industry, including Saudi Arabian Oil Co. (Saudi Aramco) crude production and some natural gas production, refining/processing and marketing; Saudi Basic Industries Corp. (SABIC) for petrochemicals   |
| <b>Major Oil/Gas Terminals</b> | Ras Tanura Facility (world's largest offshore oil loading facility, on the Persian Gulf; over 6 million bbl/d capacity total, Ras Tanura Port capacity is 2.5 million bbl/d), Ras al-Ju'aymah (on the Persian Gulf northwest of Ras Tanura, part of the larger facility; 3-3.6 million bbl/d capacity, highest volume offshore loading facility), Yanbu (on the Red Sea, fed by Petrolina; over 6 million bbl/d capacity – of which 4.5 million bbl/d crude, remainder products/LPG), Jubail, Jiddah (on Red Sea south of Yanbu), Jizan (on Persian Gulf, refined products), Ras al-Khafji (on Persian Gulf in the Saudi-Kuwaiti Divided/"Neutral" Zone, crude oil), Rabigh (on Red Sea, north of Jiddah, crude oil and refined products), |

|  |   |
|--|---|
|  | Zuluf (offshore Persian Gulf, linked to Zuluf oil field)  |
| <b>Major Oil Fields</b>                                  | Abqaiq, Abu Saafa, Berri, Ghawar, Khursaniya, Najd, Qatif, Safaniya, Shaybah, Zuluf (in addition, Khurais and Manifa are partially developed and are being brought back online)   |
| <b>Major Pipelines (capacity – million bbl/d)</b>        | Domestic: Abqaiq-Yanbu Petroline (5.0), Abqaiq-Yanbu NGL line (0.3); International: Saudi Arabia-Bahrain (estimated 0.7) , Saudi Arabia-Iraq or IPS (1.6 -- closed since August 1990), TransArabia Tapline (0.5 -- closed since 1984), New Arabia: under construction, will replace pipeline to Bahrain               |
| <b>Major Refineries (capacity January 1, 2007E)</b>      | Aramco - Rabigh 400,000 bbl/d, Ras Tanura 550,000 bbl/d, Yanbu 235,000 bbl/d, Riyadh, 120,000 bbl/d, Jeddah 85,000 bbl/d; Saudi Aramco/Mobil - Yanbu 400,000 bbl/d; Petromin/Shell - al-Jubail 305,000 bbl/d; Mina Saud (Mothballed), Arabian Oil Company (Japan) - Ras al-Khafji (30,000 bbl/d – mothballed in 2005) |
| <b>Major Gas Processing Facilities (capacity, 2006E)</b> | Haradh (1.5 Bcfd), Hawiya ( 1.4 Bcfd.), Uthmaniya (2.5 Bcfd), Shedgum (2.4 Bcfd), Berri, Juaymah, Yanbu (all condensates, NGLs)   |

\* The total energy consumption statistic includes petroleum, dry natural gas, coal, net hydro, nuclear, geothermal, solar, wind, wood and waste electric power. The renewable energy consumption statistic is based on International Energy Agency (IEA) data and includes hydropower, solar, wind, tide, geothermal, solid biomass and animal products, biomass gas and liquids, industrial and municipal wastes. Sectoral shares of energy consumption and carbon emissions are also based on IEA data.

\*\*GDP figures from OECD estimates based on purchasing power parity (PPP) exchange rates.

## Links

### EIA Links

[EIA - Country Information on Saudi Arabia](#)

### U.S. Government

[CIA World Factbook - Saudi Arabia](#)

[Library of Congress Country Study on Saudi Arabia](#)

[U.S. Consulate in Dhahran](#)

[U.S. Consulate in Jeddah](#)

[U.S. Commerce Country Commercial Guide](#)

[U.S Commercial Service – Saudi Arabia](#)

[U.S. Embassy in Riyadh](#)

[U.S. State Department's Background Note- Saudi Arabia](#)

[U.S. State Department Consular Information Sheet – Saudi Arabia](#)

[U.S State Department Travel Information Sheet – Saudi Arabia](#)

### Other Links

[Arab News](#)

[BBC: Saudi Arabia](#)

[International Energy Forum Secretariat](#)

[Joint Oil Data Initiative \(JODI\)](#)

[Lonely Planet Guide: Saudi Arabia](#)

[Organization of Petroleum Exporting Countries \(OPEC\)](#)

[Royal Commission for Jubail and Yanbu](#)

[SABIC Home Page](#)

[Saline Water Conversion Corporation](#)

[Saudi-American Bank \(SAMBA\)](#)

[Saudi Arabian Embassy in the United States](#)

[Saudi Arabian General Investment Authority \(SAGIA\)](#)

[Saudi Arabian Information Resource](#)

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[Saudi Aramco Home Page](#)

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[Saudi Ministry of Economy and Planning](#)

[Saudi Ministry of Petroleum and Mineral Resources](#)

[Saudi Ministry of Water and Electricity](#)

[Saudi Mission to the United Nations](#)

[Saudia Online.com](#)

[Saudi Ports Authority](#)

[Saudi-US Relations Information Service](#)

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Zawya

## Contact Info

cabs@eia.doe.gov  
(202)586-8800  
[cabs@eia.doe.gov](mailto:cabs@eia.doe.gov)

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