



Independent Statistics & Analysis

U.S. Energy Information  
Administration

## Country Analysis Brief: Kuwait

Last Updated: November 2, 2016

### Overview

*Kuwait was the 10<sup>th</sup>-largest producer of petroleum and other liquids in 2015.*

As a member of the Organization of the Petroleum Exporting Countries (OPEC), Kuwait was the world's 10<sup>th</sup>-largest producer of petroleum and other liquids in 2015, and it was the fifth-largest producer of crude oil among the 14 OPEC members. Despite its relatively small geographic size (about 6,900 square miles), in terms of production, it only trailed Saudi Arabia, Iraq, Iran, and the United Arab Emirates in production of petroleum and other liquids in 2015.

Kuwait's economy is heavily dependent on petroleum export revenues, which accounted for more than 70% of the government's total revenues in 2015, according to IMF estimates.<sup>1</sup> In fact, petroleum exports accounted for almost 89% of total export revenues in 2015.<sup>2</sup> Much like other OPEC producers, Kuwait saw the value of its total exports fall sharply in 2015 as crude oil prices fell. In 2014, Kuwait's value of exports totaled roughly \$104 billion and fell to about \$55 billion in 2015. The share of petroleum exports in 2014 was 94% of the total export revenue.<sup>3</sup>

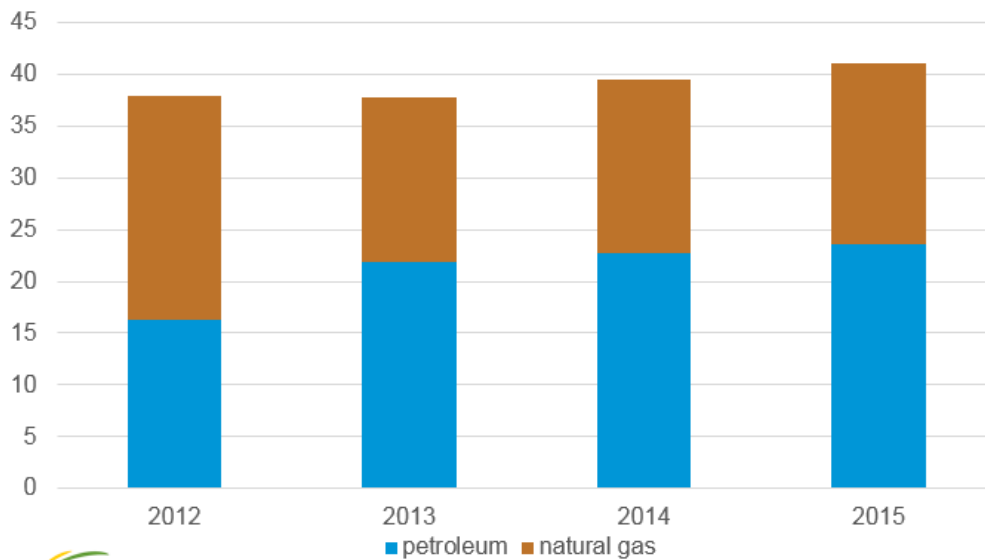
U.S. Energy Information Administration (EIA) estimates that Kuwait's net export revenues totaled \$40 billion in 2015, about half of what Kuwait earned during the previous year.<sup>4</sup> Although some of the decline in net export revenue is a result of a decrease in production and exports during the year, the decrease in crude oil prices accounted for most of the decline in net export revenues. Kuwait wants to remain one of the world's top oil producers, so the country has targeted crude oil and condensate production of 4 million barrels per day (b/d) by 2020. These planned production targets include the expansion of the Neutral Zone production, which has been shut in since the fourth quarter of 2014 because of a dispute with Saudi Arabia.<sup>5</sup> However, Kuwait has struggled to boost oil and natural gas production for more than a decade because of upstream project delays and insufficient foreign investment.

Most of the increase in oil production capacity is expected to come from the Kuwait Oil Company (KOC) projects, with total KOC capacity expected to reach 3.65 million b/d by 2020. The remaining 350,000 b/d is expected to come from the Kuwait Gulf Oil Company (KGO) in the Partitioned Neutral Zone (PNZ).<sup>6</sup>

To diversify its oil-heavy economy, Kuwait increased efforts to explore and develop its nonassociated natural gas fields, which currently make up a small portion of its natural gas production.<sup>7</sup> Greater natural gas production would increase Kuwait's feedstock for its struggling electricity sector, which frequently fails to generate enough electricity to meet peak demand. Kuwait's share of natural gas use in its primary energy consumption has increased from 34% in 2009 to about 43% in 2015, while the remaining share, consisting of petroleum and other liquids, has declined.<sup>8</sup>

Kuwait's energy policy is set by the Supreme Petroleum Council and the policy is overseen by the Ministry of Oil. The Kuwait Petroleum Corporation and its various subsidiaries execute the oil policy in the country. Kuwait's sovereign-wealth fund is managed by the Kuwait Investment Authority, which oversees all state expenditures and international investments.

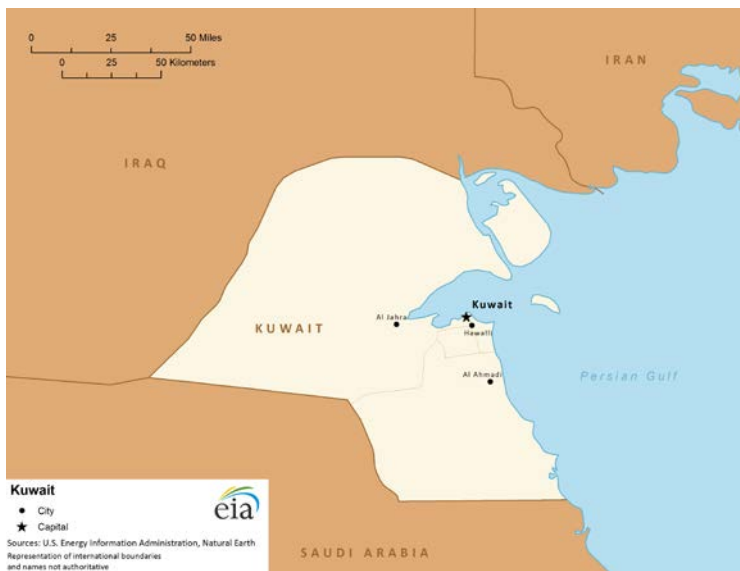
**Figure 1. Kuwait's total energy consumption, 2012-15**  
million tons of oil equivalent



Source: BP Statistical Review of World Energy

Despite Kuwait's constitutional ban on foreign ownership of its resources and revenues, the government has taken measures to increase foreign participation in the oil and natural gas sectors through technical and service contracts.<sup>9</sup> Kuwait is a constitutional emirate led by the Emir of Kuwait, a hereditary seat led by the Al-Sabah family. The Prime Minister, his deputy, and the council of ministers are approved by the Emir. Kuwait's frequent delays of major energy projects are the result of political disagreements between the Emir and the parliament over contract management, especially those contracts involving foreign companies and project logistics. The frequent changes in government and dissolutions of parliament have delayed the progress of major projects.

**Figure 2. Map of Kuwait**



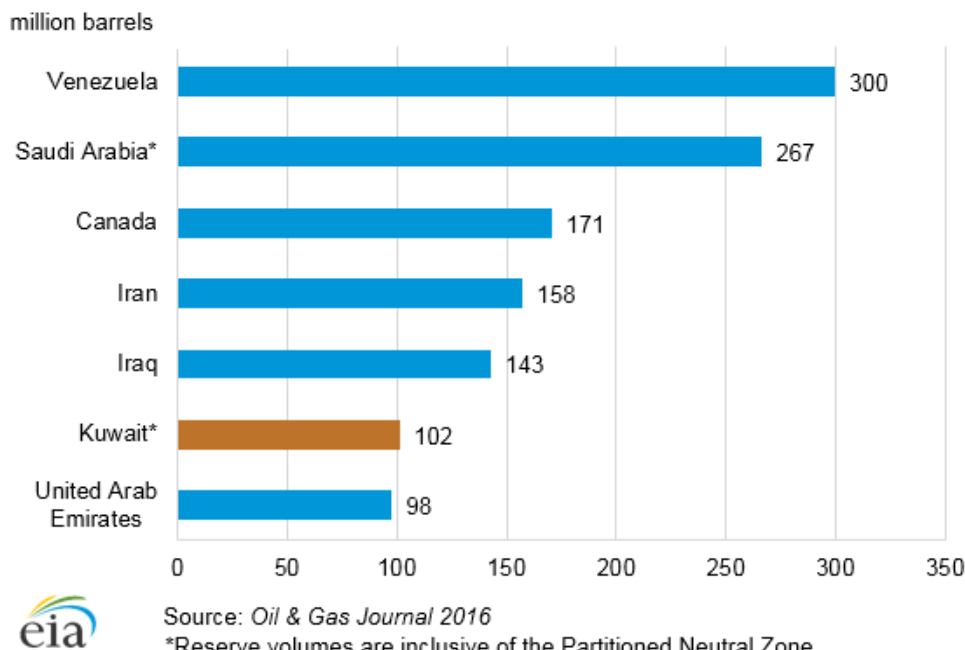
Source: U.S. Energy Information Administration

## Petroleum and other liquids

*Kuwait holds the world's sixth-largest oil reserves and is one of the top 10 global producers and exporters of total petroleum liquids.*

According to the *Oil & Gas Journal* (OGJ), as of January 2016, Kuwait had an estimated 102 billion barrels of proved oil reserves, roughly 6% of the world total and sixth among all of the world's producers. These totals include roughly 5 billion barrels of proved reserves held in the Partitioned Neutral Zone (PNZ), which Kuwait shares evenly with Saudi Arabia. Kuwait's oil reserves include approximately 13 billion barrels of heavy oil, located primarily in northern Kuwait, with other reserves concentrated in the PNZ.

**Figure 3. Top proved world oil reserves, 2016**



### Sector organization

*Kuwait Petroleum Corporation, Kuwait's national oil company, and its subsidiaries control the entire petroleum and other liquids sector from upstream to downstream and exports.*

The government of Kuwait owns and controls all development of the oil sector. The Supreme Petroleum Council (SPC) oversees Kuwait's oil sector and sets oil policy. The SPC is headed by the Prime Minister. The other members of the council (six ministers and six representatives from the private sector) all serve three-year terms, and are selected by the Emir. The Ministry of Petroleum supervises all aspects of policy implementation in the upstream and downstream portions of the oil and natural gas sectors.

The Kuwait Petroleum Corporation (KPC) manages domestic and foreign oil investments. The Kuwait Oil Company (KOC), the upstream subsidiary of KPC, was taken over by the Kuwaiti government in 1975 and manages all upstream development in the oil and natural gas sectors.<sup>10</sup> The Kuwait National Petroleum Company (KNPC) controls the downstream sector, and the Petrochemical Industries Company (PIC) oversees the petrochemical sector. Export operations are overseen by both KNPC and the Kuwait Oil Tanker Company (KOTC). The Kuwait Foreign Petroleum Exploration Company (KUFPEC) handles foreign

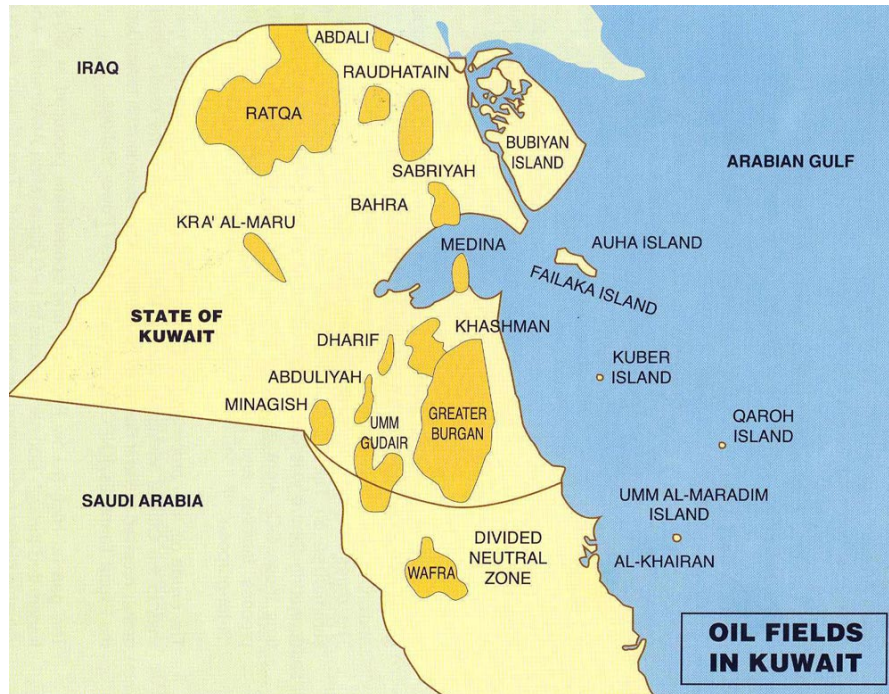
interests of KPC, including KPC's foreign upstream oil and gas activities in eight countries and Kuwait Petroleum International (KPI) downstream activities.<sup>11</sup>

There are also several non-state-owned companies that operate in Kuwait, including the Independent Petroleum Group, Aref Energy Holding, and Kuwait Energy Company (KEC). KEC in particular has been successful and has developed a number of foreign interests since it was founded in 2005, including interests in Yemen, Egypt, Russia, Pakistan, Ukraine, and Oman.<sup>12</sup>

The managing companies for the PNZ are separated by onshore and offshore activities. The onshore sector was initially developed by American Independent Oil Company (Aminoil), which was nationalized in 1977. Getty Oil, which later became part of Chevron Oil Corporation, was brought in to develop onshore PNZ fields of Wafra, South Umm Gudair, and Humma. Chevron remains a participant along with KPC, although management of all KPC's PNZ interests has been transferred to the Kuwait Gulf Oil Company (KGOC).

A Japanese company, the Arabian Oil Company (AOC), discovered the offshore fields of Khafji, Hout, Lulu, and Dorra in the 1960s. The concessions with Saudi Arabia and Kuwait expired in 2000 and 2003, respectively. KGOC was established in 2002 to oversee the offshore operations for KPC. Subsequently, KGOC, along with Aramco Gulf Operations Company (AOGC), set up a joint operating company, Al-Khafji Joint Operations Company (KJO), which manages the offshore PNZ production.<sup>13</sup>

**Figure 4. Kuwait's oil fields**



Source: Kuwait's Ministry of Oil

## Exploration and production

*Kuwait implemented enhanced oil recovery measures to boost stagnant production rates. New discoveries have been made, but Kuwait's regulated oil sector has slowed further exploration and production.*

In 2015, Kuwait's petroleum and other liquids production was approximately 2.7 million barrels per day (b/d), including its share of oil production from the PNZ. However, since 2015, production at the Wafra and Khafji fields in the PNZ has been shut in because of a dispute between Saudi and Kuwaiti governments regarding the development of the PNZ. The series of disputes reached their nadir when Saudi Arabia shut

down Khafji in October 2014 citing environmental reasons, followed by a shutdown of Wafra in May 2015. Little information is available about a possible restart of production in the PNZ.

In 2015, Kuwait produced approximately 2.5 million b/d of crude oil and about 200,000 b/d of non-crude liquids. About half of Kuwaiti crude oil production in 2015 came from the southeast region of the country, largely from the Burgan field, which has a sustainable production capacity of 1.7 million b/d.<sup>14</sup>

Because of the constitutional ban on foreign ownership of Kuwait's natural resources, development of domestic fields has stalled. Several discoveries of lighter crudes have been made in the center of the country, but production has not begun. In 1984, a discovery was made in South Maqwa in the Greater Burgan field, revealing light crude of API 35° to 40° grade. After drilling began at Kra'a al-Mara in 1990, significant volumes of 49° API crude oil grade were found. Another discovery was made in 2006 in the Sabriya and Umm Niqa areas in the northern region of the country, which added an estimated 20 to 25 billion barrels of reserves, although mostly of a heavier, sour quality that is more technically challenging to develop.

Kuwait recently announced a new discovery of light crude oil in the western part of the country. The new field, located in Jathathil, is expected to boost Kuwait's production capacity and reserves for both light crude and natural gas.<sup>15</sup> Kuwait has ambitious plans to lift its production of crude oil to 4 million b/d by 2020, despite continued lower crude oil prices. The KOC received a \$33 billion budget to carry out the expansion plans.<sup>16</sup> Kuwait also plans to upgrade its export infrastructure and build downstream facilities, both domestically and abroad. Part of the longer-term expansion plan is to develop four oil and gas fields in the north, especially given the uncertainty regarding the PNZ output. To achieve this 2020 target, investment and participation from international companies will be necessary.

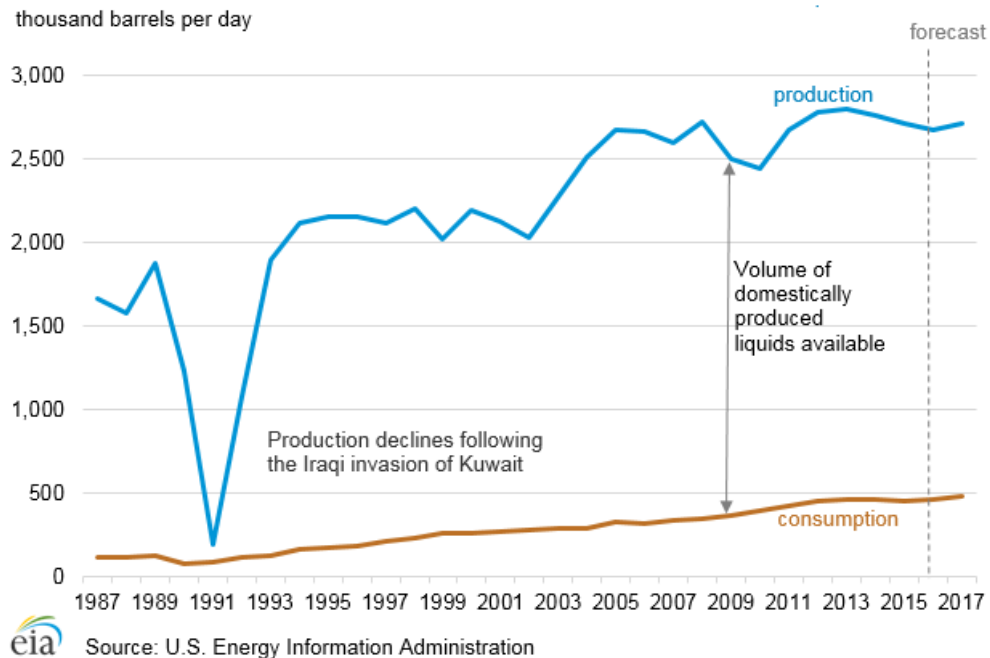
A number of international oil companies (IOCs) have agreements to assist Kuwait in enhanced oil recovery (EOR) of its mature fields and through Enhanced Technical Service Agreements (ETSA). Foreign companies are not permitted to invest in Kuwait's upstream or downstream activities. In February 2010, Royal Dutch Shell signed an ETSA to develop the Sabriya and Umm Niqa fields, although progress to boost production has been slow. In an effort to develop the Lower Fars reservoir of the northern Ratqa field, KOC initially negotiated with ExxonMobil, Shell, and Total, but then abandoned plans for a joint project development. In January 2015, however, KOC awarded a \$4 billion contract to Petrofac for the first phase of the Lower Fars heavy oil project. KOC also signed a memorandum of understanding (MOU) in July 2010 with Japan Oil, Gas, and Metals National Corporation (JOGMEC) to assess the feasibility of carbon dioxide injection as a potential EOR technique.

Most of Kuwait's oil reserves and oil production are concentrated in a few mature oil fields discovered in the 1930s and 1950s. The Greater Burgan oil field accounts for most of both reserves and production in the country. Burgan is considered to be the world's second-largest oil field, surpassed only by Saudi Arabia's Ghawar field. Greater Burgan was discovered in 1938, but it was not fully developed until after World War II.<sup>17</sup> Generally, the Greater Burgan produces medium to light crudes, with API gravities in the 28° to 36° range. Greater Burgan's production accounts for about half of Kuwait's total production, and Burgan can produce as much as 1.7 million b/d. KOC wants to boost the Greater Burgan's capacity through enhanced oil recovery methods such as injection of seawater and carbon dioxide.<sup>18</sup>

Other production centers in the southwest region of the country include Umm Gudair, Minagish, and Abduliyah. Umm Gudair and Minagish produce a variety of crude oil grades, which largely fall in the medium range, with gravities of 22° to 26° API. In January 2003, water injection began at Minagish to enhance oil recovery and to offset natural production declines.

Most of Kuwait's larger fields are in the northern part of the country. Apart from the Greater Burgan field, Kuwait's second-largest source of crude production is from the northern Raudhatain field, with a capacity of 350,000 b/d. The Sabriya field, adjacent to Raudhatain, adds another 100,000 b/d. The frontier fields of Ratqa (the southern extension of Iraq's South Rumaila structure) and the smaller Abdali field have capacities of 45,000 b/d and 30,000 b/d, respectively.<sup>19</sup>

**Figure 5. Kuwait's petroleum and other liquids production and consumption, 1987 - 2017**



## Project Kuwait

*In an otherwise nationalized oil sector, Project Kuwait plans to provide incentives for foreign investment to boost production capacity to 4 million b/d by 2020.*

Project Kuwait is the key part of Kuwait's plan to attain a production capacity of 4 million b/d by 2020. Proposed in 1997, Project Kuwait was an effort to create incentives to attract foreign participation, particularly for the country's northern fields. The contract structure that resulted was challenged as unconstitutional, and the National Assembly has impeded progress of Project Kuwait for several years. Kuwait's constitution bars foreign ownership of the country's natural resources, which precludes the product-sharing agreements (PSAs) that provide the desired incentive for investment from the IOCs. To allow IOC involvement, an incentivized buy-back contract (IBBC) arrangement was created, which does not involve production sharing or concessions.<sup>20</sup>

The structure of the IBBC agreements allows the Kuwaiti government to retain full ownership of oil reserves, control over oil production levels, and strategic management of the ventures. Foreign firms are paid a per unit (or per barrel) fee, in addition to allowances for capital recovery and incentive fees for increasing reserves. In May 2007, the Kuwaiti ruling family conceded the responsibility of approving each related IBBC for Project Kuwait to the National Assembly, which has resulted in further delays. Additionally, more performance-based incentives have been introduced using this enhanced technical service agreement structure.

Nearly all of Kuwait's current crude oil production comes from onshore fields. Project Kuwait is designed to expand offshore production capacity. Additional capacity will come from the development of the Lower Fars heavy oil field and associated oil production from the Jurassic gas field. The expansion of the Ratqa heavy oil field would add about 60,000 b/d by 2020, while the liquids from the Jurassic natural gas field could reach 350,000 b/d.<sup>21</sup>

An unconventional source of potential production will come from the clean-up of the large pools of crude oil that have remained since the withdrawal of the Iraqi army after the Persian Gulf War in 1991. In February



2012, KOC awarded tenders to HERA Company of Spain, GS Engineering and Construction Corporation of South Korea, and TERI Company of India to aid in soil remediation, which could result in significant crude oil volumes.<sup>22</sup> The entire operation will take many years and will cost roughly \$3.5 billion, paid for by the United Nations reparations fund. The first phase involves only three sites. During the Persian Gulf War, the Iraqi army set more than 700 wells on fire, and estimates indicate that as much as 5 million b/d were lost over the nine months it took to extinguish the fires. The oil spills resulted in the creation of thousands of crude oil lakes. Additionally, the crude lakes make it difficult to access producing areas and known reserves, which further restricts exploration and production.

## Partitioned Neutral Zone

*The territorial disputes between Kuwait and Saudi Arabia led to the creation of the Partitioned Neutral Zone. The production of oil and natural gas in the zone is divided equally between the two countries.*

The Partitioned Neutral Zone (PNZ) was established in 1922 to settle a territorial dispute between Kuwait and Saudi Arabia. The PNZ encompasses a 6,200-square-mile area. Earlier estimates by the *Oil and Gas Journal* reveal that the PNZ includes 5 billion barrels of oil and 1 trillion cubic feet (Tcf) of natural gas.<sup>23</sup> Oil production capacity in the PNZ was about 600,000 b/d in 2015, all of which was divided equally between Saudi Arabia and Kuwait. However, production averaged roughly 500,000 b/d immediately prior to the shutdown of output at the Khafji field in October 2014.

Onshore production in the PNZ centers on the Wafra oil field, which began producing oil at the end of 1953. Wafra is the largest of the PNZ's onshore fields, with approximately 4.9 billion barrels in estimated recoverable reserves, and is considered a super-giant heavy field. Wafra has related production facilities and gathering centers with South Umm Gudair and South Fuwaris.<sup>24</sup>

A full-field steam flood injection EOR project led by Chevron was under development to offset field declines and to boost production of the heavy oil play. However, because of the dispute between Saudi Arabia and Kuwait and Chevron's difficulty in securing work and equipment permits, Chevron's activities in the PNZ have stopped.<sup>25</sup>

The production capacity of offshore fields in the PNZ is less than 300,000 b/d. This production is operated by Khafji Joint Operations (KJO), the joint venture between the Kuwait Gulf Oil Company and Aramco Gulf Operations Company. The KJO also is in charge of developing and expanding the offshore capacity of the PNZ. The offshore production comes from a handful of major fields, with Khafji field accounting for the majority of production in the PNZ. Future expansion plans center on this field. Additional production comes from the extension of Saudi Arabia's Safaniyah field (the world's largest offshore field); Hout, which is also an extension of Safaniyah; and Dorra, an extension of Iran's Arash and which is shared with Saudi Arabia.

## Exports and consumption

*Kuwait's domestic oil consumption has been increasing, but most of its oil production is exported to Asia.*

In 2015, Kuwaiti exports of crude oil were estimated at 1.9 million b/d. So far in 2016, export of crude oil have averaged at roughly the same level. Most Kuwaiti crude oil is sold on term contracts and is destined for the Asian market.<sup>26</sup> Kuwait's crude oil exports are a single blend of all its crude types. The largest proportion is the medium Burgan crude, which is blended with heavier, sour crude from northern fields, as well as marginal amounts from Minagish and Umm Gudair. Kuwait's single export blend (called Kuwait) has a specific gravity of 30.5°API (a typical medium Mideast crude). It is generally considered sour, with 2.6% sulfur content.<sup>27</sup> In 2015, the Asia-Pacific region received approximately 66% of total Kuwaiti exports, or about 1.2 million b/d of crude oil, while exports to the United States totaled about 200,000 b/d. The largest importers were South Korea and China, which imported 315,000 b/d and 290,000 b/d, respectively.<sup>28</sup>

Through August 2016, export destinations of Kuwaiti crude oil remain the same as in 2015, although Asian markets are accounting for a larger share of total exports. South Korea received about 21% of total exports,

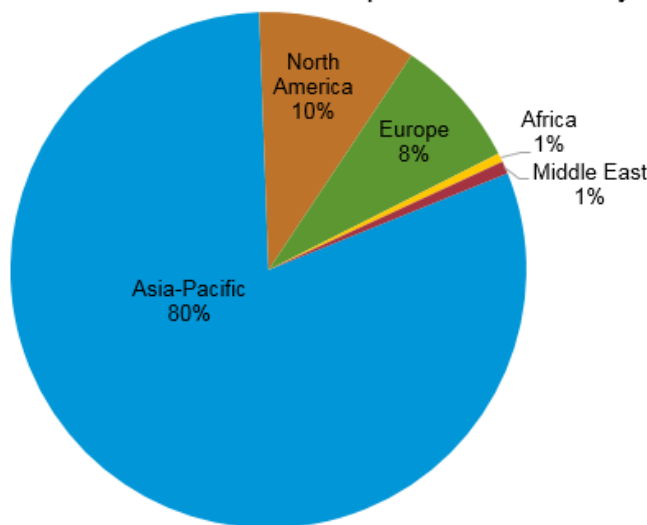
followed by China at 16% and Japan at 12%. Exports to European countries, including France, Greece, Italy, and Turkey, have decreased considerably.<sup>29</sup>

With most of its crude oil export volumes headed to Asian markets, Kuwait's most significant price benchmarks for exports are Dubai Crude or Oman Crude or a combination. Generally, Kuwaiti oil exports are priced at a slight discount. European buyers purchase from a benchmark linked between a Brent weighted-average and Saudi Arab Medium.

Kuwait's main port for exporting crude oil is Mina al-Ahmadi. Kuwait also has operational oil export terminals at Mina Abdullah, at Shuaiba, and at Mina Saud, otherwise known as Mina az-Zour.<sup>30</sup>

Kuwait consumes only a small portion of its total petroleum production. The country consumed a total of 455,000 b/d in 2016, leaving most of its domestic oil production available for exports. In addition to crude oil, Kuwait also exports petroleum products with 2015 petroleum product exports averaging 739,000 b/d. However, domestic oil consumption has been steadily increasing, partially as a result of increased petroleum-fired electricity generation.<sup>31</sup>

Figure 6. Kuwait's crude oil export destinations by region, Jan - Aug 2016



Source: Lloyd's Intelligence List, APEX Tanker Tracking database

## Refining

*Kuwait maintains refining and marketing interests in Europe and looks to expand into Asia, particularly China, Vietnam, and Indonesia. The country also continues to export refined petroleum products worldwide.*

Kuwait's nameplate refining capacity from its three refinery complexes (Mina al-Ahmadi, Mina Abdullah, and Shuaiba) was estimated at 936,000 b/d in 2015. All of the refineries are located near the coast, about 30 miles south of Kuwait City and are owned and operated by Kuwait National Petroleum Company (KNPC). The largest refinery, Mina al-Ahmadi, was built in 1949 and has a refining capacity of 466,000 b/d. Mina Abdullah and al-Shuaiba have nameplate refining capacities of 270,000 b/d and 200,000 b/d, respectively.<sup>32</sup>

Kuwait Petroleum International (KPI) manages KPC's international refining and marketing operations. KPI's operations include more than 4,400 retail stations across Belgium, Spain, Sweden, Luxembourg, and Italy. KPI has interests in refineries abroad, including the 50-50 joint venture with Italian oil major ENI in the 240,000 b/d capacity refinery in Milazzo, Italy. In addition, KPI is part of a joint venture with Vietnam Oil and Gas Group, Idemitsu, and Mitsui Chemical in the Nghi Son Refinery and Petrochemical Complex.<sup>33</sup>



Table 1. Kuwait's refineries

Refinery	Current capacity (b/d)	Planned capacity (b/d)
Mina al-Ahmadi	466,000	346,000
Mina Abdullah	270,000	454,000
Al-Shuaiba	200,000	0
Az-Zour	0	615,000
<b>Total capacity</b>	<b>936,000</b>	<b>1,415,000</b>

Source: Oil & Gas Journal, Middle East Economic Survey, Arab Oil & Gas Directory

## Clean Fuels Project and Az-Zour

After years of planning and delays, Kuwait appears to be making some progress on its ambitious downstream projects. In February 2014, the Central Tenders Committee approved the Clean Fuels Project (CFP), estimated to cost more than \$12 billion. CFP is slated to upgrade Kuwait's existing refineries and raise overall capacity to 800,000 b/d by 2019.<sup>34</sup>

In addition to the CFP, the planned overhaul of Kuwait's refining sector includes building a new Az-Zour refinery, shutting down the al-Shuaiba refinery, retiring old units, and installing new components at the remaining refineries. A crude distillation unit will be taken out of commission at the Mina al-Ahmadi, and Mina Abdullah will lose a number of components, but the overall capacity of the two refineries will increase to 800,000 b/d. Once operational, the proposed refinery will be the largest in the Middle East, likely will commence operations in 2020.<sup>35</sup>

## Natural Gas

*Kuwait increasingly relies on imports of natural gas to meet domestic demand. The increase in domestic consumption has led to an increased focus on natural gas exploration and development of sources for domestic consumption.*

According to the *Oil & Gas Journal*, as of January 2016, Kuwait had an estimated 63 trillion cubic feet (Tcf) of proved natural gas reserves. Kuwait is intent to diversify its economy has spurred an extensive focus on natural gas exploration. Vast discoveries of nonassociated gas (not associated with oil production) in the northern region of the country have attracted interest from IOCs. However, contract structures and political uncertainty remain principal impediments to any rapid expansion of either reserves or production. Additionally, new natural gas discoveries are geologically more complex, mainly in tight and sour natural gas deposits that require more sophisticated development and have higher capital costs.

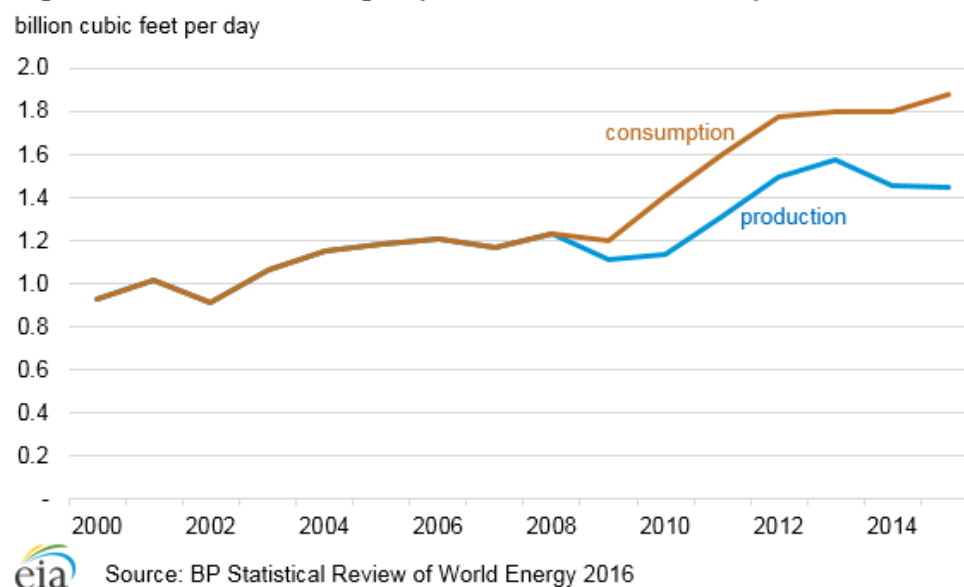
## Sector organization

*Kuwait's natural gas sector, like the petroleum and other liquids sector, is also managed by Kuwait Petroleum Corporation. Kuwait is using technical service agreements to attract necessary international investment for natural gas development.*

As in the oil sector, all of the natural gas resources are owned by the Kuwait Petroleum Corporation (KPC). The Kuwaiti constitution prohibits the use of production-sharing agreements (PSAs) that allow for an equity stake by an IOC in development projects; therefore, Kuwait uses technical service agreements (TSAs) to bring in IOCs to develop more difficult projects. In February 2010, Royal Dutch Shell signed an ETSA to

develop the 2006 natural gas discoveries in northern Kuwait, known as the Jurassic fields, which contain 35 Tcf of reserves in place. These reserves are too sour for local firms to develop.

**Figure 7. Kuwait natural gas production and consumption, 2001-15**



## Exploration and production

*Kuwait plans to increase dry natural gas production to 3 billion cubic feet per day by 2030 to satisfy increasing domestic consumption and to reduce dependence on natural gas imports during peak summer months.*

In 2015, Kuwait produced 1.4 billion cubic feet per day (Bcf/d), or 530 Bcf per year, of natural gas, a decrease of 1.5 Bcf/d from the previous year. Kuwait's natural gas production has been steadily falling since 2013, when it reached a record high of 1.6 Bcf/d. Domestic natural gas production started rising after 2009 with the introduction of nonassociated production, and driven by a need to meet rising domestic consumption. Given the predominance of associated natural gas in Kuwaiti production, domestic natural gas supplies have fluctuated in tandem with liquid fuels production.

Kuwait requires large supplies of natural gas to generate electricity, for water desalination, and for petrochemical production, as well as for enhanced oil recovery (EOR) techniques to boost oil production. Kuwait is shifting its exploration efforts to focus on natural gas discoveries to reduce dependence on imports of liquefied natural gas (LNG) and to decrease the share of oil used domestically, particularly for electricity plants and desalination plants. KOC has announced a production target of 3 Bcf/d by 2030, more than double the current production level.<sup>36</sup>

Associated natural gas production makes up most of Kuwait's overall production at 80% of the total natural gas production.<sup>37</sup> Production of non-associated natural gas from northern Kuwait is seen as the most promising source of future natural gas production growth, because Kuwait's challenging fiscal and political climate has not allowed for much progress in exploring offshore prospects.

Kuwait plans to expand production from the Jurassic nonassociated gas field in the northern region, which was discovered in 2006, with an estimated 35 Tcf of reserves. The field currently produces 150 million cubic feet per day (MMcf/d), and plans include production expansion to 600 MMcf/d. Initial plans expected that this expansion would be completed by 2013, but the project has been delayed until 2019 at the earliest. In addition to the political challenges of expanding production, the Jurassic non-associated gas field presents technical and geologic challenges, as the gas is in a tight formation and is ultra-sour.<sup>38</sup>

The other prospect for nonassociated natural gas production is the Dorra gas field offshore PNZ. This field is shared by Kuwait, Saudi Arabia, and Iran. Kuwait and Saudi Arabia originally planned to begin production at Dorra by 2017, providing an additional 500–800 MMcf/d in the area shared by Kuwait and Saudi Arabia. However, Kuwait and Saudi Arabia delayed project development as a result of a disagreement over transportation and allocation of resources.<sup>39</sup>

## Consumption and imports

In 2015, Kuwait consumed approximately 1.9 Bcf/d of natural gas, equivalent to about 695 Bcf per year.<sup>40</sup> Kuwait's electricity demand, fueled increasingly by natural gas, has outpaced domestic natural gas production during the summer months. This increased demand for electricity has resulted in the shutdown of refinery and petrochemical operations to make more natural gas available to generate electricity. Kuwait is seeking to diversify its electricity generation supply portfolio by replacing some petroleum products with more natural gas and renewables.

Insufficient domestic natural gas supply has contributed to frequent blackouts and brownouts during peak demand periods. Kuwait has resorted to importing liquefied natural gas (LNG) as a stopgap measure at its Mina Al-Ahmadi floating terminal. Initially, Kuwait imported LNG to meet peak summer demand (March–October). However, in 2015, Kuwait imported LNG cargoes through December 2015 and resumed LNG imports in February 2016. In 2015, Kuwait imported about 3.1 million metric tons (Mt) of LNG, almost 15% above the 2014 LNG imports. Kuwait's main source of LNG has been Qatar, but it has also imported LNG cargoes from Nigeria, Trinidad, Yemen, Oman, along with cargoes that were re-exported from Spain and India.<sup>41</sup>

Kuwait signed supply purchase agreements with Shell and the energy trading company Vitol and received LNG supplies from 2009 through 2013. Kuwait took delivery of the LNG at the Persian Gulf's first regasification terminal, Mina al-Ahmadi GasPort, a floating facility that has the flexibility to supply LNG to Kuwait during periods of high seasonal demand. The regasification capacity of al-Ahmadi was 500 MMcf/d. Mina Al-Ahmadi GasPort was operated under a contract with Excelerate and when that contract expired in 2013, Kuwait signed a new five-year agreement with Golar LNG to charter a larger floating LNG vessel with a capacity of 760 MMcf/d. The contract expires in 2019 by which time Kuwait hopes it will have increased domestic natural gas production and establish a permanent land-based liquefaction terminal. The proposed onshore LNG plant could meet Kuwait's natural gas demand year-round. The Mina al-Ahmadi onshore terminal is designed to have a processing capacity of 1.5 Bcf/d.<sup>42</sup>

## Electricity

*Kuwait's electric sector capacity has been slow to expand despite rapidly rising electricity consumption over the past decade and persistent power shortages during peak demand periods.*

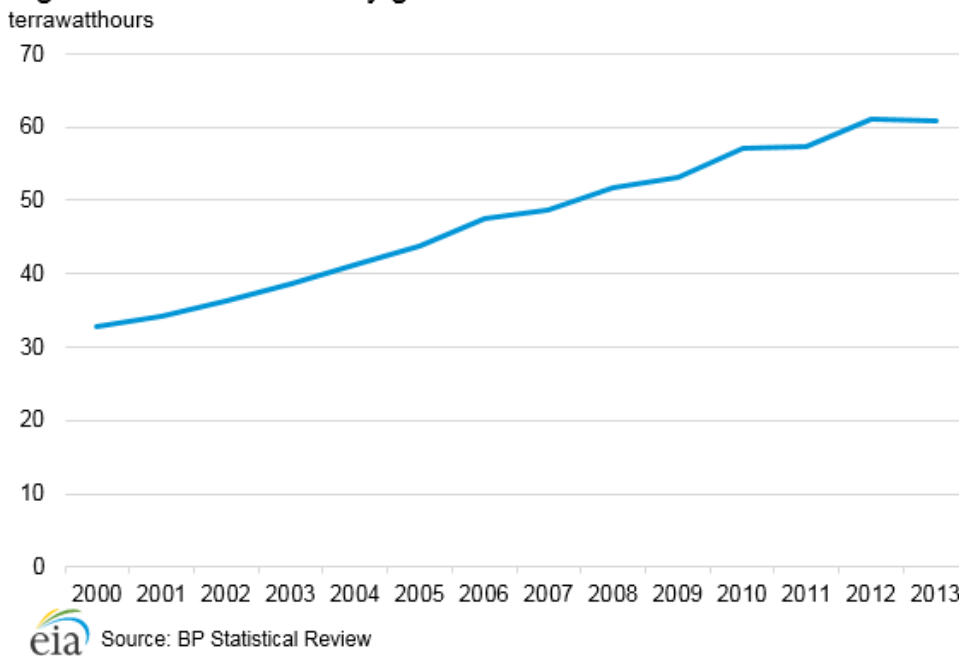
Kuwait relies on oil and natural gas to generate electricity, with oil accounting for most of the generating capacity. Insufficient domestic production and imports of natural gas to meet peak electricity demand in the summer months have resulted in Kuwait's power sector relying on more expensive, heavy fuel oil and crude oil to generate electricity. Given Kuwait's dependence on oil export revenues, it has significant financial incentives to move away from burning oil for domestic power use.<sup>43</sup>

In 2015, Kuwait had an installed electric generation capacity of 15.7 gigawatts (GW), according to IHS, with five power plants proving baseload generation. However, this level of generation capacity was insufficient to meet summer demand. Kuwait plans to increase baseload capacity to 25 GW by 2020.

Kuwait's increasing population and gross domestic product levels and low electricity tariffs over the past decade have led to higher electricity demand in the residential sector. According to the World Bank, Kuwait was the world's sixth-largest electricity consumer on a per capita basis in 2013, having seen a decrease in per capita consumption in the past few years.<sup>44</sup> As is the case with Kuwait's oil and gas sectors, the development of their electricity sector has stalled because of political factors and a lack of investment over the past decade. The country is slow to implement generation capacity projects because of political infighting between the Emir and the National Assembly. The lack of natural gas supply also has contributed to chronic

shortages in electricity supply as Kuwait builds gas-fired power generation. Kuwait had one of the largest generation reserve margins in the Persian Gulf region before 2006, but the country now is perpetually in a state of electricity shortage and experiences frequent blackouts and brownouts each summer.

**Figure 8. Kuwait electricity generation 2000-2015**



Given the rapidly increasing power demand over the past decade, the Kuwaiti government unveiled an extensive development plan for the electric grid. Since 2007, the Kuwaiti government has commissioned approximately 5 GW in capacity through new combined-cycle gas-fired plants and several smaller expansions to oil-fired facilities. These additions are still not high enough to close the gap between electricity supply and demand.<sup>45</sup> The Kuwaiti government plans to increase installed capacity to 25 GW by 2020 to meet anticipated growth in demand.

To achieve these ambitious goals, Kuwait is using more private capital through public-private projects (PPP), as well as independent water and power projects (IWPP). Kuwait was the last Persian Gulf country to incorporate the private sector into the development of its electric sector. Kuwait allowed private-sector participation in the expansion project of the Al-Subiya power plant built by General Electric (GE) and Hyundai Heavy Industries of South Korea, which partially came online in July 2011 with installed capacity of 1,350 MW. The following year, GE and Hyundai completed the 700 MW expansion of the power plant to its nameplate capacity of 2,000 MW. The power plant is a combined-cycle facility, using primarily natural gas, with heavy fuel oil as a backup fuel.<sup>46</sup>

The Kuwaiti government, in a partnership with Sumitomo, Abdullah Hamad Al Sagar & Brothers, and ENGIE, is constructing the country's first IWPP, Az-Zour North. The first phase of this natural gas-fired facility has a generating capacity of 1.5 GW and is scheduled to come online by the end of 2016. The second phase will add another 1.5 GW, but tenders have been repeatedly delayed.<sup>47</sup> Total capacity for all four phases of Az-Zour North is 4.8 GW, which, if constructed, is expected to meet much of the anticipated electricity demand.

## Nuclear power

In 2009, Kuwait started plans to develop nuclear energy plants and announced its intention to establish a nuclear commission. In 2010, the head of the National Nuclear Energy Committee announced a 20-year cooperative deal with the French Atomic Energy Commission to develop nuclear power in Kuwait. Kuwait was considering constructing four nuclear reactors, set to become operational by 2022. The country agreed to allow International Atomic Energy Agency (IAEA) inspectors into any future nuclear sites. However,

following Japan's Fukushima nuclear disaster in 2011, Kuwait dissolved its National Nuclear Energy Committee and decided to suspend its plans to produce nuclear power.<sup>48</sup>

**Table 2. Kuwait's planned power plants**

Project	Generation capacity	Fuel
Az-Zour South Upgrade	0.5 GW	Natural gas
Al-Subiya Expansion	0.5 GW	Natural gas
Az-Zour North Phase 1	1.5 GW	Natural gas
Az-Zour North Phase 2	1.5 GW	Natural gas
Al-Khairan Phase 1	1.5 GW	Low sulfur fuel oil and natural gas
Al-Abdaliya	0.28 GW	Natural gas and solar
<b>Total capacity</b>	<b>6.78 GW</b>	

Sources: Ministry of Electricity and Water, Middle East Economic Survey, Middle East Economic Digest

## Gulf Cooperation Council (GCC) Grid

*Facing rising electricity demand, the Gulf Cooperation Council is developing an interconnected power grid.*

Gulf Cooperation Council (GCC) members face rapidly increasing demand for electricity. As a result, the six Gulf countries (the United Arab Emirates (UAE), Kuwait, Qatar, Bahrain, Saudi Arabia, and Oman) commissioned a region-wide power grid. This three-phase project, completed in late 2012, connected the Northern System–Kuwait, Bahrain, Saudi Arabia, Qatar–to the Southern System–UAE and Oman. Some analysts believe the GCC Grid has the potential to expand into North Africa and eventually link with Europe's power grids. Kuwait needs to import electricity from the Northern System, as it has experienced electricity supply shortfalls. In addition to meeting the growing electricity demands and sharing electricity reserve requirements in the Persian Gulf countries, the integrated power grids will reduce power outages in the short term and increase power exchange across seasons and time zones.

## Notes

- Data presented in the text are the most recent available as of November 2, 2016.
- Data are EIA estimates unless otherwise noted.

## Endnotes

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- <sup>28</sup> Lloyd's APEX crude oil tanker tracking database.
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