

Upstream overview



Nasir K. Al-Naimi
Executive Vice President, Upstream

“Upstream’s steadfast commitment and outstanding performance has resulted in a record-breaking year. By prioritizing safety, maintaining reliability and committing to expansion, Upstream demonstrated Aramco’s role in stabilizing markets while reinforcing our crucial, long-term role in the orderly transition to a net-zero future.”

The Upstream segment’s activities consist of exploring for, developing and producing crude oil, condensate, natural gas and NGL. Aramco manages the Kingdom’s unique reserves and resource base to optimize production and maximize long-term value pursuant to the Hydrocarbons Law, which mandates Aramco’s hydrocarbon operations, promotes long-term productivity of the Kingdom’s reservoirs and, supports the prudent stewardship of its hydrocarbon resources.

As set out in the Concession, Aramco has the exclusive right to explore, develop and produce the Kingdom’s hydrocarbon resources, except in the Excluded Areas, for an initial period of 40 years, which will be extended by the Government for 20 years provided Aramco satisfies certain conditions commensurate with current operating practices. In addition, the Concession may be extended for an additional 40 years beyond the prior 60-year period subject to Aramco and the Government agreeing to the terms of the extension. The provision of a specified term in the Concession impacts the calculation of Aramco’s reserves as compared to the Kingdom’s reserves in the fields Aramco operates. The Concession also requires Aramco to meet domestic demand for certain hydrocarbons, petroleum products and LPG through domestic production or imports.

As at December 31, 2022, Aramco’s reserves under the Concession agreement were 258.8 billion boe (2021: 253.6 billion boe), including 200.8 billion barrels (2021: 196.9 billion barrels) of crude oil and condensate, 25.2 billion barrels (2021: 25.2 billion barrels) of NGL, and 201.9 tscf (2021: 194.5 tscf) of natural gas.

The Government determines the Kingdom’s maximum level of crude oil production in the exercise of its sovereign prerogative and requires Aramco to maintain Maximum Sustainable Capacity (MSC) in excess of its then current production in accordance with the Hydrocarbons Law. MSC was maintained at 12.0 mmbpd for the year ended December 31, 2022. In line with the Government’s mandate for MSC to be increased to 13.0 mmbpd, Aramco is proceeding with plans to reach the mandated MSC by 2027. The spare capacity afforded by maintaining an MSC provides operational flexibility to increase its production. It also uses this spare capacity as an alternative supply option in case of unplanned production outages and to maintain its production levels.

Upstream competitive strengths

Unrivaled scale

Unrivaled scale of crude oil and condensate production, and conventional proved reserves.

Long reserves life

Long reserves life and proven track record of low-cost reserves replacement.

In 2022, Aramco maintained its position as one of the world's largest producers of crude oil and condensate with an average total daily hydrocarbon production of 13.6 mmbpd (2021: 12.3 mmbpd). For the year ended December 31, 2022, approximately 85% (2021: 84%) of the aggregate hydrocarbon production consisted of liquids, which generally command a higher margin.

In 2022, Aramco also maintained its position as one of the lowest-cost producers globally. The average upstream lifting cost was SAR 11.44 (\$3.05) per boe produced (2021: SAR 11.40 (\$3.04)), while upstream capital expenditures averaged SAR 20.3 (\$5.4) (2021: SAR 18.4 (\$4.9)) per boe produced. This competitive advantage is a result of the Company's robust fiscal discipline, its low depletion rate operational model, the unique nature of the Kingdom's geological formations, favorable onshore and shallow water offshore environments in which Aramco's reservoirs are located, synergies available from Aramco's use of its large infrastructure and logistics networks, and its scaled application of technology. Given the quality of most of Aramco's reservoirs and its operational model, it is possible to achieve high recovery factors while maintaining relatively low water cut levels for long periods of time.

Key events in 2022

- Progressed with the Government's mandate for MSC to be increased from 12.0 mmbpd to 13.0 mmbpd by 2027.
- Progressed with the development of the Jafurah unconventional gas field.
- Maintained total hydrocarbon reserves under the Concession agreement at 258.8 billion boe.
- Maintained low upstream carbon intensity of 10.3 kg of CO₂e/boe.
- Maintained its low-cost position with average lifting cost and average capital expenditures of SAR 11.44 (\$3.05) and SAR 20.3 (\$5.4) per boe produced, respectively.

Outlook for 2023

Aramco will continue its investments in future growth projects, including the MSC expansion to 13.0 mmbpd as well as growing its gas production capacity, to meet future demand growth.

<p>Active management</p> <p>Unique ability to capture value through exclusive active management of the world's largest conventional hydrocarbons reserves base.</p>	<p>Multiple crude grades</p> <p>Ability to produce multiple crude grades with access to global delivery points.</p>	<p>Low upstream carbon intensities</p> <p>Crude oil extraction with one of the lowest average upstream carbon intensities in the industry.</p>	<p>Large upstream capital projects</p> <p>Ability to execute some of the world's largest upstream capital projects.</p>
<p>Unique operational flexibility</p> <p>Unique operational flexibility and opportunities to rapidly increase its crude oil production.</p>	<p>High-quality gas reserves</p> <p>Extensive high-quality gas reserves with exclusive access to the Kingdom's large and growing domestic marketplace.</p>	<p>Low lifting cost</p> <p>Low lifting cost and capital expenditures per barrel of oil equivalent produced.</p>	

Upstream hydrocarbon production

		Year ended December 31		% change
		2022	2021	
Total liquids¹	mbpd	11,540	10,359	11.4%
Total gas²	mmscfd	10,617	10,136	4.7%
Total hydrocarbon production³	mboed	13,617	12,343	10.3%

1. Total liquids is comprised of crude oil, NGL and condensate.

2. Total gas includes natural gas and ethane.

3. Total hydrocarbon production (mboed) is derived from mmscfd (for natural gas and ethane) by dividing the relevant product production by 5.400 (in the case of natural gas) and 3.330 (in the case of ethane).

Upstream financial results

All amounts in millions unless otherwise stated	SAR		USD*		
	Year ended December 31		Year ended December 31		
	2022	2021	2022	2021	% change
Revenue and other income related to sales (including inter-segment revenue)	1,573,405	1,015,437	419,575	270,783	54.9%
Earnings before interest, income taxes and zakat	1,092,425	750,118	291,313	200,031	45.6%
Capital expenditures – cash basis	109,789	88,758	29,277	23,669	23.7%

* Supplementary information is converted at a fixed rate of U.S. dollar 1.00 = SAR 3.75 for convenience only.

Earnings before interest, income taxes and zakat (EBIT) for the year ended December 31, 2022, totaled SAR 1,092,425 (\$291,313), compared to SAR 750,118 (\$200,031) in 2021, an increase of SAR 342,307 (\$91,282), or 45.6%. These outstanding results were mainly driven by growth in global energy demand resulting in stronger average realized crude oil prices and reinforced by higher crude oil volumes sold. Such increase in EBIT was partly offset by higher crude oil production royalties.

Capital expenditures in 2022 increased by 23.7%, compared to the year ended December 31, 2021, from SAR 88,758 (\$23,669) to SAR 109,789 (\$29,277). This increase reflects higher drilling and development activities related to increasing crude oil MSC, and gas projects.

Crude oil

Overview

Aramco actively manages its prolific reserves base to maximize long-term value while optimizing ultimate recovery from its fields. Because of the size, number, and spare capacity of its fields, the Company is able to maintain its level of overall production by tapping into new reservoirs when required to improve long-term value through portfolio capacity optimization. Diversification of supply sources for crude oil from fresh reservoirs has the benefit of allowing lower depletion rates from existing fields and deferring costs for additional wells and facilities to handle higher total fluid displacement rates at such fields.

Aramco's principal fields are located in close proximity to each other within the Central and Eastern Provinces of the Kingdom. Aramco believes that its portfolio includes the world's largest discovered conventional onshore oil field (Ghawar) and largest discovered conventional offshore oil field (Safaniyah). The crude oil, condensate, natural gas and NGL that Aramco produces from its fields travel through the extensive network of pipelines to multiple facilities for processing into refined and petrochemical products, or to domestic customers or export terminals. In particular, Aramco's East-West Pipeline is critical in linking oil production facilities in the Eastern Province with Yanbu' on the west coast, and providing flexibility to export from the east and west coasts of the Kingdom.

Aramco owns and operates the Abqaiq facility, which is its largest oil processing facility and the largest crude oil stabilization plant in the world. Aramco also operates four crude export terminals that contribute to its operational flexibility and supply reliability. In addition, Aramco has strategic international delivery points located in Rotterdam (the Netherlands), Sidi Kerir (Egypt), and Okinawa (Japan).

Aramco consistently produces five grades of Arabian crude oil: Arabian Super Light, Arabian Extra Light, Arabian Light, Arabian Medium, and Arabian Heavy. These crude grades and the wide range of blends that can be produced from them are compatible with most global refineries. In 2022, Arabian Super Light, Arabian Extra Light and Arabian Light accounted for approximately 68% (2021: 66%) of Aramco's total crude oil production and were classified as premium grades. In 2022, Aramco's Downstream business was the largest customer of the Upstream crude oil production, utilizing 44% (2021: 43%), while the remainder was sold to international and domestic third-party customers.

Performance and achievements



▲ Aramco offshore wellhead, Arabian Gulf

Upstream continues to invest in cutting-edge technologies and digital transformation programs. Aramco successfully deployed the Ghawar-1 supercomputer for reservoir simulation. The supercomputer is the second fastest in the MENA region after Aramco's Dammam-7. It is expected to increase the number of completed simulation runs, enabling the Company to exploit more opportunities from its existing resources.

The Manifa field development project was recognized as the Upstream Project of the Year at the 2022 Middle East Energy Awards. Aramco continues to show its leadership in both operational excellence and environmental protection through its careful development, management, and production of the Manifa field, which includes innovative solutions for protecting the fragile marine ecosystem.

Construction and engineering activities for the Marjan and Berri crude oil increments continue to progress, and are expected to add production capacity of 300 mbpd and 250 mbpd, respectively, by 2025.

Construction activities are continuing on the Dammam development project, which is expected to add 25 mbpd and 50 mbpd of crude oil by 2024 and 2027, respectively.

The Zuluf crude oil increment is in the engineering phase, and is expected to provide a central facility to process a total of 600 mbpd of crude oil from the Zuluf field by 2026. The facility will also be equipped to process associated gas, condensate, and produced water.

Gas and NGL

Overview

Aramco's nonassociated gas fields vary widely in reservoir properties, depths, pressures and compositions. In general, the southern area around the Ghawar field has rich gas at moderate depths and permeability, while the northern offshore fields (Karan, Arabiyah and Hasbah) have leaner gas in deeper reservoirs with high permeability. Additionally, Aramco's crude oil production provides a base load of associated gas, which is rich in liquids.

Aramco's primary natural gas processing and fractionation facilities are located in Ghawar and the northern and western areas of the Kingdom. The Company's facilities are strategically located near its fields to reduce transportation and pipeline compression costs, as well as the time required to deliver gas products to market. As at December 31, 2022, the total conventional and unconventional raw gas processing capacity was 18.3 bscfd (2021: 18.3 bscfd), which primarily feeds into the Master Gas System (MGS), an extensive network of pipelines that connects Aramco's key gas production and processing sites throughout the Kingdom.

Pursuant to the Concession, Aramco is the exclusive supplier of natural gas in the Kingdom. Aramco sells natural gas to power generation plants primarily pursuant to long-term contracts and to customers in the Kingdom's industrial sector. The supply of natural gas to domestic customers is regulated by the Law of Gas Supplies and Pricing (which is replaced by the Energy Supplies Law that became effective on March 7, 2023), and the prices paid by domestic customers are set by resolutions issued from time to time by the Council of Ministers. Aramco also exports a portion of its NGL production.

In 2022, Aramco's average gas production was approximately 10.6 bscfd (2021: 10.1 bscfd) including both natural gas and ethane. The Company also achieved a historic single-day production record of 11.3 bscfd of natural gas.

Aramco continued to progress a number of major gas projects within the Kingdom to meet growing domestic demand.

Performance and achievements



▲ Hawiyah Gas Compression Plant, Saudi Arabia

The compression projects at the Haradh and Hawiyah fields have commenced commissioning activities and are expected to achieve full capacity in 2023.

The Hawiyah Gas Plant expansion, part of the Haradh gas increment program, has started commissioning activities and is expected to be onstream in 2023.

Construction at the Hawiyah Unayzah Gas Reservoir Storage is at an advanced stage and has commenced injection activities. It is the first underground natural gas storage project in the Kingdom and will enable surplus natural gas to be injected into the reservoir during off-peak periods. The program is designed to provide up to 2.0 bscfd of natural gas for reintroduction into the Kingdom's MGS by 2024.

Construction continues at the Tanajib Gas Plant, part of the Marjan development program. Once completed, the project will add 2.6 bscfd of additional processing capacity from Marjan, Safaniyah and Zuluf fields. The project is expected to be onstream by 2025.

Aramco progressed with design and initial construction activities of the Jafurah Gas Plant, part of the development of the Jafurah unconventional gas field that is expected to expand gas production and is a key component of Aramco's unconventional gas program. The facility will be developed in two phases and is expected to have a raw gas processing capacity of 3.1 bscfd upon completion in 2027. The Jafurah field is expected to commence production in 2025 and will gradually increase natural gas deliveries to reach a sustainable rate of 2.0 bscfd by 2030, which is expected to provide feedstock for hydrogen and ammonia production and will help meet expected growing local energy demand.

Exploration

Overview

Through Aramco's exploration program, the Company continued its efforts to achieve the strategic objectives and associated targets of growing the Kingdom's oil and nonassociated gas initially in place endowments. Aramco has historically replaced reserves on an organic basis through revisions of reserve estimates at existing fields and through delineation and exploration to identify new fields. As a result, the Kingdom's estimated proved reserves at the largest oil fields operated by Aramco have increased since the time of original production. Aramco's exploration program is aligned with strategic value drivers to maximize profitability and lower future finding and development costs through exploring for high-value premium crude and accelerating infrastructure-led gas exploration and delineation programs.

Crude oil

The majority of Aramco's current crude oil exploration activities are focused in the Eastern Province, with smaller scale of exploration activities in known hydrocarbon-bearing basins in the Rub' al-Khali, Northwest, and Summan regions. Aramco places a strong emphasis on improving the operational performance of its drilling activities by applying innovative technologies and benchmarking of key metrics to identify trends and potential areas for enhancement. Aramco believes that its approach to drilling and development has led to high levels of well integrity.

Natural gas

Aramco's nonassociated gas exploration activities have yielded a number of major discoveries, with particular success in the Ghawar area and in deep reservoirs in the Arabian Gulf. Aramco has enjoyed high success rates in locating new reserves in known hydrocarbon-bearing basins adjacent to its existing fields and production infrastructure, allowing it to meet growing domestic demand at low cost, while also exploring in new basins with high potential. Aramco is looking to further expand its natural gas reserves through new field discoveries, new reservoir additions in existing fields, and the delineation and reassessment of existing reservoirs and fields.

Unconventional resources

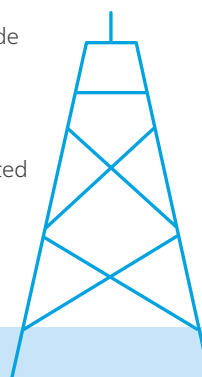
Aramco, through its unconventional resource program, is assessing several areas within the Kingdom for their potential to deliver gas and associated liquids to help meet future domestic energy needs. The unconventional resource program consists of exploration activities, pilots, producing wells and production facilities, with the objective of developing unconventional gas resources in support of the Kingdom's growing demand for gas, and to offset the use of crude oil for power generation.

Strategy in action

Upstream
preeminence



Aramco plans to expand its gas business to provide feedstock for hydrogen and ammonia production, and help meet expected growing local energy demand.



Jafurah gas basin drilling commences

200 tscf unconventional gas

Performance and achievements



▲ Reservoir modeling, Dhahran, Saudi Arabia

Aramco's exploration activities resulted in the discovery of two unconventional gas fields in the Kingdom's eastern region.