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Transboundary Offshore Oil and Gas Fields in the Gulf:

Promise of Cooperation or Potential for Conflict?

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The fancies of geology around the world have dictated that petroleum resources often occur in transboundary reservoirs straddling two or more states (or regions) and are therefore shared between them. Oil and gas reservoirs do not conform to political boundaries; petroleum flows according to geological formations, not lines drawn on a map.

According to the standards of the international petroleum industry, when two or more jurisdictions share a single hydrocarbon field, applying one of the following four strategies ensures the optimal development of the structure:

- **International Unitization Agreements:** This is the gold standard in global petroleum engineering and law. Neighboring governments sign a treaty allowing companies on both sides to jointly operate the field as a single project, eliminating artificial border constraints.
- **Single Operator Designation:** The participating stakeholders agree on a single, impartial operating company to manage all extraction and production, ensuring uniform pressure maintenance inside the reservoir and efficient drainage.
- **Dynamic Tract Participation:** The revenue and cost-sharing split is determined by a formula based on the percentage of hydrocarbons located on each nation's side. Because reservoirs shift and deplete over time, formulas usually include a redetermination clause, where reserves are periodically reassessed using updated three-dimensional (3D) seismic data.
- **Unified Reservoir Management:** Technicians implement a unified Enhanced Oil Recovery (EOR) plan (e.g., water or gas injection) across the entire field without worrying about pressure loss crossing state boundaries.

When deciding to apply one of these strategies, many factors must be considered. These include the size of the transboundary field, its composition and depth, and its distance from the nearest logistical, processing, and transport infrastructure. An important factor is whether the joint field is already covered by a definitive border delimitation agreement between the countries concerned.

Oil and gas reservoirs do not conform to political boundaries;petroleum flows according to geological formations not lines drawn on a map

It is obvious that developing transboundary petroleum fields acts as either a catalyst for conflict or a powerful tool for peacebuilding. When managed cooperatively through diplomatic or legal frameworks, shared resources can provide immense mutual wealth and deter militarized standoffs. Conversely, if control is contested, they frequently fuel resource wars, rebel insurgencies, and geopolitical instability.

What about the Gulf? This petroleum-rich region has many offshore transboundary hydrocarbon fields and geological reservoirs that extend across international maritime boundaries, requiring specialized cross-border development treaties. While many of these structures have been the subject of joint development agreements, several other transboundary petroleum fields in the region remain underdeveloped.

Thus, the situation in the Gulf and its offshore oil and gas fields differs from one structure to the next and from one country to another. A brief review of the offshore transboundary fields in the region, aimed at assessing the state of each, follows.

1. North Field/South Pars Gas Field

Located offshore in the central Gulf, the world's largest non-associated gas field is known as the North Field in Qatar and the South Pars in Iran. It is a massive geological deposit containing an estimated 51 trillion cubic meters of recoverable natural gas.

There is no joint development of the structure as a whole. The North Field accounts for the larger share (around 60 percent) and is the foundation of Qatar's massive gas export industry, which supplies nearly 20 percent of the world's liquefied natural gas (LNG). South Pars has a smaller geographic footprint (about 40 percent), though it is highly productive. Iran uses its reserves primarily for domestic power, industrial heating, and petrochemical production, satisfying some 70 percent of the country's total domestic gas consumption.

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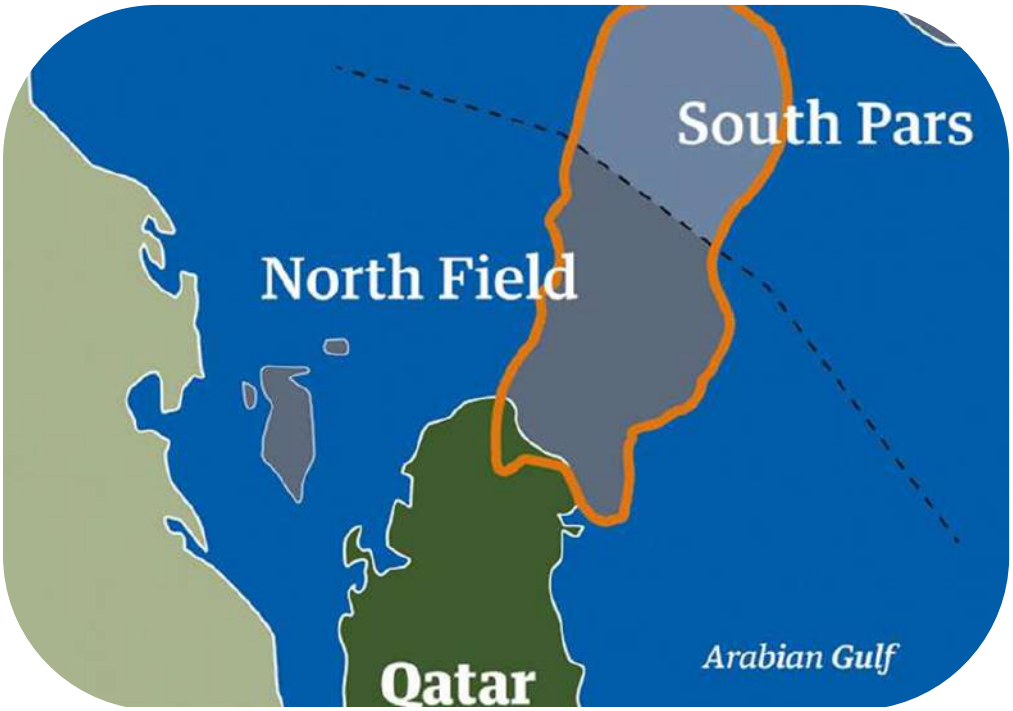
The structure contains another oil reservoir, which is shared by Iran and Qatar, called the South Pars Oil Layer (SPOL) in Iran and the Al-Shaheen oil field in Qatar which is currently producing between 200,000 and 250,000 barrels per day (b/d).



2. Abu Safah Oil Field

The Abu Safah offshore oil field is situated in the waters between Saudi Arabia and Bahrain. Discovered in 1963, the field is massive, measuring around 19 km by 10 km, and is situated southeast of the major Saudi Berri field. It is currently producing about 300,000 b/d from around 1 billion barrels of remaining recoverable reserves.

Unlike traditionally contested boundaries, Saudi Arabia and Bahrain share the extraction revenues equally. Saudi Aramco manages the field, and the revenue from the 150,000-b/d Bahraini equity share is marketed and managed on behalf of the government in Manama. Revenue from this field is a massive component of Bahrain's overall national economy.

> **Saudi Arabia and Bahrain share the extraction revenues equally Saudi Aramco manages the field**

3. Saudi Arabia/Kuwait Divided Zone Fields

The Partitioned Neutral Zone (PNZ) between Saudi Arabia and Kuwait was established under the 1922 Uqair Protocol. These are not disputed boundaries but rather a uniquely agreed-upon "divided zone."

Both nations share sovereign administration, oil production, and revenues from the petroleum fields in this area (including offshore fields such as Khafji and Hout and onshore fields such as Wafra).

4. Salman/Abu Al-Bukhoosh (ABK) Oil Field

The Salman-Abu Al-Bukhoosh field is a cross-border offshore oil field in the Gulf, which was discovered in 1965 and 1969, respectively. It straddles the maritime boundary between the UAE (Abu Dhabi) and Iran, approximately 144 km south of Iran's Lavan Island. About 70 percent of the field lies in Iranian waters (where it is known as Salman), and some 30 percent offshore Abu Dhabi (known there as Abu Al-Bukhoosh or ABK). Although the field is shared, both sides operate completely independently.

The oil-in-place reserves of the field were originally estimated at about 4.5 billion barrels, with some 1.6 billion barrels of recoverable reserves, while the remaining recoverable reserves are estimated at approximately 500 million barrels. ABK currently produces around 11,000 b/d of oil and condensates, compared to about 50,000 b/d from Salman.

5. Nosrat/Fateh Oil Field

The Nosrat oil field is a shared offshore petroleum reservoir located in the Gulf, approximately 35 km southeast of Iran's Sirri Island. Discovered in 1981, it is jointly controlled, with the UAE's share extending from Dubai's mature Fateh field.

The UAE side of the field is operated by Dubai Petroleum, while the Iranian side is developed by the Iranian Offshore Oil Company (IOOC). The ultimate oil production from the UAE side reached 65,000 b/d in the 1970s, compared to just 3,500 b/d from the Iranian section.

6. Bunduq Oil Field

The Bunduq (or Al-Bunduq) field is a shared offshore oil field straddling the Gulf maritime boundary between Abu Dhabi and Qatar. It is located approximately 100 km east of Doha and roughly 200 km west of Abu Dhabi City.

Discovered in 1965 and producing since 1975, the field is governed by a unitization agreement under which all reserves, production costs, and revenues are shared equally between the two nations. The field, producing between 15,000 and 20,000 b/d, is managed and operated by Bunduq Company Limited, a Japanese consortium that is fully owned by United Petroleum Development Co. Ltd. (UPD).

7. Hengam/West Bukha Oil and Gas Field

The Hengam-West Bukha field is an offshore oil and gas reservoir straddling the maritime boundary of Iran and Oman in the Strait of Hormuz. The Iranian side of the field is known as Hengam, while the Omani part is called West Bukha.

Discovered in 1976, the field contains substantial reserves of natural gas and oil condensates. Because the reservoir is cross-border, both nations have signed multiple memoranda of understanding (MoUs) over the decades to explore joint development. However, with the exact division of resource shares being a sensitive political topic, no final agreement has been reached to formally split the extraction shares or profits. Meanwhile, Iran has been daily extracting around 16,000 barrels of oil and condensate, and some 1.2 million cubic meters of gas from its side of the field.

8. Mubarak Oil Field

The Mubarak oil field is a mature offshore oil field in the Gulf, shared between the UAE emirate of Sharjah and Iran. Discovered in 1971 by Crescent Petroleum, the field made Sharjah in 1974 the third oil-producing emirate in the UAE.

The Mubarak field spans the Iran-UAE boundary near the island of Abu Musa. Due to contested territorial claims, a 1971 MoU stipulated that oil revenues from the field are split equally between Sharjah and Iran. The field's peak production hit roughly 38,000 b/d of crude and condensates in 1975.

9. Forouzan/Marjan Oil Field

The Forouzan-Marjan field is a major offshore oil structure located roughly 100 km southwest of Iran's Kharg Island. Discovered in 1966 and known as Forouzan in Iran and Marjan in Saudi Arabia, it has an estimated in-place crude reserve of over 2.3 billion barrels. Saudi Arabia controls the vast majority (more than 80 percent) of its hydrocarbon reserves.

Although both nations have targeted the joint structure for further drilling and production, they have developed their sections competitively and lack a joint development plan or any scheme for sharing the resource. The Iranian side of the field historically produced around 100,000 b/d, but dropped to 40,000 b/d due to aging infrastructure and international sanctions. Meanwhile, on the Saudi side which has historically produced between 500,000 and 600,000 b/d, making it one of the world's largest offshore fields, Saudi Aramco has executed a massive expansion program to add around 550,000 barrels of crude and about 70 million cubic meters of gas to its daily capacity.

10. Esfandiar/Lulu Oil Field

The offshore oil field, estimated to hold around 532 million barrels when discovered in 1966, is known as Esfandiar in Iran and Lulu in the Saudi-Kuwait Neutral Zone, and is located some 95 km southwest of Kharg Island.

The structure has not been developed on either side and has indeed been one of Iran's least developed oil fields. Consequently, production in the field has tailed off in recent years.

Saudi Aramco has executed a massive expansion program on Marjan oil field to add around 550,000 barrels of crude and about 70 million cubic meters of gas to its daily capacity

11. Farzad-A/Arabiyah and Farzad-B/Hasbah Gas Field

The transboundary offshore gas field between Iran and Saudi Arabia has been under slow development on the Iranian side (Farzad-A), while the Saudi side (Arabiyah) has been daily producing about 30 million cubic meters of gas since 2013. The whole structure holds roughly 340 billion cubic meters of dry gas.

Nearby, Iran owns the larger share (around 75 percent), the Farzad-B gas field reserves, estimated at about 650 billion cubic meters. However, Tehran has yet to advance the field's development. In contrast, Saudi Arabia has developed its portion of the reservoir, known as Hasbah. During normal operations, Hasbah daily produces up to 37 million cubic meters of gas.

12. Al-Khaleej/Reshadat Oil Field

The Al-Khaleej oil field in Qatar, known as Reshadat on the Iranian side, is a shared offshore reservoir located near the Iran-Qatar maritime border, approximately 40 km northeast of Qatar's Halul Island.

While the Qatari section (Al-Khaleej) has been producing since 1997 and is actively developed by France's TotalEnergies, the Iranian side (Reshadat) has faced operational hurdles and decades of delays. As a result, Al-Khaleej currently yields around 25,000 b/d, compared with around 8,000 b/d from Reshadat.

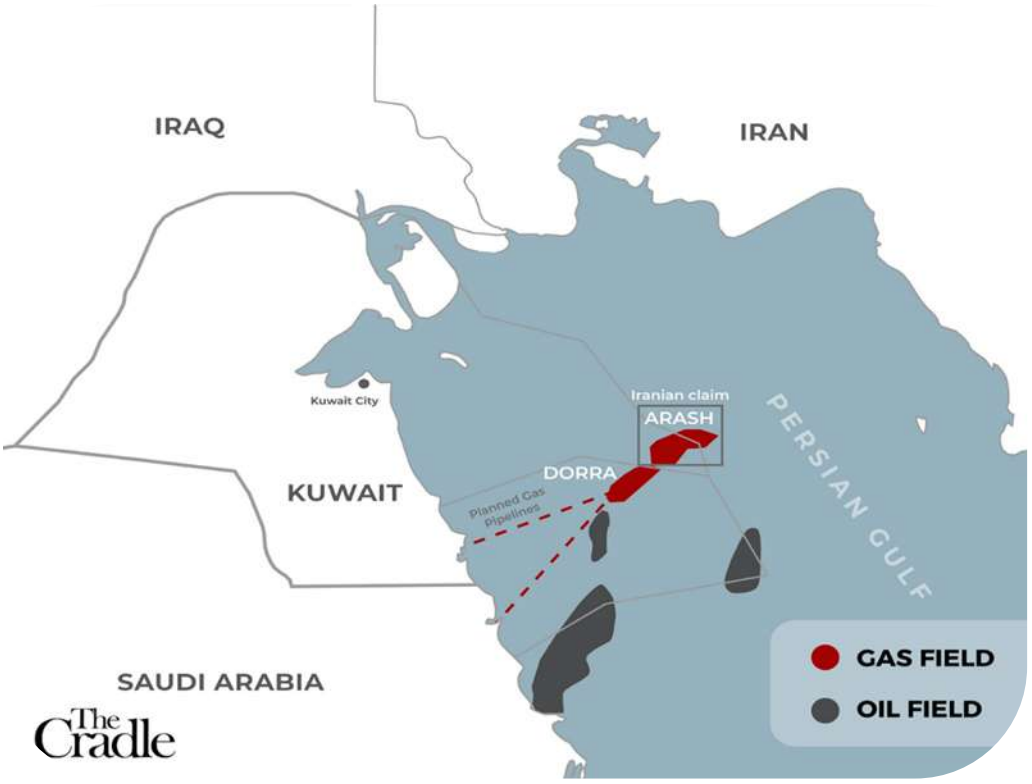
13. Belal Oil and Gas Field

The Belal oil and gas field was discovered in 1967 and is estimated to contain approximately 85 billion cubic meters of gas, some 530 million barrels of crude oil, and more than 180 million barrels of condensate in place. It is located roughly 40 km east of South Pars and along the maritime border between Iran and Qatar.

Although it is a shared reservoir, the Belal field has so far been developed only by Iran. Currently, the field is projected to achieve daily production of around 14.2 million cubic meters of gas and some 15,000 barrels of condensate starting in 2028.

14. Dorra/Arash Gas Field

The highly contested natural gas field in the northern Gulf is known as Arash in Iran and as Dorra in Saudi Arabia and Kuwait. Iran claims that 40 percent of the structure falls within its territorial waters, whereas Saudi Arabia and Kuwait assert joint, exclusive rights over the entire area. The field's gas reserves are estimated at roughly 570 billion cubic meters.



Kuwait and Saudi Arabia signed agreements to jointly develop the Dorra-Arash field and have issued tenders for gas extraction

While a 1968 agreement established the baseline maritime boundary between Iran and Saudi Arabia, the exact coordinates and subterranean resource allocations across many shared fields--including Dorra-Arash--remain un-demarcated.

Kuwait and Saudi Arabia signed agreements to jointly develop the Dorra-Arash field and have issued tenders for gas extraction. Iran has consistently rejected these bilateral agreements, citing them as illegal, and has threatened to proceed with unilateral drilling.

Conclusion: The Need for Optimally Developing Transboundary Fields

Unfortunately, many transboundary petroleum fields in the Gulf remain sub-optimally developed. This is far from the most advantageous scenario, since the development and exploitation of these strategically important structures could provide significant economic benefits to the countries that share them.

Indeed, failing to optimize the development of a transboundary field leads to "drainage" or "offset drilling," where operators on one side race to extract as much as possible before the resource migrates across the border. This competitive race drastically reduces the field's ultimate recovery rate, causes rapid pressure loss, increases environmental risks, and can raise the risk of serious geopolitical conflict. On the other hand, when a joint field is managed cooperatively through diplomatic or legal frameworks, its shared resources can yield immense mutual wealth and deter militarized standoffs.

Whether transboundary fields in the Gulf lead to peace or conflict depends heavily on pre-existing political will, transparent governance, and the adoption of equitable international frameworks. But to achieve such a scenario of cooperation, Gulf countries must first establish an environment of sustainable trust and confidence among themselves. The countries of the region will need to invest time and energy alongside genuine determination and good neighborliness, which will prove the key to durable and lasting cooperation.

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