Regional Brief: Emerging Hydrocarbon Producers in Africa

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African Frontier Markets in Context

- Africa has significant hydrocarbon resources, with basins that are considered underexplored and that may hold large resources that could be commercially viable. This briefing will focus on Namibia, Kenya, Uganda, Mauritania, Senegal, and Mozambique. These countries have uncovered hydrocarbon discoveries that may be potentially significant and commercially viable, which has led to increased investor interest in upstream exploration and development in their respective territories.[1]
- Mauritania, Senegal, and Mozambique are seeking to develop natural gas hubs and are attempting to build out infrastructure that would enable large-scale production from their recent offshore natural gas discoveries, as well as increase domestic natural gas consumption. However, upstream development is subject to specific risks unique to each country. Mozambique has in recent years dealt with a sudden influx of militant attacks on areas close to export infrastructure. These security issues have resulted in the declaration of force majeure on the Mozambique LNG project, delaying the facility's start date and the development of other LNG infrastructure projects. Mauritania and Senegal are both seeking to capitalize on recent natural gas finds that fall across the shared maritime boundary of both countries, but project delays have occurred as a result of technical issues at the field.
- On the liquid fuels side, a series of recent liquid fuels discoveries have generated a significant amount of investor interest in Namibia. However, Namibia is considered a frontier country in terms of upstream exploration, and the Namibian government lacks experience and governance in commercializing these discoveries. Kenya and Uganda are East African countries that are seeking to make the most of their own liquid fuels resources but face a different set of challenges and constraints regarding their finds. Both countries' liquid fuels discoveries lie inland and so would require pipeline infrastructure to be built to export the extracted liquid fuels to other countries. Constructing pipeline infrastructure poses a number of challenges, particularly for Uganda because it is a land-locked country and would need to transit another country such as Kenya or South Sudan and Sudan to reach a viable port for export. Extracting liquid fuels resources for domestic consumption is another option for both countries, but it requires refining infrastructure, which both countries currently lack, to process the liquid fuels into petroleum products.

Figure 1. Map of Africa

Data source: Map created by the U.S. Energy Information Administration

Exploration

- **Mozambique** awarded six exploration blocks in its Angoche Basin and Mozambique Basin in December 2022 from its sixth licensing round that was launched in November 2021. Five of the exploration blocks were awarded to a consortium that included the China National Offshore Oil Corporation (CNOOC) and Empresa Nacional de Hidrocarbonetos (ENH), the Mozambican national oil company. One exploration block was awarded to a consortium that included Eni and ENH.
- **Mauritania** launched a licensing round in 2022, putting up 28 exploration blocks on offer and, as of October 2023, evaluating submitted bids; results from the bidding round have not yet been announced.[2]
- **Kenya** and **Uganda** reportedly are planning to hold licensing rounds sometime in 2023, but no details on the licensing round and their respective deadlines are available.[3]
- **Senegal** and **Namibia** have not yet announced any future licensing rounds (Table 1).

Table 1. Ongoing or upcoming licensing rounds for exploration

Country	Licensing round	Status	Number of blocks offered	Location	Notes
Mauritania	2022 licensing round	Bids under evaluation	28	Offshore	Awards for blocks expected to be announced at the end of 2023.
Mozambique	Sixth licensing round	Completed	16	Offshore	Five blocks (Area A6-D, A6-E, and A6-G in Angoche Basin, and Area A6-A and A6-B in Mozambique Basin) awarded to CNOOC/ENH consortium. One block (Area A6-C in Angoche Basin) awarded to Eni/ENH consortium in December 2022.

Data source: Rystad Energy, Energy Capital & Power

Petroleum and Other Liquids

- According to estimates as of January 1, 2023, by the *Oil & Gas Journal* (OGJ), **Uganda** had the largest proved crude oil reserves of the selected African countries, estimated at 2.5 billion barrels. **Mauritania** is estimated to have 20 million barrels in proved crude oil reserves. OGJ estimates proved crude oil reserves for **Mozambique** and **Namibia** to be zero, and OGJ currently does not have available estimates for either **Kenya** or **Senegal** (Table 2).[4]

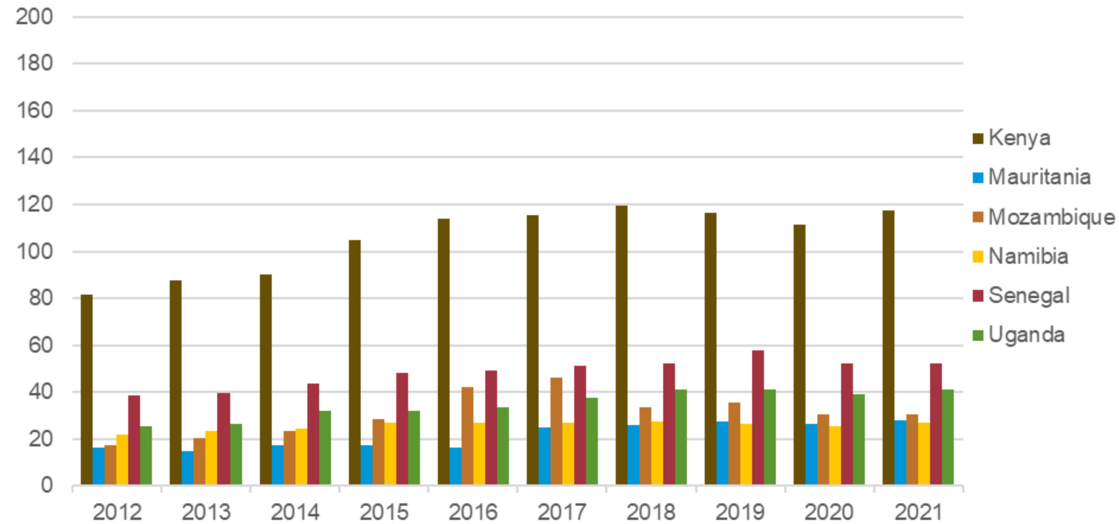
Table 2. Proved oil reserves of selected countries in Africa, 2023

Country	Million barrels of oil reserves
Kenya	N/A
Mauritania	20
Mozambique	-
Namibia	-
Senegal	N/A
Uganda	2,500

Data source: *Oil & Gas Journal*
Note: N/A=not available. A dash=zero.

- Given that the selected group of countries are either at preliminary stages of development or have areas still undergoing exploration efforts, **Kenya**, **Mauritania**, **Mozambique**, **Namibia**, **Senegal**, and **Uganda** currently do not have any liquid fuels production.
- **Kenya** is the largest liquid fuels consumer of the six African countries, in part a reflection of its relatively larger population and more diversified economy.[5] From 2012 to 2021, Kenya consumed an average of about 106,000 barrels per day (b/d) of liquid fuels. **Senegal** and **Uganda** were the second- and third-largest consumers in the group but consumed far less than Kenya, averaging about 49,000 and 35,000 b/d, respectively, during the same time period. **Mozambique**, **Namibia**, and **Mauritania** each consume relatively small amounts of liquid fuels to meet domestic demand, averaging about 31,000 b/d, 26,000 b/d, and 21,000 b/d, respectively, during 2012–2021.[6] (Figure 2)

Figure 2. Annual liquid fuels consumption, selected countries in Africa, 2012–2021
thousand barrels per day



Data source: U.S. Energy Information Administration, International Energy Statistics database

Recent petroleum and other liquid fuels discoveries

- **Senegal's** Sangomar project is the country's first upstream oil project and the one most likely to start in the near future. The Sangomar project, which is located about 63 miles (or about 100 kilometers [km]) offshore of Dakar, is currently planned to be developed in three phases. The first phase was expected to reach a final investment decision (FID) in 2020, but Woodside, the project operator, has postponed the start date of the first phase to mid-2024 because of remedial work that needed to be carried out on the floating production and offloading (FPSO) vessel. According to Rystad Energy, the second and third phases of the project are at a pre-FID stage and are not likely to start until 2029 and 2031, respectively.[7]
- The Tilenga and Kingfisher South projects are the two main oil projects currently under development in **Uganda**; both projects reached an FID in 2022 and aimed to start production by 2025. However, delays in building a pipeline and refinery needed to transport and process the extracted crude oil have resulted from project delays caused by legal and financial hurdles. According to Rystad Energy, the projects are not likely to start until 2026 or later; once brought on line, the two projects would enable Uganda to potentially produce around 200,000 b/d by the 2030s.[8]
- **Kenya** is seeking to develop fields in its first major upstream oil project, the South Lokichar onshore project, located in Turkana country in northwestern Kenya. However, the project is reportedly years behind schedule and continues to suffer from project delays. Tullow Oil is currently the sole project operator after minority stake partners TotalEnergies and Africa Oil Corp announced their intent to withdraw their exploration licenses from Blocks 10BB and 13T in

May 2023. This latest setback is likely to further delay the development of the project; Rystad Energy estimates that the first phase of the South Lokichar project could start in 2028.[9]

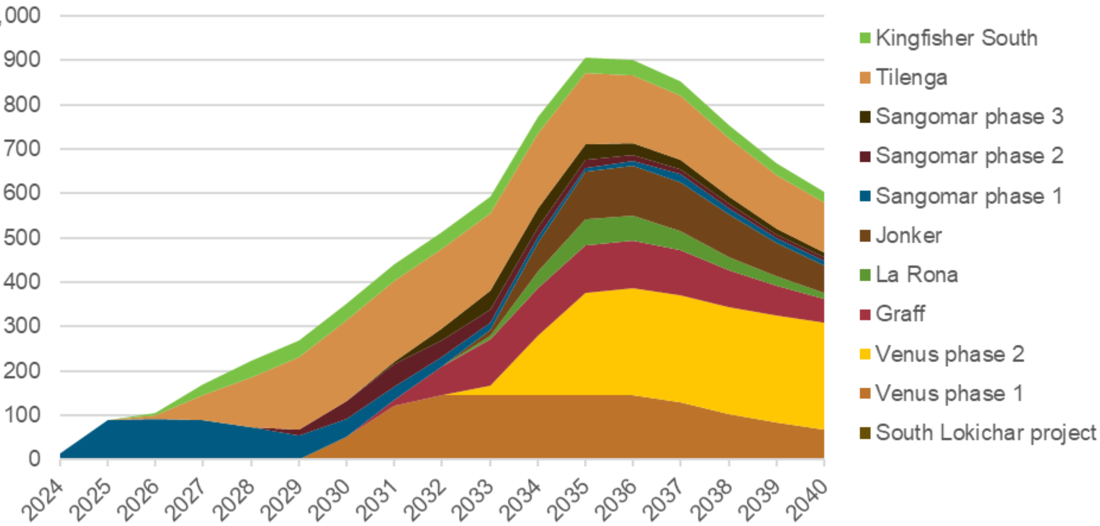
- Recent exploration efforts in **Namibia's** offshore led to a number of discoveries concentrated in the Orange Basin, which is in the southern part of the country near the Namibian and South African maritime boundary. Namibia is also seeking to expand port infrastructure to accommodate future production coming from its offshore fields and to facilitate exports to international markets. Although the flurry of discoveries has led to renewed interest in exploring Namibia's offshore basins, the discoveries are still in preliminary stages of development and are not likely to begin production until late 2020s at the earliest, according to Rystad Energy estimates. However, potential production growth from the four discoveries alone is promising; Rystad Energy estimates that the four discoveries could bring Namibia's liquid fuels production to over 500,000 b/d by the mid-2030s, surpassing African OPEC producers Equatorial Guinea, Gabon, and the Republic of Congo.[10]
- **Mauritania** and **Mozambique** do not have any liquid fuels discoveries or fields under development (Table 3 and Figure 3).

Table 3. Significant crude oil and other liquids discoveries in selected African countries

Country name	Project name	Location	Operator	Discovery date	Estimated startup date
Kenya	South Lokichar development project	Onshore, Blocks 10BB and 13T	Tullow Oil	2013–2014	2028
Namibia	Venus phase 1	Orange Basin, Block 2913B	TotalEnergies	2022	2029
	Venus phase 2	Orange Basin, Block 2913B	TotalEnergies	2022	2033
	Graff	Offshore, Block 2913A	Shell	2022	2031
	La Rona	Offshore, Block 2913A	Shell	2022	2033
	Jonker	Offshore, Block 2913A	Shell	2023	2033
Senegal	Sangomar phase 1 (Leopold Sedar Senghor)	Sangomar offshore deep (SNE)	Woodside	2014	2024
	Sangomar phase 2 (South)	Sangomar offshore deep (SNE)	Woodside	2014	2029
	Sangomar phase 3 (North Edge)	Sangomar offshore deep (SNE)	Woodside	2014	2031
Uganda	Tilenga	Onshore, Blocks EA-1 and EA-2	TotalEnergies	2008	2026
	Kingfisher South	Onshore, Block EA 3	CNOOC	2006	2026

Data source: Rystad Energy

Figure 3. Forecast liquid fuels production from selected projects in Africa, 2024–2040
thousand barrels per day



Data source: Rystad Energy

Trade

- To commercially leverage its oil discoveries, **Uganda** is planning to build midstream and downstream infrastructure in the form of a pipeline and refinery to export and process future crude oil production. The pipeline project, known as the East African Crude Oil Pipeline (EACOP), is a proposed $5 billion, 902-mile (1,443 km) pipeline with a capacity of 246,000 b/d that will extend from Hoima, Uganda, which is located near Lake Albert in western Uganda, to the Tanzanian port of Tanga. Construction of the pipeline is scheduled to begin in 2024; however, development of the pipeline faces obstacles such as cost overruns and legal challenges raised by environmental groups, both of which may result in delays in constructing the pipeline.[11]
- Uganda is seeking to build a $4-billion, 60,000 b/d refinery in Hoima to process crude oil extracted from the Kingfisher South and Tilenga development projects. The proposed refinery has yet to reach an FID, and Uganda is searching for alternative project partners to develop the project after the previously selected partner, the Albertine Graben Refinery Consortium, pulled out of talks in June 2023 because of funding issues.[12]
- **Kenya** is evaluating options for exporting and processing crude oil when its development projects are brought on line. As of October 2023, Kenya did not have any refining capacity; its sole refinery at the port of Mombasa closed in 2013 after plans to upgrade the facility were abandoned and the refinery was later taken over by the Kenyan government and converted into a storage facility. The government is reportedly seeking to establish a refinery, but no concrete proposals have been announced.[13]
- Kenya is seeking to build a pipeline that would transport crude oil produced from the South Lokichar Basin to the Lamu Port on the coast in southeastern Kenya for export to international

markets. The Lokichar-Lamu pipeline (also known as the Kenya Crude Oil Pipeline) is 156-mile (825 km) proposed pipeline with a 65,000 b/d capacity that is also to be a segment of a larger regional midstream project, the Lamu Port-South Sudan-Ethiopia Transport (LAPSSET) Corridor project. The LAPSSET Corridor project is a proposed pipeline to transport crude oil from South Sudan's oil fields in Juba to Kenya's port for export but is also still under development.[14]

- **Mauritania**, **Mozambique**, **Namibia**, and **Senegal** do not have any major midstream or downstream infrastructure for crude oil export (Table 4).

Table 4. Relevant midstream and downstream crude oil infrastructure in selected African countries

Facility	Status	Capacity (thousand barrels per day)	Operators and shareholders	Notes
East African Crude Oil Pipeline (EACOP)	Proposed	246	TotalEnergies, Uganda National Oil Company, CNOOC, and the Tanzania Petroleum Development Corporation	Proposed onshore pipeline to carry liquid fuels from Uganda's Tilenga and Kingfisher fields to Tanzanian port of Tanga
Hoima refinery	Proposed	60	Unknown	Proposed refinery in Uganda to process liquid fuels extracted from Kingfisher and Tilenga development projects
Lokichar-Lamu Crude Oil Pipeline (Kenya Crude Oil Pipeline)	Under development	65	Tullow Oil, Africa Oil, and TotalEnergies	Proposed onshore pipeline to carry crude oil from Kenya's South Lokichar Basin to Port Lamu. Pipeline also a segment of the larger proposed Lamu Port-South Sudan-Ethiopia Transport (LAPSSET) Corridor project.

Data source: Rystad Energy, *Offshore Technology, Pumps Africa News,* company websites

Natural Gas

- According to estimates as of January 1, 2023, by OGJ, **Mozambique** had the largest proved natural gas reserves of the selected African countries, estimated at 100 trillion cubic feet (Tcf). **Mauritania** and **Namibia** have relatively smaller estimates of proved natural gas reserves, holding 1 Tcf and 2.2 Tcf, respectively. **Uganda** is estimated to only have 500 billion cubic feet (Bcf) in proved reserves. OGJ currently does not have available estimates for either **Kenya** or **Senegal** (Table 5).[15]

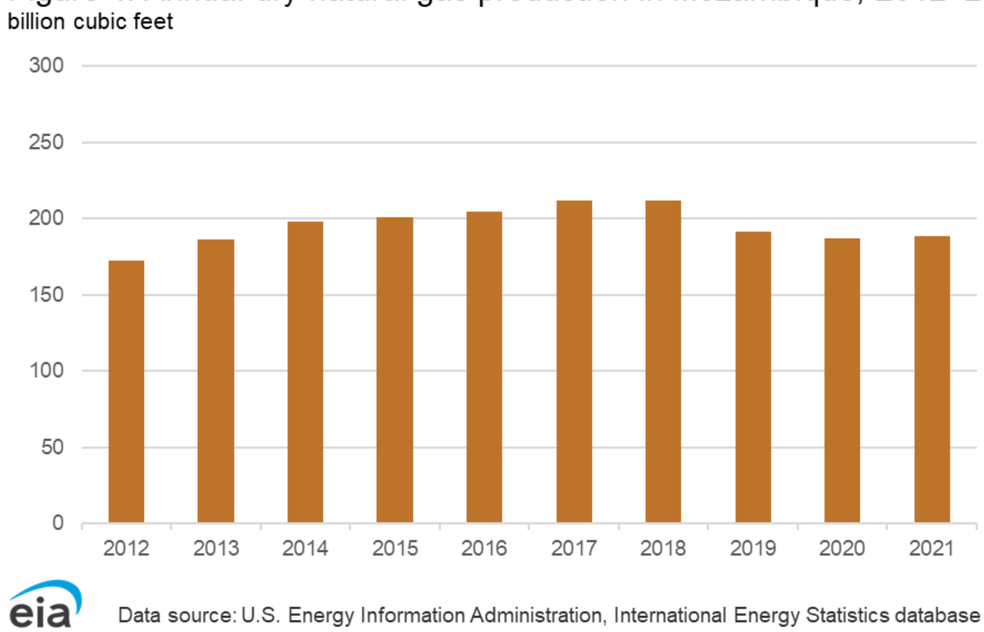
Table 5. Estimated proved natural gas reserves of selected countries in Africa, 2023

Country	Estimated reserves (billion cubic feet)
Kenya	N/A
Mauritania	1,000
Mozambique	100,000
Namibia	2,200
Senegal	N/A
Uganda	500

Data source: *Oil & Gas Journal*
Note: N/A=not available.

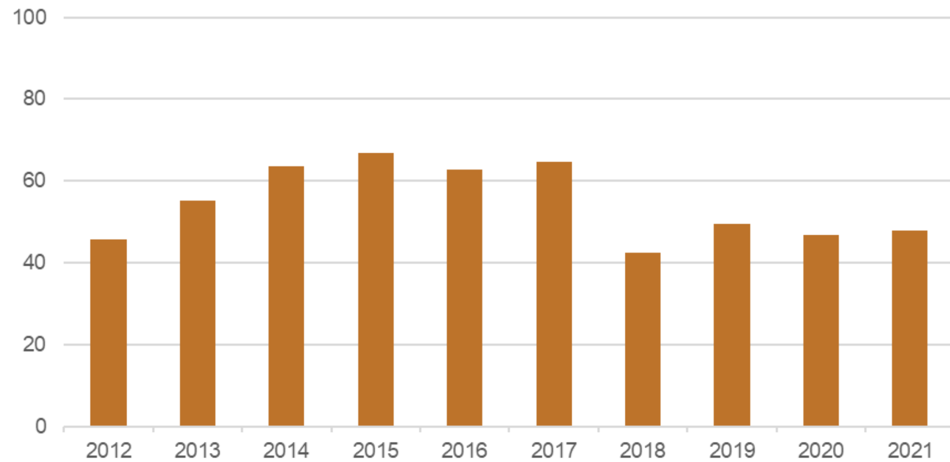
- Of the selected African countries in the group, **Mozambique** is virtually the sole producer of natural gas. Mozambique produced an average of about 195 Bcf per year of dry natural gas during the 2012–2021 time period. **Senegal** produces only marginal amounts of dry natural gas, averaging about 2 Bcf per year during the 2012–2021 time period. **Kenya**, **Mauritania**, **Namibia**, and **Uganda** do not produce any dry natural gas (Figure 4).[16]

Figure 4. Annual dry natural gas production in Mozambique, 2012–2021



- The natural gas consumption profiles of the selected African countries is similar to their production profiles. Both **Mozambique** and **Senegal** consume natural gas domestically. Mozambique consumed an average of 55 Bcf per year, while Senegal consumed about 2 Bcf per year from 2012 to 2021. Mozambique consumes relatively smaller amounts of natural gas to meet its domestic demand and exports excess natural gas. Senegal consumes all the natural gas that it produces. **Kenya**, **Mauritania**, **Namibia**, and **Uganda** do not consume any dry natural gas (Figure 5).[17]

Figure 5. Annual dry natural gas consumption in Mozambique, 2012–2021
billion cubic feet



Data source: U.S. Energy Information Administration, International Energy Statistics database

Recent natural gas discoveries

- Recent significant natural gas discoveries in **Mozambique** are in Area 1 and Area 4 blocks offshore; nearly all of Mozambique's natural gas production comes from the Pande and Temane fields, which are located onshore and are operated by Sasol. The Area 1 block is currently under development and aims to extract natural gas from the Golfinho and Atum fields to the proposed Mozambique LNG facility onshore in the Cabo Delgado province. Security issues onshore near the site of the proposed LNG facility have led to delays in building the facility and have affected the timeline for the startup of the Golfinho and Atum fields. Rystad Energy estimates that these fields are likely to begin production in 2028 after the first two trains of the Mozambique LNG facility come on line.[18]
- The Coral and Mamba natural gas fields are the two main fields within Mozambique's Area 4 block that have projects under development or have recently begun producing. In 2022, the Coral project and Coral South project began producing natural gas for export via the Coral South floating LNG (FLNG) facility. Eni, the operator of the projects, is seeking to develop expansion projects at the Coral field to increase natural gas production; Rystad Energy estimates that these projects are not likely to begin production until the late 2020s. ExxonMobil also aims to start production in Area 4 and draw natural gas from the Mamba field for export through the proposed Rovuma LNG facility, which is located onshore in the Cabo Delgado province. Security issues remain a significant concern given the proposed facility's close proximity to the town of Mocimboa da Praia, where militant attacks occurred in August 2020. Rystad Energy estimates that the LNG facility and the initial natural gas project, Mamba South, will begin production in 2030, but the projects could be significantly delayed if security issues in the province persist.[19]

- The Greater Tortue Ahmeyim (GTA) LNG project is **Mauritania's** and **Senegal's** first significant offshore natural gas development project and straddles the maritime border of the two countries. The GTA LNG project aims to develop two offshore natural gas fields, Tortue and Ahmeyim, and extract natural gas for export via a FLNG facility. The governments of Mauritania and Senegal signed an inter-government cooperation agreement in February 2018 to approve the development of the project, with each country sharing resources and revenues on a 50/50 basis. BP is the operator of the project, and it is being developed as a joint venture in collaboration with Kosmos Energy, Société des Pétroles du Sénégal (Petrosen), and Société Mauritanienne des Hydrocarbures (SMH), the latter two of which are the national oil companies for Senegal and Mauritania, respectively. The GTA LNG project will be developed in phases, with the first phase of the project reaching an FID in February 2018. In August 2023, BP announced that it had postponed the start date of the first phase operations to early 2024 because of construction delays and deployment of the FLNG facility. The second phase of the GTA development project is currently planned for development. However, an FID has not been reached, and whether the second phase will go forward remains unclear.[20]
- In addition to the development of the GTA LNG project, both Mauritania and Senegal are developing natural gas resources that are located solely within their territories. Mauritania is seeking to develop resources at the Orca discovery, which is an offshore natural gas discovery located north of the GTA LNG project. The Orca discovery will be developed as part of the Bir Allah LNG Hub project, which aims to extract resources from the Orca discovery and transport them to an onshore LNG facility for export. BP is the operator of the project and is partnering with Kosmos Energy and Petrosen and SMH to develop the project, which Rystad Energy estimates will begin production by 2036.[21]
- The Yakaar-Teranga Hub project is a major development project that Senegal is aiming to bring on line in the late 2020s. The Yakaar-Teranga Hub project is composed of natural gas fields offshore of Senegal that will be developed and connected through a series of subsea tiebacks. The natural gas will be transported via pipeline to an onshore LNG facility for export to international markets. BP, the operator of the project, has partnered with Petrosen and Kosmos Energy in the development of the project and plans to begin production in 2028.[22]
- **Kenya, Namibia,** and **Uganda** have not had any recent significant natural gas discoveries reported to date (Table 6 and Figure 6).

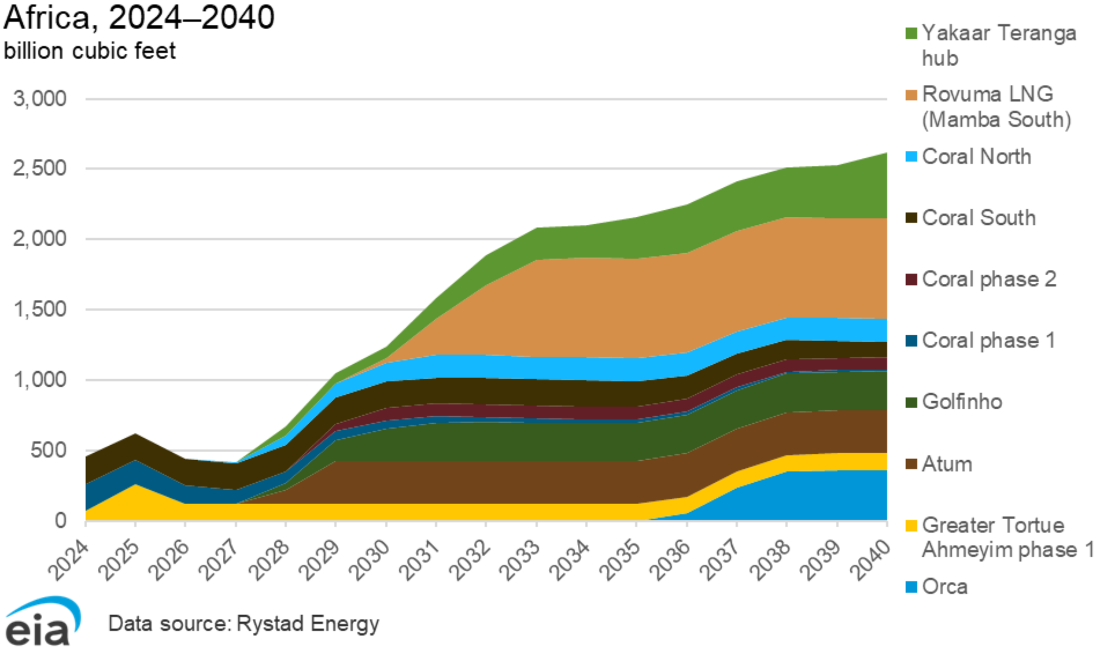
Table 6. Significant natural gas projects in selected African countries

Country name	Discovery name	Discovery date	Location	Operator	Estimated startup date
Mauritania and Senegal	Greater Tortue Ahmeyim (GTA) development project phase 1	2015	Offshore	BP	2024
	Greater Tortue Ahmeyim (GTA) development project phase 2	2015	Offshore	BP	Unknown
Mauritania	Orca	2019	Offshore, Block C-8	BP	2036
Mozambique	Atum	2012	Offshore, Area 1	TotalEnergies	2028
	Golfinho	2012	Offshore, Area 1	TotalEnergies	2028
	Coral phase 1	2012	Offshore, Area 4	Eni	2022

	Coral phase 2	2012	Offshore, Area 4	Eni	2029
	Coral South	2012	Offshore, Area 4	Eni	2022
	Coral North	2012	Offshore, Area 4	Eni	2027
	Mamba South	2011	Offshore, Area 4	ExxonMobil	2030
Senegal	Yakaar-Teranga Hub project	2017	Offshore, Cayar Offshore Profond Block	BP	2028

Data source: Rystad Energy

Figure 6. Forecast natural gas production from selected projects in Africa, 2024–2040



Data source: Rystad Energy

Trade

- The Coral South (or Coral Sul) FLNG facility was **Mozambique's** sole operating LNG facility, as of October 2023. The Eni-operated facility, which sent its first shipment of LNG in November 2022, delivers natural gas extracted from the Coral field located in the Rovuma Basin's Area 4 block. Eni is reportedly considering building a second FLNG vessel as part of an expansion project to boost production and exports from the basin, but an FID for the expansion has not been reached.[23]
- Mozambique also has other LNG projects that could enable the country to further leverage its natural gas resources for domestic consumption and export if they are brought on line. The Mozambique LNG terminal is a proposed onshore LNG export facility located in the Cabo Delgado province that aims to deliver natural gas from the Golfinho and Atum natural gas fields in the Rovuma Basin's Area 1 block. TotalEnergies, the project operator, declared force majeure during construction of the two-train facility in April 2021 and withdrew all its project personnel as a result of militant attacks in the nearby city of Palma. TotalEnergies is reportedly planning to

restart construction, and commercial operations, originally scheduled for 2024, have been reportedly pushed back to 2027 at the earliest. An expansion project that aims to build two additional trains at the same location is also under consideration, but whether this project will go forward remains unclear.[24]

- The Rovuma LNG project is another proposed onshore LNG export facility on the Afungi peninsula in the Cabo Delgado province. The project aims to build two liquefaction trains that can deliver natural gas extracted from the Mamba natural gas field located in the Rovuma Basin's Area 4 block. ExxonMobil operates the facility and is seeking to reach an FID by 2025 and start commercial operations at the facility before the end of this decade.[25]
- In addition to LNG infrastructure, Mozambique maintains a natural gas pipeline that transports natural gas from Mozambique's onshore Temane and Pande fields to the Secunda gas-to-liquids plants in Secunda, South Africa. The pipeline is about 541 miles long (or about 965 km) and is owned by a joint venture between South African companies Sasol and iGas and Mozambique's Companhia Mocambiçana de Gasoduto (CMG). The pipeline has a capacity of about 197 Bcf per year.[26]
- **Mauritania** and **Senegal** are in the process of bringing on line the required infrastructure to commercialize natural gas from the GTA LNG project. The FLNG vessel for the first phase of the GTA project is scheduled to arrive in the fourth quarter of 2023. As of September 2023, the FLNG vessel was under construction in Singapore, with plans to deploy it to the GTA project once it is completed and the project is ready for commercial operations, which is reportedly scheduled to begin in the first quarter of 2024.[27]
- **Kenya, Namibia,** and **Uganda** do not have any LNG projects currently under development (Table 7).

Table 7. LNG infrastructure in selected countries in Africa

Country	Facility name	Status	Facility type	Location	Operator	Start date	Nameplate capacity (billion cubic feet per year)
Mauritania and Senegal	Greater Tortue Ahmeyim FLNG project	Delayed	Floating production, storage, and offloading vessel	Offshore	BP	2024	122
Mozambique	Mozambique LNG (Area 1) T1 - T2	Delayed	Liquefaction terminal	Onshore	TotalEnergies	2027	627
	Mozambique LNG (Area 1) T3 - T4	Proposed	Liquefaction terminal	Onshore	TotalEnergies	Unknown	487
	Area 4 Rovuma LNG	Proposed	Liquefaction terminal	Offshore	ExxonMobil	Unknown	740
	Coral Sul floating FLNG project	Operating	Floating liquefaction terminal	Offshore	Eni	2022	166
Senegal	Sengal FSRU	Under construction	Floating storage and regasification unit	Offshore	Karadeniz Group	2023	122

Data source: *Global Energy Monitor, NS Energy Business, International Group of Liquefied Natural Gas Importers (GIIGNL) 2023 Annual Report, International Gas Union 2023 Annual Report*

Notes

- Data presented in the text are the most recent available as of December 7, 2023.
- Data are EIA estimates unless otherwise noted.

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[1] For more on hydrocarbon resource potential in Africa, see U.S. Department of Interior, U.S. Geological Survey, World Petroleum Assessment. Also, see Christopher Schenk, et al., "Assessment of Undiscovered Conventional Oil and Gas Resources of the Senegal Basin Province of Northwest Africa, 2021," U.S. Geological Survey Publication Warehouse, Factsheet 2022-3080.

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