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INCLUDES 10-YEAR FORECASTS TO 2025



Angola Oil & Gas Report Q3 2016

INCLUDES 10-YEAR FORECASTS TO 2025

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BMI Industry View

BMI View: Angola's oil production is forecast to remain strong and unaffected by low oil prices, with output rising up until 2018. Post-2018 oil production will fall off due to a steep decline in rates on mature fields and no new projects forecast to counteract the declines. However, with plenty of pre-FID projects in the pipeline and a strong oil major presence, oil production risks lie to the upside. Gas production will remain limited throughout our forecast with weak domestic demand, but will benefit from the ALNG coming back online after two years of closure. The downstream outlook is bleak, as we have removed one of the two planned refineries from our forecast due to a lack of progress and the poor financial position of Sonangol.

Table: Headline Forecasts (Angola 2014-2020)

	2014	2015e	2016f	2017f	2018f	2019f	2020f
Crude, NGPL & other liquids prod, 000b/d	1,757.0	1,809.7	1,894.8	2,015.6	2,036.7	1,999.8	1,940.8
Refined products production, 000b/d	43.8	45.6	47.0	48.4	65.3	114.3	142.8
Refined products consumption & ethanol, 000b/d	115.7	120.9	124.7	128.7	133.4	138.5	144.3
Dry natural gas production, bcm	1.7	0.5	4.7	6.5	6.8	7.0	7.1
Dry natural gas consumption, bcm	0.8	0.5	0.5	0.8	1.1	1.1	1.2
Brent, USD/bbl	99.50	53.60	40.00	53.00	62.00	65.00	71.00

e/f = BMI estimate/forecast. Source: EIA, BMI

Latest Updates And Key Trends

- Angola will see continued exploration of its prospective offshore waters. However, we expect a slowdown in high-cost, high-risk ultra-deepwater and pre-salt drilling as companies look to rein in capital expenditure and exercise tighter fiscal discipline.
- We have removed the planned 200,000 barrel per day (b/d) Lobito refinery from our forecast due to the lack of progress on construction plans and the fragile state of Sonangol, the state petroleum company. The removal of the Lobito refinery from our forecast has resulted in Angola remaining a net importer of refined fuels for the decade. Angola has a rapidly growing refined fuels demand with consumption averaging 4.0% over the next 10 years driven by robust construction sector growth and rises in disposable household income. Therefore, despite the Soyo refinery helping to ease imports needs from 80,000 b/d in 2018 to less than 2,000 b/d in 2020, strong domestic consumption will result in imports rising post-2020 and by 2025 we expect Angola's refined fuels imports to stand at 33,000 b/d.
- **Maersk Oil** has postponed making a final investment decision on its deep-water Chissonga project in an effort to make cost-saving this year, expressing keenness to develop the project at a later date.
- Sonangol has announced significant discoveries in the Kwanza basin adding up to 2.2bn barrels of oil equivalent, raising the country's oil reserves by 419mn barrels and gas reserves by 0.3tcf. The additional

reserves were in the **BP** operated Block 24 and the Sonangol operated Block 20, highlighting the prospectivity of the region.

- **Eni** have reaffirmed their commitment to continue exploratory drilling around the East and West Hub Development Projects with any discoveries able to tie-in to the existing FPSO's.
- Our Power team expects the Soyo combined-cycle power plant to be operational by mid-2017. The capacity of the plant will be 750 megawatts and we expect it to demand around 0.43bn cubic metres (bcm) of gas per year. While this is comparatively negligible, it will help to nearly double Angolan gas consumption. We have therefore revised up our forecasts for Angola's gas consumption, now projecting volumes to reach 0.54bcm in 2016, 0.76bcm in 2017 and 1.07bcm in 2018.
- Chevron has announced that the Angolan LNG export project has started recommissioning with exports expected to begin in Q216.
- Gas production levels will remain low, and heavily linked to LNG exports. Looseness in the global LNG market and a lack of long-term sales agreements will depress demand for Angolan LNG, constraining both production and export levels across our 10-year forecast period.

SWOT

SWOT Analysis

- Strengths**
- An established oil sector with developed infrastructure and a diverse services industry.
 - Highly prospective and underexplored deepwater and pre-salt acreage.
 - A substantial underdeveloped gas reserves base.
 - A stable licensing and taxation regime.
- Weaknesses**
- A challenging business environment, plagued by high-level corruption.
 - Heavy state presence in the industry, through national oil company Sonangol.
 - Comparatively tight fiscal terms.
 - A small domestic gas market.
- Opportunities**
- A spate of major projects currently under development.
 - A government-led drive towards monetisation of the country's non-associated gas resources.
 - Strong forecast oil and gas consumption growth.
 - Planned and proposed downstream expansion projects.
- Threats**
- A lower oil price environment and capex claw-backs across the industry.
 - Declining export revenues, due to the sharp fall in oil and LNG prices.
-

Industry Forecast

Upstream Exploration

***BMI View:** Sonangol's recent discoveries in the Kwanza Basin show strong prospectivity and will spur further exploration efforts in the region.*

Latest Updates

- The Angolan onshore bid round closed on October 1 2015; **Sonangol** is currently examining the bids and was aiming to release the results in Q415. However at the time of writing there was still no update on the round.
- Sonangol has announced significant discoveries in the Kwanza basin adding up to 2.2bn barrels of oil equivalent, raising the country's oil reserves by 419mn barrels and gas reserves by 0.3tcf. The additional reserves were in the **BP** operated Block 24 and the Sonangol operated Block 20, highlighting the prospectivity of the region.
- **Eni** have reaffirmed their commitment to continue exploratory drilling around the East and West Hub Development Projects with any discoveries able to tie-in to the existing FPSO's.
- Sonangol is seeking an alternative operator for blocks 20 & 21 after Cobalt International sold its 40% stakes in each. The blocks contain the major Cameia, Bicular, Mavinga, Lontra and Orca pre-salt discoveries.

Structural Trends

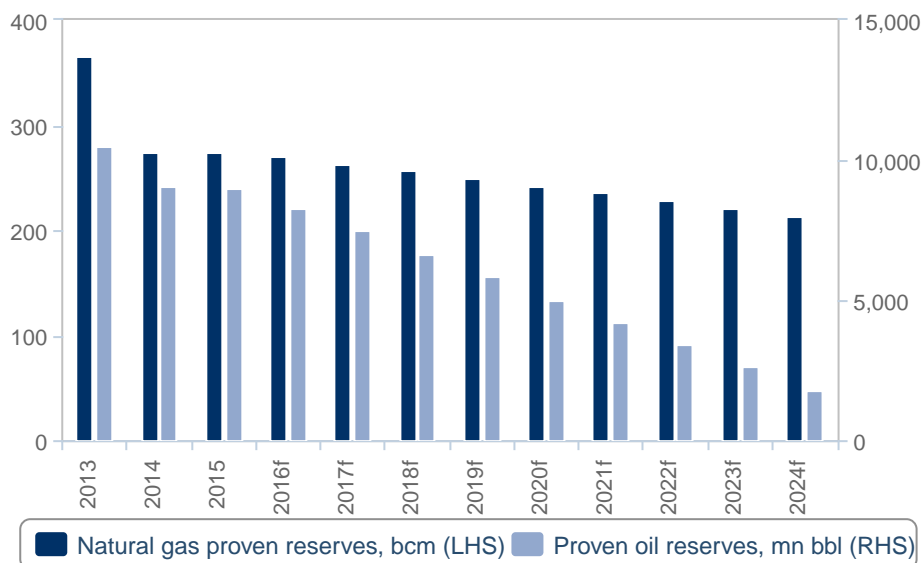
Angola's reserves are located offshore and onshore along the coast in three main basins: the Lower Congo Basin, the Kwanza Basin and the Namibe Basin. Most of the country's reserves are in Lower Congo or Kwanza, with most production coming from the exclave of Cabinda.

The Angolan offshore is among the most prospective plays in Africa and continues to draw high levels of investment. Drilling results are broadly positive, with exploration yielding a number of high-impact discoveries in recent years. A heavy focus on the Kwanza Basin pre-salt has returned five major discoveries since 2011: Bicular, Cameia, Lontra, Mavinga and Orca in blocks 20 and 21. The blocks' previous operator **Cobalt International** offered a gross resource estimate of 1.1-2bn barrels (bbl) of oil and well testing reports good reservoir quality and high flow rates of up to 9,500 barrels of oil equivalent per day (boe/d). The Lower Congo also continues to offer a high drilling success rate. Major discoveries in 2014 included **Eni's** Ochigufu discovery in deepwater block 15/06. The discovery is estimated to contain 300mn bbl of oil in place and will be tied back to the company's West Hub development.

Given the country's high prospectivity offshore, we see strong interest in exploration sustained over the coming years, in both the Lower Congo and Kwanza Basins. The bulk of drilling will continue to target deepwater and pre-salt prospects, spearheaded by industry supermajors, such as **BP**, **Eni** and **Total**.

Continued Exploration Offers Upside Risk To Reserves

Angola Oil & Gas Reserves Forecasts



f = BMI forecast. Source: BMI, EIA

In spite of continued exploration and strong prospectivity, we expect the pace of reserves replacement in the Lower Congo and Kwanza basins to begin to slow. Over the past decade annual discoveries have rarely dipped below 1bn bbl, peaking at 2.8bn bbl in 2013. Angola also retains substantial underexplored acreage, offering significant upside risk to reserves. However, the highest impact discoveries are typically made towards the beginning of an exploration cycle, and the size of discoveries will likely begin to fall. Strong forecast production growth and rapid depletion rates at producing fields will also put further pressure on reserves replacement.

The main downside risk to exploration is the current lower oil price environment. With Angola's most prospective acreage in the deepwater, ultra-deepwater and pre-salt areas, exploration can be characterised as high-risk, high-reward. Illustrative of this, in November 2014 ConocoPhillips announced that its Kamoxi-1

exploration well targeting a subsalt prospect in the Kwanza Basin had come up dry. The well has cost the company USD140mn, post-tax. Development costs are similarly prohibitive, estimated at up to USD50mn per well by **Sonangol**; where a discovery is made, commerciality will typically depend on a large, liquids-rich and high-productivity reservoir, or else close proximity to an existing development and infrastructure.

Several discoveries in the northern Kwanza Basin have pointed to higher gas content. Given the typically weaker economics of gas developments, limited options for monetisation and Sonangol's heavy restrictions on gas marketing by foreign entities, more gaseous discoveries could pose risks to production.

In general, in a lower price environment companies demonstrate a lower appetite for risk. We have seen increasing capital expenditure cutbacks, asset divestments and tightening fiscal discipline among the major sub-Saharan African players over recent months. Given its exploration history, Angola is less vulnerable to this trend than other less prospective and more frontier plays in the West African offshore. However, sustained lower oil prices may dampen interest in the highest-cost ventures, and we expect a slowdown in exploration activity over the coming quarters.

In July 2015 the government launched a new onshore licensing round, offering a total of 10 blocks - three in the Lower Congo basin and seven in the Kwanza basin. Pre-qualified bidders include **Chevron**, **Eni**, **Tullow**, **Glencore** and **Dragon Oil**, alongside national oil companies **Socar** and **Ecopetrol**. Companies were asked to submit their proposals by October 1 2015 and Sonangol has yet to announce the results of the bid.

Onshore exploration in Angola was heavily constrained during the civil war (1975-2002) and there has been limited exploration activity since. Angolan firm **Somoil** and Sonangol produce onshore, but output is marginal, below 20,000 barrels per day (b/d). An Angolan bid round should draw significant interest and the lower costs of exploration and development onshore may answer to companies' currently more conservative investment profiles. However, the small size of discoveries onshore to-date and the lack of infrastructure in the region will weigh to the downside.

Upstream Projects

Table: Angola's Major Upstream Projects

Name	Field Name	Companies	Status	Est. Peak Oil/Liquids Output (b/d)	Est. Peak Gas Output (bcm)	Type of Project
Block 20	Orca (Baleia)	BP (30%), Sonangol (70%)	Appraisal	-	-	Oil
Block 21	Cameia	Sonangol (100%),	Development	100,000	-	Oil
Block 23, Kwanza Basin	Azul	Svenska Petroleum Exploration (30%), Maersk Oil (50%), Sonangol (20%)	Appraisal	-	-	Oil
Block 20	Lontra	Sonangol (70%), BP (30%)	Appraisal	-	-	Gas & Condensate
Kizomba C (Block 15)	Modo, Saxi, Batuque	ExxonMobil (40%), BP (26.67%), Eni S.p.A (20%), Statoil (13.33%)	Production	300,000	-	Oil
Kizomba Satellite Phase 1 Project (Block 15)	Clochas, Mavacola	ExxonMobil (40%), BP (26.67%), Eni S.p.A (20%), Statoil (13.33%)	Production	100,000	-	Oil
Block 17	Cravo, Lirio, Orquidea, Violeta	Total E&P Angola (40%), Statoil (23.33%), ExxonMobil (20%), BP ANGOLA BV (16.7%)	Production	160,000	-	Oil
Girassol (Block 17)	Jasmim	Total E&P Angola (40%), Statoil (23.33%), ExxonMobil (20%), BP ANGOLA BV (16.67%)	Production	200,000	-	32 degree API
Pazflor (Block 17)	Acacia, Hortensia, Perpetua, Zinia	Total E&P Angola (40%), Statoil (23.33%), ExxonMobil (20%), BP ANGOLA BV (16.67%)	Production	220,000	1.6	Oil & Gas
Block 39, Kwanza Basin	Dilolo	Statoil (37.5%), Sonangol Sinopec International (30%), WRG Angola (15%), Ecopetrol (10%), Total (7.5%)	Exploration	-	-	Oil & Gas
Block 38, Kwanza Basin	Jacare Prospect	Statoil (45%), Sonangol (30%), WRG Angola (15%), Ecopetrol (10%)	Exploration	-	-	Oil & Gas
Block 17/06	Canna	Somol (10%), Sonangol (20%), Sonangol Sinopec International (27.5%), ACREP	Discovery	-	-	33 degree API

Angola's Major Upstream Projects - Continued

Name	Field Name	Companies	Status	Est. Peak Oil/Liquids Output (b/d)	Est. Peak Gas Output (bcm)	Type of Project
		(5%), Partex Oil and Gas Group (2.5%), Falcon Oil & Gas (5%), Total (30%)				
Block 18/06	Manganes	Petroleo Brasileiro - Petrobras (30%), Sonangol Sinopec International (40%), Sonangol (20%), Falcon Oil & Gas (5%), Germinas (5%)	Discovery	-	-	Oil
Kizomba Satellite Phase 2 Project (Block 15)	Kakochoa, Bavuca, Mondo South	Statoil (13.33%), Eni S.p.A (20%), ExxonMobil (40%), BP (26.67%)	Production	70,000	-	Oil
Block 16	Chissonga	Odebrecht (15%), Sonangol (20%), Maersk Oil (65%)	Development	100,000	-	Oil
Block 15/06	Ochigufu	Statoil (5%), Falcon Oil & Gas (5%), SSI (25%), Sonangol (30%), Eni S.p.A (35%)	Discovery	-	-	Oil
Block 14	Malange	Galp Energia (9%), Eni S.p.A (20%), Sonangol Pesquisa e Producao (20%), Chevron (31%), Total (20%)	Development	50,000	-	Oil & Gas
Block 0, Area B	Nemba	Chevron (39.2%), Eni S.p.A (9.8%), Sonangol (41%), Total (10%)	Upgrade/EOR	50,000	-	Oil & Gas
Block 0, Area B	N'Dola	Eni S.p.A (9.8%), Chevron (39.2%), Sonangol (41%), Total (10%)	Suspended	28,000	-	Oil
Block 0, Area B	Greater Longui Area (GLA)	Eni S.p.A (9.8%), Chevron (39.2%), Sonangol (41%), Total (10%)	Appraisal	-	-	Oil & Gas
Block 0, Area A	Kambala	Eni S.p.A (9.8%), Chevron (39.2%), Sonangol (41%), Total (10%)	Appraisal	28,000	-	Oil & Gas
Block 0	Lifua	Chevron (39.2%), Eni S.p.A (9.8%), Sonangol (41%), Total (10%)	Appraisal	-	-	Oil & Gas
Block 0, Area C	Minzu	Eni S.p.A (9.8%), Chevron (39.2%), Sonangol (41%), Total (10%)	Appraisal	-	-	Oil & Gas

Angola's Major Upstream Projects - Continued

Name	Field Name	Companies	Status	Est. Peak Oil/Liquids Output (b/d)	Est. Peak Gas Output (bcm)	Type of Project
Block 14	Kuito	Galp Energia (9%), Eni S.p.A (20%), Sonangol Pesquisa e Producao (20%), Chevron (31%), Total (20%)	Production	100,000	-	Oil
Block 14	Tombua-Landana	Galp Energia (9%), Eni S.p.A (20%), Sonangol Pesquisa e Producao (20%), Chevron (31%), Total (20%)	Production	100,000	-	Oil
Block 36, Kwanza basin	Kamoxi	ConocoPhillips (50%), Sonangol (50%)	Exploration	-	-	Oil & Gas
BBLT, Block 14	Benguela, Belize, Lobito, Tomboco (BBLT)	Eni S.p.A (20%), Total (20%), Sonangol (20%), Chevron (31%), Galp Energia (9%)	Production	200,000	-	Oil & Gas
Kizomba A (Block 15)	Hungo, Chocalho	ExxonMobil (40%), Eni S.p.A (20%), BP (26.67%), Statoil (13.33%)	Production	250,000	-	Oil
Kizomba B (Block 15)	Dikanza, Kissanje	ExxonMobil (40%), Eni S.p.A (20%), BP (26.67%), Statoil (13.33%)	Production	250,000	-	Oil
East Hub Project, Block 15/06	Cabaca Norte, Cabaca South East	SSI (25%), Sonangol (35%), Eni S.p.A (35%), Falcon Oil & Gas (5%)	Development	100,000	-	Oil
Block 5	Block 5	Sonangol Pesquisa e Producao, Vaalco Energy	Exploration	-	-	Oil & Gas
Block 6/06, Kwanza Basin	Block 6/06	Initial Oil & Gas (10%), Falcon Oil & Gas (10%), Sonangol (40%), Petrobras (40%)	Exploration	-	-	Oil & Gas
Block 37, Kwanza Basin	Block 37	ConocoPhillips	Exploration	-	-	Oil & Gas
Block 3/05	Bufalo, Impala, Impala SE, Pacassa, Palanca, Pambi, Cobo, Oombo	INA-Industrija nafte (4%), Naftgas (4%), Somoil (10%), Eni S.p.A (12%), Ajoco (20%), Sonangol Sinopec International (25%), Sonangol (25%)	Upgrade/EOR	-	-	Oil & Gas
Block 3/05A	Caco-Gazela, Punja	INA-Industrija nafte (4%), Naftgas (4%), Somoil (10%), Eni S.p.A (12%), Ajoco	Development	-	-	Oil & Gas

Angola's Major Upstream Projects - Continued

Name	Field Name	Companies	Status	Est. Peak Oil/Liquids Output (b/d)	Est. Peak Gas Output (bcm)	Type of Project
		(20%), Sonangol Sinopec International (25%), Sonangol (25%)				
Block 2/85	Block 2/85	Kotoil (9.1%), Poliedro Oil (9.1%), Somoil (9.3%), Chevron (20%), Petrobras (27.5%), Sonangol (25%)	Production	4,000	-	Oil
Block 3	Canuku	Sonangol (100%)	Production	-	-	Oil
Fina Sonangol Texaco Area (FST block)	Fina Sonangol Texaco Area	Sonangol (68.5%), Chevron (16.3%), Somoil (15%)	Production	16,000	-	Oil
FS Block	FS Block	Somoil (15%), Sonangol (85%)	Production	-	-	Oil
Block 4/05	Gimboa	ACREP (15%), Somoil (15%), Statoil (20%), Sonangol (50%)	Production	50,000	-	Oil
Cabinda North Block, North Congo Basin	Cabinda North	Teikoku Oil (17%), Petropars (10%), Eni S.p.A (10%), Sonangol Sinopec International (11%), ACREP (15%), Soco International (17%), Sonangol (20%)	Exploration	-	-	Oil & Gas
Cabinda South Block	Cabinda South (Cabinda Sul)	Cuba Petroleo (CUPET) (5%), Gale Force Petroleum (20%), Sonangol (20%), Plus	Production	7,000	-	Oil & Gas
Block 2/05	Block 2/05	Poliedro Oil (10%), Kotoil (10%), Somoil (30%), Sonangol (50%)	Production	-	-	Oil
Block 5/06	Block 5/06	Sonangol (60%), Vaalco Energy (40%)	Exploration	-	-	Oil & Gas
Block 8	Block 8	Sonangol (20%), Svenska Petroleum Exploration (30%), Maersk Oil (50%)	Exploration	-	-	Oil & Gas
Block 9/09	Block 9/09	Nazaki Oil and Gas (15%), Sonangol (85%)	Exploration	-	-	Oil & Gas
Block 19/11	Block 19/11	Sonangol Sinopec International (10%), Sonangol (40%), BP (50%)	Exploration	-	-	Oil & Gas
Block 21/09	Block 21/09	Alper Oil (10%), Nazaki Oil and Gas	Appraisal	-	-	Oil & Gas

Angola's Major Upstream Projects - Continued

Name	Field Name	Companies	Status	Est. Peak Oil/Liquids Output (b/d)	Est. Peak Gas Output (bcm)	Type of Project
		(15%), Sonangol (75%)				
Block 22/11, Kwanza Basin	Block 22/11	Statoil (20%), Sonangol (50%), Repsol (30%)	Discovery	-	-	Oil
Block 24/11	Block 24/11	Sonangol (50%), BP (50%)	Exploration	-	-	Oil & Gas
Block 25/11	Block 25/11	BP (15%), Statoil (20%), Total (35%), Sonangol (30%)	Exploration	-	-	Oil & Gas
Block 26/06	Block 26/06	Sonangol (20%), BP (40%), Petrobras (40%)	Exploration	-	-	Oil & Gas
Block 33	Block 33	Galp Energia (5.3%), Falcon Oil & Gas (16%), Sonangol (20%), Total (58.7%)	Exploration	-	-	Oil & Gas
Block 35/11	Block 35/11	Repsol (25%), Sonangol (45%), Eni S.p.A (30%)	Exploration	-	-	Oil & Gas
Block 37/11	Omosi	Repsol (20%), Sonangol (50%), ConocoPhillips (30%)	Exploration	-	-	Oil & Gas
Block 40/11	Umbundu	Petronas (10%), Statoil (20%), Sonangol (30%), Total (40%)	Exploration	-	-	Oil & Gas
Block 17	Dalia	BP (16.67%), ExxonMobil (20%), Statoil (23.33%), Total (40%)	Production	30,000	-	Oil
Greater Plutonio, Block 18	Galio, Cromio, Paladio, Plutonio, Cobalto	SSI (50%), BP (50%)	Expansion	250,000	-	Low Sulphur, Medium Gravity Crude Oil
PSVM, Block 31	Plutao, Saturno, Venus, Marte	Marathon Oil (10%), BP (26.67%), Total (5%), ExxonMobil (25%), Sonangol (20%), Statoil (13.33%)	Production	150,000	-	Oil
Lianzi	Lianzi	Chevron (31.25%), Societe nationale des petroles du Congo (National Petroleum Company of the Congo) SNPC (7.5%), Galp Energia (4.5%), Sonangol (10%), Eni S.p.A (10%), Total (36.75%)	Development	46,000	-	Oil

Angola's Major Upstream Projects - Continued

Name	Field Name	Companies	Status	Est. Peak Oil/Liquids Output (b/d)	Est. Peak Gas Output (bcm)	Type of Project
Block 14, Lower Congo Basin	Lucapa	Chevron (31%), Galp Energia (9%), Eni S.p.A (20%), Sonangol (20%), Total (20%)	Development	100,000	0.9	Oil & Gas
Block 0, Area A	Mafumeira Sul (Mafumeira South)	Eni S.p.A (9.8%), Total (10%), Sonangol (41%), Chevron (39.2%)	Development	110,000	-	Oil & Gas (LPG)
Block 18, Greater Plutonio	Platina, Chumbo, Cesio (PCC)	SSI (50%), BP (50%)	Development	70,000	-	Oil
Girassol (Block 17)	Girassol	Total E&P Angola (40%), BP ANGOLA BV (16.67%), ExxonMobil (20%), Statoil (23.33%)	Production	200,000	-	Oil
Girassol (Block 17)	Rosa	Total E&P Angola (40%), Statoil (23.33%), ExxonMobil (20%), BP ANGOLA BV (16.67%)	Production	160,000	-	Oil
Block 0, Area A	Mafumeira Norte (Mafumeira North)	Eni S.p.A (9.8%), Total (10%), Sonangol (41%), Chevron (39.2%)	Expansion	40,000	0.32	Oil & Gas
Block 31	Palas, Ceres, Juno, Astraea, Hebe, Urano, Titania, Terra, Portia, Miranda, Cordelia	Marathon Oil (10%), BP (26.67%), Total (5%), ExxonMobil (25%), Sonangol (20%), Statoil (13.33%)	Development	-	-	Oil
Negage (Block 14)	Negage	Chevron	Development	75,000	-	Oil & Gas
West Hub project, Block 15/06	Sangos, N'Goma, Cinguvu	Sonangol (35%), Falcon Oil & Gas (5%), Eni S.p.A (35%), SSI (25%)	Production	80,000	-	Oil
Kaombo, Block 32	Gindungo, Canela, Mostardo, Louro, Gengibre, Caril, Salsa, Cola, Manjericao, Caminhos, Colorau, Alho	SSI (20%), Sonangol (30%), Total (30%), ExxonMobil (15%), Galp Energia (5%)	Development	230,000	-	Oil

blank space = not available/applicable. Source: BMI Upstream Projects Database

Upstream Production - Oil

***BMI View:** We have maintained our oil production forecast for Angola this quarter with production expected to peak in 2018. The strong pre-FID pipeline and robust demand from China for Angolan crudes result in risks lying to the upside.*

Latest Updates

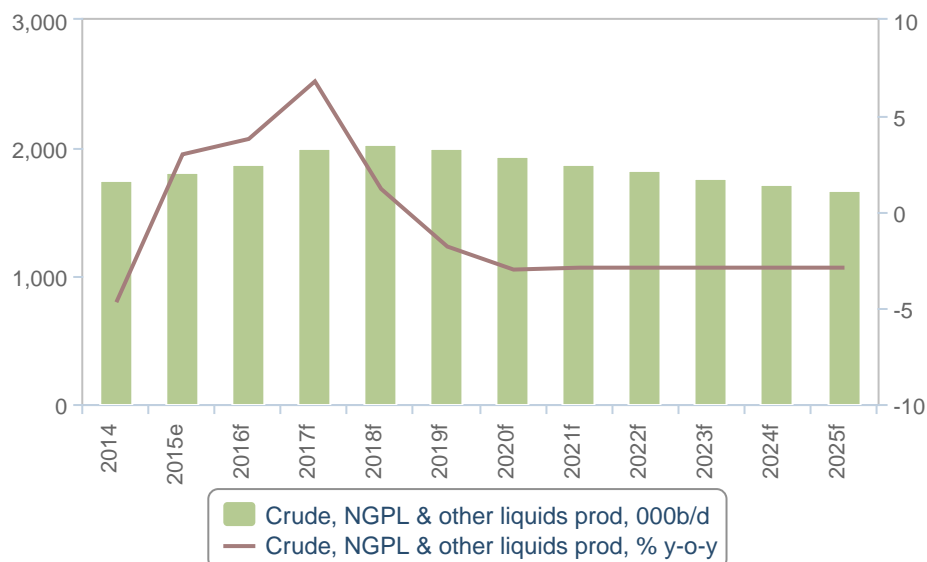
- Angolan oil production will rise strongly in both 2016 and 2017, due to a strong pipeline of new projects brought on stream.
- **Maersk Oil** has postponed making a final investment decision on its deep-water Chissonga project in an effort to make cost-saving this year, expressing keenness to develop the project at a later date.
- **Eni** has given more clarity regarding the East Hub Development project with the first phase expected to start in 2017, bringing 45,000 b/d online. The company is conducting further exploration around the development in order to tie-in any additional discoveries.
- Eni has started production from the Mpungi field in the West Hub Development Project, with overall output ramping up to 100,000b/d in Q116.

Structural Trends

We have revised up our Angola oil production forecast. We now forecast annual average production of 1.87mn b/d in 2016, rising to 2.03mn b/d in 2018 before tapering to 1.66mn b/d by the end of our forecast period in 2025.

Oil Production Forecast

(2014-2025)



BMI/EIA

Growth is driven by a number of major new projects coming online, including CLOV (2014 - 160,000b/d), Mafumeira Sul (2015 - 110,000b/d) and Kaombo (2017 - 200,000b/d): we calculate 680,000b/d in aggregate new production for the period 2015-2017. Companies have also increased investment both into maintenance operations - tackling a range of technical issues which have depressed output - and into stemming decline rates at maturing fields.

The risks to the forecast remain largely to the upside, particularly in the period post-2020. Five major pre-final investment decision (FID) projects remain in the pipeline; combined, they account for 325,000b/d of potential additional production. Further to this, Eni's West and East Hub development projects in block 15/06 provide additional upside risk to production as there are a number of discoveries within their vicinities that are yet to be tie-in to the existing FPSOs. The scale of these projects will render them attractive. However, following the sharp fall in oil prices there is a high probability of project delay, pushing first oil outside the 10-year forecast period.

Companies are delaying FID on a slew of the higher-cost projects across the globe, re-engineering design concepts and awaiting further reductions in industry services costs or a recovery in the price of Brent.

Excluding Malange, all the pre-FID projects are deepwater and pre-salt developments, placing them towards the higher end of the industry cost curve and significantly raising the risk of delay.

Table: Angola Key Projects Pre-FID

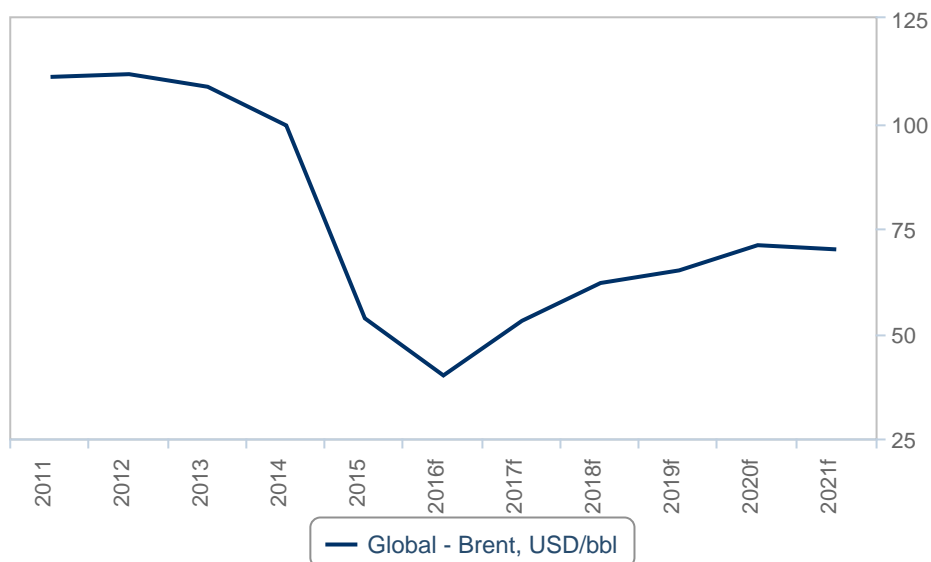
Block	Operator	Project	Peak Production Capacity (000 b/d)
14	Chevron	Negage	75
14	Chevron	Lucapa	100
16	Maersk Oil	Chissonga	100
0, Area B	Chevron	Malange	50

Source: Company data, EIA, BMI

The main downside risk to our forecast stems from continued cutbacks in company capex. This could inhibit spending on field maintenance and drive accelerated depletion rates at producing fields. The bulk of both legacy and future production is in deepwater and ultra-deepwater zones, areas which have seen the most aggressive cutbacks in capex to-date. We have lowered production in the backend of the forecast to reflect this trend, but flag the risk of a further downgrade.

Lower Oil Price Environment

Front-Month Brent Price Forecast (USD/bbl)



e/f = BMI estimate/forecast. Source: BMI, Bloomberg

Table: Oil Production (Angola 2014-2019)

	2014	2015e	2016f	2017f	2018f	2019f
Crude, NGPL & other liquids prod, 000b/d	1,757.0	1,809.7	1,878.7	2,006.0	2,030.2	1,994.3
Crude, NGPL & other liquids prod, % y-o-y	-4.7	3.0	3.8	6.8	1.2	-1.8

e/f = BMI estimate/forecast. Source: BMI, EIA

Table: Oil Production (Angola 2020-2025)

	2020f	2021f	2022f	2023f	2024f	2025f
Crude, NGPL & other liquids prod, 000b/d	1,935.5	1,878.5	1,823.3	1,769.7	1,717.8	1,667.5
Crude, NGPL & other liquids prod, % y-o-y	-3.0	-2.9	-2.9	-2.9	-2.9	-2.9

f = BMI forecast. Source: BMI, EIA

Upstream Production - Gas

***BMI View:** The Angolan LNG facility is expected to restart in Q216 giving a significant boost to gas production, with total output expected to be 4.7bcm in 2016.*

Latest Updates

- We expect natural gas production to grow throughout our forecast period, however total output could be much higher if adequate export infrastructure were installed to monetise the gas that is flared and reinjected.
- The Angolan LNG project, which has been shut since April 2014, is expected to restart in Q216, helping production to recover significantly.
- Sonangol's recent large scale gas discoveries in the Kwanza Basin give long term upside risk to Angola's gas production.

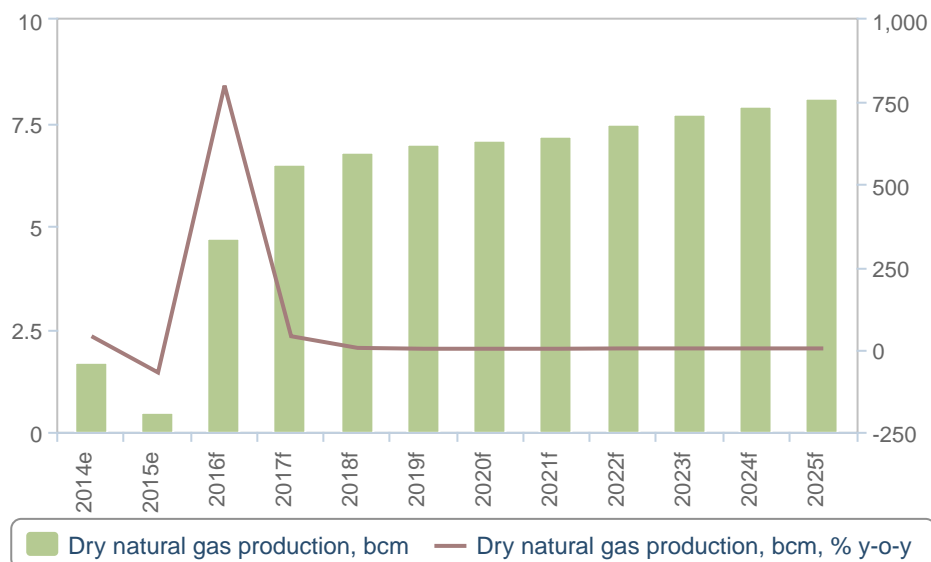
Structural Trends

The Angolan gas industry is still relatively immature, and for 2014 we estimated marketable gas production of 1.7bn cubic metres (bcm). Actual production will have been significantly higher, with the excess gas reinjected or flared.

Given the lack of an evolved domestic gas market, production growth is heavily tied to exports. In 2015, total output fell to 0.5bcm, due to the continued outage of the Angola LNG export facility. For 2016 we expect production to recover as the Angola LNG terminal restarts operations, forecasting output of 4.7bcm for the year.

Gas Production Forecast

(2014-2025)



e/f = BMI estimate/forecast. Source: EIA, BMI

The government plans to boost domestic gas production, with a focus on development of the country's non-associated gas resources. In November 2014 national oil company **Sonangol** and Italian major **Eni** agreed to a joint study of the non-associated gas potential of the offshore Lower Congo Basin. The companies will reportedly consider both domestic and international options for monetising the gas.

Exploration of the Lower Congo Basin could significantly increase the country's reserves base; the Lower Congo is an established hydrocarbons province and has yielded two non-associated gas discoveries in shallow waters in blocks 1 and 2. However, under current market conditions we question the commercial viability of both domestic and international gas monetisation options.

On the domestic side, increased use of gas-fired generation capacity could boost consumption in the power sector. Angola is heavily dependent on hydropower, which accounts for around 69% of the total, and alternative sources of supply will be needed to compensate for periods of low hydroelectric output. The development of new hydropower facilities is also significantly lagging behind electricity consumption growth, and thermal generators may be needed to bridge the gap between supply and demand.

However, under current market conditions, it is our view that liquid fuels and not gas will remain the dominant feedstock for Angola's thermal generation capacity. The lack of gas pipeline infrastructure is a key factor, and the distance between the bulk of gas output in the north and the key demand centres in the south would significantly raise development costs.

The Angolan utilities, EDF and EDEL, are also under severe financial strain. Theft of power and the widespread non-payment of bills is one issue; another is the low electricity tariffs squeezing profit margins. Given their financial positions, these companies could struggle to fund the required midstream gas infrastructure. Liquid fuels in Angola are also heavily subsidised and there is little commercial impetus to switch feeds.

In the industrial sector, a range of projects has been proposed, including urea, methanol and gas-to-liquids (GTL) facilities. However, these projects are typically highly capital intensive and in Angola would be heavily export driven. Export markets for urea and methanol are highly competitive and given the lack of gas infrastructure and the greenfield nature of the developments in Angola, we question their economic feasibility. GTL technology is both expensive and complex, and output may become less price-competitive in increasingly saturated global products markets and within a lower oil price environment.

With limited options for monetisation domestically, non-associated gas development could be anchored to a second-train expansion of Angola LNG. However, long project lead times would not see a second train brought online before the 2020s. At this point, Angola LNG would face heavy competition for market share from a number of major export facilities coming online in Australia and the US. The project has no long-term sales agreements and we believe it would struggle to lock-in sufficient sales to support the proposed expansion.

The fiscal and regulatory environment remains broadly unsupportive of gas production in Angola. Under Article 29 in the country's model production sharing agreement, Sonangol has the exclusive right to appraise, develop and produce all non-associated gas discoveries. International companies may be asked to partner Sonangol, but the nature of this involvement and the extent of potential financial returns remain unclear.

There are also restrictions on foreign marketing activities. This, alongside the poor domestic gas pricing dynamics, will also serve to deter non-associated gas development. Production will remain heavily export-driven throughout our 10-year forecast period, rising in line with the growth in output at Angola LNG.

Table: Gas Production (Angola 2014-2019)

	2014	2015e	2016f	2017f	2018f	2019f
Dry natural gas production, bcm	1.7	0.5	4.7	6.5	6.8	7.0
Dry natural gas production, bcm, % y-o-y	40.0	-70.0	800.0	40.0	4.6	2.0
Dry natural gas production, % of domestic consumption	209.7	99.9	856.0	856.0	635.0	616.8

e/f = BMI estimate/forecast. Source: EIA, BMI

Table: Gas Production (Angola 2020-2025)

	2020f	2021f	2022f	2023f	2024f	2025f
Dry natural gas production, bcm	7.1	7.2	7.5	7.7	7.9	8.1
Dry natural gas production, bcm, % y-o-y	2.0	2.0	3.0	3.0	3.0	3.0
Dry natural gas production, % of domestic consumption	588.0	560.5	534.6	500.6	468.7	438.9

f = BMI forecast. Source: EIA, BMI

Refining

BMI View: *We have revised Angola's refined fuels forecast downwards due to a lack of progress on the Lobito refinery. We now forecast Angola to remain a net importer of refined fuels across our 10-year forecast period.*

Latest Updates

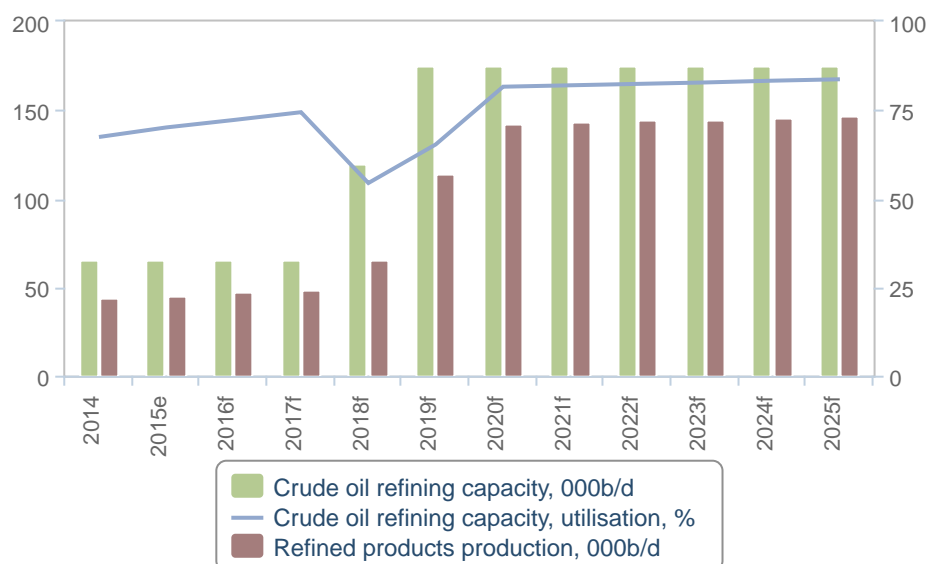
- We have removed the planned 200,000 barrel per day (b/d) Lobito refinery from our forecast due to the lack of progress on construction plans and the fragile state of Sonangol, the state petroleum company.

Structural Trends

Angola has one operational refinery at Luanda, with nameplate capacity of 65,000b/d. Capacity is set to increase significantly from 2018, due to the start of construction on the 110,000b/d Soyo refinery in the northern province of Zaire. We forecast that by 2019 Angola's nameplate capacity will be brought up to 175,000 b/d.

Refining Capacity Forecast

(2014-2025)



e/f = BMI estimate/forecast. Source: EIA, BMI

Table: Refining Capacity and Refined Products Production (Angola 2014-2019)

	2014	2015e	2016f	2017f	2018f	2019f
Crude oil refining capacity, 000b/d	65.0	65.0	65.0	65.0	120.0	175.0
Crude oil refining capacity, % y-o-y	0.0	0.0	0.0	0.0	84.6	45.8
Crude oil refining capacity, utilisation, %	67.4	70.1	72.2	74.4	54.4	65.3
Refined products production, 000b/d	43.8	45.6	47.0	48.4	65.3	114.3
Refined products production, % y-o-y	1.9	4.0	3.0	3.0	35.0	75.0
Refined products production & ethanol, 000b/d	43.8	45.6	47.0	48.4	65.3	114.3
Refined products production & ethanol, % y-o-y	1.9	4.0	3.0	3.0	35.0	75.0

e/f = BMI estimate/forecast. Source: JODI, EIA, BMI

Table: Refining Capacity and Refined Products Production (Angola 2020-2025)

	2020f	2021f	2022f	2023f	2024f	2025f
Crude oil refining capacity, 000b/d	175.0	175.0	175.0	175.0	175.0	175.0
Crude oil refining capacity, % y-o-y	0.0	0.0	0.0	0.0	0.0	0.0
Crude oil refining capacity, utilisation, %	81.6	82.0	82.4	82.8	83.3	83.7
Refined products production, 000b/d	142.8	143.5	144.3	145.0	145.7	146.4
Refined products production, % y-o-y	25.0	0.5	0.5	0.5	0.5	0.5
Refined products production & ethanol, 000b/d	142.8	143.5	144.3	145.0	145.7	146.4
Refined products production & ethanol, % y-o-y	25.0	0.5	0.5	0.5	0.5	0.5

f = BMI forecast. Source: JODI, EIA, BMI

Gas Consumption

BMI View: *We have revised up our Angola gas consumption forecast due to the expected start-up of the Soyo power plant in mid-2017. New developments in the Angolan power sector pose additional upside risk to our forecast.*

Latest Updates

- Our Power team expects the Soyo combined-cycle power plant to be operational by mid-2017. The capacity of the plant will be 750 megawatts and we expect it to demand around 0.43bn cubic metres (bcm) of gas per year. While this is comparatively negligible, it will help to nearly double Angolan gas consumption. We have therefore revised up our forecasts for Angola's gas consumption, now projecting volumes to reach 0.54bcm in 2016, 0.76bcm in 2017 and 1.07bcm in 2018.

Structural Trends

We forecast relatively robust growth in Angolan gas consumption, averaging 14.3% a year across the next 10 years. However, this is largely a result of low base effects, and consumption will remain comparatively limited.

Power Sector Provides Significant Upside

Our Power team expects the Soyo combined-cycle power plant to be operational by mid-2017. The capacity of the plant will be 750 megawatts and we expect it to demand around 0.43bn cubic metres (bcm) of gas per year. While this is comparatively negligible, it will help to nearly double Angolan gas consumption. We have therefore revised up our forecasts for Angola's gas consumption, now projecting volumes to reach 0.54bcm in 2016, 0.76bcm in 2017 and 1.07bcm in 2018.

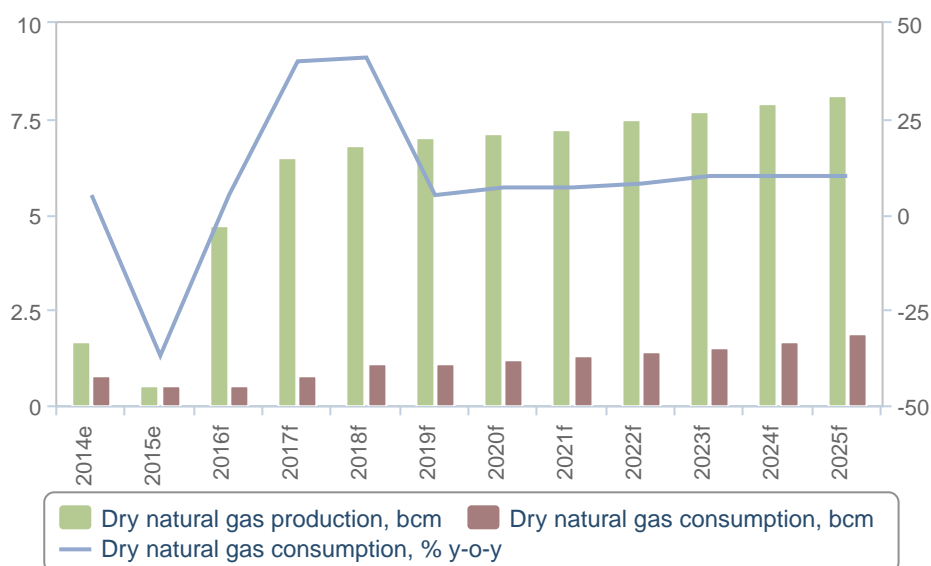
The Angolan government is installing high voltage power lines for the distribution of electricity from the Soyo power plant, which will serve the provinces of Zaire and Luanda. The high voltage substation at Nzeto, due to distribute power to Luanda, Cuimba and locally, will reportedly be completed in mid-2016. We have previously highlighted that Angola's power sector holds significant upside on the gas consumption side (see 'Gas Production To Remain Heavily Export-Led', October 23 2015). Consumption, however, has been restrained by a number of factors including:

- Lack of gas pipeline infrastructure
- Distance between gas production in the north and core consumption areas further south
- Severe financial strain on the Angolan utility companies due to theft of power, non-payment of bills and low electricity tariffs
- Subsidised liquid fuels providing little commercial incentive to switch feeds

Nevertheless, the government plans to expand the role of gas in domestic power generation and there have been proposals to build gas-fired plants near to gas production sites. These plans, though, have seen little progress.

Gas Production and Consumption Forecast

(2014-2025)



e/f = BMI estimate/forecast. Source: EIA, BMI

There is also limited demand from the industrial sector. A number of projects have been proposed, including methanol and urea plants and gas-to-liquids (GTL) facilities, but we see neither the market conditions nor the pricing dynamics as supportive of these projects. As such, we forecast domestic consumption to remain limited throughout our forecast period.

Table: Gas Consumption (Angola 2014-2019)

	2014	2015e	2016f	2017f	2018f	2019f
Dry natural gas consumption, bcm	0.8	0.5	0.5	0.8	1.1	1.1
Dry natural gas consumption, % y-o-y	5.0	-37.0	5.0	40.0	41.0	5.0

e/f = BMI estimate/forecast. Source: EIA, BMI

Table: Gas Consumption (Angola 2020-2025)

	2020f	2021f	2022f	2023f	2024f	2025f
Dry natural gas consumption, bcm	1.2	1.3	1.4	1.5	1.7	1.9
Dry natural gas consumption, % y-o-y	7.0	7.0	8.0	10.0	10.0	10.0

f = BMI forecast. Source: EIA, BMI

Trade - Oil

BMI View: Angolan crudes will benefit from strong Chinese demand ensuring Angolan crudes clear smoothly. After taking the Lobito refinery out of our forecast, Angola will be unable to make the transition from net fuel importer to exporter in the next 10 years.

Latest Updates

- We have revised Angola's refined fuels forecast downwards due to a lack of progress on the Lobito refinery. We now forecast Angola to remain a net importer of refined fuels across our 10-year forecast period.
- Angolan crudes have not had any loading problems this year as strong demand from China in particular helping to smoothly clear cargos.

Structural Trends

Crude Oil Trade Forecasts

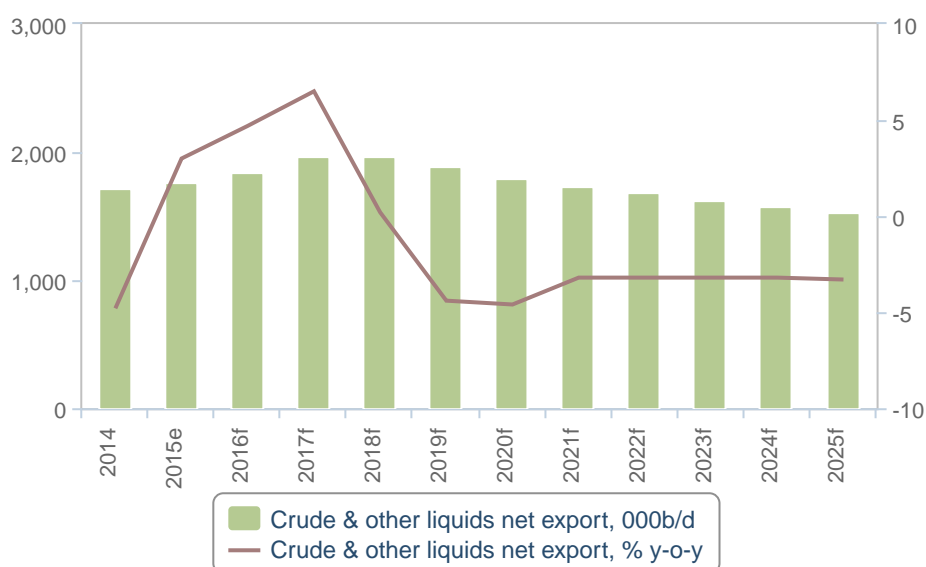
West African crudes are struggling to find markets as demand growth in key European and Asian refining centres remains weaker than anticipated, amid a sharp rise in global supply. Angola has been significantly less affected than Nigeria, due to the higher proportion of medium, sour grades in its overall production. Demand for medium, sour crudes has remained more robust than the demand for light, sweet grades.

However, the country has been forced to offer higher discounts, in increasingly competitive export markets.

Over the past five years, Angola has lost substantial market share in North America, as the rapid rise in US shale production displaced the need for lighter crude imports. From an average of 450,000 barrels per day (b/d) in 2010, US imports of Angolan crude declined to an average 125,000b/d in 2014. Angola has been forced to diversify its exports, with a heavier reliance on Asian consumers.

Crude Oil Net Exports Forecast

(2014-2025)



e/f = BMI estimate/forecast. Source: EIA, BMI

However, we are increasingly bearish on Asian demand for light crudes. Two key factors are driving this view.

- Asian refinery crude slates. Although we forecast robust growth in Asian refining capacity, many of the new refineries are designed to process heavier crudes than many of the Angolan blends.
- Asian domestic oil production. Several countries, particularly in South East Asia, produce substantial volumes of oil. We expect them to favour domestically produced crude as the cheaper feedstock alternative, particularly in light of rising freight costs.

In Asia the problem of weak demand has been exacerbated by competition from other producers, also crowded out of US markets. Algeria is a key competitor for Asian buyers, and along with Angola and Nigeria has created a glut in the supply of light and medium-light crudes in Asian markets. Libya produces similar grade crude, but has around 1.4mn b/d capacity offline due to ongoing instability. Exporters could see Asian markets tighten when Libyan production is brought back online. Another source of competition is the Middle East, which is increasingly re-orienting its exports towards Asia.

West African producers have also lost ground in Western Europe, in the face of slowing downstream demand. Refining margins have been shrinking and European refiners have substantially cut their crude runs as a result. We see little room for recovery in the region's refining sector, and forecast Western European net oil imports to fall from an estimated 6.2mn b/d in 2014, to around 5.9mn b/d by 2024.

Although we forecast Angola to increase its export volumes over the longer term, market share will be gained at the expense of price. Latest trading data from the February 2015 loading schedules puts differentials for several Angolan crudes, including Cabinda, at the lowest levels since 2009. We expect continued weakness in differentials over the coming years, in context of tepid demand growth and comfortable global supply.

Table: Crude Oil Net Exports (Angola 2014-2020)

	2014	2015e	2016f	2017f	2018f	2019f	2020f
Crude & other liquids net export, 000b/d	1,713.2	1,764.1	1,847.8	1,967.2	1,971.4	1,885.5	1,798.0
Crude & other liquids net export, % y-o-y	-4.8	3.0	4.7	6.5	0.2	-4.4	-4.6
Crude & other liquids net export, USDbn	60.2	32.1	25.0	35.9	42.5	42.7	44.6

e/f = BMI estimate/forecast. Source: EIA, BMI

Table: Crude Oil Net Exports (Angola 2020-2025)

	2020f	2021f	2022f	2023f	2024f	2025f
Crude & other liquids net export, 000b/d	1,798.0	1,740.1	1,684.0	1,629.6	1,576.8	1,525.6
Crude & other liquids net export, % y-o-y	-4.6	-3.2	-3.2	-3.2	-3.2	-3.3
Crude & other liquids net export, USDbn	44.6	42.6	42.4	42.2	41.4	40.1

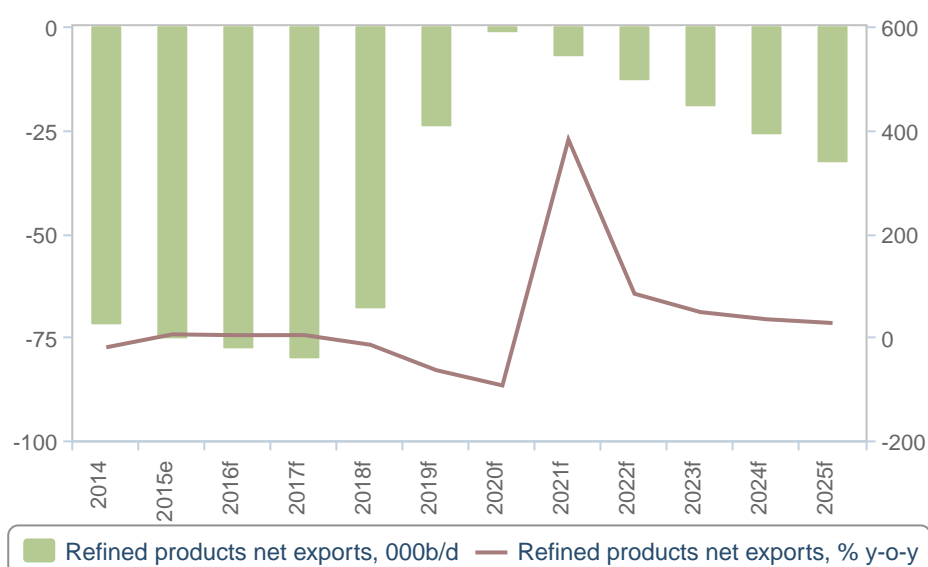
f = BMI forecast. Source: EIA, BMI

Fuels Trade Forecasts

The removal of the Lobito refinery from our forecast has resulted in Angola remaining a net importer of refined fuels for the decade. Angola has a rapidly growing refined fuels demand with consumption averaging 4.0% over the next 10 years driven by robust construction sector growth and rises in disposable household income. Therefore, despite the Soyo refinery helping to ease imports needs from 80,000 b/d in 2018 to less than 2,000 b/d in 2020, strong domestic consumption will result in imports rising post-2020 and by 2025 we expect Angola's refined fuels imports to stand at 33,000b/d.

Refined Products Net Exports Forecast

(2014-2025)



ef = BMI estimate/forecast. Source: EIA, BMI

Angola's main trade partners for refined products are South Korea and the US, both in terms of exports and imports. However, with major planned expansion of global refining capacity, international products markets look set to become increasingly saturated. Angola will have to compete to increase its share in key exports markets in Asia and the Americas.

While Angolan refiners benefit from access to lower-cost domestic feedstock, they lack many of the structural advantages enjoyed by the refining juggernauts of Asia and the Middle East, including large

economies of scale and proximity to the main Asian demand centres. West African countries typically boast strong consumption growth profiles (albeit from a comparatively low base), but are deficit in domestic refining capacity.

Table: Refined Fuels Net Exports (Angola 2014-2019)

	2014	2015e	2016f	2017f	2018f	2019f
Refined products net exports, 000b/d	-71.8	-75.3	-77.7	-80.3	-68.1	-24.2
Refined products net exports, % y-o-y	-20.2	4.8	3.2	3.4	-15.3	-64.4
Refined products net exports, USDbn	-2.9	-1.8	-1.5	-1.8	-1.7	-0.7

e/f = BMI estimate/forecast. Source: EIA, BMI

Table: Refined Fuels Net Exports (Angola 2020-2025)

	2020f	2021f	2022f	2023f	2024f	2025f
Refined products net exports, 000b/d	-1.5	-7.2	-13.1	-19.4	-26.0	-33.0
Refined products net exports, % y-o-y	-93.8	381.0	83.3	47.8	34.0	26.7
Refined products net exports, USDbn	-0.2	-0.3	-0.5	-0.7	-0.8	-1.0

f = BMI forecast. Source: BMI, EIA

Trade - Gas (Pipeline And LNG)

***BMI View:** The Angola LNG export terminal has started re-commissioning, with exports expected in Q216; weakness in the global LNG market will see the facility remain underutilised throughout our forecast period.*

Latest Updates

- **Chevron** has announced that the Angolan LNG export project has started re-commissioning.
- Exports will begin to recover from 2016, with ALNG on track for a return to output at the beginning of the second quarter.
- Angola LNG (ALNG) and EDF Trading have announced that they have entered into a flexible sales arrangement, for the delivery of liquefied natural gas (LNG) cargoes on an ex-ship basis (DES).

Structural Trends

Angola LNG, a joint venture (JV) between the country's major producers, including **Sonangol**, **Chevron**, **BP**, **Eni** and **Total**, came online in June 2013. The facility has one liquefaction train with annual capacity of 5.2mn tonnes, or 7.1bn cubic metres (bcm), processing gas from blocks 0, 1, 2, 14, 15, 17 and 18.

The companies had targeted peak production by the end of 2013, but a number of technical issues, including gas leaks and delays tying in Chevron's blocks 0 and 14 slowed the initial ramp-up. Total exports for 2013 stood at 0.45bcm, according to the International Group of Liquefied Natural Gas Importers (GIIGNL).

In 2014 exports were higher, around 0.90bcm according to our calculations. However, a major rupture on a flare line forced the plant to close in April and repairs will see the restart of production delayed until 2016. The plant reportedly demands major reconstruction to fix fundamental design flaws and replace corroded equipment. Estimates put the total cost of the project at USD12bn after repairs, up from USD4bn initially.

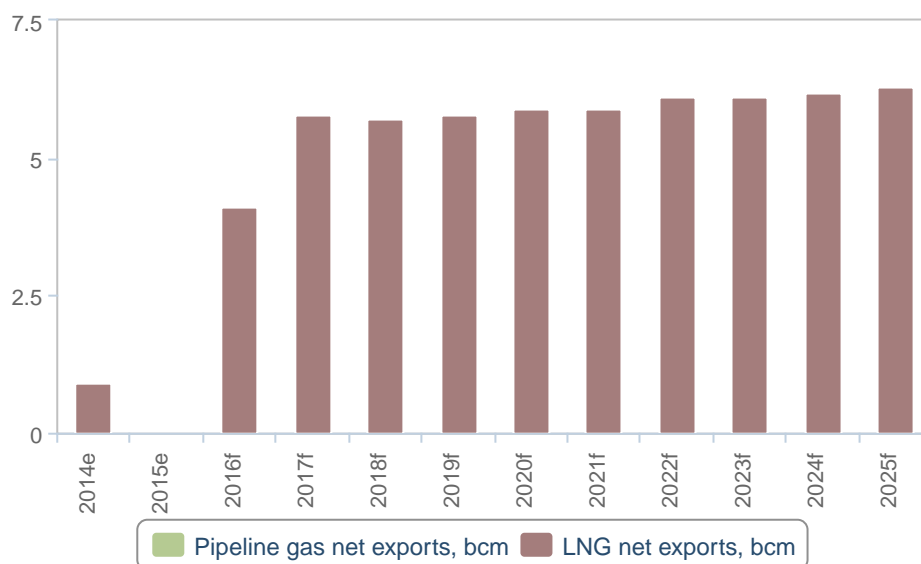
EDF Trading Deal

Angola LNG (ALNG) and **EDF Trading** have announced that they have entered into a flexible sales arrangement, for the delivery of liquefied natural gas (LNG) cargoes on an ex-ship basis (DES). The sales arrangement covers the delivery of multiple cargoes from 2016 through to 2018. ALNG is operated by **Chevron**, which holds a 36.4% stake, and is in a joint venture with **Sonangol** (22.8%), **BP** (13.6%), **Eni** (13.6%) and **Total**(13.6%).

ALNG's recommissioning process began in January and we expect exports to begin in Q216. After first opening in the summer of 2013, ALNG was forced to close in April 2014 after technical issues halted operations. The closure severely hit domestic gas production, as it was the only available export route, while domestic consumption remained too low to soak up any additional production. With the terminal offline for all of 2015, Angola's production stood at a paltry 0.5 billion cubic metres (bcm).The restarting of the terminal will give Angola's gas production a significant boost. In 2016 we forecast production to be 4.7bcm, rising to 7.1bcm in 2020.

Gas Net Exports Forecast

(2014-2025)



e/f = BMI estimate/forecast. Source: EIA, BMI

The additional cost of repairs will put a strain on the project's overall profitability. It may also create challenges for the facility to find sufficient offtake for its gas. Angola LNG has no long-term sales contracts, selling all of its gas via spot or short-term contracts. The US had been its initial target market but the advent of shale gas production has seen the demand for LNG imports fall flat. The Angolan oil minister for petroleum, José Maria Botelho de Vasconcelos, has indicated that the bulk of output will now be directed to Asia and Europe. Given the weakness of European demand growth, Angola LNG may struggle to gain a significant foothold in the region. Asia and Latin America may offer deeper and more lucrative markets for spot trading.

However, we forecast a marked loosening in the global LNG market in the coming years. A wave of liquefaction capacity is slated to come online in 2015-2017, boosting supply, while demand growth in the core Asian markets, which accounts for around 75% of global consumption, has begun to slow. A sharp fall in global oil prices, to which the bulk of LNG contracts are indexed, will help make LNG imports more competitive. But the impact of lower prices on demand will be limited by a host of other factors in the Asia region, including continued energy efficiency gains, the return of nuclear power generation in Japan and an increase in gas pipeline imports into China.

Strong growth in supply and weakening growth in consumption will strain the industry more generally, but we see Angola LNG as particularly vulnerable to these trends. With the slowdown in global consumption growth, the call on spot purchases will be significantly lower. As such, we see it remaining underused throughout our 10-year forecast period.

Table: Gas Net Exports (Angola 2014-2019)

	2014	2015e	2016f	2017f	2018f	2019f
Dry natural gas net exports, bcm	0.9	0.0	4.1	5.8	5.7	5.8
Dry natural gas net exports, % y-o-y	101.1	-100.1	-572,395.0	40.0	-0.2	1.4
Dry natural gas net exports, USDbn	0.4	0.0	0.8	1.4	1.7	1.8
Pipeline gas net exports, bcm	0.0	0.0	0.0	0.0	0.0	0.0
Pipeline gas net exports, % y-o-y			-100.0			
Pipeline gas net exports, % of total	0.0	100.0	0.0	0.0	0.0	0.0
LNG net exports, bcm	0.9	0.0	4.1	5.8	5.7	5.8
LNG net exports, % y-o-y	101.1	-100.0		40.0	-0.2	1.4
LNG net exports, % of total gas exports	100.0	0.0	100.0	100.0	100.0	100.0

e/f = BMI estimate/forecast. Source: EIA, BMI

Table: Gas Net Exports (Angola 2020-2025)

	2020f	2021f	2022f	2023f	2024f	2025f
Dry natural gas net exports, bcm	5.9	5.9	6.1	6.1	6.2	6.3
Dry natural gas net exports, % y-o-y	1.0	1.0	1.9	1.4	1.3	1.1
Dry natural gas net exports, USDbn	2.0	2.0	2.1	2.2	2.2	2.3
Pipeline gas net exports, bcm	0.0	0.0	0.0	0.0	0.0	0.0
Pipeline gas net exports, % of total	0.0	0.0	0.0	0.0	0.0	0.0
LNG net exports, bcm	5.9	5.9	6.1	6.1	6.2	6.3
LNG net exports, % y-o-y	1.0	1.0	1.9	1.4	1.3	1.1
LNG net exports, % of total gas exports	100.0	100.0	100.0	100.0	100.0	100.0

f = BMI forecast. Source: EIA, BMI

Industry Risk Reward Index

Africa - Oil & Gas Risk/Reward Index

BMI View: Africa continues to underperform is below-ground potential, with a large reserves base and substantial underexplored acreage offset by continued headwinds above ground. Low oil prices, a weak security environment and unfavourable fiscal and regulatory frameworks have undercut both output and investment across a number of key markets. The African downstream sector is the worst performing globally, despite significant forecast capacity growth. The low complexity of the region's refineries, chronic underinvestment and recurrent feedstock issues will all continue to weigh on the index.

The main themes emerging from BMI's Africa Oil & Gas Risk/Reward Index (RRIs) are:

- Africa continues to underperform in the global upstream index this quarter, as a chronically weak risk profile undercuts strong prospective rewards.
- Africa has been among those regions most exposed to the collapse in global oil prices and consequent pullback in company spending. This has put downside pressure on the RRI, as project delays and cancellations undercut longer-term production growth.
- The worst performers in our Upstream Index are countries such as Sudan and Chad, which combine weak prospects for production with highly unattractive conditions above ground.
- Mozambique remains the outperformer, following wide-ranging reforms to the country's fiscal and licensing regime and with a strong prospective projects pipeline.
- Africa's downstream sector remains challenging as stringent government regulations, segmented markets and poor intra-regional connectivity continue to deter investment.

Table: BMI Africa Oil & Gas Risk/Reward Index

	Upstream R/R Ratings	Downstream R/R Ratings	Oil & Gas R/R Ratings	Rank
South Africa	50.9	51.6	51.2	1
Congo (Brazzaville)	55.9	41.8	48.8	2
Nigeria	56.9	38.0	47.4	3
Egypt	49.2	45.4	47.3	4
Libya	61.4	33.2	47.3	5
Ghana	53.2	38.6	45.9	5
Mozambique	63.5	28.1	45.8	7
Algeria	52.1	37.0	44.6	8
Cameroon	53.0	33.1	43.1	9
Angola	55.8	30.1	43.0	10

BMI Africa Oil & Gas Risk/Reward Index - Continued

	Upstream R/R Ratings	Downstream R/R Ratings	Oil & Gas R/R Ratings	Rank
Gabon	42.9	40.2	41.5	11
Tunisia	45.6	32.7	39.2	12
Tanzania	42.2	29.1	35.6	13
Equatorial Guinea	43.7	25.9	34.8	14
South Sudan	37.4	32.2	34.8	15
Sudan	30.8	37.6	34.2	16
Chad	33.8	27.6	30.7	17
Uganda	24.5	28.0	26.2	18
Average	47.4	35.0	41.2	-

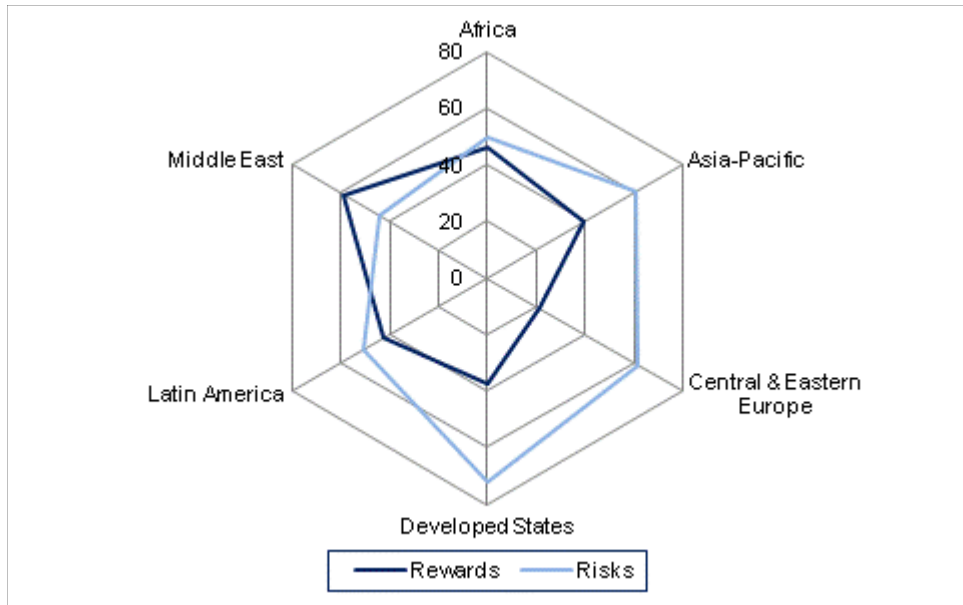
Note: Scores out of 100. Source: BMI

Despite its substantial resource base, Africa has increasingly underperformed in the regional Upstream RRI. Political instability and an unsettled regulatory outlook in a number of countries have weakened the region's risk indices and - excluding the Middle East - Africa has the worst risk profile of any region globally.

Large reserves and a strong growth outlook are buoying Africa's reward indices, although persistent supply outages have put downward pressure on the region's Industry Rewards score. As the impacts of aggressive clawbacks in companies' exploration and production capex feed through to lower investments in African exploration and development, the Index may face increased pressure in the coming quarters.

Weak Showing Masks Significant Potential

Regional Upstream Risk/Reward Indices

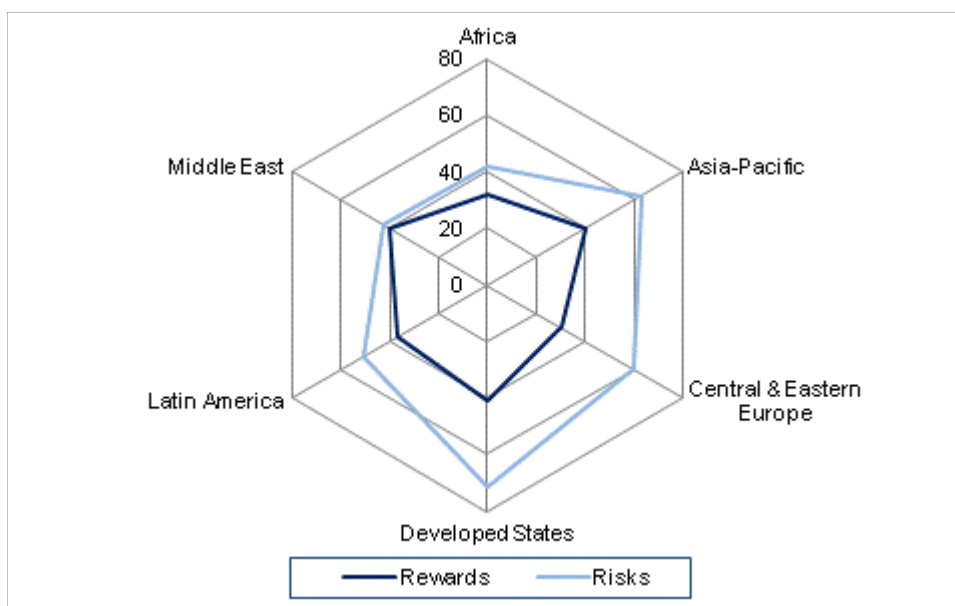


Note: Scores out of 100. Source: BMI

Africa's Downstream RRI scores remain critically low, underperforming every other region in the index. A low level of physical infrastructure, lack of reliable crude feeds and continued use of fuel subsidies present key risks to the sector, overshadowing the rewards of a growing population and a strong rise in fuels consumption.

Downstream Blues Remain

Regional Downstream Risk/Reward Indices



Note: Scores out of 100. Source: BMI

Above-Ground Risks Dulling Below-Ground Potential

Table: BMI Africa Upstream Risk/Reward Index

	Upstream Industry Rewards	Upstream Country Rewards	Upstream Rewards	Upstream Industry Risks	Upstream Country Risks	Upstream Risks	Upstream R/R Ratings	Rank
Mozambique	62.5	90.0	69.4	55.0	39.9	49.7	63.5	1
Libya	76.3	80.0	77.2	25.0	23.8	24.6	61.4	2
Nigeria	58.8	65.0	60.3	55.0	37.5	48.9	56.9	3
Congo (Brazzaville)	48.8	75.0	55.3	70.0	33.3	57.1	55.9	4
Angola	52.5	75.0	58.1	65.0	23.6	50.5	55.8	5
Ghana	43.8	45.0	44.1	80.0	63.9	74.4	53.2	6
Cameroon	51.3	40.0	48.4	80.0	33.5	63.7	53.0	7
Algeria	45.0	74.5	52.4	60.0	35.7	51.5	52.1	8
South Africa	28.8	87.5	43.4	72.5	60.1	68.2	50.9	9
Egypt	33.8	85.0	46.6	62.5	42.4	55.5	49.2	10

BMI Africa Upstream Risk/Reward Index - Continued

	Upstream Industry Rewards	Upstream Country Rewards	Upstream Rewards	Upstream Industry Risks	Upstream Country Risks	Upstream Risks	Upstream R/R Ratings	Rank
Tunisia	33.8	78.5	44.9	50.0	41.7	47.1	45.6	11
Equatorial Guinea	27.5	75.0	39.4	75.0	14.7	53.9	43.7	12
Gabon	32.5	77.5	43.8	40.0	42.8	41.0	42.9	13
Tanzania	25.0	87.5	40.6	45.0	47.4	45.8	42.2	14
South Sudan	31.3	50.0	35.9	52.5	18.8	40.7	37.4	15
Chad	20.0	63.8	30.9	55.0	13.9	40.6	33.8	16
Sudan	18.8	50.0	26.6	52.5	19.2	40.8	30.8	17
Uganda	5.0	55.0	17.5	40.0	42.6	40.9	24.5	18
<i>Average</i>	<i>38.6</i>	<i>69.7</i>	<i>46.4</i>	<i>57.5</i>	<i>35.2</i>	<i>49.7</i>	<i>47.4</i>	<i>-</i>

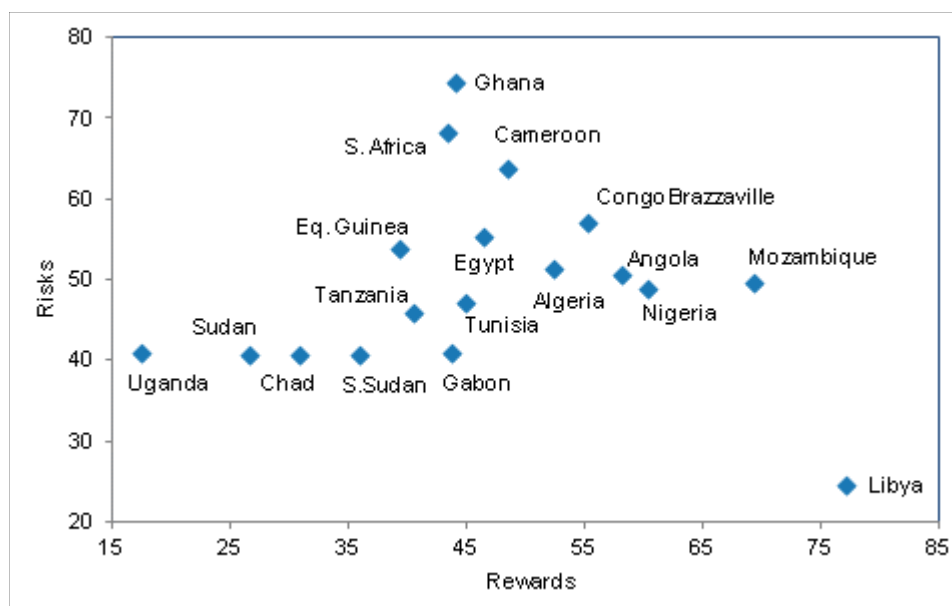
Note: Scores out of 100. Source: BMI

Oil & gas production in Africa is dominated by six countries, which together accounted for more than 80% of oil production in 2015: Algeria, Angola, Egypt, Libya, Nigeria and South Sudan. Given the size of their reserves bases and the volume of their output, these countries heavily underperform as a group. However, individual performances have increasingly diverged in recent quarters.

- In both **Libya** and **South Sudan**, output remains highly uncertain. A poor security environment and deep political fragmentation point to a high probability of future production outages. However, the prospects for a negotiated settlement in Libya have improved, strengthening the country's Upstream Rewards.
- In **Algeria**, a restrictive fiscal and regulatory regime and the high level of state participation continue to deter foreign investors. Falling investment in a lower price environment risks further downgrades to the country's rewards indices.
- In **Nigeria**, repeated attacks on infrastructure and widespread oil theft and a failure to pass the PIB have weakened the country's showing in the index. However, a progressive push under President Buhari and continued progress towards operational, fiscal and regulatory reforms offer large upside in the coming quarters.
- In **Egypt**, political uncertainty and falling investment in the wake of the Arab Spring materially damaged Egypt's risk/reward indices. However, the rapid return of investment in recent quarters has seen the country's upstream rewards scores begin to recover. The discovery at Zohr may help accelerate this trend.

Major Producers Underperforming

Africa Upstream RRIs



Note: Scores out of 100. Source: BMI

Among Africa's emergent producers, the rising scope for state intervention and mounting fiscal and regulatory uncertainties have heightened risks and undermined rewards in a number of countries.

- In **South Africa**, proposed amendments to the petroleum act triggered a downgrade of the country's Industry Risk score. The act allows for uncapped state participation in all new oil & gas ventures and has materially worsened licensing terms. Depressed activity in the upstream has also weighed heavily on the rewards index, driving South Africa further down the rankings.
- In **Uganda**, slow bureaucratic procedures, heavy state interference and weak institutional capacity have dragged on the country's rewards profile, as first production has been progressively delayed.
- In **Tanzania** and **Mozambique**, passage of key legislation has removed a layer of regulatory uncertainty. We note strong upside potential in the index, pending FID on LNG export projects.

Long-term production decline among smaller maturing producers - including **Cameroon**, **Equatorial Guinea** and **Gabon** - has seen them slip down the rankings. However, in a lower oil price environment as companies renew their focus on lower-cost, lower-risk projects, a number of the more established producers stand to gain. Countries such as **Congo-Brazzaville** and **Cameroon**, with substantial pre-existing

infrastructure and generally favourable above-ground conditions, have been resurgent in the Index in recent quarters, bolstered by improved reserves and production outlooks.

Those that perform worst in our Upstream Index are countries such as **Sudan** and **Chad**, which combine stagnant production and a falling reserves base with highly unfavourable conditions above ground. The weaknesses in these markets are largely structural and we see limited scope for near-term improvement.

Downstream Sector Holds Limited Opportunity

Table: BMI Africa Downstream Risk/Reward Index

	Down-stream Industry Rewards	Downstream Country Rewards	Down-stream Rewards	Downstream Industry Risks	Down-stream Country Risks	Down-stream Risks	Downstream R/R Ratings	Rank
South Africa	32.2	66.0	40.7	95.0	50.3	77.1	51.6	1
Egypt	44.4	52.0	46.3	40.0	47.8	43.1	45.4	2
Congo (Brazzaville)	32.2	46.0	35.7	65.0	42.8	56.1	41.8	3
Gabon	33.3	36.0	34.0	70.0	31.3	54.5	40.2	4
Ghana	35.6	30.0	34.2	50.0	47.2	48.9	38.6	5
Nigeria	38.9	48.0	41.2	20.0	46.7	30.7	38.0	5
Sudan	30.0	52.0	35.5	50.0	31.3	42.5	37.6	7
Algeria	37.8	37.8	37.8	25.0	50.4	35.2	37.0	7
Libya	37.8	31.8	36.3	20.0	35.0	26.0	33.2	9
Cameroon	30.0	30.0	30.0	45.0	33.3	40.3	33.1	9
Tunisia	28.9	24.0	27.7	45.0	44.0	44.6	32.7	11
South Sudan	24.4	38.0	27.8	50.0	31.1	42.4	32.2	12
Angola	33.3	36.0	34.0	15.0	30.4	21.1	30.1	13
Tanzania	22.2	36.0	25.7	30.0	47.8	37.1	29.1	14
Mozambique	23.3	14.0	21.0	50.0	36.8	44.7	28.1	15
Uganda	25.6	30.0	26.7	20.0	47.4	31.0	28.0	16
Chad	24.4	30.0	25.8	37.5	23.3	31.8	27.6	17
Equatorial Guinea	14.4	24.0	16.8	60.0	27.2	46.9	25.9	18
<i>Average</i>	<i>30.5</i>	<i>36.8</i>	<i>32.1</i>	<i>43.8</i>	<i>39.1</i>	<i>41.9</i>	<i>35.0</i>	<i>-</i>

Note: Higher score = lower risk, scores out of 100. Source: BMI

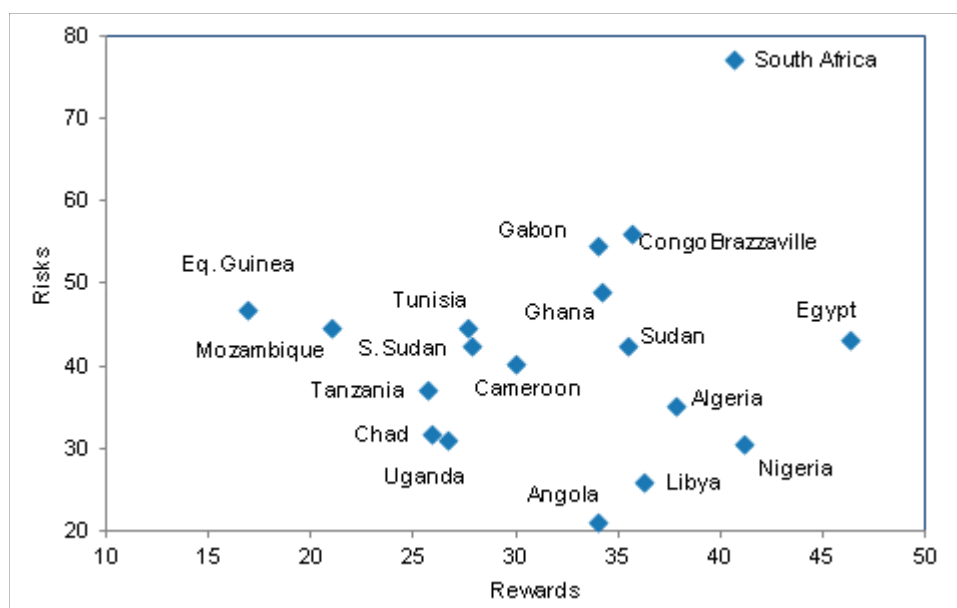
Africa on the whole performs poorly in our Downstream RRI. This is mainly due to the following factors:

- Small, segmented markets
- A lack of regional midstream infrastructure
- Fuel subsidies diminishing the potential returns on investment
- Unstable political environments

Together, these dynamics can render refinery projects - both greenfield and brownfield - uneconomic and uncertain. With the exception of South Africa, countries at the top of our table enjoy higher scores due to their large populations and implied growth potential, rather than the size of their downstream sectors.

High Risks And Low Rewards Undercutting Indices

Africa Downstream RRI



Note: Scores out of 100. Source: BMI

Angola has plans to construct two refineries at Soyo and Lobito, slated to come online in 2017-2018, while **Nigeria** has plans to construct a new 650,000b/d refinery, targeting output from 2018. Several other countries, such as **Algeria, Equatorial Guinea** and **Ghana**, have plans for major upgrade and expansion work. However, due to a range of factors, including financing issues, limited availability of domestic crude

feedstock and small local product markets, we do not see these projects progress. **Uganda** also scores significantly below the regional average. However, the planned refinery at Hoima should buoy the country's scores over the coming years.

Angola - Risk/Reward Index

***BMI View:** Angola has a relatively strong performance in the upstream, buoyed by a substantial reserves base and a strong production profile. However, the upstream score has been brought down slightly with the exit of Cobalt and a revision of the historical data. The downstream sector remains very weak and is looking more likely to stay this way during our forecast period.*

Upstream Index - Overview

A high level of proven reserves and sustained forecast production growth offer attractive below-ground rewards. The country also benefits from a stable fiscal and licensing regime and a highly diversified competitive landscape. However, the dominance of national oil company **Sonangol**, widespread corruption and a weak rule of law create a level of risk, and this weighs on Angola's overall performance in the rankings.

Downstream Index - Overview

Angola's refining capacity is limited, and it has a small domestic fuels market. Refining capacity expansion and continued consumption growth will offer upside risk to its rankings over the coming years, but a poor regulatory environment, high state ownership of assets and a weak privatisation trend will continue to act as major deterrents to foreign participation in the downstream segment, dragging on the country's overall score.

Market Overview

Angola Energy Market Overview

The Angolan oil & gas sector is overseen by the Angolan Ministry of Petroleum. The main functions of the ministry include granting licences for exploration and production, developing industry policy and guidelines and co-ordinating and regulating the activities of the sector. The main legislation relating to oil and gas is the Petroleum Activities Law (PAL), 2004.

The national oil company is **Sonangol**, formed in 1976 from the nationalisation of ANGOL. Sonangol is the sole concessionaire in Angola and fulfils all commercial functions for the government in the upstream, downstream and midstream sectors.

Fiscal Regime

Table: Angola MPSA Main Fiscal Terms

Corporate Income Tax	Royalties	Fees and Bonuses	Resource Tax	Export Duties	Import Duties	Other Key Fiscal Terms
Yes (Petroleum Income Tax), 50%	No	Surface rental fee (USD300/sq km); signature bonus and production bonus, both biddable.	No	No	Yes, at a rate of 2-50%, although goods imported solely for use in oil and gas operations may be exempted.	Cost recovery is set at 100%, from a biddable portion of production. Share of profit oil is also biddable, determined on a sliding scale of returns after tax.

Source: Ernst & Young

Licensing Regime

Table: Angola MPSA Main Contract Terms

Main Contract Type	Contract Duration	State Participation	Local Content Requirement	Domestic Supply Requirement	Stabilisation Clause	Other Key Licensing Terms
Production sharing agreement	Exploration and production periods are biddable, the exploration term can be extended once.	Yes, Sonangol holds a carried interest through exploration, development and production; interests vary significantly by contract.	Yes, preference must be given to local materials, equipment and services, where they are of equivalent quality and cost no more than 10% higher than import alternatives (including transport, insurance and customs costs)	Yes, companies may be required to supply a portion of their production (not exceeding 40% of the project's total output) to the domestic market; prices will be calculated on the basis of free-on-board prices obtained from arm's length sales to third parties.	Yes, where a change in law worsens the rights, benefits or obligations of a contractor, the terms of the PSA may be renegotiated to restore these rights.	Contractual disputes are to be settled by agreement, if an agreement cannot be reached the dispute is to be arbitrated in Angola, applying Angolan law. The PSA includes dispute mechanisms consistent with both the above and UNCITRAL rules.

Source: Freshfields Bruckhaus Deringer

Licensing Rounds

The PAL allows for both bid rounds and open tenders. However, typically the government will invite bids from a select number of companies. The most recent round was an onshore bidding round, completed in Q315. Sonangol has yet to announce the results.

Table: Angola 2015 Onshore Bid Round

Basin	Block
Lower Congo	CON1
Lower Congo	CON5
Lower Congo	CON6
Kwanza	KON3
Kwanza	KON5
Kwanza	KON7
Kwanza	KON8
Kwanza	KON9

Angola 2015 Onshore Bid Round - Continued

Basin	Block
Kwanza	KON17

Source: Sonangol

Oil And Gas Infrastructure

Angola has highly developed offshore production, storage and export infrastructure. Its onshore infrastructure is more limited and has a critical lack of gas infrastructure.

Oil Refineries

Table: Angola Oil Refineries

Location	Project Name	Capacity (b/d)	Status	Completion	Main Owner
Luanda	Luanda	65,000	Active	1955	Fina Petroleos de Angola (Operator) (100%)
Zaire	Soyo	110,000	Under construction	2017	Sonangol
Lobito	SonaRef	200,000	Under construction	2018	Sonangol
Ambriz	Prince of Kinkakala	400,000	Proposed	2020	Sonangol

Source: BMI Global Refineries Database

Oil Storage Facilities

With the majority of Angola's oil production lying offshore, this is where most of the country's storage and export capacity lies (*see Oil Trade Facilities, below*). Its onshore capacity is relatively restricted.

Table: Angola Onshore Oil Storage Facilities

	Location	Company	Type	Capacity (bbl)	Access
Crude	-	-	-	-	-
	Lobito	Sonangol	Port terminal	436,457	-
Refined Fuels	-	-	-	-	-
	Amboim	Sonangol	Port terminal	222,658	-

Angola Onshore Oil Storage Facilities - Continued

Location	Company	Type	Capacity (bbl)	Access
Luanda	Sonangol	Port terminal	220,115	-
Luanda	Sonangol	Port terminal	139,138	-
Malongo	Sonangol	Port terminal	35,218	-
Soyo	Sonangol	Port terminal	24,527	-

Source: Bloomberg

Oil Trade Facilities

Angola produces the bulk of its crude offshore, via floating production storage and offloading units (FPSOs). The majority of its exports are therefore loaded directly from the FPSOs, rather than from onshore export terminals. This is also where the majority of its storage capacity is held.

Table: Angola Oil Trade Facilities

Trading Operation	Facilities	Processing Capacity ('000 b/d)	Storage Capacity (mn bbl)	Companies	Status	Completion
Kizomba A	FPSO	250	2.2	Exxon Mobil (BP, Eni, Statoil)	Operational	2004
Kizomba B	FPSO	250	2.2	Exxon Mobil (BP, Eni, Statoil)	Operational	2004
Mondo	FPSO	100	2.1	Exxon Mobil (BP, Eni, Statoil)	Operational	2007
Saxi Batuque	FPSO	100	1.6	Exxon Mobil (BP, Eni, Statoil)	Operational	2008
Plutonio	FPSO	200	2.0	BP (Sonango, SSI, Statoil, Marathon)	Operational	2007
PSVM	FPSO	157	1.8	BP (Sonango, SSI, Statoil, Marathon)	Operational	2011
Dalia	FPSO	240	2.0	Total (Statoil, ExxonMobil, BP)	Operational	2006
Pazflor	FPSO	200	1.9	Total (Statoil, ExxonMobil, BP)	Operational	2011
Girassol	FPSO	200	2.0	Total (Statoil, ExxonMobil, BP)	Operational	2001
CLOV	FPSO	160	1.8	Total (Statoil, ExxonMobil, BP)	Operational	2014
N'Goma	FPSO	100	1.7	Eni (Sonangol, SSI, Falcon)	Operational	2014
Gimboa	FPSO	60	1.8	Sonangol (Statoil, Somoil, Angola Consulting Resources)	Operational	2008

Source: EIA, company data

LNG Terminals

Table: Angola LNG Terminals

Name	Location	Type	Capacity (bcm)	Company	Status	Completion
Angola LNG	Soyo	Export	7.1	Angola LNG (Chevron, Sonangol, BP, Eni, Total)	Suspended (for repair work, back online by Q216)	2013

Source: GIIGNL

Competitive Landscape

Angola's oil and gas sector is state-controlled. The main government vehicle is the wholly state-owned **Sociedade Nacional de Combustíveis de Angola** (Sonangol), which accounts for around 40% of the country's oil production and most of the country's gas supply, and owns shares in domestic refining and distribution businesses. International oil company involvement (IOC) is extensive, but in partnership with the state through production sharing contracts (PSCs). Major partners are US-based **Chevron** and **ExxonMobil**, the UK's **BP**, **Total** of France, Norway's **Statoil** and Italy's **Eni**.

Competitive Landscape Summary

- Sonangol accounts for around 40% of the country's oil production and most of the gas supply, and owns shares in domestic refining and distribution businesses. China will lend USD2bn to Sonangol to aid in the expansion of oil and gas projects. The financing agreement will last for 10 years. The first project that will benefit from the fund will be the 200,000 barrels per day (b/d) SonaRef oil refinery in Lobito.
- In September 2015 Sonangol and **Cobalt International** announced a Sale and Purchase Agreement for Sonangol to acquire all of Cobalt's 40% participating interest in Blocks 21/09 and 20/11 offshore Angola for USD1.75bn. The two parties expected a final investment decision for the Cameia development in Block 21/09 by year-end 2015 in order to deliver first oil from Cameia in 2018. Notwithstanding Cobalt's continuing as operator for an interim period, all costs will be borne by Sonangol.
- Chevron operates and holds a 39.2% interest in Block 0, a concession adjacent to the Cabinda coastline, and a 31% interest in a PSC for deepwater Block 14, located west of Block 0. The company also has a 16.3% non-operated working interest in the onshore Fina Sonangol Texaco (FST) concession area. In 2014 its Angola, operations had production of 114,000b/d of liquids and 0.81bn cubic metres (bcm) of gas. Downstream, Chevron has a 36.4% stake in the Angola LNG plant, from which exports began in June 2013, but have since been halted. The renovation of the facility is likely to add USD12bn to the project's cost.
- ExxonMobil has interests in four deep water blocks covering 2.7mn acres in Angola. ExxonMobil and its co-venturers have announced a total of 63 discoveries in Angola, with a recoverable resource potential of approximately 14bn barrels of oil equivalent (boe). Including production from the jointly operated Block 17, net production in Angola averaged 131,000b/d in 2014, with several new projects under construction or at the development planning stage.
- **Total**'s Angolan oil production in 2014 was an average 191,000b/d, plus 0.56bcm of gas. It is involved in the mature output of Block 0, although its key interest is the 40% equity share in (and operatorship of) deepwater Block 17. Total also has 30% and operatorship of ultra-deepwater Block 32 and a 20% stake in Block 14. It plans to invest USD16bn in the ultra deepwater Kaombo project, according to state-owned Sonangol, USD4bn less than initially planned. Total has sold a stake in the Eni Block 15/06 to Sonangol EP for USD750mn, so that it can focus on its main assets, according to Jacques Marraud des Grottes, senior vice-president for Total Africa.
- **BP** has shares in all three of Angola's principal deepwater blocks (15, 17 and 18) and is operator of the substantial Greater Plutonio complex of oil discoveries. It shares output from Total's Block 17 fields. In 2014 oil production net to BP was 181,000b/d. BP also holds a 13.6% stake in the Angola LNG project. BP is planning to invest USD15bn in exploration and development in Angola in the next 10 years, according to Marketing Director Amílcar da Costa.

- Eni's production should increase as volumes rise from ongoing development projects, with Eni targeting 150,000b/d of net output in the medium term, compared with 75,000b/d of oil production in 2014. Eni in January 2015 obtained a three-year extension to the exploration period for its Block 15/06. The three-year plan envisages the drilling of three wells and the acquisition of 3D seismic data over the block. The extension also includes an area adjacent to Block 15/06, which covers the Reco-Reco discovery that is estimated to hold around 100mn barrels of oil in place. So far Eni has drilled 23 exploration and appraisal wells and discovered more than 3bn bbl of oil in place on Block 15/06, which the company acquired in 2006.
- **Statoil** has divested a 10% interest in Blocks 38 and 39 in the Kwanza Basin to Colombian state-owned **Ecopetrol**. The divestment was completed via two separate transactions: the company purchased a 7.5% interest from Total under one agreement and subsequently divested the 10% stake in Block 39 through another, reducing its net equity by 2.5%. In May 2014 Statoil divested its 5% stake in block 15/06 to Sonangol for USD200mn.
- The Angolan government has revoked a **Petrobras** concession on block 6/06 in the Kwanza Basin, according to a government order. The order, signed by Oil Minister Botelho de Vasconcelos, states that Sonangol 'plans to retake this block' and therefore the concession on the block is now 'extinct' and the area concerned is once again part of the assets of that public company. Petrobras was the operator of the block with a 40% stake, under the production-sharing contract with the government (Macauhub).
- **Sinopec** of China has concluded a deal valued at USD1.52bn with **Marathon Oil** for the purchase of a 10% stake in an oil and gas field in Angola. Ownership of Marathon's stake has transferred to Sinopec's subsidiary **Sonangol Sinopec**. BP is the operator of Block 31 with a 26.67% stake. In early 2014 Marathon completed the sale of a stake in Block 32 to Sonangol.
- An Angolan-Chinese consortium will build a new oil refinery, known as Prince of Kinkakala, in the municipality of Ambriz, Bengo Province, Angola. The USD14bn plant will have a refining capacity of 400,000b/d. The consortium comprises Sonangol with a 40% stake, as well as **GPM International Global Services** and a group of unnamed Chinese firms, with the remaining 60% stake. The refinery is scheduled to be commissioned in 2020 and will reduce imports of major oil products including diesel and gasoline.

Table: Key Players In Angola's Oil & Gas Sector

Company	2012 sales, USDmn	% of total sales	No. of employees	Year est.	Ownership
Sonangol	na	100	5,500	1976	100% state
CABGOC	na	na	3,100	1963	100% Chevron
Total Angola	na	2.0e	na	1953	100% Total
Eni Angola	na	na	na	1980	100% Eni
Esso Angola	na	1.5e	na		100% ExxonMobil
BP Angola	na	1.0e	260	1974	100% BP
Sonangalp	na	na	na		51% Sonangol; 49% Petrogal
Statoil	na	1.5e	70	2007	100% Statoil

e = estimate; na = not available. Source: Company data, BMI

Table: Key Upstream Players

Company	Oil production, 2014, 000b/d	Market share, %	Gas production, 2011, bcm	Market share, %
Sonangol	808e	44.9	na	na
CABGOC (Chevron)	114	6.5	0.81	na
Total Angola	191	10.0	0.56	na
Eni Angola	75	4.3	0.40	na
Esso Angola	131	7.0	na	na
BP Angola	181	9.3	na	na
Statoil	180e	11.1	na	na
Petrobras	2	0.1	na	na

e = estimate; na = not available. Source: Company data, BMI

Table: Key Downstream Players

Company	Refining capacity, 000b/d	Market share, %	Retail outlets	Market share, %
Sonangol	65	100%	80 in 2008	na

na = not available/applicable. Source: 2011 Oil and Gas Journal Worldwide Refining Survey

Company Profile

Sonangol

Latest Updates

- Sonangol was supposed to award exploration rights to onshore concessions by December 2015; however, at time of writing, the results of the round are yet to be announced. The company will conclude analysis of the proposals and sign contracts to seven oil rights in the Kwanza River basin and three in the Congo River. Chevron, ENI, Glencore and GALP Energia are among the prequalified companies in line to operate the blocks.
- Sonangol has announced significant discoveries in the Kwanza basin adding up to 2.2bn barrels of oil equivalent, raising the countries oil reserves by 419mn barrels and gas reserves by 0.3tcf. The additional reserves were in the BP operated Block 24 and the Sonangol operated Block 20, highlighting the prospectivity of the region

Strengths

- Control of all key hydrocarbons interests.
- Unrivalled access to exploration acreage.
- Substantial production upside potential.
- International oil companies provide much project funding.

Weaknesses

- Limited financial or operational freedom.
- Cost and efficiency disadvantages.
- Lack of geographic diversification.

Opportunities

- Substantial output growth as a result of international firms' investment.
- Considerable untapped gas export potential.
- Large areas of unexplored territory.

Threats

- Delays to LNG exports; substantial additional costs.
- Local political unrest.
- Changes in national energy policy.

Company Overview Sociedade Nacional De Combustíveis De Angola (Sonangol)'s responsibilities include coordinating and controlling all petroleum activities in Angola, supplying petroleum products to the domestic market, marketing and export of petroleum and crude oil products. It operates an airline subsidiary that provides support to its petroleum operations, and participates in a series of joint ventures (JVs) with international contractors that provide related services to the oil and gas sector.

Table: Major Upstream Assets In Angola

Name	Field Type	Peak Production, boe
Cameia (Block 21)	Oil	Appraisal
Orca (Block 20)	Oil	Appraisal
Mafumeira Sul (Block 0)	Oil	110,000

Source: BMI Upstream Database

Financial Data EBITDA

- 2012: USD5.21bn
- 2011: USD5.96bn

Net Income

- 2012: USD1.24bn

Company Details

- Sonangol
- Rua 1° Congresso do MPLA 8-16
Luanda
- CP1316
- Angola
- Tel: +244 (2) 334 448
- www.sonangol.co.ao

BP Angola

- Strengths**
- Excellent deepwater drilling success rate.
 - Rapid output growth from new fields.
 - Extensive exploration portfolio.
 - Involvement in gas export infrastructure.
- Weaknesses**
- Ongoing high-level capital commitment.
- Opportunities**
- Substantial oil output growth potential.
 - Untapped gas export potential.
 - Large areas of unexplored territory.
- Threats**
- Extensive state involvement.
 - Local political unrest.
 - Changes in national energy policy.

Company Overview BP first established a presence in Angola in the 1970s. Initially small, BP Angola's share of the group's global presence was boosted in the 1980s and 1990s by the acquisition of substantial offshore interests and the merger with Amoco. The firm has a share in all three of Angola's deepwater blocks (15, 17 and 18) as well as a share in the ultra-deepwater Block 31. In 2014 oil production net to BP was 181,000 barrels per day (b/d). BP is planning to invest USD15bn in exploration and development in Angola in the next 10 years, according to marketing director Amílcar da Costa. Given the dramatic decline in oil prices, spending plans are now under review, along with those of most other operators.

Table: Major Upstream Assets In Angola

Field Name	Field Type	Production Peak, b/d
Block 20	Oil	Appraisal
Kizomba (Block 15)	Oil	250,000
Dalia	Oil	30,000

Source: BMI Upstream Database

Table: Key Financial Data (USDmn)

	2013	2014	2015
Revenue, Adj	379,136	353,568	222,894
EBITDA, Adj	43,549	26,617	23,273
Capital Expenditure	24,520	22,546	18,648

Source: Bloomberg

Chevron

Latest Updates

- Chevron has announced that recommissioning of the ALNG started in Q116 and that exports are expected to resume in Q216.

Strengths

- Established presence in mature assets.
- Substantial production upside potential.
- Numerous deepwater exploration prospects.
- Involvement in initial LNG export plans.

Weaknesses

- Possible overdependence on Angola for growth.
- Ongoing high-level capital commitment.

Opportunities

- Substantial national output growth potential.
- Considerable untapped gas export potential.
- Large areas of unexplored territory.

Threats

- Gas exports face stiff regional competition.
- Extensive state involvement.
- Technical issues slowing LNG build-up.
- Changes in national energy policy.

Company Overview Chevron operates and holds a 39.2% interest in Block 0, a concession adjacent to the Cabinda coastline, and a 31% interest in a production sharing contract (PSC) for deepwater Block 14, located west of Block 0. Chevron's interest in Block 2 expired in July 2014. The company has a 16.3% non-operated working interest in the onshore

Fina Sonangol Texaco (FST) concession area. In 2014 its Angola, operations had an average net daily production of 114,000 barrels of liquids. Gas production in 2014 was 0.81bcm. Downstream, Chevron has a 36.4% stake in the Angola LNG plant, from which exports began in June 2013, but have since been halted. The renovation of the facility is likely to add USD12bn to the project's cost.

Table: Major Projects In Angola

Name	Type	Peak Production, b/d
Lianzi	Oil	20,000
Mafumeira Sul	Oil	110,000
Lucapa	Oil	100,000

Source: BMI Upstream Database

Table: Key Financial Data (USDmn)

	2013	2014	2015
Revenue, Adj	211,664	192,308	122,289
EBITDA, Adj	41,476	36,519	19,799
Capital Expenditure	37,985	35,407	29,504

Source: Bloomberg

Eni Angola Production

Latest Updates

- The Mafumeria Sul project is expected to start up in H216 with peak production estimated at 110,000 b/d.
- The East Hub development project is forecast to come online in H217 which combined with the West Hub project will see production in Block 15/06 peak at 145,000 b/d.
- Africa remains the core focus for Eni whose project pipeline has 13 out of 15 projects based on the continent.

Strengths

- Established presence in mature assets.
- Substantial production upside potential.

Weaknesses

- Ongoing high-level capital commitment.

Opportunities

- Substantial national output growth potential.
- LNG export capability.
- Large areas of unexplored territory.
- Subsalt acreage.

Threats

- Extensive state involvement.
- LNG project reconstruction costs.
- Local political unrest.
- Changes in national energy policy.

Company Overview As one of Eni's most important overseas interests, Angola will continue to receive significant levels of investment. Eni's activities are concentrated in the conventional and deep offshore, over a developed and undeveloped acreage of 21,489sq km (4,443sq km net to Eni). In 2007 the company acquired a 13.6% stake in Angola LNG, which owns Angola's first liquefied natural gas (LNG) plant.

Table: Major Assets In Angola

Name	Type	Peak Production b/d
West Hub	Oil	100,000
East Hub	Oil	45,000
Mafumeira Sul	Oil	110,000

Source: BMI Upstream Database

Table: Key Financial Data (USDmn)

	2013	2014	2015
Revenue, Adj	114,697	93,187	67,740
EBITDA, Adj	21,355	18,916	12,647
Capital Expenditure	10,913	10,685	10,619

Source: Bloomberg

Esso Exploration Angola

Latest Updates

- Esso Angola has started oil production ahead of schedule at the Kizomba Satellites Phase 2 project offshore Angola. The second phase of the Kizomba project is a block 15 subsea infrastructure development of the Kakocha, Bavuca and Mondo South fields. Mondo South is the first field to commence production and the other two fields are projected to start up shortly. The Phase 2 project develops about 190mn barrels of oil, with an estimated peak production capacity of 70,000b/d of oil. The project is likely to increase the total production capacity of block 15 to 350,000b/d.

Strengths

- Excellent deepwater drilling success rate.
- Rapid output growth from new fields.
- Extensive exploration portfolio.

Weaknesses

- No exposure to gas export potential.
- Ongoing high-level capital commitment.

Opportunities

- Substantial national output growth potential.
- Large areas of unexplored territory.

Threats

- Extensive state involvement.
- Local political unrest.
- Changes in national energy policy.

Company Overview There is unlikely to be a shift in Exxon's strategic direction in Angola, with the deepwater portfolio still capable of delivering reserves and production growth. The group will use its existing production and transport infrastructure to develop satellite accumulations, improving unit profitability. Exxon has interests in four deep water blocks covering 2.7mn acres.

Table: Key Assets In Angola

Name	Type	Peak Production, b/d
Kizomba A	Oil	250,000
Kizomba B	Oil	250,000
Kizomba C	Oil	100,000

Source: BMI Upstream Database

Table: Key Financial Data (USDmn)

	2013	2014	2015
Revenue, Adj	390,247	364,763	236,810
EBITDA Adj	57,483	50,965	30,931
Capital Expenditure	33,952	32,952	26,490

Source: Bloomberg

Total Exploration Angola

Latest Updates

- Work is progressing on the 230,000b/d Kaombo ultra-deepwater project that is expected to come online in 2017. Two FPSO units will be used to utilise the 660mn barrel reserves that the discoveries are estimated to hold.

Strengths

- Established presence in mature assets.
- Strong relationship with state oil company.
- Substantial production upside potential.
- Numerous deepwater exploration prospects.
- Involvement in initial LNG export plans.

Weaknesses

- Possible overdependence on Angola for growth.
- Ongoing high-level capital commitment.

Opportunities

- Substantial output growth potential.
- Considerable untapped gas export potential.
- Large areas of unexplored territory.

Threats

- Gas exports face stiff regional competition.
- Extensive state involvement.
- Local political unrest.
- Changes in national energy policy.

Company Overview Total is looking to secure its leading position in the Angolan upstream segment and has been investing heavily in development to support robust output growth plans. The French company's Angolan oil production in 2014 was an average 191,000 barrels of oil

per day (b/d), plus 0.56bn cubic metres (bcm) of gas. It is involved in the mature output of Block 0, although its key interest is the 40% equity share in (and operatorship of) deepwater Block 17.

Table: Key Assets In Angola

Name	Type	Peak Production, b/d
CLOV (Block 17)	Oil	160,000
Pazflor (Block 17)	Oil	220,000
Kaombo	Oil	230,000

Source: BMI Upstream Database

Table: Key Financial Data (USDmn)

	2013	2014	2015
Revenue, Adj	228,086	211,987	143,421
EDITDA, Adj	37,586	29,556	22,256
Capital Expenditure	29,754	26,320	25,132

Source: Bloomberg

Regional Overview

Africa - Bullish Gas, Bearish Oil

***BMI View:** Africa's oil production will continue to lag its potential across our 10-year forecast period, depressed by repeated supply outages and a pullback of spending in the region. The gas production outlook is brighter, although heavily contingent on the pending FIDs in Tanzania and Mozambique. Both oil and gas consumption is forecast for strong growth across the period, with the Africa region a global outperformer. The refining sector is structurally weak, driving a heavy dependence on imported fuels.*

To highlight key themes in **BMI's** Africa oil and gas outlook and forecasts, we have compared countries on the basis of the following key indicators:

- Oil Production
- Oil Consumption
- Refining Capacity
- Gas Production
- Gas Consumption

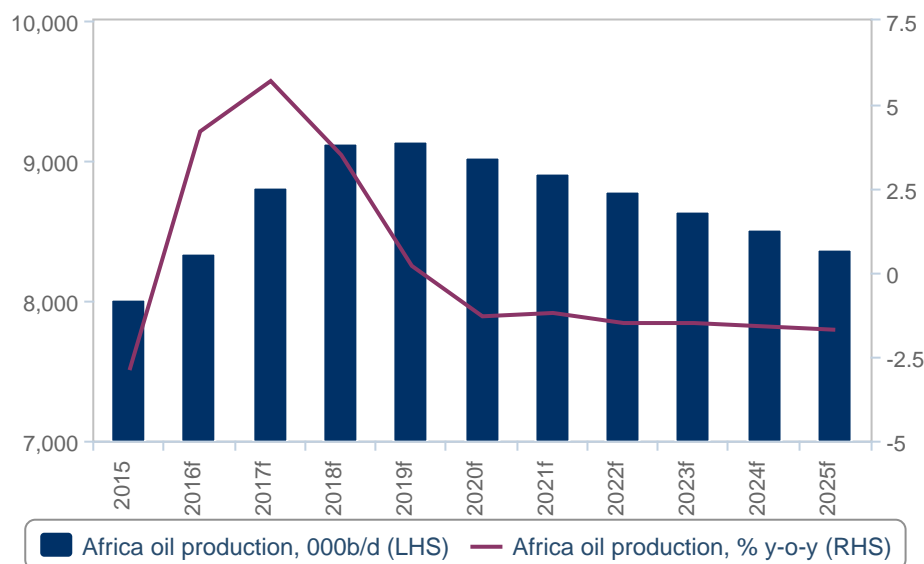
Oil Production

Despite the region's substantial reserves and vast prospective resource base, Africa's long-term oil production outlook is bearish. A mix of lower oil prices, continued insecurity and ongoing fiscal and regulatory uncertainties has undercut upstream investments and will ultimately drag on overall production.

Output growth will be strong in the period 2016-2017, due to a large pipeline of projects which are post-FID and under construction. However, from 2018 growth rates will slump before production lapses into decline in 2020.

Production Growth Unsustainable

Africa Oil Production Forecast (000b/d & % chg y-o-y)



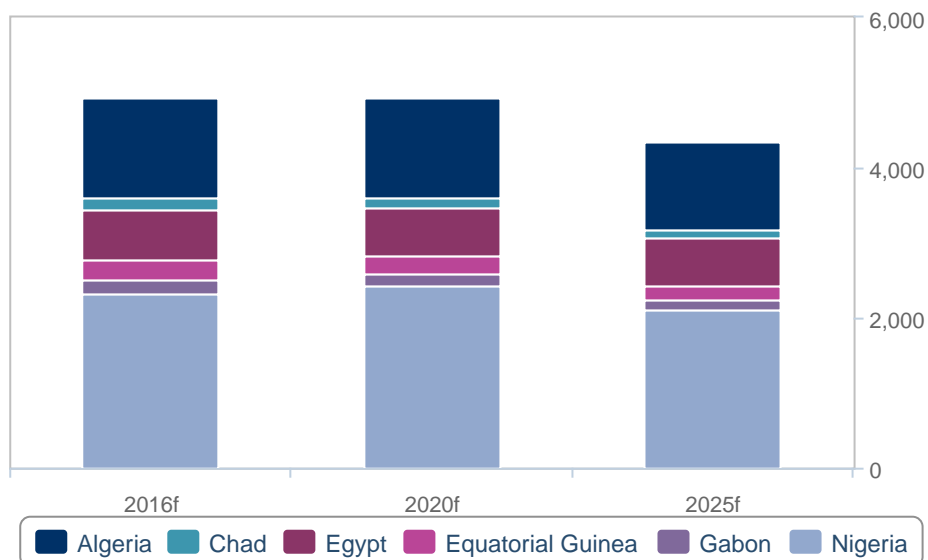
f = BMI forecast. Source: National sources, EIA, BMI

Sustained lower oil prices will be a major driver behind structural decline in the region's production. Cutbacks in spending in higher cost and higher risk areas are putting a number of African markets and several key projects at a disadvantage; for instance, those offshore Tanzania and Mozambique or in deepwater West Africa are facing a high risk of cancellation or delay.

Among the region's major maturing producers, several are battling falls in output. The heaviest losses are seen in Algeria and Nigeria. In Nigeria, underlying insecurity, widespread oil theft and continued uncertainty over the passage of the Petroleum Industry Bill is inhibiting growth. However, a reformist push under the Buhari government promises significant upside risks to production. In particular, the government has made strong progress towards reform of the **Nigerian National Petroleum Corporation (NNPC)** in recent months. Algeria boasts relative fiscal and regulatory stability, but contract terms are poor and the dominance of national oil company **Sonatrach** is a major deterrent to investment. These dynamics are unlikely to change, posing little upside risk to our 10-year forecast.

Mature Producers Driving Decline

Select Countries - Oil Production Forecasts (000b/d)



f = BMI forecast. Source: National sources, BMI

Several countries - notably Libya and South Sudan - are producing significantly below production capacity. Pervasive security threats have triggered repeated outages, contributing to high volatility in output in recent years. Given the degree of social and political fragmentation in these countries and the deeply entrenched nature of the conflicts, prospects for a full recovery in production are relatively poor.

West Africa is a regional bright spot and we forecast net output additions of 455,000b/d in Angola, Congo-Brazzaville and Ghana combined in 2016 and 2017. However, there remain risks to these countries at the tail end of our forecast period, due to the slow pace of exploration and continued pullbacks in spending across the industry.

Oil Consumption

Africa is set for the most rapid growth in refined fuels consumption of any region globally, averaging 3.0% a year over the next 10 years. However, there are mounting risks to the forecast, due to the deteriorating macroeconomic environment in several key consumer countries and ongoing subsidy reforms.

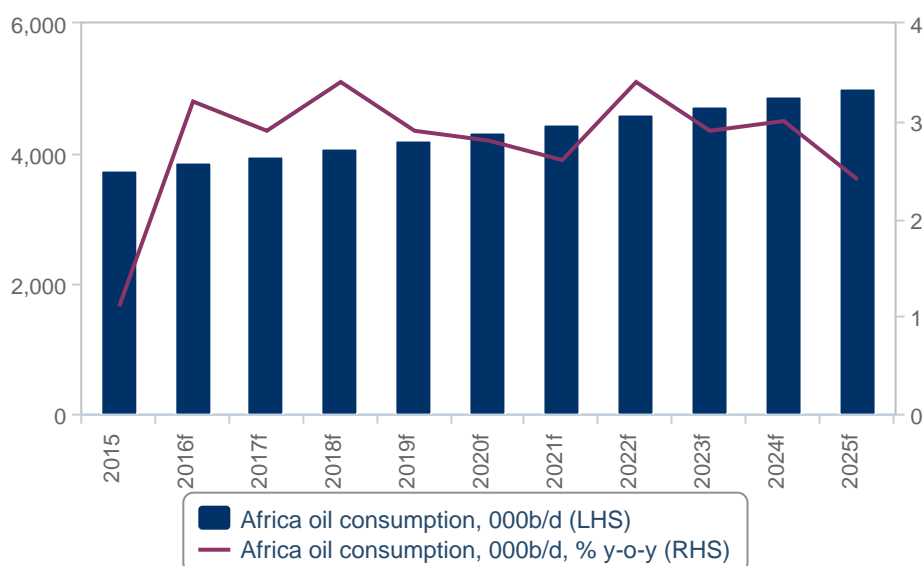
Consumption is heavily concentrated in Algeria, Egypt, Nigeria and South Africa, which will account for 52.4% of the regional total in 2016. We forecast these four majors to consume 50.3% of Africa's refined fuels in 2025. Strong growth in a number of peripheral markets in both East Africa (Mozambique, Tanzania and Uganda) and West Africa (Cameroon, Congo-Brazzaville, Ghana and Gabon) will only partly dilute their share of consumption.

Subsidy reforms in Egypt are driving a slower pace of consumption growth, averaging 1.6% over the 10-year period. There have been signs of policy slippage in recent months, but the reformist agenda remains broadly on track. Algeria and Nigeria have both reduced domestic fuel subsidies in 2016, although prices in Algeria remain substantially below market rates. South Africa has also proposed subsidy reform, but we believe continued inflationary pressures will likely restrain progress here.

Of greater concern, the commodity price slump has exacerbated existing structural weaknesses in the economies of Algeria, Nigeria and South Africa, worsening growth outlooks. A sustained slowdown of growth in these countries could have significant feed through effects on regional consumption levels.

Outpacing Global Peers

Africa Oil Consumption Forecast (000b/d & % chg y-o-y)



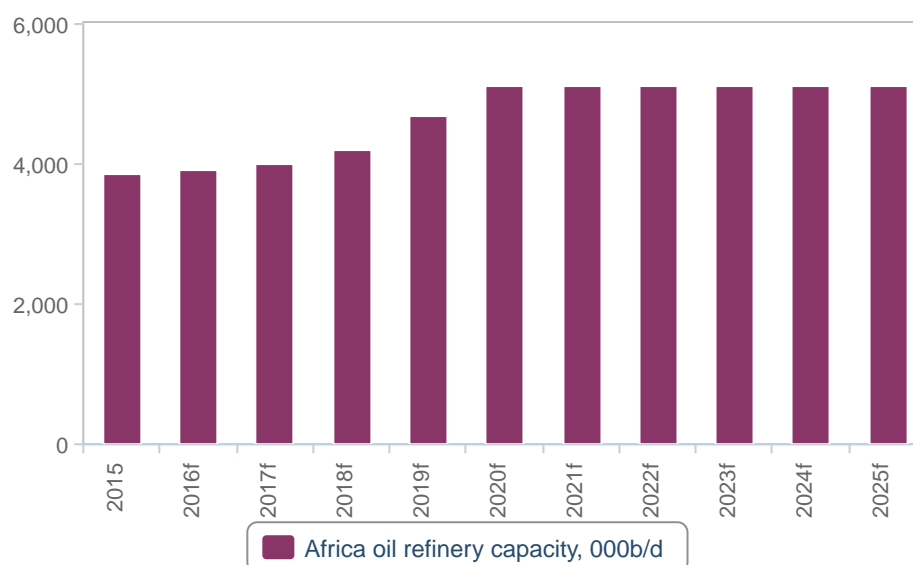
f = BMI forecast. Source: National sources, EIA, BMI

Refining

The African downstream sector is weak and faces major barriers to growth. Nominally, regional refining capacity will be broadly sufficient to keep pace with demand across our forecast period; however, output will continue to lag below capacity, driving a continued dependence on imported fuels in the region.

Set For Small But Significant Capacity Growth

Africa Refining Capacity Forecast (000b/d)



f = BMI forecast. Source: National sources, EIA, BMI

Typically, African refineries are low complexity and have poor operational efficiency. Refiners face various headwinds including fuel subsidies, financing constraints and the unreliability of crude feeds, which undercut overall profitability. We forecast capacity additions in Angola, Cameroon, Egypt, Nigeria and Uganda but see limited appetite for further investment in the African downstream in the coming years.

In total, Africa refining capacity will see a net addition of 1.3mn b/d across our 10-year forecast period, in line with the 1.3mn b/d increase in refined fuels consumption. Incremental efficiency gains will also support marginally higher utilisation rates at existing facilities. However, a substantial deficit will remain, with net fuels imports standing at 950,000b/d in 2025, compared to 1.1mn b/d in 2015.

Gas Production

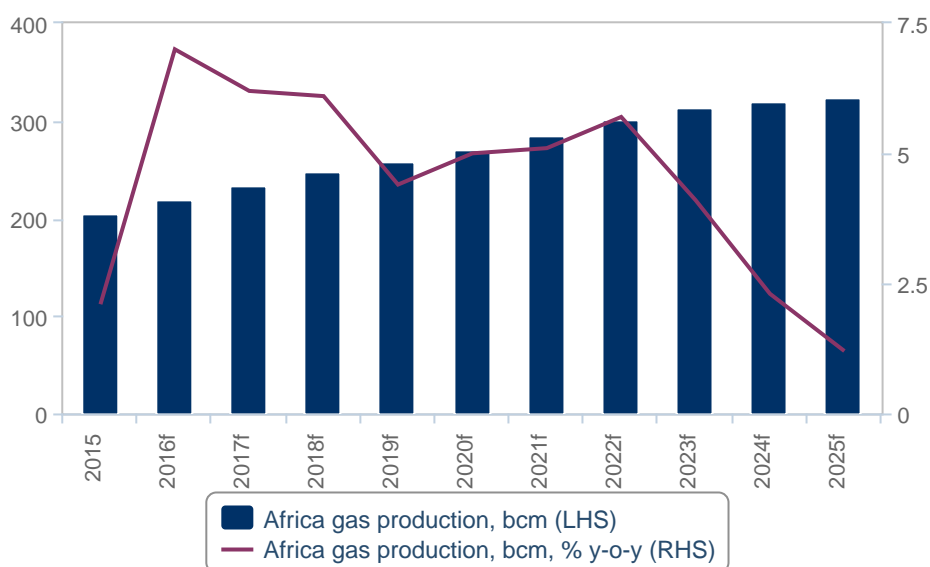
In contrast to oil, the outlook on gas production is broadly bullish. We forecast a net increase of 119.3bcm over the next 10 years, with 4.7% CAGR.

Increased political stability and rising investment will support higher production in Egypt, while the discovery at Zohr poses large risk to the upside. Nigeria is also growing its output, with progress made on a reduction in flaring. However, the country will underperform its vast potential, with infrastructural bottlenecks dragging on growth.

Algeria is the only country in the region facing decline over the period, as depletion of the major Hassi R'Mel field offsets a number of smaller field developments. A slowdown in investment and falling foreign participation in the sector pose further downside risks.

Emergent Producers Drive Surge In Output

Africa Gas Production Forecast (bcm & % chg y-o-y)



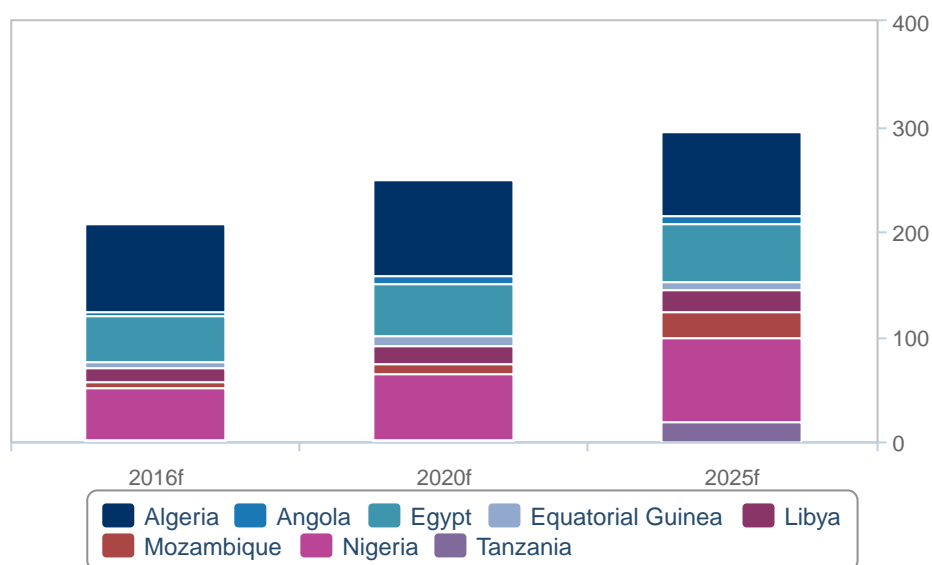
f = BMI forecast. Source: National sources, EIA, BMI

Mozambique and Tanzania will see the fastest pace of growth, with major offshore discoveries forecast to add a combined 43.8bcm by 2025, offering 10-year growth of 525.7%. However, the risks to this forecast

lie to the downside. Given the small size of the domestic markets, production depends on the development of large LNG export facilities. With softening LNG prices and a mounting glut in the global supply, there are downside risks to 2016 FID on the major onshore projects, which could push the ramp-up in production outside our forecast period.

Emergent Producers Spurring Growth

Selected Countries Gas Production Forecast (bcm)



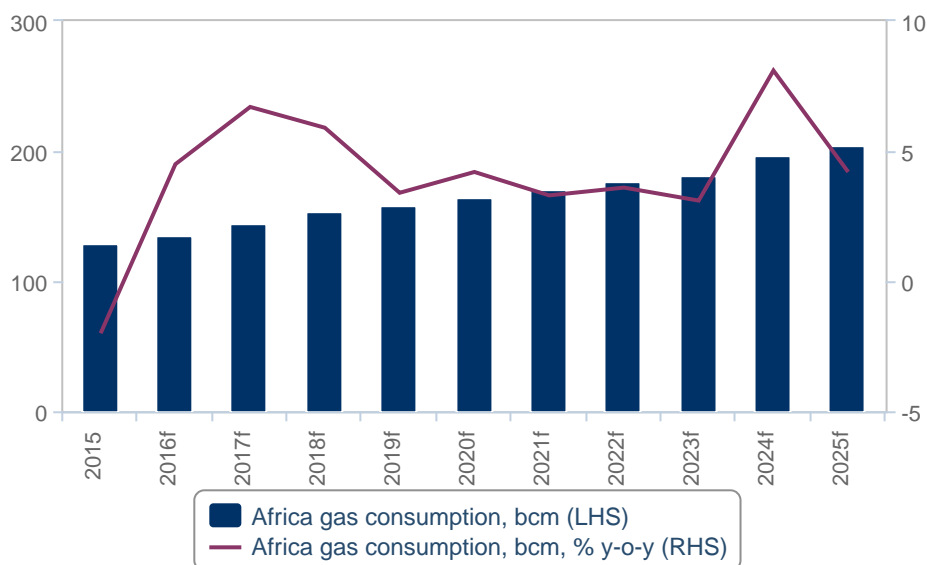
f = BMI forecast. Source: National sources, BMI

Gas Consumption

We forecast strong gas consumption growth for the region at 75.4bcm, with an annual average growth rate of 4.7%. However, consumption will remain heavily dominated by Algeria, Egypt and Nigeria, which accounted for 78.1% of the region's consumption in 2015, and will account for 72.9% in 2025.

Regional Demand Growth On Solid Uptrend

Africa Gas Consumption Forecast (bcm & % chg y-o-y)



f = BMI forecast. Source: National sources, EIA, BMI

Due to the lack of regional pipeline infrastructure, the small size of the domestic markets and the high cost of LNG import terminals, consumption growth in most countries - excluding South Africa - is closely tied to the growth in domestic production. We flag Angola, Cameroon, Ghana and Gabon in West Africa, and Mozambique and Tanzania in East Africa as the key emergent growth markets. However, midstream and offtake infrastructure remains limited in all these countries, and could serve to bottleneck consumption. Mozambique and Tanzania are both exploring options for pan-regional gas networks, but the high cost of these developments coupled by the lack of anchor offtake projects pose barriers.

Table: Africa Oil & Gas Production, Consumption, Refining Capacity And Trade

	2014	2015	2016f	2017f	2018f	2019f	2020f
Africa oil production, 000b/d	8,246.8	8,008.5	8,344.3	8,820.4	9,131.4	9,148.4	9,026.9
Africa oil production, % y-o-y	-4.9	-2.9	4.2	5.7	3.5	0.2	-1.3
Africa oil consumption, 000b/d	3,701.8	3,741.7	3,861.9	3,972.2	4,107.3	4,225.2	4,345.5
Africa oil consumption, 000b/d, % y-o-y	1.5	1.1	3.2	2.9	3.4	2.9	2.8
Africa oil net exports, 000b/d	4,545.0	4,266.9	4,482.4	4,848.2	5,024.1	4,923.2	4,681.4
Africa oil net exports, 000b/d, % y-o-y	-9.5	-6.1	5.1	8.2	3.6	-2.0	-4.9
Africa oil refinery capacity, 000b/d	3,837.7	3,863.7	3,916.7	4,001.7	4,202.7	4,679.7	5,119.7
Africa oil refinery capacity, 000b/d, % y-o-y	0.7	0.7	1.4	2.2	5.0	11.3	9.4
Africa gas production, bcm	201.1	205.4	219.7	233.3	247.6	258.4	271.5
Africa gas production, bcm, % y-o-y	-0.9	2.1	7.0	6.2	6.1	4.4	5.0
Africa gas consumption, bcm	132.5	129.8	135.6	144.6	153.2	158.4	165.1
Africa gas consumption, bcm, % y-o-y	-3.1	-2.0	4.5	6.7	5.9	3.4	4.2
Africa gas net exports, bcm	68.6	75.6	84.1	88.7	94.3	100.0	106.4
Africa gas net exports, bcm, % y-o-y	3.7	10.2	11.3	5.4	6.3	6.0	6.4

f = BMI forecast. Source: BMI, EIA

Glossary

Table: Glossary Of Terms

AOR	additional oil recovery	KCTS	Kazakh Caspian Transport System
APA	awards for predefined areas	km	kilometres
API	American Petroleum Institute	LAB	linear alkyl benzene
bbbl	barrel	LDPE	low density polypropylene
bcm	billion cubic metres	LNG	liquefied natural gas
b/d	barrels per day	LPG	liquefied petroleum gas
bn	billion	m	metres
boe	barrels of oil equivalent	mcm	thousand cubic metres
BTC	Baku-Tbilisi-Ceyhan Pipeline	Mcm	mn cubic metres
BTU	British thermal unit	MEA	Middle East and Africa
Capex	capital expenditure	mn	million
CBM	coal bed methane	MoU	memorandum of understanding
CEE	Central and Eastern Europe	mt	metric tonne
CPC	Caspian Pipeline Consortium	MW	megawatts
CSG	coal seam gas	na	not available/ applicable
DoE	US Department of Energy	NGL	natural gas liquids
EBRD	European Bank for Reconstruction & Development	NOC	national oil company
EEZ	exclusive economic zone	OECD	Organisation for Economic Cooperation & Development
e/f	estimate/forecast	OPEC	Organization of the Petroleum Exporting Countries
EIA	US Energy Information Administration	PE	polyethylene
EM	emerging markets	PP	polypropylene
EOR	enhanced oil recovery	PSA	production sharing agreement
E&P	exploration and production	PSC	production sharing contract
EPSA	exploration and production sharing agreement	q-o-q	quarter-on-quarter
FID	final investment decision	R&D	research and development
FDI	foreign direct investment	R/P	reserves/production
FEED	front end engineering and design	RPR	reserves to production ratio
FPSO	floating production, storage and offloading	SGI	strategic gas initiative
FTA	free trade agreement	SoI	statement of intent
FTZ	free trade zone	SPA	sale and purchase agreement
GDP	gross domestic product	SPR	strategic petroleum reserve

Glossary Of Terms - Continued			
G&G	geological and geophysical	t/d	tonnes per day
GoM	Gulf of Mexico	tcm	trillion cubic metres
GS	geological survey	toe	tonnes of oil equivalent
GTL	gas-to-liquids conversion	tpa	tonnes per annum
GW	gigawatts	TRIPS	Trade-Related Aspects of Intellectual Property Rights
GWh	gigawatt hours	trn	trillion
HDPE	high density polyethylene	T&T	Trinidad & Tobago
HoA	heads of agreement	TTPC	Trans-Tunisian Pipeline Company
IEA	International Energy Agency	TWh	terawatt hours
IGCC	integrated gasification combined cycle	UAE	United Arab Emirates
IOC	international oil company	USGS	US Geological Survey
IPI	Iran-Pakistan-India Pipeline	WAGP	West African Gas Pipeline
IPO	initial public offering	WIPO	World Intellectual Property Organization
JOC	joint operating company	WTI	West Texas Intermediate
JPDA	joint petroleum development area	WTO	World Trade Organization

Source: BMI

Methodology

Industry Forecast Methodology

BMI's industry forecasts are generated using the best-practice techniques of time-series modelling and causal/econometric modelling. The precise form of model we use varies from industry to industry, in each case being determined, as per standard practice, by the prevailing features of the industry data being examined.

Common to our analysis of every industry is the use of vector autoregressions. Vector autoregressions allow us to forecast a variable using more than the variable's own history as explanatory information. For example, when forecasting oil prices, we can include information about oil consumption, supply and capacity.

When forecasting for some of our industry sub-component variables, however, using a variable's own history is often the most desirable method of analysis. Such single-variable analysis is called univariate modelling. We use the most common and versatile form of univariate models: the autoregressive moving average model (ARMA).

In some cases, ARMA techniques are inappropriate because there is insufficient historic data or data quality is poor. In such cases, we use either traditional decomposition methods or smoothing methods as a basis for analysis and forecasting.

BMI mainly uses OLS estimators and in order to avoid relying on subjective views and encourage the use of objective views, **BMI** uses a 'general-to-specific' method. **BMI** mainly uses a linear model, but simple non-linear models, such as the log-linear model, are used when necessary. During periods of 'industry shock', for example poor weather conditions impeding agricultural output, dummy variables are used to determine the level of impact.

Effective forecasting depends on appropriately selected regression models. **BMI** selects the best model according to various different criteria and tests, including but not exclusive to:

- R^2 tests explanatory power; adjusted R^2 takes degree of freedom into account;
- Testing the directional movement and magnitude of coefficients;
- Hypothesis testing to ensure coefficients are significant (normally t-test and/or P-value);
- All results are assessed to alleviate issues related to auto-correlation and multi-collinearity.

BMI uses the selected best model to perform forecasting.

Human intervention plays a necessary and desirable role in all of **BMI**'s industry forecasting. Experience, expertise and knowledge of industry data and trends ensure that analysts spot structural breaks, anomalous data, turning points and seasonal features where a purely mechanical forecasting process would not.

Sector-Specific Methodology

There are a number of principal criteria that drive our forecasts for each energy indicator.

Energy Supply

This covers the supply of crude oil, natural gas, refined oil products and electrical power, which is determined largely by investment levels, available capacity, plant utilisation rates and national policy. We therefore examine:

- National energy policy, stated output goals and investment levels;
- Company-specific capacity data, output targets and capital expenditures, using national, regional and multinational company sources;
- International quotas, guidelines and projections from organisations such as OPEC, the International Energy Agency (IEA), and the US Energy Information Administration (EIA).

Energy Consumption

A mixture of methods is used to generate demand forecasts, applied as appropriate to each individual country:

- Underlying economic (GDP) growth for individual countries/regions, sourced from **BMI** published estimates;
- Historic relationships between GDP growth and energy demand growth in an individual country are analysed and used as the basis for predicting levels of consumption;
- Government projections for oil, gas and electricity demand;
- Third-party agency projections for regional demand, from organisations such as the IEA, EIA and OPEC;

Extrapolation of capacity expansion forecasts based on company- or state-specific investment levels.

Cross Checks

Whenever possible, we compare government and/or third-party agency projections with the declared spending and capacity expansion plans of the companies operating in each individual country. Where there are discrepancies, we use company-specific data as physical spending patterns to determine capacity and supply capability. Similarly, we compare capacity expansion plans and demand projections to check the energy balance of each country. Where the data suggest imports or exports, we check that necessary capacity exists or that the required investment in infrastructure is taking place.

Source

Sources include those international bodies mentioned above, such as OPEC, IEA, and EIA, as well as local energy ministries, official company information, and international and national news, plus international and national news agencies.

Risk/Reward Index Methodology

BMI's Risk/Reward Index (RRI) provides a comparative regional ranking system evaluating the ease of doing business and the industry-specific opportunities and limitations for potential investors in a given market. The RRI system is divided into two distinct areas:

Rewards: Evaluation of sector's size and growth potential in each state, and also broader industry/state characteristics that may inhibit its development. This is further broken down into two sub-categories:

- Industry Rewards (this is an industry-specific category taking into account current industry size and growth forecasts, the openness of market to new entrants and foreign investors, to provide an overall score for potential returns for investors);
- Country Rewards (this is a country-specific category, and the score factors in favourable political and economic conditions for the industry).

Risks: Evaluation of industry-specific dangers and those emanating from the state's political/economic profile which call into question the likelihood of anticipated returns being realised over the assessed time period. This is further broken down into two sub-categories:

- Industry Risks (this is an industry-specific category whose score covers potential operational risks to investors, regulatory issues inhibiting the industry, and the relative maturity of a market);
- Country Risks (this is a country-specific category in which political and economic instability, unfavourable legislation and a poor overall business environment are evaluated to provide an overall score).

We take a weighted average, combining Market and Country Risks, or Industry and Country Rewards. These two results in turn provide an overall Risk/Reward Index score, which is used to create our regional ranking system for the risks and rewards of involvement in a specific industry in a particular country.

For each category and sub-category, each state is scored out of 100 (with 100 the best), with the overall Risk/Reward Index score a weighted average of the total score. Importantly, as most of the countries and territories evaluated are considered by **BMI** to be 'emerging markets', our index is revised on a quarterly basis. This ensures that the index draws on the latest information and data across our broad range of sources, and the expertise of our analysts.

Sector-Specific Methodology

BMI's approach in assessing the Risk/Reward balance for oil and gas industry investors is three-fold:

- First, we have disaggregated the upstream (oil and gas exploration and production) and downstream (oil refining and marketing, gas processing and distribution), enabling us to take a more nuanced approach to analysing the potential in each segment, and identifying the different risks along the value chain.
- Second, we have identified objective indicators that may serve as proxies for issues and trends that were previously evaluated on a subjective basis.
- Finally, we have used **BMI**'s proprietary Country Risk Index in a more refined manner in order to ensure that only those risks most relevant to the industry have been included.

Conceptually, the index is organised in a manner that enables us clearly to present the comparative strengths and weaknesses of each state. The headline oil and gas index score is the principal score. However, the differentiation of upstream and downstream and the articulation of the elements that comprise each segment enable more sophisticated conclusions to be drawn, and also facilitate the use of the index by clients who have varying levels of exposure and risk appetite.

Our sector-specific industry indices include:

- Oil & Gas Risk/Reward Index: this is the overall index score, which comprises 50% upstream and 50% downstream;
- Upstream Oil & Gas Risk/Reward Index: this is the overall upstream index score, which is composed of rewards/risks (see below);
- Downstream Oil & Gas Risk/Reward Index: this is the overall downstream index score, which comprises rewards/risks (see below).

The following indicators have been used. Overall, the index uses three subjectively measured indicators and 41 separate indicators/datasets.

Table: Bmi's Oil & Gas Upstream Risk/Reward Index

Rationale	
Upstream RRR: Rewards	
Industry Rewards	
Resource Base	
- Proven oil reserves, mn bbl	Indicators used to denote total market potential. High values given better scores.
- Proven gas reserves, bcm	
Growth Outlook	
- Oil production growth, 2009-2014	Indicators used as proxies for BMI's market assumptions, with strong growth accorded higher scores.
- Gas production growth, 2009-2014	
Market Maturity	
- Oil reserves/production	Indicator used to denote whether industries are frontier/emerging/developed or mature markets. Low existing exploitation in relation to potential is accorded a higher score.
- Gas reserves and production	
- Current oil production versus peak	
- Current gas production versus peak	
Country Rewards	
State ownership of assets, %	Indicator used to denote opportunity for foreign NOCs/IOCs/independents. Low state ownership scores higher.
Number of non-state companies	Indicator used to denote market competitiveness. Presence (and large number) of non-state companies scores higher.
Upstream RRR: Risks	
Industry Risks	
Licensing terms	Subjective evaluation of government policy towards sector against BMI-defined criteria. Protectionist states are marked down.
Privatisation trend	Subjective evaluation of government industry orientation. Protectionist states are marked down.
Country Risks	
Physical infrastructure	Score from BMI's Country Risk Index (CRI). It evaluates the constraints imposed by power, transport and communications infrastructure.
Long-term policy continuity risk	From CRI. It evaluates the risk of a sharp change in the broad direction of government policy.
Rule of law	From CRI. It evaluates government's ability to enforce its will within the state.
Corruption	From CRI, to denote risk of additional legal costs and possibility of opacity in tendering or business operations affecting companies' ability to compete.

NOC = national oil company; IOC = international oil company. Source: BMI

Weighting

Given the number of indicators/datasets used, it would be inappropriate to give all sub-components equal weight. Consequently, the following weighting has been adopted:

Table: Weighting	
Component	Weighting, %
Upstream RRI	50, of which
Rewards	70 of Upstream RRI, of which
- Industry Rewards	75
- Country Rewards	25
Risks	30 of Upstream RRI, of which
- Industry Risks	65
- Country Risks	35
Downstream RRI	50 of Oil & Gas RRI, of which
Rewards	70 ,of which
- Industry Rewards	75
- Country Rewards	25
Risks	30, of which
- Industry Risks	60
- Country Risks	40

Source: BMI

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