BMI Research
A FitchGroup Company

Q3 2016

www.bmiresearch.com

TANZANIA

POWER REPORT

INCLUDES 10-YEAR FORECASTS TO 2025

Published by:BMI Research

Tanzania Power Report Q3 2016

INCLUDES 10-YEAR FORECASTS TO 2025

Part of BMI's Industry Report & Forecasts Series

Published by: **BMI Research**

Copy deadline: June 2016

ISSN: 2049-033X

BMI Research
Senator House
85 Queen Victoria Street
London
EC4V 4AB
United Kingdom
Tel: +44 (0) 20 7248 0468
Fax: +44 (0) 20 7248 0467
Email: subs@bmiresearch.com
Web: http://www.bmiresearch.com

CONTENTS

BMI Industry View

BMI View: *The Tanzanian power sector will become increasingly diversified on the back of increased gas and coal-fired generation, while the government seeks to decrease reliance on hydropower. Increased gas supply from new discoveries will help to drive further investment into gas-fired capacity. Government efforts to increase electrification rates will help boost small-scale distributed renewable energy solutions.*

Table: Headline Power Forecasts (Tanzania 2015-2021)

	2015e	2016f	2017f	2018f	2019f	2020f	2021f
Generation, Total, TWh	4.750	3.960	4.600	7.450	11.100	11.130	11.180
Consumption, Net Consumption, TWh	4.4	4.9	5.4	6.4	7.1	7.8	8.7
Capacity, Net, MW	1,475.4	1,475.4	1,475.4	2,166.0	2,766.0	2,766.0	2,766.0

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

Latest Updates And Structural Trends

- Construction on the 240 megawatt (MW) Kinyerezi II gas-fired power plant has started in March and is forecast to be commissioned and operational in 2018.
- The Tanzania Electricity Supply Company (Tanesco) has stated that it has plans to upgrade the Kinyerezi I gas-fired power plant from 150MW to 335MW. We will incorporate this into our forecasts if we see progress on the planned upgrades.
- Apart from the 80MW Rusumo Falls hydroelectric project, we do not currently expect any further hydropower investment in Tanzania. This is as a result of the government stating that it will actively seek to diversify the country's power sector away from hydropower by increasing its thermal power generation. Rusumo falls will also offer Tanzania only 26.6MW of capacity, as the total 80MW is to be split evenly between Rwanda, Burundi and Tanzania.
- The World Bank Board of Executive Directors has approved a loan of USD200mn to the Tanzanian government for the extension of electricity grid access to a further 2.5mn households over the next five years. The extension is being done through the Tanzania Rural Electrification Expansion Programme. The programme will involve increasing the supply of renewable energy in rural areas.
- The China Export-Import Bank has approved the funds for the construction of a transmission line between Dar Es Salaam and Arusha via Chalinze.

SWOT

SWOT Analysis

Strengths	▪ Tanzania's population and economy is growing steadily, ensuring an increase in demand for electricity over our 10-year forecast period to 2025. ▪ The country is relatively stable on a regional basis and the institutions are fairly strong and legitimate. ▪ The government is committed to doubling electricity production over the next four years and has developed a 25-year plan for the development of the energy sector.
Weaknesses	▪ The electricity grid is in poor condition, hindering the connection of additional generating capacity. ▪ The electrification rate in Tanzania stands at around 20%, limiting the scope for further electricity sales ▪ The state-owned Tanzania Electric Supply Company retains a privileged and dominant position in the generation, transmission and distribution of electricity, limiting the scope for competition.
Opportunities	▪ Tanzania has massive natural gas resources which will support the development of gas-fired domestic power. ▪ The abundance of sunshine is conducive to the development of on and off-grid solar power production. ▪ The government is making rapid progress in extending access to the electricity grid.
Threats	▪ Periodic drought can suspend generation of hydropower which constitutes to just under 40% of Tanzania's electricity generation. ▪ Theft of power from the grid by remote and informal communities results in heavy losses from the system.

SWOT Analysis - Continued

- The commercial environment is hostile: corruption is rife and the institutions inefficient.

Industry Forecast

Tanzania Snapshot

Table: Country Snapshot: Economic and Demographic Data (Tanzania 2014-2019)

	2014e	2015e	2016f	2017f	2018f	2019f
Nominal GDP, USDbn	47.8	43.8	46.0	49.8	54.3	58.7
Real GDP growth, % y-o-y	7.0	7.1	6.7	6.7	6.5	6.4
GDP per capita, USD	940	837	855	898	951	999
Population, mn	51.8	53.5	55.2	56.9	58.6	60.4

e/f = BMI estimate/forecast. Source: National sources, BMI

Table: Country Snapshot: Economic and Demographic Data (Tanzania 2020-2025)

	2020f	2021f	2022f	2023f	2024f	2025f
Nominal GDP, USDbn	64.0	70.2	76.4	83.2	90.6	99.2
Real GDP growth, % y-o-y	6.2	6.5	6.5	6.7	6.6	6.4
GDP per capita, USD	1,060	1,130	1,196	1,268	1,343	1,431
Population, mn	62.3	64.1	66.1	68.0	70.0	72.0

f = BMI forecast. Source: National sources, BMI

Table: Country Snapshot: Power Sector

Access to Electricity, % of population	**36**
Quality of Electricity Supply (Value)	2.6/7
Quality of Electricity Supply (Rank)	122/140

Sources: World Economic Forum - Global Competitiveness Report 2015-2016, World Bank, BMI

Tanzania Power Forecast Scenario

Thermal Generation And Capacity Forecast

BMI View: *The Tanzanian government will increase its focus on thermal power investment in its bid to decrease reliance on its unreliable hydropower plants. New discoveries of gas reserves and further gas pipelines will help to boost gas-fired generation over our 10-year forecast period up until 2025. Plans to increase coal-fired capacity will help to diversify thermal power generation as well.*

Latest Updates

- Construction on the 240 megawatt (MW) Kinyerezi II gas-fired power plant has started in March and is forecast to be commissioned and operational in 2018.
- The Tanzania Electricity Supply Company (Tanesco) has stated that it has plans to upgrade the Kinyerezi I gas-fired power plant from 150MW to 335MW. We will incorporate this into our forecasts if we see progress on the planned upgrades.

Structural Trends

The discovery of large gas reserves throughout Tanzania means that thermal power generation growth will be driven by new gas-fired capacity. Throughout our 10-year forecast period, thermal generation in Tanzania will increase from 2.3 terawatt hours (TWh) in 2016 up to 8.8TWh in 2025, at an average yearly increase of 20.3%. Up to 88% of Tanzania's thermal electricity generation is sourced from natural gas, with the remainder comprising of coal and oil-fired generation.

Gas-fired generation will comprise the majority of thermal power up until 2019, when it will generate just over 53% of thermal power. This is mostly due to the 600MW Mchuchuma coal-fired power plant, which we forecast to come online in 2019, which will increase the share of coal-fired power to over 44% of thermal power generation. The granting of the Rukwa mining licence to **Edenville Energy** - which is currently in talks with TANESCO for a PPA - means that the 300MW Rukwa coal-fired power plant is also on our radar for a future development, and we will add it to our forecasts once we have a timeline for the construction of the plant.

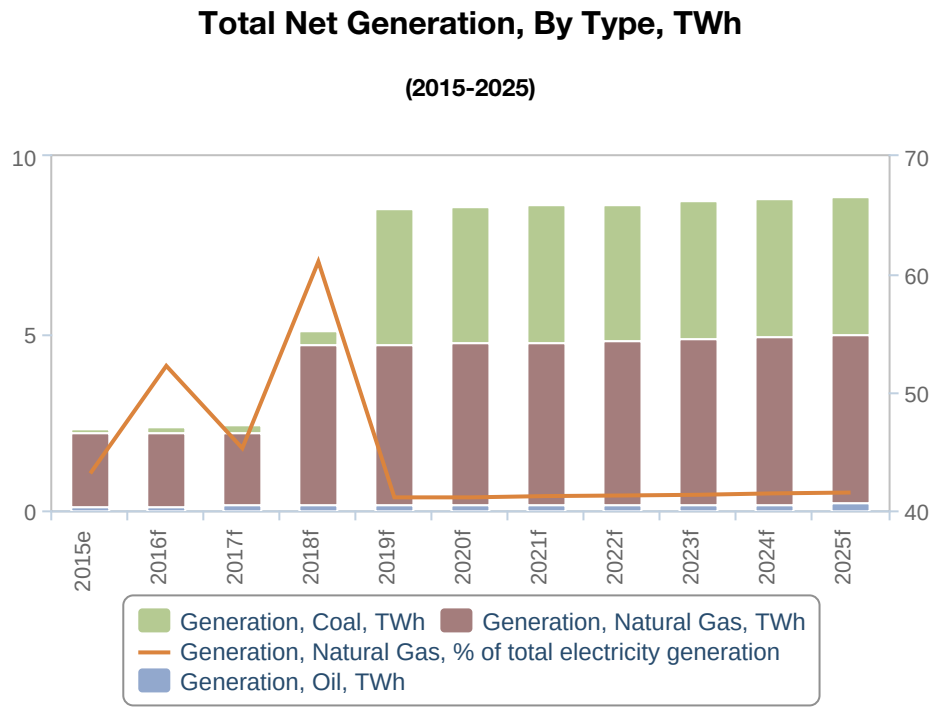
However, through the long term past our 10-year forecast period, we maintain that the majority of investment will be focused on gas-fired power plants. The abundance of natural gas and the high emissions from coal-fired power will mean that natural gas remains the more attractive option. In January 2015, the Tanzanian government was also struggling to raise funds for the Rukwa project, which at the time was

projected to cost up to USD3bn. The progress at the coal mine and its abundant reserves - projected to be able to provide coal for the power plant for 100 years - means that we are not currently removing it from our forecasts, though we do highlight it as a risk.

New gas-fired capacity will come from the 240MW Kinyerezi II power plant, which we forecast to come online in 2018. We also forecast the 400MW Mtwara gas-fired power plant to come online during the same year. The potential for increased gas-fired capacity for the future is highly likely as increased efficiency at the existing plants comes into place (Kinyerezi I is reportedly currently operating at half of its 150MW capacity). The investment into new gas-fired power plants further underscores this forecast, such as the Mkuranga and Kilwa power plants, both with a planned capacity of 300MW each. Tanesco has also announced its intention to increase Kinyerezi I's capacity from 150MW to 335MW.

Oil-fired generation makes up the smallest portion of thermal power, with it forecast to decrease from 5.8% of thermal electricity generation in 2016 to 2.2% in 2025. We predict oil-fired generation will continue decreasing as it is much more expensive than other thermal power sources (in Tanzania it can cost up to USD1/kWh) and will be crowded out by continued investment into natural-gas and coal-fired power.

This overall increase in thermal power generation from 2.3TWh in 2016 to 8.8TWh in 2025 will result in Tanzania being less dependent on Hydropower as a source of electricity. Tanzania's power sector will therefore be less susceptible to drought conditions, ensuring a more stable electricity supply.



e/f = BMI estimate/forecast. Source: National sources, BMI

Hydropower Generation And Capacity Forecast

BMI View: *Increased focus on thermal power will result in reduced hydropower investment over our 10-year forecast period up until 2025. Reduced hydropower output as a result of drought and discovery of more gas reserves will further decrease the attractiveness of hydropower as a power source in Tanzania.*

Latest Updates

- Apart from the 80MW Rusumo Falls hydroelectric project, we do not currently expect any further hydropower investment in Tanzania. This is as a result of the government stating that it will actively seek to diversify the country's power sector away from hydropower by increasing its thermal power generation. Rusumo falls will also offer Tanzania only 26.6MW of capacity, as the total 80MW is to be split evenly between Rwanda, Burundi and Tanzania.

Structural Trends

We do not forecast any new hydropower plants to come online within our 10-year forecast period up until 2025. After the announcement by TANESCO that it is actively diversifying the power sector in order to

make Tanzania less reliant on hydropower, other sources of electricity generation have taken preference. This is especially true in the wake of power cuts across the Sub-Saharan African region due to droughts which have rendered hydropower plants inefficient.

We therefore highlight our forecast of hydropower's share of the total electricity generation mix decreasing from 38.5% in 2016 to 20.7% in 2025.

Though we do not forecast any new hydropower plants coming online, we note that Tanzania does not intend to completely move away from hydropower, as it has three potential hydropower plants being planned. These three plants are the Rusumo Falls Hydroelectric project (80MW), the Rumakali hydropower plant (222MW), and the Kikagati - Murongo hydropower project (16MW) on the border with Tanzania. Delays and lack of updates are keeping our forecasts for an increase in Tanzanian hydropower capacity bearish, although we do note that construction work on the Rusumo Falls hydropower plant has been stated to start in the beginning of 2016. We will therefore include Rusumo Falls if we receive any further updates on the project.

Electricity Generation And Power Generating Capacity

Table: Total Electricity Generation Data And Forecasts (Tanzania 2014-2019)

	2014	2015e	2016f	2017f	2018f	2019f
Generation, Total, TWh	4.440	4.750	3.960	4.600	7.450	11.100
Generation, Thermal, % of total generation	45.810	48.920	59.340	53.370	68.410	77.050
Generation, Coal, TWh	0.140	0.140	0.140	0.220	0.400	3.840
Generation, Coal, % y-o-y	0.720	0.750	1.740	56.740	76.780	869.220
Generation, Coal, % total electricity generation	3.140	2.960	3.610	4.880	5.320	34.590
Generation, Natural Gas, TWh	1.780	2.050	2.070	2.080	4.550	4.560
Generation, Natural Gas, % y-o-y	2.640	15.170	0.800	0.670	118.720	0.260
Generation, Natural Gas, % of total electricity generation	40.080	43.130	52.240	45.260	61.070	41.100
Generation, Oil, TWh	0.120	0.130	0.140	0.150	0.150	0.150
Generation, Oil, % change y-o-y	65.610	16.940	2.440	7.550	1.820	0.350
Generation, Oil, % of total electricity generation	2.590	2.830	3.490	3.230	2.030	1.370
Generation, Nuclear, % of total electricity generation	0.000	0.000	0.000	0.000	0.000	0.000
Generation, Hydropower, TWh	2.350	2.350	1.530	2.060	2.150	2.340
Generation, Hydropower, % change y-o-y	0.000	0.000	-35.000	35.000	4.200	9.000
Generation, Hydropower, % total electricity generation	52.840	49.370	38.560	44.800	28.800	21.070
Hydro-Electric Pumped Storage, TWh	0.000	0.000	0.000	0.000	0.000	0.000

Total Electricity Generation Data And Forecasts (Tanzania 2014-2019) - Continued

	2014	2015e	2016f	2017f	2018f	2019f
Hydro-Electric Pumped Storage, % total electricity generation	0.000	0.000	0.000	0.000	0.000	0.000
Generation, Non-Hydropower Renewables, TWh	0.060	0.080	0.080	0.080	0.210	0.210
Generation, Non-Hydropower Renewables, % change y-o-y	55,644.590	34.940	2.300	1.400	146.930	0.280
Generation, Non-Hydropower Renewables, % of total electricity	1.350	1.710	2.100	1.830	2.790	1.880

e/f = BMI estimate/forecast. Source: National sources, BMI

Table: Total Electricity Generation Data And Forecasts (Tanzania 2020-2025)

	2020f	2021f	2022f	2023f	2024f	2025f
Generation, Total, TWh	11.130	11.180	11.230	11.300	11.360	11.430
Generation, Thermal, % of total generation	77.080	77.090	77.180	77.240	77.310	77.400
Generation, Coal, TWh	3.850	3.850	3.870	3.880	3.890	3.910
Generation, Coal, % y-o-y	0.230	0.120	0.450	0.320	0.150	0.500
Generation, Coal, % total electricity generation	34.580	34.470	34.470	34.360	34.230	34.190
Generation, Natural Gas, TWh	4.580	4.610	4.630	4.670	4.710	4.750
Generation, Natural Gas, % y-o-y	0.290	0.690	0.580	0.800	0.800	0.800
Generation, Natural Gas, % of total electricity generation	41.100	41.210	41.260	41.320	41.440	41.510
Generation, Oil, TWh	0.160	0.160	0.160	0.180	0.190	0.200
Generation, Oil, % change y-o-y	2.400	1.250	4.300	7.350	6.000	4.650
Generation, Oil, % of total electricity generation	1.390	1.410	1.460	1.560	1.640	1.710
Generation, Nuclear, % of total electricity generation	0.000	0.000	0.000	0.000	0.000	0.000
Generation, Hydropower, TWh	2.340	2.350	2.350	2.360	2.360	2.360
Generation, Hydropower, % change y-o-y	0.120	0.250	0.020	0.320	0.120	0.170
Generation, Hydropower, % total electricity generation	21.040	21.000	20.910	20.840	20.760	20.660
Hydro-Electric Pumped Storage, TWh	0.000	0.000	0.000	0.000	0.000	0.000
Hydro-Electric Pumped Storage, % total electricity generation	0.000	0.000	0.000	0.000	0.000	0.000
Generation, Non-Hydropower Renewables, TWh	0.210	0.210	0.210	0.220	0.220	0.220
Generation, Non-Hydropower Renewables, % change y-o-y	0.690	1.610	0.810	1.000	0.950	1.010
Generation, Non-Hydropower Renewables, % of total electricity	1.880	1.910	1.910	1.920	1.930	1.940

f = BMI forecast. Source: National sources, BMI

Table: Electricity Generating Capacity Data And Forecasts (Tanzania 2014-2019)

	2014	2015e	2016f	2017f	2018f	2019f
Capacity, Net, MW	1,250.0	1,475.4	1,475.4	1,475.4	2,166.0	2,766.0
Capacity, Net, % y-o-y	2.5	18.0	0.0	0.0	46.8	27.7
Capacity, Conventional Thermal, MW	658.0	883.3	883.3	883.3	1,524.0	2,124.0
Capacity, Conventional Thermal, % y-o-y	0.0	34.3	0.0	0.0	72.5	39.4
Capacity, Conventional Thermal, % of total capacity	52.6	59.9	59.9	59.9	70.4	76.8
Capacity, Nuclear, MW	0.0	0.0	0.0	0.0	0.0	0.0
Capacity, Nuclear, % of total capacity	0.0	0.0	0.0	0.0	0.0	0.0
Capacity, Hydropower, MW	561.8	561.8	561.8	561.8	561.8	561.8
Capacity, Hydropower, % y-o-y	0.0	0.0	0.0	0.0	0.0	0.0
Capacity, Hydropower, % of total capacity	44.9	38.1	38.1	38.1	25.9	20.3
Capacity, Non-Hydroelectric Renewables, MW	30.2	30.2	30.2	30.2	80.2	80.2
Capacity, Non-Hydroelectric Renewables, % y-o-y	14,423.1	0.0	0.0	0.0	165.5	0.0
Capacity, Non-Hydroelectric Renewables, % of total capacity	2.4	2.1	2.1	2.1	3.7	2.9

e/f = BMI estimate/forecast. Source: National sources, BMI

Table: Electricity Generating Capacity Data And Forecasts (Tanzania 2020-2025)

	2020f	2021f	2022f	2023f	2024f	2025f
Capacity, Net, MW	2,766.0	2,766.0	2,766.0	2,766.0	2,766.0	2,766.0
Capacity, Net, % y-o-y	0.0	0.0	0.0	0.0	0.0	0.0
Capacity, Conventional Thermal, MW	2,124.0	2,124.0	2,124.0	2,124.0	2,124.0	2,124.0
Capacity, Conventional Thermal, % y-o-y	0.0	0.0	0.0	0.0	0.0	0.0
Capacity, Conventional Thermal, % of total capacity	76.8	76.8	76.8	76.8	76.8	76.8
Capacity, Nuclear, MW	0.0	0.0	0.0	0.0	0.0	0.0
Capacity, Nuclear, % of total capacity	0.0	0.0	0.0	0.0	0.0	0.0
Capacity, Hydropower, MW	561.8	561.8	561.8	561.8	561.8	561.8
Capacity, Hydropower, % y-o-y	0.0	0.0	0.0	0.0	0.0	0.0
Capacity, Hydropower, % of total capacity	20.3	20.3	20.3	20.3	20.3	20.3
Capacity, Non-Hydroelectric Renewables, MW	80.2	80.2	80.2	80.2	80.2	80.2
Capacity, Non-Hydroelectric Renewables, % y-o-y	0.0	0.0	0.0	0.0	0.0	0.0

Electricity Generating Capacity Data And Forecasts (Tanzania 2020-2025) - Continued						
	2020f	2021f	2022f	2023f	2024f	2025f
Capacity, Non-Hydroelectric Renewables, % of total capacity	2.9	2.9	2.9	2.9	2.9	2.9

f = BMI forecast. Source: National Sources, BMI

Electricity Consumption

An average of 10.8% y-o-y increase in electricity consumption will result in Tanzanians consuming 12.2TWh by 2025, up from 4.9TWh in 2016. The majority of electricity consumption will come from households, which makes up more than half of Tanzania's total electricity consumption. This is followed by industrial and construction sectors. With Tanzania's current electrification rate of 24% along with large growth in generation forecast, Tanzania's population is set to benefit towards the future. However, a major constraint to increased electricity consumption growth is the average electricity prices in Tanzania, which at USD0.05/kWh is low compared to most countries in the region, but still too high for the majority of Tanzanian's living on a small income.

Table: Total Electricity Consumption Data And Forecasts (Tanzania 2014-2019)						
	2014	2015e	2016f	2017f	2018f	2019f
Consumption, Net Consumption, TWh	4.1	4.4	4.9	5.4	6.4	7.1
Consumption, Net Consumption, % y-o-y	11.6	9.7	9.7	11.7	16.7	11.8
Consumption, Net Consumption, KWh per capita	78.2	83.1	88.3	95.7	108.3	117.4

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

Table: Total Electricity Consumption Data And Forecasts (Tanzania 2020-2025)						
	2020f	2021f	2022f	2023f	2024f	2025f
Consumption, Net Consumption, TWh	7.8	8.7	9.5	10.3	11.2	12.2
Consumption, Net Consumption, % y-o-y	9.8	11.4	9.1	8.8	8.9	9.0
Consumption, Net Consumption, KWh per capita	125.1	135.3	143.3	151.5	160.3	169.7

f = BMI forecast. Source: BMI, EIA

Transmission & Distribution

BMI View: *Increased investment and foreign funding will help the Tanzanian government to increase the national electrification rate. We forecast that upgrades to the electricity grid will lead to transmission and distribution losses decreasing from 20.4% of total output in 2016 to 14.6% in 2025.*

Latest Updates

- The World Bank Board of Executive Directors has approved a loan of USD200mn to the Tanzanian government for the extension of electricity grid access to a further 2.5mn households over the next five years. The extension is being done through the Tanzania Rural Electrification Expansion Programme. The programme will involve increasing the supply of renewable energy in rural areas.
- The China Export-Import Bank has approved the funds for the construction of a transmission line between Dar Es Salaam and Arusha via Chalinze.

Structural Trends

We forecast that Tanzania's transmission and distribution losses will increase from 0.8TWh to 1.7TWh in 2025. However, we note that the percentage of total generation lost will actually decrease from 20.4% in 2016 to 14.6% in 2025 due to increased capacity being met with improved grid infrastructure.

Upgrades to the grid are necessary if Tanzania wishes to improve their low electrification rates of 36%. Although, despite the low levels of access to electricity, Tanzania is ranked 87th out of 189 countries for ease of getting electricity by the World Bank Group's 'Doing Business' report, ranking the country high above the Sub-Saharan African regional average.

The construction of a backbone interconnector between Tanzania, Kenya and Uganda will enable improved power distribution and trade between the countries. This will be further enhanced should the construction of another transmission line between Tanzania and Kenya be completed at Singida.

We note that the USD200mn loan provided by the World Bank Board of Executive Directors for the Tanzania Rural Electrification Expansion Programme will bolster further electrification efforts in the country. Having improved the electrification to 36%, we believe further electrification rates will prove mostly successful provided enough electricity capacity is brought online to support it. Under the National Rural Electrification Programme (2013-2022) the Tanzanian government is aiming to increase the country's electrification rate to 50% by 2025.

Table: Electric Power T&D Losses Data And Forecasts (Tanzania 2014-2019)

	2014	2015e	2016f	2017f	2018f	2019f
Electric power distribution losses, TWh	1.0	1.0	0.8	0.9	1.3	1.9
Electric power distribution losses, % of output	22.2	20.8	20.4	18.9	17.7	16.8

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

Table: Electric Power T&D Losses Data And Forecasts (Tanzania 2020-2025)

	2020f	2021f	2022f	2023f	2024f	2025f
Electric power distribution losses, TWh	1.8	1.8	1.7	1.7	1.7	1.7
Electric power distribution losses, % of output	16.2	15.9	15.5	15.1	14.9	14.6

f = BMI forecast. Source: BMI

Table: Trade Data And Forecasts (Tanzania 2014-2029)

	2014	2015e	2016f	2017f	2018f	2019f
Total Net Imports, TWh	0.6	0.7	1.7	1.7	0.2	-2.1

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

Table: Trade Data And Forecasts (Tanzania 2020-2025)

	2020f	2021f	2022f	2023f	2024f	2025f
Total Net Imports, TWh	-1.5	-0.7	0.0	0.7	1.6	2.5

f = BMI forecast. Source: EIA, BMI

Industry Risk Reward Index

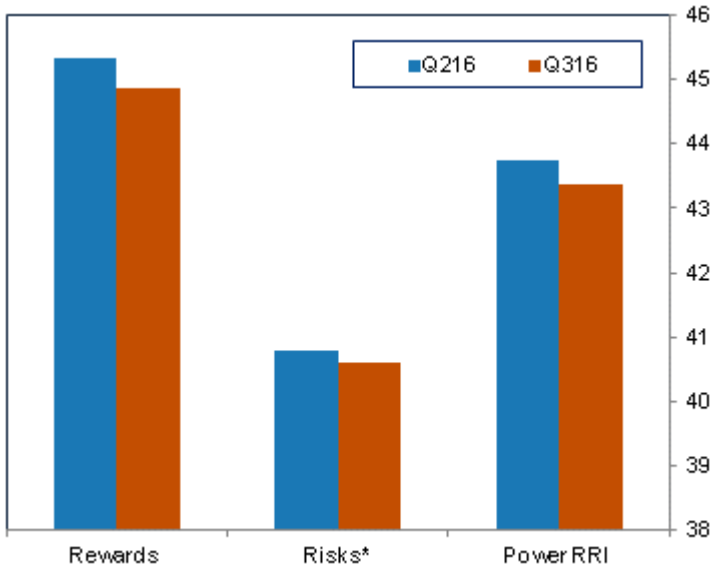
Sub-Saharan Africa Power Risk/Reward Index

BMI View: *Côte d'Ivoire maintains its leading position in our SSA Power RRI this quarter, while power markets in the Southern African region - namely Namibia, Zambia and Zimbabwe - are key underperformers with deteriorating outlooks. The average regional Power RRI score has fallen this quarter - indicating that political, economic, operational and regulatory headwinds have strengthened marginally across the region.*

Scores in our Power Risk/Reward Index (RRI) for the Sub-Sahara Africa (SSA) region continue to be dragged down by the ongoing challenges facing the power markets in the region, including underinvestment, electricity shortages, mismanagement at state-owned utilities, fuel shortages and a lack of reform hindering growth (*see 'Barriers To Power Sector Liberalisation To Persist', March 17*). Overall, the average Power RRI score for the SSA region has fallen this quarter, both in terms of risks and rewards - indicating that political, economic, operational and regulatory headwinds have deteriorated marginally across the region.

Falling Scores Highlight Continued Challenges

SSA Power RRI (Scores Out Of 100)



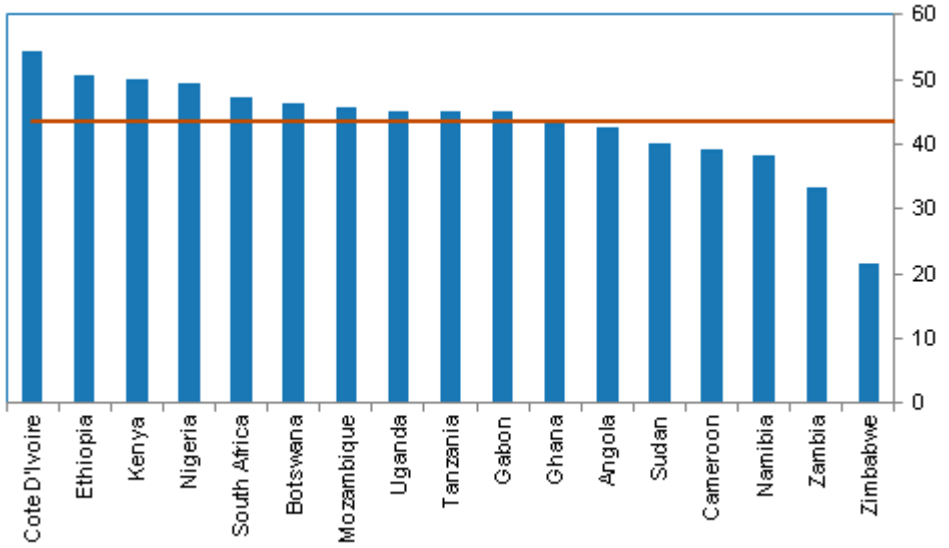
**Higher score = Lower risks. Source: BMI.*

There is a gap of more than 30 points between the first-ranked and last-ranked power markets in the SSA RRI. This reflects diverging trends across the power markets in the region, in terms of level of development, available growth opportunities and risks facing prospective investors.

We have seen some shifts in the rankings of our SSA Power RRI table this quarter. Kenya dropped to third position behind Ethiopia, while Côte d'Ivoire maintained its top spot. Sudan has moved up the table, as the commissioning of hydropower projects in the country has translated into brightening 'Rewards' scores in our index. Conversely, power markets in the Southern African region - namely Namibia, Zambia and Zimbabwe - are key underperformers, with deteriorating outlooks.

SSA Power RRI Snapshot

Power RRI By Country (Scores Out Of 100)



**Higher score = Lower risks. Source: BMI.*

Côte d'Ivoire Maintaining The Lead

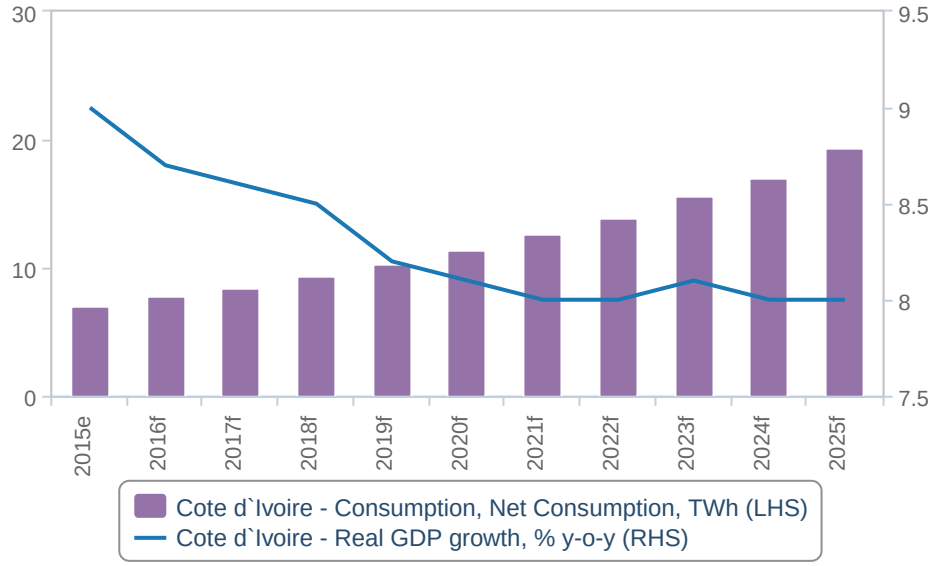
Political stability, a pro-business operating environment and a bright economic outlook will support growth in the power sector in Côte d'Ivoire over our 10-year forecast period, ensuring the country maintains its top spot in our ranking. Our Country Risk team forecasts real GDP annual growth of 8.7% in 2016, making Côte d'Ivoire our top SSA economic growth pick for this year(*see 'A Good News Story In 2016', January 5).*

Expanding the power sector will be high on the government's priority list, as increased industrial activity (most notably gold mining, but also nascent manufacturing and food processing) and private consumption growth will require a stable and growing supply of power over the coming decade. As such, we expect there to be significant opportunities for investors looking to Côte d'Ivoire's power sector. Supporting this view, it was announced in January that China has committed to provide USD813mn for a power project in the country, which involves expanding the national grid to supply power to 500 towns in Côte d'Ivoire. The

funding will be in the form of a USD778mn loan from the Export-Import Bank of China and a USD35mn grant from the Chinese government.

SSA Power Outperformer

Cote D'Ivoire - Real GDP Growth & Power Consumption



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

Kenya Falling, Ethiopia Rising

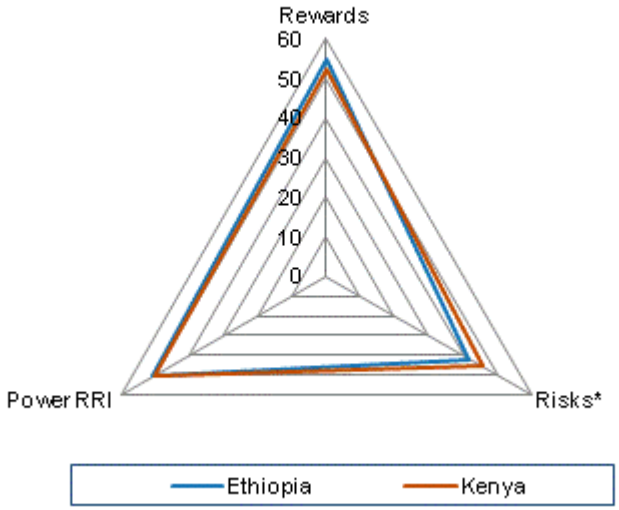
Ethiopia's and Kenya's power markets are notable bright spots in the region, due to both countries investing in new power capacity, in a bid to meet rising domestic power demand and unlock greater electricity export opportunities. However, the two have switched positions in our rankings table this quarter, on the back of Kenya's deteriorating score. Growth in Kenya's thermal power sector is being hampered by logistical issues and protests surrounding planned projects, most recently the planned coal-fired Lamu Power plant, which is muting the country's 'Industry Rewards' score (*see 'Thermal Power Hamstrung By Protests and Logistics', March 4*).

Ethiopia on the other hand, is driving up capital expenditure over the next two years in order to improve the country's infrastructural backbone, including the power sector - in line with its 'Growth and Transformation

Plan' (*see 'Expansionary Policy Will Drive Capital Expenditure', February 22*). This will support growth in power capacity, particularly hydropower projects - as the country positions itself as a manufacturing hub and also become an electricity export hub in East Africa.

Similar Profiles, Ethiopia Marginally Ahead

Power RRI By Country (Scores Out Of 100)

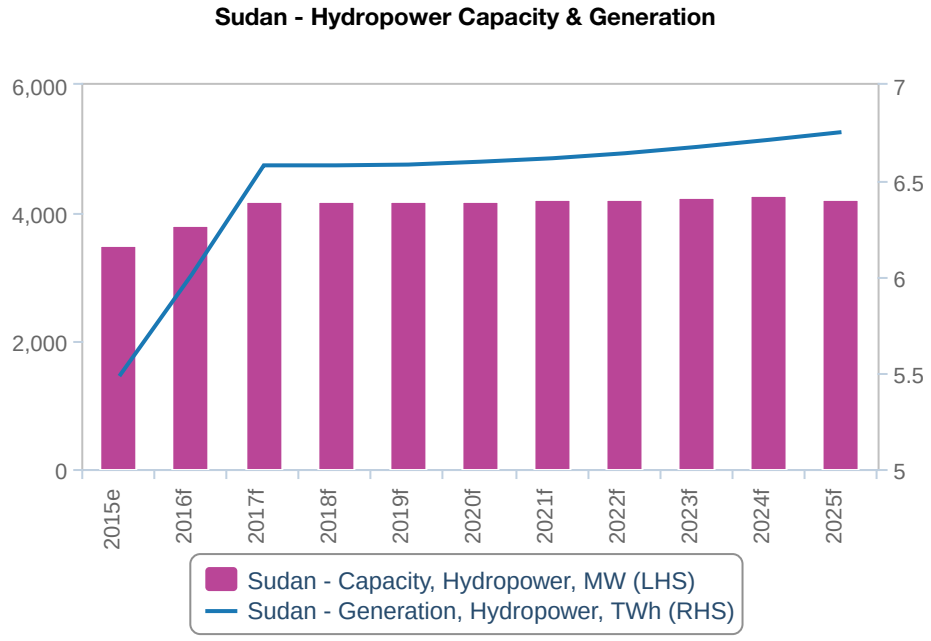


**Higher score = Lower risks. Source: BMI.*

Sudan Moving Up The Table

Although still positioned towards the latter end of our SSA RRI rankings, Sudan registered a notable increase in its score this quarter - driven by growing 'Rewards' - which saw its position improve in the table. The gradual realisation of the country's hydropower project pipeline has led us to upwardly revise our power capacity and generation forecasts, as three dams - with a combined capacity of 695MW - are scheduled to come online between 2016 and 2017 (*see 'Hydropower Projects Threatened By Saudi Budget Cuts', March 10*). In light of this, hydropower will maintain its dominant share in Sudan's power generation mix, contributing up to 59% of Sudan's total electricity generation by 2025. However, this will leave the power sector highly vulnerable to supply volatility - stemming from drought conditions, which will place a ceiling on Sudan's RRI score over the coming quarters.

Boosted Forecasts From Hydro Projects



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

Southern African Power Markets Underperforming

Power markets across Southern Africa are the notable underperformers in our RRI this quarter. Zambia, Zimbabwe and Namibia are all found at the bottom of the rankings table:

- Zimbabwe has long nbeen a regional underperformer due to its weak economic outlook and an unfavourable environment for private investment.
- Zambia's overreliance on hydropower means the country will remain susceptible to power generation shortfalls over the coming decade during periods of poor hydrology. Political hurdles to electricity tariff hikes will limit the government's ability to boost investment in new power generating capacity (*see 'Bleak Outlook For Vulnerable Power Mix', January 29*).
- The operating environment for Namibia's power sector is challenging as thermal power plants experience significant delays in construction and the finalisation of power purchase agreements (PPA). Political indecisiveness and a lack of consensus on a pricing level in an uncertain environment for gas prices is dragging on investment decisions, hindering growth in the sector (*see 'Gas And Hydropower Delays Boost Attractiveness Of Renewables', February 5*).

In addition to these country- and sector-specific issues, we note that in some cases the Southern African Power Pool (SAPP) - which allows for electricity trading between countries in Southern Africa (including

the aforementioned markets) - discourages investment in strengthening the domestic power sector. Specifically, countries have preferred to rely on importing electricity via their state-owned utilities rather than building up their own domestic capacity and liberalising their markets to attract private investment.

Table: SSA Power Risk/Reward Ratings (Scores Out Of 100)

	Industry Rewards	*Country Rewards*	*Rewards*	*Industry Risks**	*Country Risks**	*Risks**	*Power RRI*	*Rank*
Cote D'Ivoire	47.50	79.60	59.85	43.19	45.97	44.38	54.43	1
Ethiopia	47.00	68.20	55.15	46.83	35.15	41.82	50.49	2
Kenya	42.50	68.20	52.38	47.09	43.72	45.64	50.02	3
Nigeria	49.75	56.80	52.46	39.29	50.39	44.05	49.52	4
South Africa	47.00	35.00	42.38	51.54	62.50	56.24	47.23	5
Botswana	34.50	50.00	40.46	40.50	78.61	56.83	46.19	6
Mozambique	41.50	70.40	52.62	28.23	39.24	32.95	45.73	7
Uganda	38.50	58.00	46.00	42.48	44.73	43.45	45.11	8
Tanzania	43.50	48.00	45.23	39.01	52.30	44.71	45.05	9
Gabon	45.50	58.60	50.54	26.90	45.41	34.83	45.04	10
Ghana	26.50	61.00	39.77	40.81	61.25	49.57	43.20	11
Angola	44.50	52.00	47.38	25.33	45.17	33.83	42.64	12
Sudan	42.00	61.00	49.31	23.57	22.00	22.90	40.06	13
Cameroon	34.50	59.20	44.00	24.17	39.07	30.55	39.29	14
Namibia	23.50	52.00	34.46	34.83	59.30	45.31	38.26	15
Zambia	16.50	49.20	29.08	35.62	49.38	41.52	33.43	16
Zimbabwe	12.50	36.00	21.54	21.33	21.80	21.53	21.54	17
Regional Average	*37.49*	*56.66*	44.86	*35.93*	*46.82*	*40.60*	*43.37*	

**Higher score = Lower risks. Source: BMI*

Tanzania Power Risk/Reward Index

Tanzania's overall performance for the **BMI** Risk/Reward Index (RRI) is just above the Sub-Saharan African average, with a score equal to that of Gabon and Uganda and slightly lower than Botswana. Dropping three places to ninth since last quarter, Tanzania's main weaknesses are its low electricity capacity (due mostly to a previous overreliance on hydropower) and low electrification rate. We note that investments into diversifying its power sector, particularly with the discovery of new gas reserves, will improve Tanzania's overall RRI score in future.

Rewards

Industry Rewards

Tanzania is ranked towards the upper end of the table in the SSA region for its Industry Rewards score, placing just behind Angola and ahead of Kenya. Tanzania's score is mostly boosted by a strong forecast increase in average generation and consumption over the next five years of 25.8% and 11.8% respectively. Although generation and consumption growth are forecast to increase at a good rate, the current low levels of electricity capacity and consumption are dragging down the score. The low electrification rate of 24% further hampers the overall score.

Country Rewards

With a Country Rewards score that is lower than the SSA regional average, Tanzania is ranked below mid-table for this indicator, behind Botswana and equal with Zambia and Namibia. A large population forecast to grow at 3.15% annually, along with a forecast annual average real GDP growth rate of just under 6.7% means that Tanzania is primed for healthy growth in its electricity consumption levels. Factors which hamper its Country Rewards score are the high dependence on electricity imports, a currently low GDP per capita growth rate and a forecast inflation rate of 5.5% annually.

Risks

Industry Risks

Tanzania's weak outlook for renewable electricity as well as a low level of liberalisation means that it scores poorly for Industry Risks. Currently, Tanzania is ranked mid-table with a score slightly above the SSA regional average, equal with Nigeria and behind Botswana. Compared to some of its regional peers, Tanzania has some transparency in its tendering process and a degree of access to financing options, although we note that these levels could be higher and ultimately are still dragging down Tanzania's score.

Country Risks

Tanzania has a relatively favourable Country Risk score in the SSA region, ranking fifth overall, ahead of Nigeria and behind Namibia. A lack of strong legal institutions, high corruption levels and high exposure to external risk are all factors that prevent Tanzania from performing better in the **BMI** Country Risks segment. Propping up Tanzania's score is the high degree of policy continuity and a measure of short term political stability in the country.

Market Overview

Key Policies And Market Structure

Key Policies And Market Structure

Markets in Sub-Saharan Africa (SSA) tend to have similar challenges facing its power sectors, but these challenges also create opportunities, paving the way for investment in power mix diversification, new power capacity and upgrading the grid network.

- **Volatile Power Supply**

An over-reliance on hydropower has exposed may power sectors in the region to vulnerability and shortages. Droughts have caused countries such as Ghana, Zimbabwe and Zambia to suffer from grossly underperforming hydropower plants. Kariba Dam in Zambia has had a 1000MW shortfall in generating capacity as a result of low rainfall. Mismanagement and ageing plants have affected other countries as can be seen in Botswana's poorly performing Morupule B coal-fired power station. South Africa's coal-fired power plants have also been experiencing disruptions due to lack of maintenance, which led to the collapse of the main silo at the Majuba power station, causing it to only be able to run at 17% of its total capacity until its repairs in 2015 (final repairs are still ongoing, although the plant is able to run at full capacity once more).

Load shedding has been a common occurrence throughout SSA. In South Africa, state-owned utility **Eskom** has had to implement load shedding, especially during winter, with the country experiencing two to three hours of power cuts daily. This situation has improved due to repairs and upgrades at its power stations and currently South Africa has not had load shedding since 2015 (which can mostly be attributed to the economic slowdown crimping power demand). Other countries have had much worse power outages, as Zambia has been implementing power outages of 10 hours a day, whereas other areas in the country have had reported cases of over 24 hours of power cuts, due to the low water levels at Kariba Dam. Ghana has been providing an average of 12 hours of electricity every 36 hours.

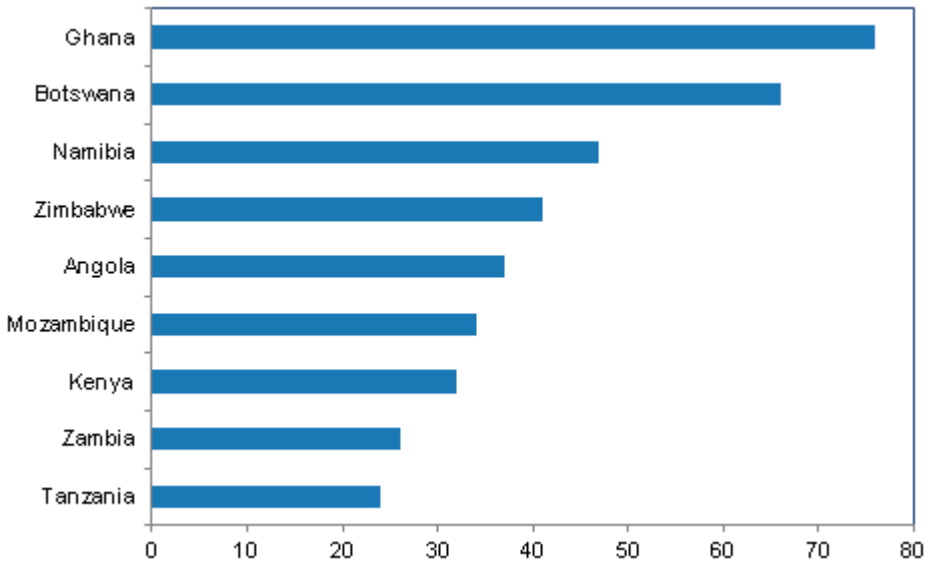
- **Grid Inefficiencies**

Many SSA countries suffer from high transmission and distribution losses due to a poor and ageing grid infrastructure. Namibia and Mozambique are countries that cover a wide area - being the world's 34th and 35th largest countries overall - with a widespread population, which makes it more difficult to extend grid

access to the population. Electricity supply tends to be of a low overall quality and many countries suffer from frequent power outages.

Access To Electricity, % of Population

Sub-Saharan Africa



As of March 2016. Source: BMI, National Sources, EIA, World Bank

That said, countries in the SSA region have been increasing their investments in improving grid infrastructure and extending electricity access. This should boost overall electrification rates as well as decrease transmission and distribution losses. Examples of such investments are:

- Mozambique has been investing over USD700mn in the construction of two major transmission line projects in the country.
- Kenya and Tanzania have received a USD145mn loan from the African Development Bank (AfDB) to build a 400kV transmission line between the two countries.
- Kenya has also received a USD457.5mn loan from the World Bank for improvements to its domestic grid infrastructure.

Increased Focus On Renewable Energy

Many SSA countries have been looking to renewable energy sources to boost overall generating capacity. Namibia and Angola have been investing in small decentralised solar power plants to supply electricity to the more rural communities, thereby decreasing the strain on the central power grid.

SSA's renewable energy leaders are South Africa and Kenya. In Kenya, construction has started on Africa's largest wind farm at Lake Turkana, set to deliver 310MW capacity, while the country has doubled its electricity exports, owing to geothermal capacity being added. By end-2025, we forecast Kenya to generate over 50% of its electricity from renewables sources.

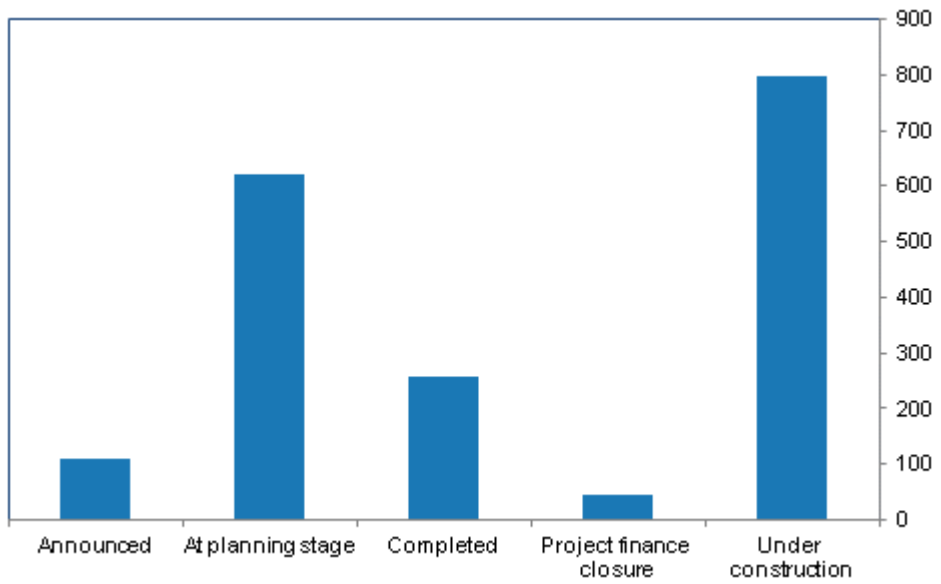
Further, the vulnerability of many SSA power sectors that are not diversified - and instead rely on hydropower sources - highlights the potential for non-hydropower renewable energy to plug any potential capacity gaps left by hydropower during dry spells.

Tanzania Power Projects Database

The majority of Tanzania's power projects have advanced to the construction phase, which can be attributed to the recent announcements by Tanzania Electric Supply Company (Tanesco) that it will actively pursue a strategy of diversifying away from hydropower. This means a lot of the projects are still relatively new, while some gas-fired projects could face possible delays as some investors will potentially wait until the gas price environment is more conducive to investment.

Projects Advancing To Construction Phase

Tanzania - Key Power And Renewables Projects By Status (MW)

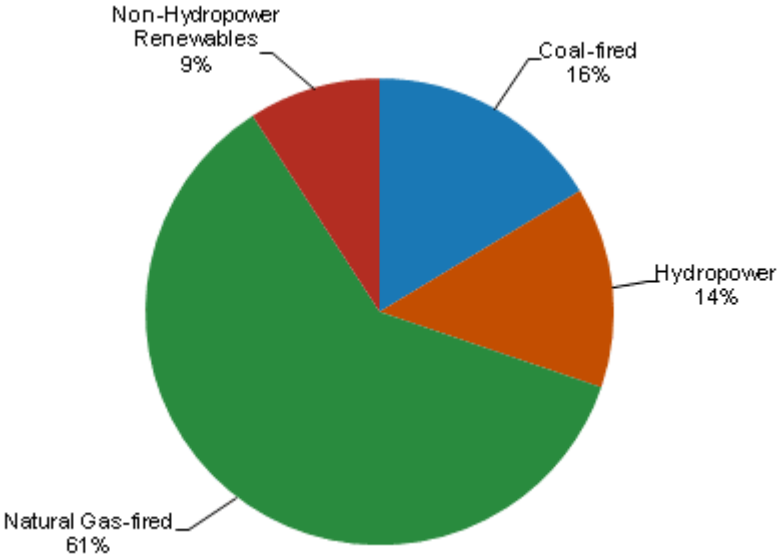


Source: BMI Key Projects Database

The discovery of vast gas reserves is reflected in the large share that gas-fired capacity has in the **BMI** Key Projects Database for Tanzania. This is a further indication of Tanesco actively diversifying the Tanzanian power sector by moving away from hydropower investment, with more than 75% of projects in the pipeline being thermal power projects.

Thermal Power To Receive Bulk Of Investment

Tanzania - Key Projects In The Pipeline By Type (MW)



Source: BMI Key Projects Database

Competitive Landscape

Increasing challenges in the Sub-Saharan African (SSA) power sector such as power shortages, have led to certain governments being more open towards the idea of liberalisation. Ongoing economic expansion in SSA has increasingly made governments aware of the need for increased electricity generation, leading to a shift towards attracting private investment. However, there are still many barriers to the SSA power sector becoming fully liberalised.

Dominance Of SOEs Potential Barriers To Growth

Competition in most SSA countries has been limited, with state-owned utilities (SOEs) still dominating their local markets. Vested interests, due to owning shares in the utilities, have made many governments reluctant to liberalise their power sectors. In South Africa, the governing ANC receives large profits from its shares in power utility, Eskom. Other governments stress they are wary of private investors increasing tariffs to levels that are unaffordable to the average consumer.

Overall, state-owned utilities in SSA have maintained their dominant positions, with many countries adopting the single buyer model and restricting IPPs to generation, while the state maintains control of transmission and distribution activities. South Africa's Eskom, Mozambique's Electricidade de Moçambique (EDM), Botswana Power Corporation (BPC), the Electricity Company of Ghana (ECG), Zimbabwe Electricity Supply Authority (ZESA) and Namibia's NamPower are all state utilities still dominating their local power sectors.

We maintain many state-owned utilities are dragging down the potential for power generation in the SSA region, due to inefficiencies and maladministration present in many sectors. In South Africa, Eskom has been struggling financially, posting a debt of ZAR333bn (Up to USD21.2bn) at end-2015, although in 2014 it paid out ZAR24.4mn (approximately USD1.56mn) in bonuses to its top three executives. In an apparent turnaround, Eskom said in July 2015 it will not be handing out bonuses at the end of the year to implement cost-cutting measures. Ghana's ECG is reportedly losing USD350mn every year, while ZESA's subsidiary, the Zimbabwe Electricity Transmission Distribution Company (ZETDC) is owed nearly USD1bn by its customers.

It is important to note the performance of some state-owned utilities has reportedly been jeopardised by government-meddling. The Zimbabwe Electricity Regulatory Authority (ZERA), although the de jure

independent regulator with the responsibility of setting tariffs, allegedly experiences frequent intervention by the government, which imposes its own tariffs on ZERA.

Towards the East African region, Uganda has been more successful with the liberalising of their power sector. In 2001 the Uganda Electricity Board (UEB) was unbundled into three successor companies: the Uganda Electricity Generation Company Ltd (UEGCL), the Uganda Electricity Distribution Company Ltd (UEDCL) and the Uganda Electricity Transmission Company Ltd (UETCL). The UEGCL, responsible for the majority of electricity generation, has been privatised, whereas the UETCL remains a government body. Eskom and **Umeme Ltd** are the companies that have won the generation and distribution licence concessions in Uganda, respectively.

In Kenya, more than 30% of overall power generation comes from independent power producers (IPPs). The overall policy climate and the sale of shares in Kenya Generating Company (KenGen) to private investors has contributed to a higher level of private participation in the Kenyan power sector compared to its SSA peers. That said, lack of clear policy and regulatory development meant there is still a degree of hesitation for some investors who could potentially enter the market.

In Tanzania, the government has been increasingly keen to attract foreign investment into the power sector, listing Tanzania Electric Supply Company Ltd (Tanesco) on the Dar es Salaam Stock Exchange. The government said it aims to increase the total generating capacity to 10GW and it has realised the most efficient and competitive manner to do this was to liberalise the power sector. The government will, however, still be maintaining a majority stake in Tanesco.

SAPP Hindering Reform In Southern Africa

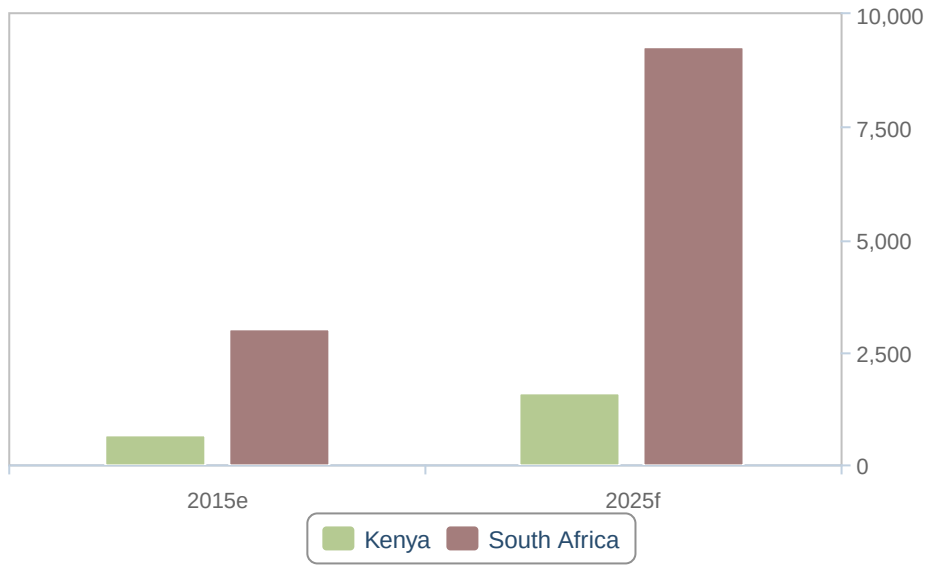
Notably, we partly attribute the slower rate of reform in Southern Africa not only to the fact that developed infrastructure is already in place, but also the Southern African Power Pool (SAPP), which allows for electricity trading between countries and, in some cases, discourages domestic investment. The SAPP was founded in 1995, and full membership is reserved for national utilities. The members of SAPP have created a common power grid between their countries and a common market for electricity.

The problem with the SAPP is that, because the level of liberalisation in many of its constituent countries is low, it has not yet evolved into an effective fully-fledged, market-based electricity trading system. While it is hoped it will ultimately evolve into such a system, the SAPP is currently aimed at the pooling resources and enhancing power sector cooperation between different countries to exploit the region's power generating potential at the lowest cost - to the benefit of all of the member states.

This has meant some countries preferred to rely on importing electricity via their state-owned utilities rather than building up their own domestic capacity and liberalising their markets to attract private investment. Others, meanwhile, have moved to advance huge export projects (often in the form of unfeasible mega-hydropower projects) to reap the revenues that can be generated from exporting electricity to their neighbours. South Africa, Mozambique, Zimbabwe and Namibia export electricity to the other participants in the SAPP, which does little to incentivise investment in costly new capacity in the countries that receive the electricity. Mozambique, for instance, exports 95% of the output from the 2,075MW Cahora Bassa hydroelectric plant at extremely low rates.

South Africa And Kenya Leading The Renewables Race

Non-Hydro Renewables Capacity By Country



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

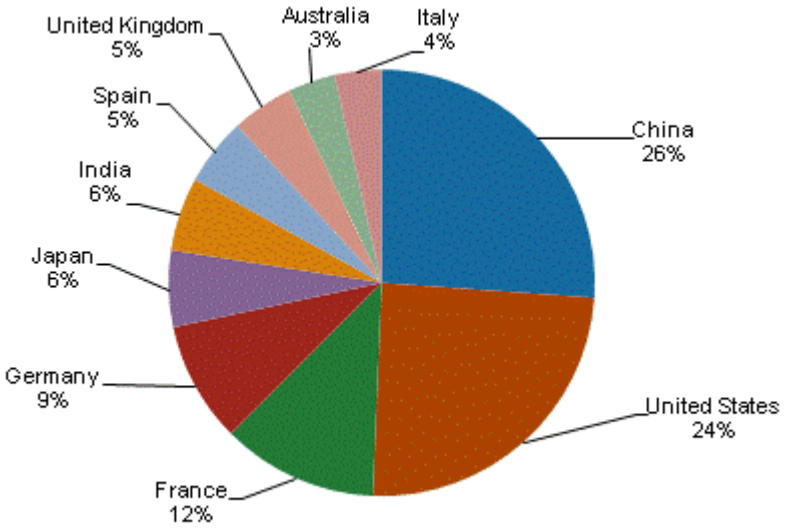
Renewables Investment Gaining Momentum

In terms of the implementation of regional power sector expansion plans and competitive electricity markets, we believe a growing emphasis on exploiting renewable energy resources could provide a foothold for entrants in the African power sector. We are seeing an uptick in the number of new entrants and private foreign competitors in SSA's renewables industry, with South Africa and Kenya leading the way in terms of

private sector investment. The number of domestic renewables companies operating in these markets has increased significantly and they dominate the competitive landscape in Kenya and South Africa. We forecast Kenya will generate more than 50% of total electricity from renewable sources (the highest ratio of any SSA country), which is being driven by continued investment in expanding its geothermal capacity.

China And US Dominate SSA Investment Landscape

Foreign Investment Into SSA Power Sector



Source: BMI Key Projects Database

SSA Power Sector Still Drawing International Attention

Although liberalisation in the SSA region has been limited, there has nonetheless been a growing amount of foreign investment in the region's power sector. The majority of investments come from South Africa, but we highlight the high level of investment from the United States and China (*see chart*). If anything, this highlights the possible scope of increased investment should higher levels of liberalisation of power sectors in SSA occur.

Regional Overview

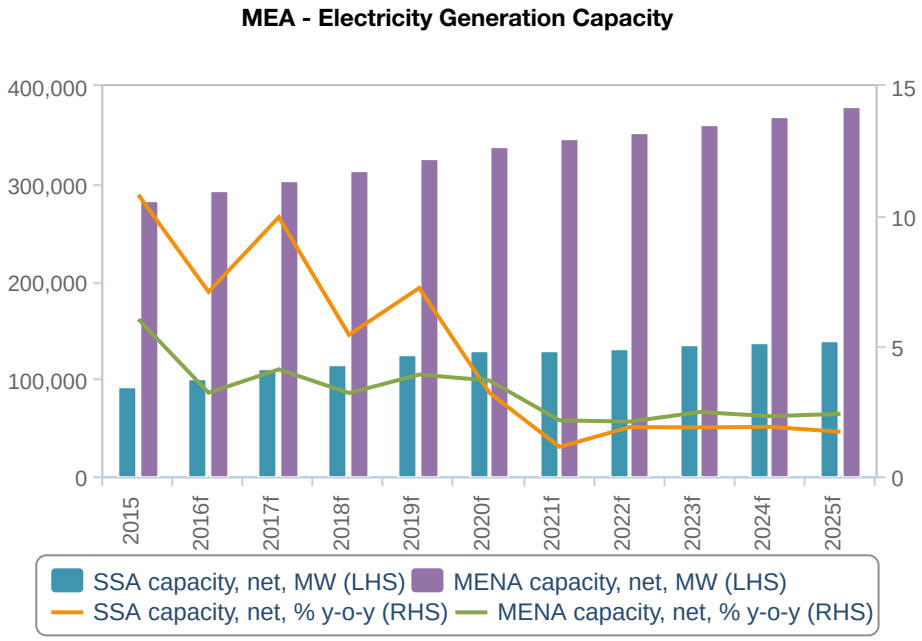
Middle East And Africa - Regional Overview

BMI View: *MENA power markets will continue to present more attractive opportunities for power sector investors than those in SSA. Relative political stability in Egypt and the relaxing of sanctions on Iran will make the two countries relatively attractive to investors in a MENA power market, while Ethiopia, Kenya and Côte d'Ivoire are poised to outperform an SSA power market that is hampered by structural problems.*

Within the broader Middle East and Africa (MEA) region, there are clear-cut differences between the power markets in the Middle East and North Africa (MENA) sub-region and those in Sub-Saharan Africa (SSA). These sub-regional distinctions can be attributed to size and maturity of power sectors, the composition of the power mix in constituent countries, the levels of economic development and the potential for growth in power generation capacity.

As illustrated in the chart below, the power markets in MENA are relatively developed and supported by strong project pipelines. In stark contrast, the power markets in the SSA are characterised by limited power generating infrastructure and widespread power shortages, stemming from underinvestment in the region's power markets.

MENA To Outperform In Terms Of Capacity Growth

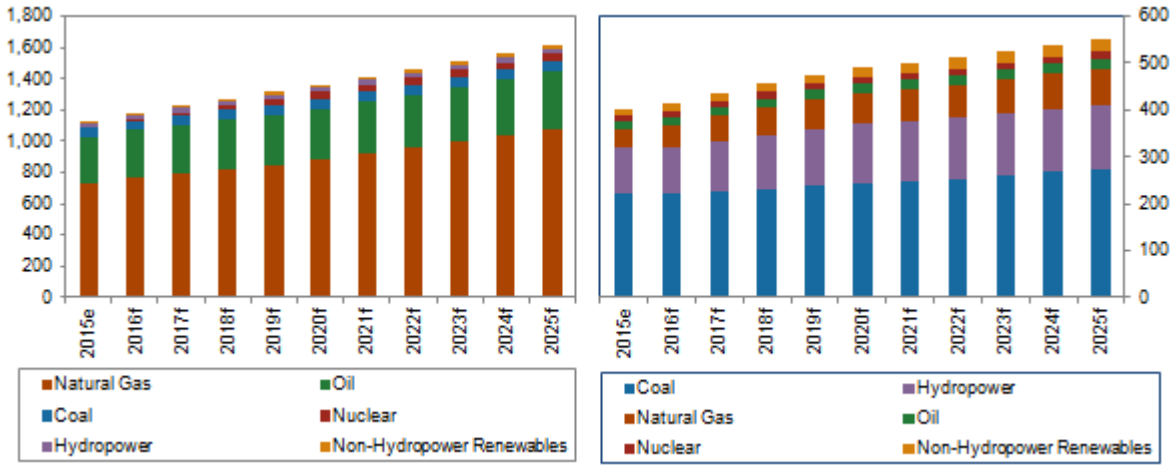


e/f = estimate/forecast. Source: EIA, BMI

Thermal power is the dominant source of electricity in both MENA and SSA (*see chart below*). In MENA, we forecast gas-fired power generation, the region's main source of electricity, to comprise 65.2% of the regional power mix in 2016. As key oil producers will look to conserve oil for export as opposed to fuelling power generation, gas's share in the power mix will grow to 66.8% by 2025. In the SSA region, coal-fired power will maintain the largest share in the power mix, mostly due to a well-established South African coal power sector (which we expect will comprise 94% of total SSA coal-fired power generation by 2025). That said we expect the share of coal in the SSA power mix to fall marginally over the next decade, as countries like Mozambique, Ghana, Nigeria and Côte d'Ivoire are all looking to boost gas-fired power generation by utilising domestic gas reserves.

Diverging Power Mixes In Composition And Size

Power Generation By Type in MENA (LHS) & SSA (RHS), TWh

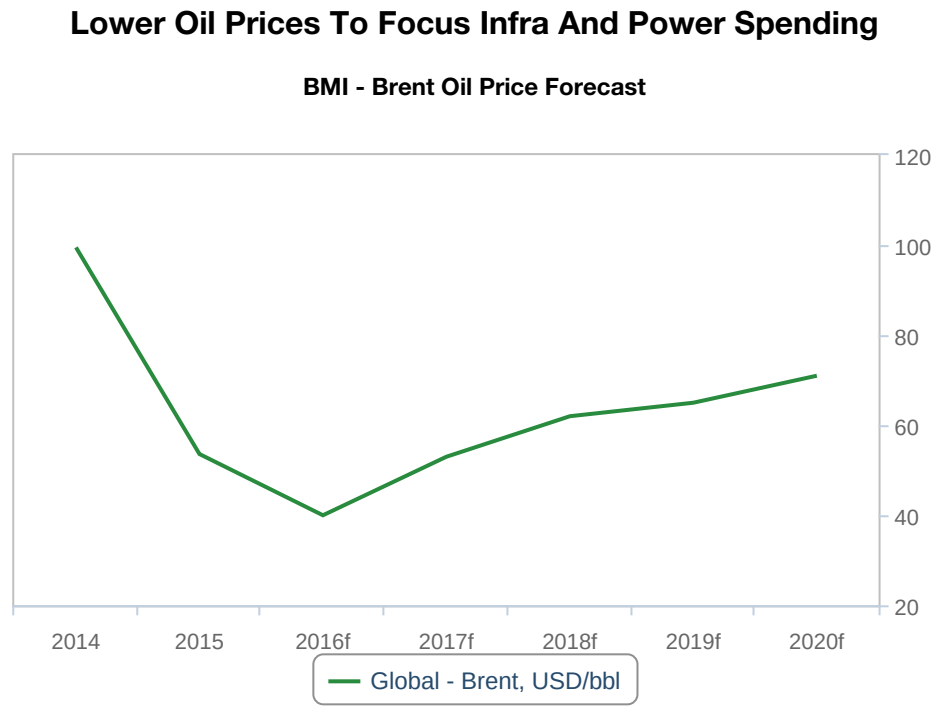


e/f = estimate/forecast. Source: EIA, BMI

Key Themes In The MENA Power Sector:

- **Lower Oil Prices To Boost Diversification Efforts**

A sustained period of lower oil prices will mean that MENA's oil exporters will focus on strategically important projects in order to meet surging power demand and support power mix diversification efforts (*see chart below*). Substantial foreign reserves and fiscal buffers will mean that oil exporters such as the UAE, Saudi Arabia and Kuwait will remain relatively resilient to lower oil prices - but we highlight that fiscal consolidation pressures are increasing. Importantly, in the case of Saudi Arabia, fiscal pressures will limit investment into nuclear power projects and renewable energy as the country consolidates its fiscal spending over the coming years.



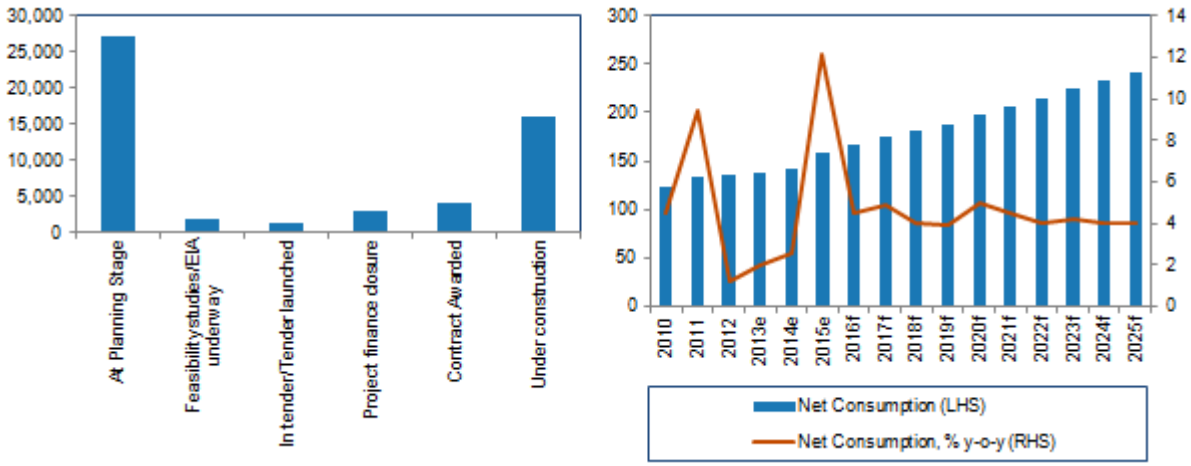
f = forecast. Source: BMI

- **Iran And Egypt Poised For Strong Growth**

We expect the stabilisation of Egyptian politics under President Abdel Fattah el-Sisi and the unwinding on sanctions on Iran to translate into strong growth trajectories for the two countries' power sectors. In the case of Egypt, relative stability in domestic politics - after a series of tumultuous years in the wake of the Arab Spring - has resulted in a series of investment pledges and an increasingly robust project pipeline (*see chart below*). While we are currently cautious to include much of the planned capacity into our 10-year forecast, due to continued political uncertainty and security threats, Egyptian power generation is still poised to expand by an annual average of 4.3% between 2016 and 2025 as the project pipeline progresses.

Materialising Project Pipeline To Help Egypt Meet Surging Power Demand

Egypt - Project Pipeline By Development Stage, MW (LHS) & Total Power Consumption (TWh) & y-o-y % chg (RHS)

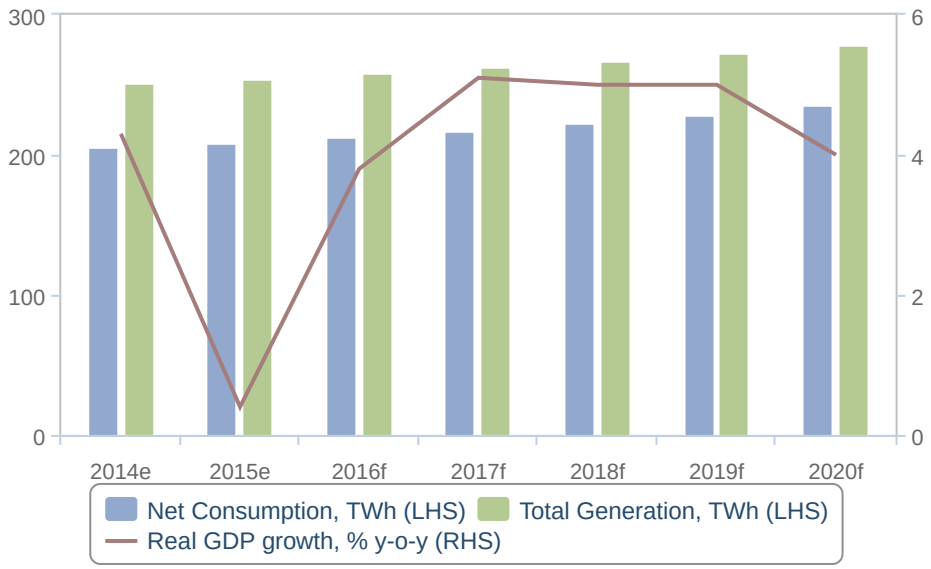


Source: BMI Key Projects Database, EIA, BMI

Iran will be another positive growth story in our MENA coverage. The relaxing of international sanctions will catalyse investor interest in its power market, bolstering a currently limited power project pipeline. We expect Iran to encourage private investment in its power sector in order to expand power generating capacity and boost efficiency at existing facilities (*see 'Sanctions Removal To Rejuvenate Power Project Pipeline, January 19).* This will in turn attract foreign direct investment (FDI) - despite obstacles such as corruption, underinvestment in infrastructure and caution among US banks - as investors aim to unlock opportunities in the Iranian power market.

Economic Growth Picking Up

Iran - Real GDP Growth y-o-y % Chg, Total Power Generation And Total Power Consumption, TWh



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

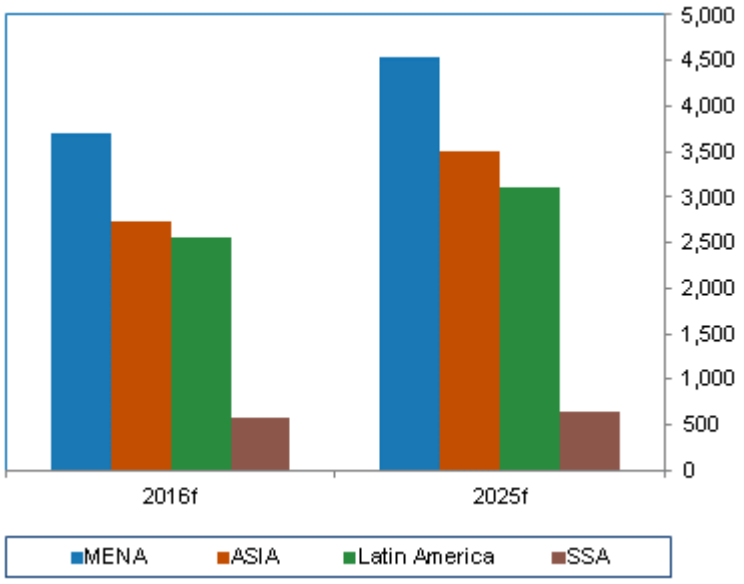
Key Themes In The SSA Power Market:

- **SSA Power Market To Remain Hampered By Limited Reform**

Limited power sector reform will continue to blight power generation in the SSA. A history of underinvestment in power generating facilities, the adverse impact of drought on hydropower generation and a continued gap between electricity tariffs and the costs of capacity deployment will mean that the region will remain defined by power generation shortfalls. Popular opposition to tariff hikes in Nigeria, South Africa, Zimbabwe, Ghana and Namibia emphasise that supporting indebted state-owned utilities via higher electricity prices will remain politically unpalatable in the region. Low electricity tariffs will also curb returns on investment for private actors. We note that in the case of Zambia, opposition to tariff hikes ahead of an upcoming general election in 2016 forced the government to backtrack within days of announcing the hikes, illustrating the hurdles to regional power market reform (*see 'Bleak Outlook For Vulnerable Power Mix', January 29).*

SSA To Remain Under-electrified

Power Generation Per Capita (kWh) By Region



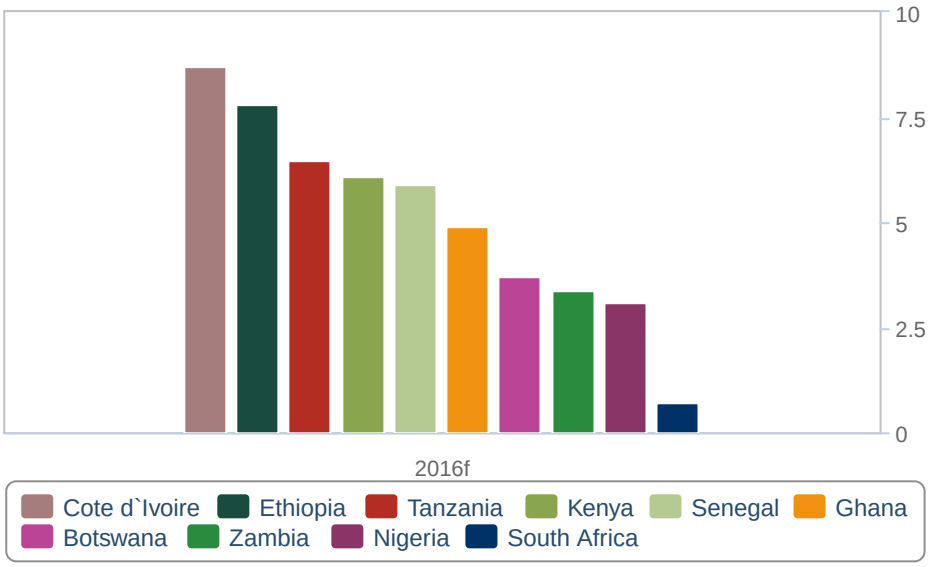
Source: EIA, BMI.

- **East-Africa Outperforming: Kenya And Ethiopia To Be Frontrunners**

East Africa has been relatively insulated to power shortages compared to its Southern and West African neighbours. In particular, Ethiopia and Kenya have been able to better meet pent up demand by installing new power generating capacity. For example, the 1,870 megawatt (MW) Gibe 3 hydropower plant has boosted power output in Ethiopia, while Kenya has been rapidly expanding its geothermal power segment - as evidenced by the 280MW expansion of the Olkaria geothermal complex in late 2015. As such, reliable access to power in turn supports our relatively upbeat GDP growth outlook for Ethiopia and Kenya - with the economic windfalls of lower oil prices supporting growth momentum for the two net oil-importing countries (*see chart below*).

Reliable Electricity Supply Benefits Economy

Select SSA Countries - Real GDP Growth, % y-o-y



Source: National statistics, BMI

We also expect Côte d'Ivoire (West Africa) to be better positioned than most of its regional counterparts over the coming years. An improved business environment under President Alassane Ouattara's leadership has been a key to improving the attractiveness of the Ivorian power sector for private investors (*see 'Gas Expansion To Cement Outperformer Status', October 2 2015)*. The ongoing gas-fired power expansion in the country and an expanding project pipeline will further cement Côte d'Ivoire's power market outperformer status in the SSA over the coming years. This upbeat outlook for the Côte d'Ivoire will be supported by a rise in the price of cocoa - the country's major export - underpinning the momentum in real GDP growth over the coming years (*see chart above*).

Glossary

Table: Glossary Of Terms

bn: billion	**IPP: independent power producer**
capex: capital expenditure	km: kilometres
CEE: Central and Eastern Europe	kW: kilowatt (10^3 watts)
CHP: combined heat and power plants	kWh: kilowatt hour
DoE: US Department of Energy	LNG: liquefied natural gas
e/f: estimate/forecast	MEA: Middle East and Africa
EBRD: European Bank for Reconstruction and Development	mn: million
EIA: US Energy Information Administration	MoU: memorandum of understanding
EM: emerging markets	MW: megawatt (electric) (10^6 watts)
EU ETS: European Union Emissions Trading System	MWh: megawatt hour
EU: European Union	na: not available/applicable
EWEA: European Wind Energy Association	NGL: natural gas liquids
FDI: foreign direct investment	OECD: Organisation for Economic Co-operation and Development
FiT: feed-in tariff	OPEC: Organization of the Petroleum Exporting Countries
FTA: free trade agreement	PV: solar photovoltaics
GDP: gross domestic product	RES: renewable energy sources
GHG: greenhouse gas	R&D: research and development
GW: gigawatt (10^9 watts)	t: metric ton = tonne (1 t = 1,000 kg)
GWh: Gigawatt hour (1 GWh = 3.6 TJ)	TPES: total primary energy supply
GWEC: Global Wind Energy Council	trn: trillion
IAEA: International Atomic Energy Agency	TW: terawatt (10^{12} watts)
IEA: International Energy Agency	TWh: terawatt hour (1 TWh = 3.6 PJ)
IMF: International Monetary Fund	-
IPO: initial public offering	-

Source: BMI

Methodology

Methodology And Sources

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 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. They 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.

We mainly use OLS estimators and in order to avoid relying on subjective views and encourage the use of objective views, we use a 'general-to-specific' method. We mainly use 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 our industry forecasting. Experience, expertise and knowledge of industry data and trends ensure analysts spot structural breaks, anomalous data, turning points and seasonal features where a purely mechanical forecasting process would not.

Sector-Specific Methodology

- **Generation And Consumption Data**

A number of principal criteria drive our forecasts for each generation and consumption variable, with the following identity forming the basis of our forecast model:

"Total consumption = total generation + total net imports - transmission and distribution losses"

- **Total Generation**

Total generation is defined as the process of producing electric energy or the amount of electric energy produced by transforming other forms of energy, commonly expressed in kilowatthours (kWh) or related units.

While gross electricity production is measured at the terminals of all alternator sets in a station, and thus includes the energy taken by station auxiliaries and losses in transformers that are considered integral parts of the station, net electricity production is defined as gross production less own use of power plants.

According to the International Energy Agency (IEA), the difference between gross and net production is generally observed to be about 7% for conventional thermal stations, 1% for hydro stations and 6% for nuclear.

Historical figures for electricity generation are based on data published by the US Energy Information Administration (EIA) and the World Bank, and consider net electricity production. Whenever possible, we compare these data with accounts published by government/ministry sources and official data of the companies operating in each country.

BMI's electricity generation forecasts examine the sector with a bottom-up approach, forecasting electricity production for each resource in order to calculate the value of total generation. The regression model used

to calculate generation considers real GDP, industrial production, fixed capital formation, population and fiscal expenditure.

- **Total Consumption**

Total consumption is commonly expressed in kilowatt hours (kWh) or related units.

Historical figures for electricity consumption are based on data published by the EIA. Whenever possible, we compare these data with accounts published by government/ministry sources and official data of the companies operating in each country. Our electricity consumption forecasts are based on a regression similar to the model illustrated above for electricity generation.

- **Total Net Imports**

Historical figures for net imports are computed as total imports, minus total exports, based on data from the EIA. Our total net imports forecasts are calculated as total consumptions, minus total generation, plus transmission and distribution losses.

- **Transmission And Distribution Losses**

Transmission and distribution losses include electric energy lost due to the transmission and distribution of electricity. Much of the loss is thermal in nature.

Our historical figures for electricity transmission and distribution losses are computed as generation, plus net imports, minus consumptions. However, transmission and distribution losses are calculated using a regression model in the forecasts.

- **Electricity Generating Capacity Data**

Electricity generation capacity is defined as the maximum output, commonly expressed in megawatts (MW) or related units, that generating equipment can supply to system load, adjusted for ambient conditions.

Historical figures for electricity generation capacity are based on data published in UN statistical databases. Whenever possible, we compare these data with accounts published by government/ministry sources and official data of the companies in each country.

Our electricity generation capacity forecasts examine the sector with a bottom-up approach, forecasting capacity for each resource to calculate the total value of capacity in each country. Our electricity generation capacity forecasts are based on a regression similar to the model illustrated above for electricity generation.

Sources

BMI uses publicly available information to compile the country reports and collate historical data. Sources used in power industry reports include those from international bodies mentioned above, such as the EIA, the World Bank and the UN as well as local energy ministries, officially released company figures, national and international bodies and associations and news agencies.

Risk/Reward Index Methodology

BMI's Risk/Reward Index (RRI) provide 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 RRR system divides into two distinct areas:

Rewards: Evaluation of a sector's size and growth potential in each state, and also broader industry/state characteristics that may inhibit its development. This is 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 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 that call into question the likelihood of anticipated returns being realised over the assessed time period. This is 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.

We take a weighted average, combining industry and country risks, or industry and country rewards. These two results in turn provide an overall Risk/Reward Index, 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 (100 being the best), with the overall Risk/Reward Index a weighted average of the total score. Importantly, as most countries and territories evaluated are considered by **BMI** to be 'emerging markets', our score is revised on a quarterly basis. This

ensures the score draws on the latest information and data across our broad range of sources, and the expertise of our analysts.

Indicators

In constructing these scores, the following indicators have been used. Almost all indicators are objectively based.

Table: Power Risk/Reward Index Indicators

	Rationale
Rewards	
Industry Rewards	
Electricity capacity, MW, 5-year average	Objective measure of size of sector, based on BMI's power forecasts. The larger the sector, the greater the opportunities.
Electricity generation, GWh, 5-year average	Objective measure of size of sector, based on BMI's power forecasts. The larger the sector, the greater the opportunities.
Electricity generation, %, 5-year average	Objective measure of growth potential, based on BMI's power forecasts. Rapid growth results in increased opportunities.
Electricity consumption, GWh, 5-year average	Objective measure of size of sector, based on BMI's power forecasts. The larger the sector, the greater the opportunities.
Electricity consumption, %, 5-year average	Objective measure of growth potential, based on BMI's power forecasts. Rapid growth results in increased opportunities.
Access to electricity, % of population	Objective measure of size of sector. The larger the sector, the greater the opportunities. Low electricity coverage is proxy for pre-existing limits to infrastructure coverage.
Country Rewards	
Real GDP growth, %, 5-year average	Proxy for the extent to which structure of economy is favourable to the power sector. The more substantial the growth rate, the greater the demand and the need for additional generation.
GDP per capita, %, 5-year average	Proxy for the extent to which structure of economy is favourable to the power sector. The more substantial the growth rate, the greater the demand and the need for additional generation.
Population, % change y-o-y	Proxy for extent to which demographic dynamics are favourable to power sector. The more substantial the growth rate, the greater the demand and the need for additional generation
Imported raw material dependence	Objective measure taken from BMI's Oil & Gas service. It gives an indication of a renewables market's exposure to thermal fuel imports, namely gas.
Electricity import dependence	Objective measure of sector. Denotes underlying risks to the security of power sector. The lower the imports, the greater the energy security.
Inflation, 5-year average	Proxy for the extent to which structure of economy is favourable to the power sector. The lower the inflation, the better the financial outlook of power projects.
Risks	
Industry Risks	
Liberalisation level	Subjective evaluation against BMI-defined criteria. Evaluates barriers to entry.

Power Risk/Reward Index Indicators - Continued	
	Rationale
Financing	Objective measure from BMI's Infrastructure Project Finance scores. It quantifies the risks to both raising financing and repayment of project loans over the course of a project's life
Renewables outlook	Objective measure taken from our Infrastructure service. Used as a gauge to measure the potential and sophistication of renewable sector
Transparency of tendering process	Subjective evaluation against BMI-defined criteria. Evaluates predictability of operating environment.
Country Risks	
Short-term political stability	From BMI's Country Risk Index (CRI). Denotes health of political structure, including various indicators such as policy making-process, social stability and security/external threats and policy continuity.
Policy continuity	Subjective score from CRI. Denote predictability of policy over successive governments.
External risk	From CRI. Denotes vulnerability to external shock, which is principal cause of economic crises.
Institutions	From CRI. Denotes strength of legal institutions in each state. Security of investment can be a key risk in some emerging markets.
Corruption	From CRI. Denotes risk of additional illegal costs/possibility of opacity in tendering/ business operations, affecting companies' ability to compete.

Source: BMI

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

Table: Weighting Of Indicators	
Component	**Weighting, %**
Rewards	65, of which
Industry Rewards	40, of which
Electricity capacity, MW, 5-year average	10
Electricity generation, GWh, 5-year average	5
Electricity generation, %	8
Electricity consumption, GWh	5
Electricity consumption, %	8
Access to electricity, % of population	4
Country Rewards	25, of which
Real GDP growth, %, 5-year average	5
GDP per capita, %, 5-year average	5

Weighting Of Indicators - Continued	
Component	**Weighting, %**
Population, % change	5
Imported raw material dependence	3.5
Electricity import dependence	3.5
Inflation, 5-year average	3
Risks	35
Industry Risks	20, of which
Liberalisation level	4
Financing	6
Renewables outlook	6
Transparency of tendering process	4
Country Risks	15, of which
Short-term political stability	4
Policy continuity	2
External risk	3
Institutions	3
Corruption	3

Source: BMI