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Q3 2016

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IRAN

POWER REPORT

INCLUDES 10-YEAR FORECASTS TO 2025

Published by:BMI Research

Iran Power Report Q3 2016

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Part of BMI's Industry Report & Forecasts Series

Published by: **BMI Research**

Copy deadline: June 2016

ISSN: 1755-7054

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BMI Industry View

BMI View: *The easing of sanctions, which began in earnest in Q116, is beginning to result in investment in Iran, including in the power sector, and we expect such gains to continue as firms seek to exploit the opportunities created by fresh access to a very large, and long-neglected, market. However, the overall outlook is for moderate, rather than strong, growth due to a poor outlook for government spending and the partial nature of the sanctions removal.*

Table: Headline Power Forecasts (Iran 2015-2021)

	2015e	2016f	2017f	2018f	2019f	2020f	2021f
Generation, Total, TWh	262.940	272.980	277.590	285.370	298.620	309.750	320.160
Consumption, Net Consumption, TWh	213.9	223.6	232.6	239.5	249.8	261.5	272.4
Capacity, Net, MW	84,825.9	87,046.7	89,221.2	91,926.7	94,363.8	96,562.3	98,582.0

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

Latest Updates And Structural Trends

- Iran's Energy Minister Hamid Chitchian flagged the possibility of linking Iran's power grid to counterparts in the EU (June 2016).
- Turkey's **Unit International** announced it will invest USD4.2bn in seven gas fired plants in Iran, adding 6,020MW to the national grid (June 2016).
- South Korea's **Hyundai Engineering** announced it is close to sealing a deal with Iran to construct a 500MW power plant 25km off Zanjan, together with a gas injection station and high voltage power transmission lines (April 2016).
- China's **Shanxi Energy** met with Iran's Renewable Energy Organization to discuss a potential 600MW photovoltaic plant (April 2016).
- UK company **Cyan** secured a USD14mn contract to provide smart electricity meters to Iran; 360,000 units will be provided to major industrial users, which account for 25% of Iran's power consumption (April 2016).
- Germany's **Siemens** announced in March 2016 that it had signed a deal with Iran's **Mapna Group**, with the latter acquiring technology to manufacture over 20 gas turbines. The two firms also signed a memorandum of understanding (MoU) for further work in Iran's power sector.
- Iran's Atomic Energy Organization announced in March 2016 that it was seeking to cooperate with Japan in building several small nuclear plants, according to the Tehran Times.

- Iran in February 2016 announced that it was evaluating a potential project, in cooperation with Hungary, to design a 25MW nuclear reactor, which would then be marketed across Africa and Asia. If successful, a 100MW reactor may then be launched, again for sale across continents.
- Greece's energy ministry stated in February 2016 that it was in talks with Iran to secure a supply of natural gas for local needs, which could be followed by further shipments through Greece to other European markets. This news followed an agreement between Greece's **Hellenic Petroleum** and Iran for the latter to supply the former with crude oil, which would be refined by the Greek entity, with some refined output finding its way back to Iran.
- In October 2015, Germany's **Green Energy 3000 GmBH** signed a memorandum of understanding with the **Khuzestan District Electricity Company** (KDEC) to install 100MW of solar power in the southwestern city of Ahvaz. The Ahvaz MoU follows the signing of an agreement in August between the German and Iranian governments in August, which aims to generate 100MW of wind power, plus 400MW of solar in Khuzestan.
- Iranian press reported the government had signed a series of agreements which could lead to the installation of around 1GW of new solar capacity in Khuzestan.
- In early November, it was reported the government had signed an agreement worth USD6bn with an unnamed European company to install 4,250MW of new capacity, much of it made up of wind power, in the country.
- Italy's **Fata**, part of **Finmeccanica**, has also reportedly signed a preliminary agreement with the **Ghadir Investment Company** to build a power plant in Iran. The agreement could be worth up to USD543mn.
- It was also reported in the Iranian press the government had held a series of talks with South Korean energy companies, aimed at developing renewables plants. The companies reportedly included **Hyundai**, **Tucson**, and **LSLC**, as well as the Export-Import Bank of Korea.
- Several government delegations have visited Tehran with a view to foster cooperation in the electricity sector. This includes a September visit by Spain's Industry, Energy and Tourism Minister Jose Manuel Soria to see Energy Minister Hamid Chitchian, during which the two discussed cooperation on renewable energy and a visit from Russian Energy Minister Alexander Novak, aimed at exploring cooperation on power issues between Iran and Russia.
- There has also been considerable progress on the strengthening of Iran's electricity trade with its neighbours, including the launching of a new round of talks aimed at building a 400kV line from the Turkmen city of Mary to the Iranian city of Sarakhs, and negotiations between the Iranian and Armenian governments to increase their gas for power trade by 75%.

SWOT

Iran Power SWOT

Strengths	▪ Iran has abundant reserves of hydrocarbon wealth, providing the basis for long-term energy self-sufficiency. It is estimated to hold the world's second-largest gas reserves and fourth-largest oil reserves. It also has some hydroelectric resources, abundant sunlight, and despite international opposition, continues to pursue its nuclear power ambitions. ▪ Iran's high access rate - almost 100% - means the country is an enormous market for sale of electricity. ▪ Iran currently trades power with Afghanistan, Armenia, Azerbaijan, Iraq, Pakistan, Turkey and Turkmenistan.
Weaknesses	▪ The price of natural gas to residential and industrial consumers is state controlled at extremely low prices, undermining profitability. ▪ Iran's economy continues to be hamstrung by the low price of oil and gas, meaning it will continue to be difficult for the government to raise prices and cut subsidies.
Opportunities	▪ Iran is believed to have the potential to produce some 6.5GW of electricity from wind energy, as well as significant solar power potential. ▪ Nearby states, such as India and Pakistan, face a shortage of electricity, providing export opportunities. ▪ Foreign power developers may export a portion of the power they produce to neighbouring countries. Easing of sanctions by US government from Q116 creates major opportunities for foreign firms, after years of under investment.
Threats	▪ Sanctions withdrawal will be phased and gradual with potential for major hiccups along the way. ▪ Despite poor government finances, there is little prospect that power subsidies will be cut much further over the medium-term, amid fears of unleashing unrest.

Iran Power SWOT - Continued

- Gas and oil are major drivers of government finances, and both commodities have suffered a bear market in the last couple of years.

Industry Forecast

Iran Snapshot

Table: Country Snapshot: Economic and Demographic Data (Iran 2015-2020)

	2015e	2016f	2017f	2018f	2019f	2020f
Nominal GDP, USDbn	465.8	423.0	469.9	515.3	562.4	608.5
GDP per capita, USD	5,860	5,257	5,771	6,256	6,754	7,230
Real GDP growth, % y-o-y	0.4	3.8	5.1	5.0	5.0	4.0
Population, mn	79.1	80.0	81.0	81.8	82.6	83.4

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

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

	2020f	2021f	2022f	2023f	2024f	2025f
Nominal GDP, USDbn	608.5	645.9	675.8	708.2	742.6	772.7
GDP per capita, USD	7,230	7,599	7,876	8,179	8,502	8,774
Real GDP growth, % y-o-y	4.0	3.6	3.9	3.9	3.6	3.4
Population, mn	83.4	84.1	84.8	85.4	86.0	86.5

f = BMI forecast. Source: National sources, BMI

Table: Country Snapshot: Power Sector

Access to electricity, % of population	**100.0**
Quality of electricity supply (value)	5.0/7
Quality of electricity supply (rank)	58/140

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

Iran Power Forecast Scenario

BMI View: *Iran's total power generation will increase 3.8% y-o-y in 2016. Over the rest of our forecast period to 2025, this output will grow at an average rate of over 3.0%. This marks an upward revision to our forecasts over the last quarter; the announcement of a number of major projects have necessitated a more positive outlook, even if the poor outlook for oil and gas prices constrain further growth potential.*

Electricity Generation And Power Generating Capacity

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

	2014	2015e	2016f	2017f	2018f	2019f
Generation, Total, TWh	258.210	262.940	272.980	277.590	285.370	298.620
Generation, Thermal, % of total generation	92.050	91.690	91.790	91.650	91.700	92.000
Generation, Coal, TWh	0.480	0.490	0.490	0.500	2.600	2.760
Generation, Coal, % y-o-y	5.470	2.230	1.100	1.250	422.000	6.030
Generation, Coal, % total electricity generation	0.180	0.190	0.180	0.180	0.910	0.920
Generation, Natural Gas, TWh	176.940	180.120	189.410	193.110	198.170	210.930
Generation, Natural Gas, % y-o-y	5.940	1.800	5.160	1.950	2.620	6.440
Generation, Natural Gas, % of total electricity generation	68.530	68.500	69.390	69.570	69.440	70.630
Generation, Oil, TWh	60.280	60.490	60.660	60.810	60.930	61.040
Generation, Oil, % change y-o-y	0.420	0.350	0.290	0.240	0.200	0.170
Generation, Oil, % of total electricity generation	23.340	23.000	22.220	21.910	21.350	20.440
Generation, Nuclear, TWh	6.410	6.410	6.420	6.420	6.420	6.430
Generation, Nuclear, % y-o-y	0.200	0.010	0.100	0.020	0.040	0.100
Generation, Nuclear, % of total electricity generation	2.480	2.440	2.350	2.310	2.250	2.150
Generation, Hydropower, TWh	13.850	15.180	15.610	15.790	16.080	16.090
Generation, Hydropower, % change y-o-y	5.020	9.590	2.850	1.200	1.800	0.100
Generation, Hydropower, % total electricity generation	5.360	5.770	5.720	5.690	5.630	5.390
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	0.260	0.260	0.390	0.960	1.170	1.370
Generation, Non-Hydropower Renewables, % change y-o-y	8.120	0.830	48.320	148.240	21.910	17.340
Generation, Non-Hydropower Renewables, % of total electricity	0.100	0.100	0.140	0.350	0.410	0.460

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

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

	2020f	2021f	2022f	2023f	2024f	2025f
Generation, Total, TWh	309.750	320.160	332.080	344.430	356.470	368.190
Generation, Thermal, % of total generation	92.260	92.480	92.590	92.700	92.800	92.890
Generation, Coal, TWh	2.890	3.010	3.150	3.290	3.430	3.570
Generation, Coal, % y-o-y	4.830	4.300	4.560	4.530	4.230	3.950
Generation, Coal, % total electricity generation	0.930	0.940	0.950	0.960	0.960	0.970
Generation, Natural Gas, TWh	221.760	231.870	243.070	254.680	266.020	277.060
Generation, Natural Gas, % y-o-y	5.140	4.560	4.830	4.780	4.450	4.150
Generation, Natural Gas, % of total electricity generation	71.590	72.420	73.190	73.940	74.630	75.250
Generation, Oil, TWh	61.130	61.200	61.260	61.310	61.350	61.390
Generation, Oil, % change y-o-y	0.140	0.120	0.100	0.080	0.070	0.060
Generation, Oil, % of total electricity generation	19.730	19.110	18.450	17.800	17.210	16.670
Generation, Nuclear, TWh	6.430	6.440	6.440	6.440	6.440	6.450
Generation, Nuclear, % y-o-y	0.040	0.040	0.040	0.040	0.040	0.040
Generation, Nuclear, % of total electricity generation	2.080	2.010	1.940	1.870	1.810	1.750
Generation, Hydropower, TWh	16.140	16.220	16.740	17.260	17.760	18.250
Generation, Hydropower, % change y-o-y	0.300	0.500	3.200	3.070	2.910	2.760
Generation, Hydropower, % total electricity generation	5.210	5.070	5.040	5.010	4.980	4.960
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	1.400	1.410	1.420	1.440	1.460	1.480
Generation, Non-Hydropower Renewables, % change y-o-y	1.730	1.330	0.720	1.340	1.210	1.020
Generation, Non-Hydropower Renewables, % of total electricity	0.450	0.440	0.430	0.420	0.410	0.400

f = BMI forecast. Source: National sources, BMI

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

	2014	2015e	2016f	2017f	2018f	2019f
Capacity, Net, MW	83,505.2	84,825.9	87,046.7	89,221.2	91,926.7	94,363.8
Capacity, Net, % y-o-y	3.6	1.6	2.6	2.5	3.0	2.7
Capacity, Conventional Thermal, MW	71,079.2	71,359.9	73,500.7	75,485.2	77,900.7	80,237.8
Capacity, Conventional Thermal, % y-o-y	3.4	0.4	3.0	2.7	3.2	3.0
Capacity, Conventional Thermal, % of total capacity	85.1	84.1	84.4	84.6	84.7	85.0
Capacity, Nuclear, MW	915.0	915.0	915.0	915.0	915.0	915.0
Capacity, Nuclear, % y-o-y	0.0	0.0	0.0	0.0	0.0	0.0
Capacity, Nuclear, % of total capacity	1.1	1.1	1.1	1.0	1.0	1.0
Capacity, Hydropower, MW	10,850.0	11,890.0	11,890.0	11,890.0	12,020.0	12,020.0
Capacity, Hydropower, % y-o-y	5.0	9.6	0.0	0.0	1.1	0.0
Capacity, Hydropower, % of total capacity	13.0	14.0	13.7	13.3	13.1	12.7
Capacity, Non-Hydroelectric Renewables, MW	661.0	661.0	741.0	931.0	1,091.0	1,191.0
Capacity, Non-Hydroelectric Renewables, % y-o-y	2.6	0.0	12.1	25.6	17.2	9.2
Capacity, Non-Hydroelectric Renewables, % of total capacity	0.8	0.8	0.9	1.0	1.2	1.3

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

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

	2020f	2021f	2022f	2023f	2024f	2025f
Capacity, Net, MW	96,562.3	98,582.0	100,693.4	102,857.5	105,075.8	107,349.6
Capacity, Net, % y-o-y	2.3	2.1	2.1	2.2	2.2	2.2
Capacity, Conventional Thermal, MW	82,436.3	84,456.0	86,567.4	88,731.5	90,949.8	93,223.6
Capacity, Conventional Thermal, % y-o-y	2.7	2.5	2.5	2.5	2.5	2.5
Capacity, Conventional Thermal, % of total capacity	85.4	85.7	86.0	86.3	86.6	86.8
Capacity, Nuclear, MW	915.0	915.0	915.0	915.0	915.0	915.0
Capacity, Nuclear, % y-o-y	0.0	0.0	0.0	0.0	0.0	0.0
Capacity, Nuclear, % of total capacity	1.0	0.9	0.9	0.9	0.9	0.9
Capacity, Hydropower, MW	12,020.0	12,020.0	12,020.0	12,020.0	12,020.0	12,020.0
Capacity, Hydropower, % y-o-y	0.0	0.0	0.0	0.0	0.0	0.0
Capacity, Hydropower, % of total capacity	12.5	12.2	11.9	11.7	11.4	11.2
Capacity, Non-Hydroelectric Renewables, MW	1,191.0	1,191.0	1,191.0	1,191.0	1,191.0	1,191.0

Electricity Generating Capacity Data And Forecasts (Iran 2020-2025) - Continued						
	2020f	2021f	2022f	2023f	2024f	2025f
Capacity, Non-Hydroelectric Renewables, % y-o-y	0.0	0.0	0.0	0.0	0.0	0.0
Capacity, Non-Hydroelectric Renewables, % of total capacity	1.2	1.2	1.2	1.2	1.1	1.1

f = BMI forecast. Source: National sources, BMI

According to our forecasts, Iran will have 87,047MW of installed capacity in 2016, representing a 2.6% increase on 2015's 84,826MW. During the period 2017 to 2025, this figure will increase steadily at an annual rate varying between 2.2% and 3.0%, reaching 107,350MW by 2025.

A number of factors underscore the cautious nature of our forecasts, even in view of the recent upward revisions. In recent years, Iran's economy has not performed well. It underwent a 10% contraction in real terms across the period 2012 to 2015. The government predicts a rapid rebound in economic growth; however, we predict that the economy will grow at just over 4% per year. The upside is limited by the poor outlook for oil and gas prices and limitations on the removal of sanctions, with the US government maintaining 'primary' sanctions. Indeed, while non-US firms and foreign subsidiaries of US firms will now be permitted to conduct business in Iran, US companies will not. Moreover, some European firms have decided to remain on the sidelines for now, since doing business with companies linked to Iran's Revolutionary Guards Corps will remain a punishable offence.

All these factors limit the prospects for growth in consumer and industrial power demand in Iran, while also limiting the resources - fiscal and professional - available for investment in the sector. Growth in the Iranian power sector will continue to be driven by gas-to-power, as the government seeks to take advantage of the country's abundant natural gas wealth. The government will also push ahead with its programme of converting older simple cycle units to combined cycle technology, thereby increasing efficiency and boosting capacity.

This said, the announcement of a number of significant projects over the last quarter have necessitated a modest revision to our forecasts, as highlighted above. The most significant development has been Turkey's **Unit International** announcing in June 2016 that it will invest in seven gas-fired combined cycle power plants in Iran, which will boost generating capacity by 6,020MW. Construction of the seven plants - all located in different provinces - is expected to begin in Q117. In April 2016, South Korea's **Hyundai**

Engineering Company announced that it was poised to build a 500MW power plant 25km off Zanjan, which would cover 22 hectares and come under the auspices of a build-own-operate agreement.

BMI's forecast thermal generation to account for some 250.6TWh during 2016, a 3.9% increase on 2015's 241.1TWh. This is equivalent to around 92% of Iran's total electricity output. In terms of installed capacity, thermal generation options are forecast to make up 73,501MW in 2016. The proportion of thermal energy in the total energy mix is forecast to remain steady through to the end of our forecast period, in 2016.

As a proportion of thermal capacity, natural gas fired generation will comprise some 75.6% in 2016, equivalent to 189.4TWh. This is equivalent to 69.4% of total electricity generated. As a percentage, natural gas' share of output generated will steadily increase during the period 2016 to 2025. By the end of the period, Iran will generate 277.1TWh from natural gas, equivalent to a y-o-y average increase of over 4%. We believe the benefits of the signing of the Joint Comprehensive Plan of Action in terms of new investment in gas fired power generation will begin to be seen in earnest during 2018, when a series of new gas fired power plants will be commissioned.

However, increasing investment in new gas fired technology forms only a part of the government's plan for taking advantage of Iran's abundant natural gas reserves. The government is also pursuing a strategy of converting older simple cycle gas fired power plants to combined cycle technology, thereby increasing efficiency and boosting output.

Iran's first combined cycle power plant, a 968MW facility, was inaugurated in Reshvanshahr in December 2012. The following year, former Iranian Energy Minister Majid Namjou announced the government intended to convert a further 12 thermal units to combined cycle. Speaking in January 2015, current Energy Minister Hamid Chitchian pledged to expand the country's generation capacity by converting a further 8,000MW to combined cycle technology. According to the Ministry of Energy, these conversions will boost the efficiency of the plants from 32% to 47%.

In terms of new gas-fired generation capacity, the Ministry of Energy announced in May 2015 that construction of three power plants had begun. Construction of the new plants is scheduled to be completed in 2016, with full output from the plants expected after three years. According to the ministry, a further 2,000MW of new gas-fired capacity will come online during 2016. In February 2015, the government announced it had brought a 328MW gas-fired power plant online in Balouchestan Province.

Generation from oil based fuel will account for 60.7TWh in 2016, a figure which will increase slightly to 61.4TWh by 2025, a negligible rise. As a percentage of output, oil based fuel accounts for 24.2% of total

thermal output and 22.2% of total output. This will decline to 18.0% and 16.7% by 2025, a result of a governmental push to use less oil based fuels because they generate electricity at a higher cost.

Coal has never played a central role in Iran's power sector. **BMI** forecast its share of total output to remain steady at just below 0.2% throughout the forecast period.

The Iranian government has ambitious plans to increase electricity generation from nuclear power plants. Iran currently has one operating nuclear power plant, the 1,000MW Bushehr power station. This began commissioning in 2011, and was handed over from its Russian operators to the Iranian government in October 2015.

In December 2013, reports suggested the Iranian and Russian authorities were in talks to begin building a second reactor at Bushehr during 2014, although this start date has since been missed. In September 2014, Iran announced it intended to build two new reactors, with an estimated capacity of 2,000MW, at the site and that it had signed an agreement with Russia's **Rosatom** to undertake the work. The success of negotiations on Iran's nuclear plans in July has provided impetus to these plans. Shortly after the deal was finalised, Iran's Atomic Energy Agency announced that China planned to build a further two nuclear power plants in the country.

However, despite these plans, and despite renewed confidence that the country will be able to generate more power from nuclear following the signing of the Joint Comprehensive Plan of Action in July 2015, **BMI**'s research does not suggest nuclear will play a more prominent role in the country's generation makeup than it currently does. **BMI** forecast Iran's output from nuclear in 2016 will be 6.42TWh, equivalent to some 2.4% of total generation capacity. **BMI**'s research suggests this figure will not substantially increase between 2016 and 2025, reaching only 6.45TWh by the end of the period. To a large extent, this conservative forecast is because the international community remains hostile to further nuclear development in Iran.

Output from hydropower is forecast to increase between 2016 and 2025, from 15.6TWh to 18.3TWh. The share of hydropower in the overall energy mix is forecast to fall from 5.7% in 2016 to just below 5.0% in 2025.

BMI does not expect there to be a substantial increase in generation from non-hydropower renewables sources between 2016 and 2025. Generation from non-hydropower renewables during 2016 is forecast to be 0.4TWh, equivalent to just over 0.1% of total generation output. **BMI** forecast this figure to reach 1.5TWh by 2025, representing an increase to 0.4% of total generation capacity.

That said, the Iranian government's plans for non-hydropower renewables are very ambitious, aiming to add 5GW of new renewable capacity by 2020. The government has also taken steps to promote its renewables sector, having adopted a German style feed-in tariff to offer a fixed rate for renewables projects some ten years ago.

International sanctions have long prevented international developers from investing. However, the easing of sanctions in 2016 may provides upside potential. Foreign investors are increasingly interested in taking advantage of the country's considerable renewable potential, including an estimated 30GW of wind potential, particularly following the signing of the Joint Comprehensive Plan of Action. **BMI** has already pointed to several indicators that companies are interested in investing in the country's renewables sector, including Berlin-based **GI Umweltconsult**, a developer, planning to invest EUR300mn in wind projects from 2016, and **Nordex SE** also looking to enter the market.

Several further deals have been signed which point to the future development of the country's renewables sector. In October 2015, Germany's **Green Energy 3000 GmBH** and the **Khuzestan District Electricity Company** (KDEC) signed a memorandum of understanding to install 100MW of solar power in the southwestern city of Ahvaz, as announced by head of the KDEC Mahmoud Janqorban. This followed an August agreement between the German and Iranian governments aiming to develop 100MW of wind and 400MW of solar power in Khuzestan.

Since the signing of the Joint Comprehensive Agreement, it has also been reported that Indian and South Korean companies have signed agreements with the Iranian government which could result in the installation of 1GW's worth of new solar capacity in Khuzestan.

Contributions from solar and biomass to Iran's overall generation matrix are only marginal. However, there is scope for that to change. China's Shanxi Energy was in talks with Iranian officials in April 2016, with a view to constructing a 600MW photovoltaic plant.

Electricity Consumption

Table: Total Electricity Consumption Data And Forecasts (Iran 2014-2019)

	2014	2015e	2016f	2017f	2018f	2019f
Consumption, Net Consumption, TWh	207.2	213.9	223.6	232.6	239.5	249.8
Consumption, Net Consumption, % y-o-y	3.0	3.2	4.6	4.0	3.0	4.3
Consumption, Net Consumption, KWh per capita	2,651.8	2,703.2	2,793.7	2,873.1	2,928.0	3,023.6

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

Table: Total Electricity Consumption Data And Forecasts (Iran 2020-2025)

	2020f	2021f	2022f	2023f	2024f	2025f
Consumption, Net Consumption, TWh	261.5	272.4	283.3	294.9	306.7	318.4
Consumption, Net Consumption, % y-o-y	4.7	4.2	4.0	4.1	4.0	3.8
Consumption, Net Consumption, KWh per capita	3,135.3	3,237.7	3,340.7	3,452.6	3,567.0	3,681.5

f = BMI forecast. Source: BMI, EIA

BMI forecast Iran's net electricity consumption in 2016 will be 223.6TWh, a 4.6% increase on 2015's 213.9TWh. This figure will rise to 318.4TWh by 2025.

Measured per capita, **BMI** forecast Iran's electricity consumption in 2016 will be 2,794TWh, representing a slight increase on 2015's 2,703TWh. By 2025, this figure will rise to 3,682TWh.

Industry and construction are forecast to account for 34.75% of total consumption in 2016, equivalent to 73.97TWh. This figure will rise to 98.8TWh by 2025, equivalent to 36.41% of total consumption.

Owing to the high level of subsidies the government pays to keep electricity prices low, Iran's per capita electricity consumption is very high compared to the regional average, and almost 100% of the country's population has access to electricity. This means the government often struggles to meet demand during peak hours.

The government has begun a programme to reduce these subsidies, cutting them by 25% in 2014, then again by 20% in 2015. This is a politically difficult move for the government, as it means electricity prices for all

consumers are rising. However, in order to attract private sector investment in the sector - which the government is now trying to do - it is of vital importance that prices better reflect costs.

Transmission And Distribution, Imports And Exports

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

	2014	2015e	2016f	2017f	2018f	2019f
Electric power distribution losses, TWh	38.8	39.2	40.3	41.5	42.4	44.1
Electric power distribution losses, % of output	15.0	14.9	14.8	15.0	14.8	14.8

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

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

	2020f	2021f	2022f	2023f	2024f	2025f
Electric power distribution losses, TWh	45.5	46.2	46.8	47.3	47.6	47.5
Electric power distribution losses, % of output	14.7	14.4	14.1	13.8	13.4	12.9

f = BMI forecast. Source: BMI

Table: Trade Data And Forecasts (Iran 2014-2019)

	2014	2015e	2016f	2017f	2018f	2019f
Total Net Imports, TWh	-12.2	-9.9	-9.1	-3.5	-3.5	-4.7

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

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

	2020f	2021f	2022f	2023f	2024f	2025f
Total Net Imports, TWh	-2.8	-1.7	-2.0	-2.2	-2.2	-2.2

f = BMI forecast. Source: BMI, EIA

BMI forecast transmission and distribution losses during 2016 to be 15.0% of total electricity produced, or equivalent to 34.2TWh. In terms of electricity lost, **BMI** forecast this figure to rise to 47.5TWh by 2025, although as a percentage of total power produced, this figure will fall slightly, to 12.9%.

Tavanir is responsible for electricity transmission. Iran has three main power distribution networks: the interconnected network, which serves all of Iran, apart from remote eastern and southern areas, using 440kV and 230kV transmission lines; the Khorassan network, which serves the eastern Khorossan province; and the Sistan and Baluchistan network, which serves the remote south eastern provinces of Sistan and Baluchistan. The government's goal is to join these three networks to establish one national grid.

The government's current five-year investment plan for the power sector sees USD9.8bn spent on the transmission system and a further USD7.1bn ploughed into distribution. Additional links to the power grids of neighbouring states are likely in order to facilitate greater regional supply flexibility and accommodate Iranian power exports.

Iran currently exports to the neighbouring countries of Afghanistan, Iraq, Pakistan, Turkmenistan, Azerbaijan, Armenia and Turkey. In June 2015, Iranian Deputy Energy Minister Hoshang Falahatian said the government planned to increase electricity exports to about 25bn KWh in the next three years, from about 8bn KWh. One of the Iranian electricity sector's main strengths is its proximity to neighbouring power markets which suffer from considerable power deficits and which lack their own natural resources to fuel power plants.

Since the signing of the Joint Comprehensive Plan of Action in July 2015, these plans have progressed well. In November 2015, the Tehran Times printed the government had initiated a new round of talks with the government of Turkmenistan to build a 400kV line from the Turkmen city of Mary, to the Iranian city of Sarakhs. Falahtian met with Vice Chairman of the **Turkmenergo State Power Corporation** to accelerate development of the line. The meeting followed a series of bilateral accords signed between the two countries in March.

Iran and Armenia are also in the process of negotiating an increase in their gas for electricity trade. Iranian Oil Minister Bijan Namdar Zanganeh and Armenian Energy and Natural Resources Minister Yervand Zakharyan agreed to raise Iran's exports of gas to Armenia in exchange for boosting the country's imports of electricity from its neighbour in early October 2015. In March 2015, the Armenian Energy Minister Armen Movsisian said Armenia planned to increase its imports of gas from Iran to 2bn cubic metres per year, an increase of almost 75%.

Currently, Iran has the capability to export 300MW to Armenia, whose grid is connected with those of Georgia, Russia and Turkey. In August 2015, the Export Development Bank of Iran signed an agreement to build a third power line connecting Iran with Armenia. The Bank pledged to commit some 80% of the total cost, equivalent to USD91mn of USD117mn, with the Armenian government committed to make up the difference. The interconnection is expected to be commissioned within an eighteen month period.

Energy Minister Hamid Chitchian announced in June 2016 that Iran stood ready to link its power grid to Europe. The proposal was made during remarks at a national power forum in Tehran.

Overall, **BMI** forecast Iran's net electricity imports to remain roughly static during the period 2017 to 2025. According to a recent report released by the Iranian energy ministry, Iran exported 6.539bn kWh of electricity between March and November 2015, whilst it imported 2,648mkWh.

In August 2015, delegates from Iran and Pakistan met in Tehran to finalise a power purchase agreement which would allow Iran to export 1,000MW to Pakistan. The two countries originally came to an agreement on power cooperation in May 2012. Reportedly, Iran has agreed to pay 70% of the cost, with Pakistan making up the difference.

Iran also signed an agreement with the Turkish government to boost cooperation on electricity issues between the two countries in July 2015. Interconnection between the two is a relatively straightforward process because the grids are so compatible. Turkey lacks natural resources of its own for power generation, so Iran's power export ambitions are highly compatible with the Turkish government's long term energy plans.

Industry Risk/Reward Index

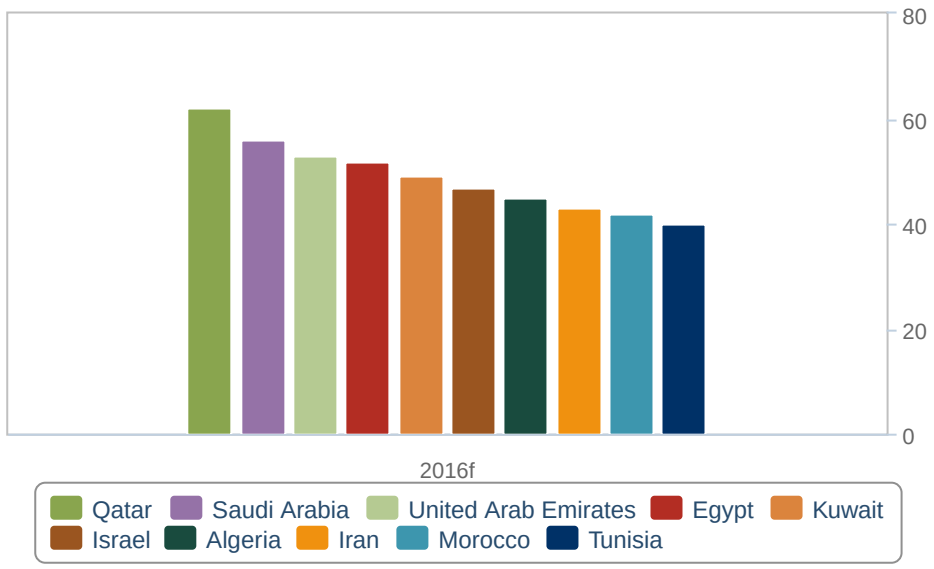
MENA Power Risk/Reward Index

BMI View: *GCC countries present investors with the most attractive combination of risk and returns within our MENA power RRI, thanks to sizeable government investment - even amid fiscal consolidation due to low oil prices - and more stable business environments. Outside of the GCC, we maintain our optimistic outlook for Egypt and Iran on the back of their improving economic prospects and the growing investor interest in their power markets.*

There have been some changes in the Risk/Reward Index (RRI) for power markets in the Middle East and Northern Africa (MENA) this quarter, most notably a sharp improvement in Qatar's score - with the country regaining first position in our ranking. Our overall outlook for the region, however, remains unchanged: countries in the Gulf Cooperation Council (GCC) will outperform within our RRI due to their vast power project pipelines and relatively stable business environments; meanwhile, relative political stability in Egypt and the relaxing of sanctions on Iran will create growing business opportunities in these countries' power markets.

GCC Will Maintain Its Lead

MENA Power Risk/Reward Index (Scores Out Of 100)



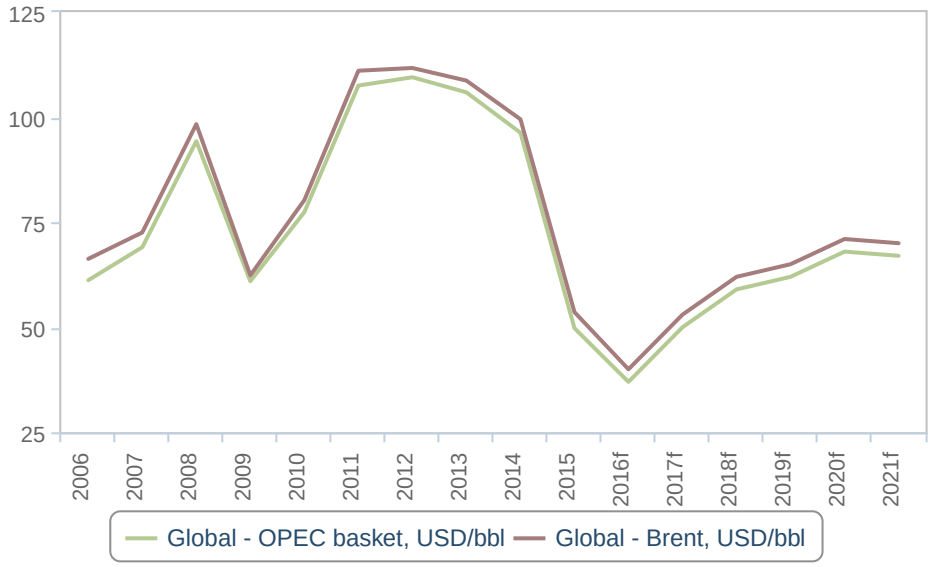
**Higher Score = Lower Risk. f = forecast. Source: BMI*

BMI's forecasts for oil prices are central to our views on risks and opportunities offered by MENA power markets. Our Oil & Gas analysts maintain that global oil markets will register only a soft recovery, starting H216, and expect Brent to average USD40.0 per barrel in 2016 and USD53.0/bbl in 2017 (*see chart*). This protracted weakness in oil revenues will force oil exporters to consolidate their spending, including on power projects that are not considered imperative.

Conversely, lighter import bills in oil importing countries will create additional momentum and support a generally brighter economic outlook - albeit from a low base - for countries outside the GCC. Our Country Risk team forecasts a significant economic rebound in Iran and to a lesser extent in Egypt (with the economies of both countries having stagnated over the past four years) and highlights Morocco is emerging as a regional outperformer in North Africa as it moves to boost competitiveness and establish its position as an exporter to Europe.

Low Oil Prices Underpin Diverse Regional Outlook

BMI - Brent And OPEC Basket Oil Price Forecasts



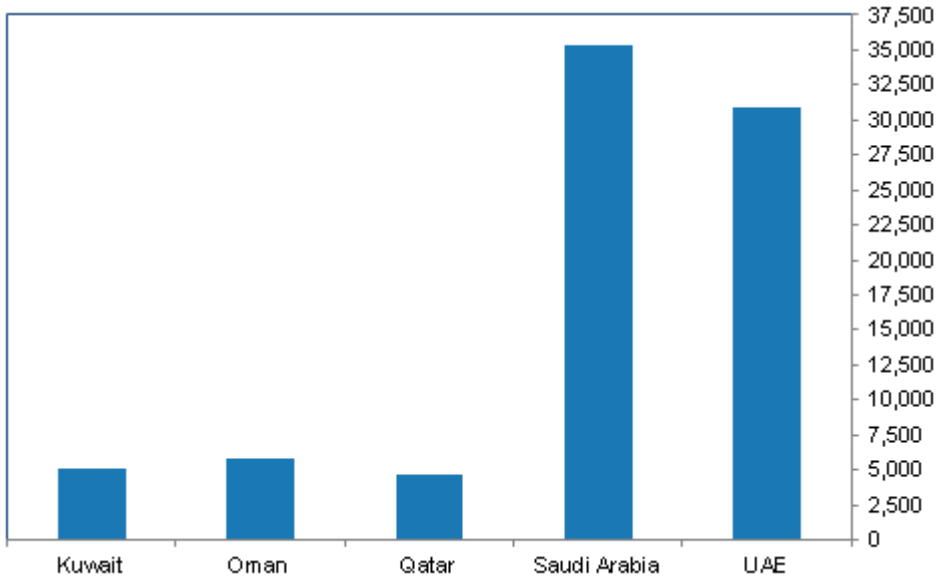
f = BMI forecast. Source: BMI

GCC Continuing To Outperform

Qatar, **Saudi Arabia** and the **UAE** remain at the top of our MENA power sector RRI, although Saudi Arabia has fallen to second position behind Qatar. We attribute the outperformance of these countries to their lower levels of risk relative to the rest of the region, coupled with the opportunities created by public investment into new power capacity. The low oil price environment will force GCC countries to adopt fiscal consolidation, but substantial foreign reserves and fiscal buffers will allow governments to carry on with the development of strategically important power projects.

GCC: Power Project Pipeline Remains Sizeable

Value Of Power Project Pipeline By Country, USDmn



Source: BMI Key Power Projects Database

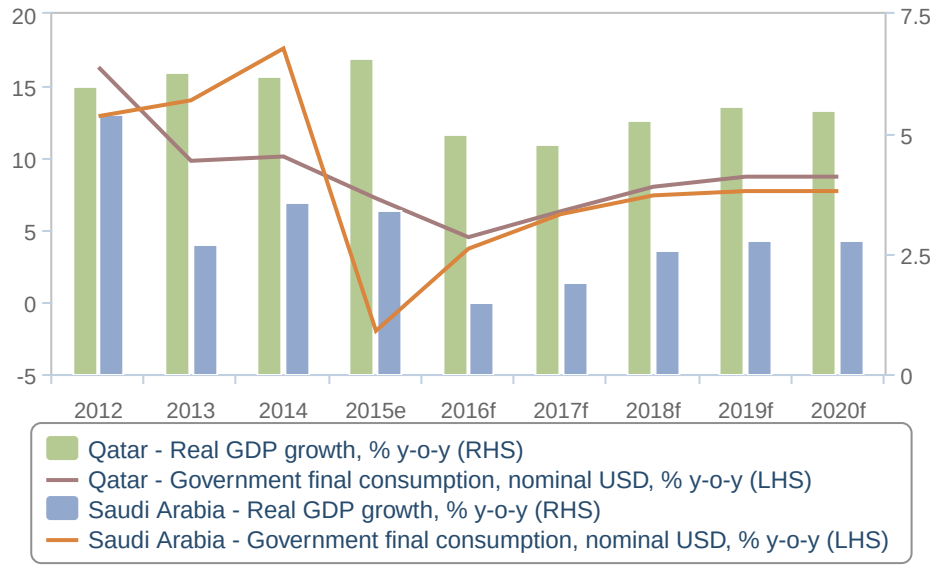
In addition to a resilient macroeconomic outlook (*see chart*) and strong growth in electricity consumption, **Qatar**'s plans to increase investment in power infrastructure account for the country's top position in our RRI this quarter. As shown in the chart above, Qatar has a relatively small pipeline of new power projects, but the 2016 government budget presents significant upside potential for growth. The government has announced plans to invest QAR30bn (USD8.2bn) on water and power projects and is looking to reform its

subsidy system and liberalise prices for utilities and fuel, while restraining the public sector wage bill and placing renewed emphasis on the private sector.

A deterioration in the macroeconomic outlook for **Saudi Arabia** - reflected in a downside revision of our Country Risk team's forecast for Saudi GDP growth in 2016 and 2017 - has weighed heavily on the Country's Rewards profile and dragged down its overall score in our index this quarter. Low oil prices have forced the government to ramp up the pace of fiscal consolidation and this has by extension darkened our capacity and generation forecasts - given the Saudi power sector's reliance on government spending. These conditions do not mean the government will not spend on power infrastructure as it attempts to diversify power generation away from oil and address fast growth in electricity demand. However, we expect certain projects, which are crucial to the Saudi energy sector, will be realised while others - such as the country's ambitious nuclear and solar power programmes - will be delayed or cancelled.

Qatar To Be More Resilient To Low Oil Prices Environment

Qatar & Saudi Arabia - Selected Macroeconomic Indicators



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

The **UAE** will be the GCC outperformer in terms of diversification of its power mix over the next few years. In particular, we expect the government to remain committed to the development of nuclear power,

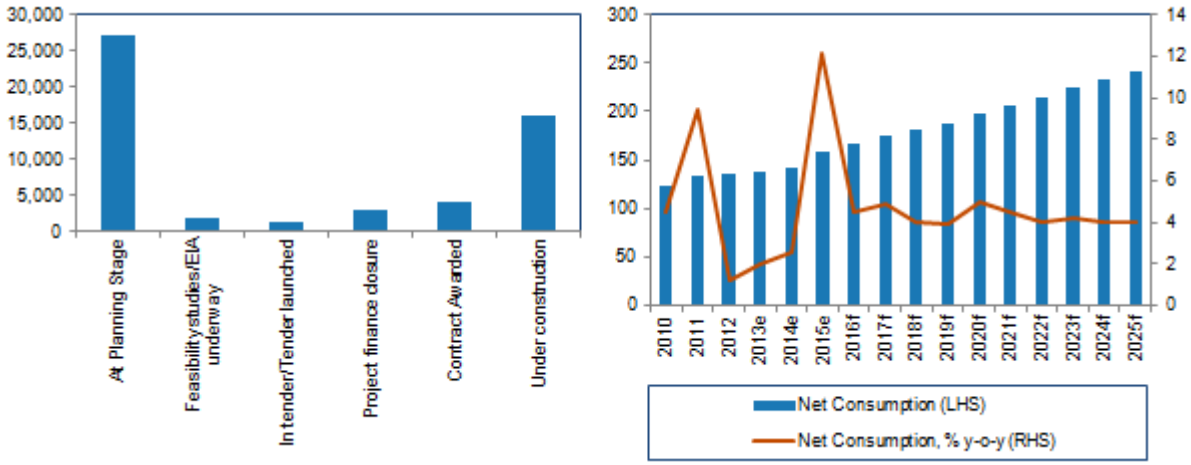
with construction of the 5,600MW Barakh nuclear power plant currently in progress. The UAE will also lead in terms of solar power development, due to the technology's cost competitiveness in the market and strong government support for the sector. These factors, coupled with fast growth in power demand, mean the country maintains third position in our MENA power sector RRI.

Non-GCC Outperformers Will Continue To Play Catch-Up

Egypt has the most attractive Risk/Reward profile among oil-importing countries included in our MENA index, as reflected in the market's fourth position in the RRI. Our relatively positive outlook is premised on robust growth in power demand and relative stability in domestic politics under President Abdel Fatta el-Sisi. This is coupled with the discovery of the Zohr gas field and the government's pledge to liberalise the gas sector by 2020. These factors have resulted in a series of investment pledges and an increasingly robust project pipeline (*see chart*). We have yet to include all these projects in our forecasts, due to continued political uncertainty and security threats. As such we see upside potential for Egypt's score in our RRI over the coming quarters as an upgrade of our power capacity and generation forecasts would lift the country's rewards score in the index.

Vast Project Pipeline And Surging Power Demand Support Egypt's Score

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



Source: BMI Key Projects Database, EIA, BMI.

Finally, we maintain our optimistic long-term outlook for **Iran** as we believe the country will offer significant business opportunities to resolute power and renewables investors. Accordingly, we expect Iran's score to rise gradually. The relaxation of international sanctions will catalyse investor interest in the market, bolstering a currently limited power project pipeline. With real GDP growth taking off over as the economy opens up, we expect the Iranian government to encourage private investment in the power sector in order to expand power generating capacity and boost efficiency at existing facilities. This will in turn gradually attract foreign direct investment (FDI), despite obstacles such as corruption, underinvestment in infrastructure and caution among US banks - which contribute to Iran's position at the lower end of our RRI currently.

Table: MENA Power Risk/Reward Index

	Industry Rewards	*Country Rewards*	*Rewards*	*Industry Risks**	*Country Risks**	*Risks**	*Power RRI Scores*
Qatar	60.00	68.40	63.23	53.28	69.79	60.36	62.23
Saudi Arabia	63.25	46.80	56.92	50.08	62.41	55.36	56.38
UAE	54.00	47.20	51.38	51.31	67.63	58.30	53.80
Egypt	61.00	47.80	55.92	44.34	46.57	45.30	52.20
Kuwait	45.25	47.40	46.08	42.03	71.20	54.53	49.04
Israel	30.00	57.00	40.38	57.07	65.40	60.64	47.47
Algeria	44.00	48.80	45.85	40.38	51.49	45.14	45.60
Iran	52.00	42.80	48.46	25.61	44.45	33.68	43.29
Morocco	36.50	41.20	38.31	50.37	51.08	50.68	42.64
Tunisia	32.00	45.60	37.23	46.45	44.08	45.43	40.10
Regional Average	*47.80*	*49.30*	*48.38*	*46.09*	*57.41*	*50.94*	*49.27*

**Higher score = lower risk. Scores Out Of 100. Source: BMI*

Iran Power Risk/Reward Index

Despite the signing of the Joint Comprehensive Plan of Action on Iran's nuclear programme in July 2015, and the unveiling of significant investments in the country's power sector, Iran's scores have remained largely stable in recent quarters, both in terms of both industry and country risks and rewards. The low oil price means economic growth remains sluggish. The government is struggling to raise the price of electricity further for fear of popular protest, a factor which may undermine its ability to attract foreign investment. Upside risks include a further round of international sanction removals - particularly 'primary' US sanctions - and an upturn in the global price of oil and gas.

Rewards

Industry Rewards

The outlook is moderately positive, in view of upward revisions to our generation and capacity forecasts over the last quarter and significant foreign investments in the sector. The sub-score for generation now stands at 3.0 out of 5.0. The Iranian power sector's greatest asset remains its near-complete coverage of the population in terms of access.

Country Rewards

Despite the partial lifting of sanctions in Q116, Iran scores poorly for this variable. The country scores low on predictions for economic growth over the coming five years - measured by per capita and real GDP - dragging down its overall Country Rewards performance. Again, low economic growth rates may mean the government struggles to raise electricity prices, despite its plans, and this is likely to have an effect on the attractiveness of the market. Real GDP growth remains sluggish because the crucial oil and gas sector has been dogged by the bear market in international commodity prices. Iran also scores very low in terms of predictions for inflation during the next five years. That said, the country continues to score well on its import dependency, both in raw materials and electricity imports.

Risks

Industry Risks

In terms of risks to realisation of potential returns in the power sector, Iran scores poorly for all four main variables. Iran is likely to remain a highly protected market for some time to come, despite the partial lifting of US sanctions, meaning poor scores for liberalisation and the transparency of tendering. The financing outlook is restricted, given continued constraints on accessing external financial markets and the pressure on government revenues generated by the oil and gas price bear market. There also appears to be little prospect of a significant move into renewables, for the time being.

Country Risks

Iran's Country Risk Score remains low, but stable. The country continues to score very poorly on perceptions of corruption in government and fares similarly in terms of the weakness and ineffectiveness of government institutions. That said, Iran continues to perform relatively well for external risk and on policy continuity. Sluggish growth and the low price of oil means the government has had little success in bringing down the food and subsidy bill. Political unrest could occur if the government tries to achieve this too quickly. The country scores better than the regional average on short term political stability, in what has become a very volatile region.

Market Overview

Key Policies And Market Structure

BMI View: *Iran's power sector is primarily controlled by state-owned utility Tavanir. Power plant construction is handled by the Iran Power Development Company (IPDC), a wholly owned subsidiary of Tavanir, which is also responsible for electricity transmission and distribution. However, in recent years the government has taken steps towards privatisation, with a number of power plants having been sold off in IPOs, and further privatisations planned over the coming years. Eventually, Tavanir may be broken up as part of a broader privatisation package.*

Regulation And Competition

Iran has received several offers for investment in the form of loans and build-operate-transfer (BOT) contracts. BOT contracts allow investors to build and operate the generating facility between 15 and 20 years, after which time the plant is turned over to the energy ministry. Negotiations have taken place with international energy firms on expansion plans for power plants at Bandar Abbas, Shaid Rajai, Alborz, Ramin and Kerman.

However, progress on moving forward with the BOT arrangements has been relatively slow - not aided by the challenging political climate that acts as a deterrent for foreign investors - with Western sanctions in particular constraining the ability of firms to invest. Following the agreement between Iran and the international community over the country's nuclear programme, which is resulting in external sanctions on Iran being partially lifted, there is considerable potential for a rise in international investment over the coming years. Indeed, there were several significant projects announced in the first half of 2016, including a pledge by Turkey's **Unit International** to invest in seven natural gas combined cycle plants. However, the removal of sanctions will be a phased and piecemeal process, potentially also with setbacks along the way, including the possible return of a much more hawkish government in US in 2017.

In June 2009, Iran's first BOT power plant became fully operational, when the last of six 159MW open-cycle gas turbine generating sets comprising the Chehelsotun power plant in South Isfahan were brought online. The 950MW gas-fired plant was developed by a 50:50 joint-venture (JV) between the Iranian investment house **IHAG** and local power contractor **Mapna**. The first unit at the Chehelsotun plant was brought on line in 2005.

In February 2010, Iran began privatising a number of the country's power plants.

IPOs have been the preferred method of privatisation. This is the method which has been used to privatise stakes in other state-owned companies over the past few years. Iran has the financial infrastructure in place to successfully carry out the IPO, but there is concern as to the identities of potential subscribers.

Pricing

Electricity prices are heavily subsidised in Iran placing a heavy burden on the government's fiscal health. In 2008, the government enacted a subsidy reform plan in an effort to improve the government's financial position and curb consumption to leave room to boost electricity exports. Gas and petrol prices are also heavily subsidised, and in an effort to improve efficiency and conservation of energy, the government is likely to continue in its efforts to raise prices, which will leave more Iranian gas production for electricity generation purposes. A second phase of this subsidy reform plan was initiated in 2014 with Tavanir announcing a further 25% price hike - and an additional 20% hike at the beginning of 2015, which has gone some way towards restraining consumption and raising the potential for the country to boost its export sector. With international oil prices having corrected downwards so heavily in recent years, the government is unlikely to be capable of continuing to fund its regime of energy subsidies, and further reforms are likely in the coming months and years.

Iran Power Projects Database

Table: Iran - Key Power Projects Database

Project	Value, USDmn	Capacity, MW	Companies	Time-frame	Status
Gas-fired power plant	10,000	6,000	Power Grid Corp of India Ltd (PGCIL), National Thermal Power Corp (NTPC)	2009-	At planning stage. The project includes a 1,500km high voltage transmission link to transfer power to India. 5,000MW may be transmitted to India and 1,000MW to Pakistan
177 dams construction project	na	na	na	na	Approved November 2008
Gas-fired power plant near to Zahedan	na	1,000	na	2009-	Announced 2010
8 electricity power plants in Khuzestan	na	6,000	na	2008-	Announced
Bushehr nuclear power plant	11,000	700	Rosatom, Atomstroyexpert	1994-2011	Completed
Iran-Russia electricity grid link	na	na	na	2008-	Contract awarded
2x new nuclear reactors, Bushehr	TBC	TBC	Rosatom State Nuclear Energy Corporation	2014-	Construction imminent (Q116)

Iran - Key Power Projects Database - Continued

Project	Value, USDmn	Capacity, MW	Companies	Time-frame	Status
Cycle power plant, Heris, East Azerbaijan province	675	1,200	Zenel Co, Tavanir	2008-	na
Iran-Turkey transmission line	1,500	2,000	na	na	Contract awarded
Rudbar-E-Lorestan hydropower project, Rudbar River, Zagros Mountain	9.52	450	PAPyry Infrastructure & Environment business group	2011-2014	na
Ghadir solar and wind power plant	4,500	1,000	na	na	Contract awarded 2011
Iran-Armenia 3rd electricity transmission line	110	650	na	na	At planning stage 2011
Tehran biomass plant	na	2	na	2010	Announced
Jarandaq wind power plant, Qazvin	na	60	na	na	Feasibility studies/EIA under way
Karachilare (Ghareh Chilar) hydropower plant, Aras River	na	130	Farab Co Iran	na	At planning stage 2013
Armenia-Iran electricity transmission line	na	1,200	Sanir	na	Approved. An Iranian consortium of private sector firms to provide financial assistance of USD571mn.
Expansion of Aras River hydropower plant to 1.7GW	na	na	na	na	na
7x combined cycle natural gas plants	4,200	6,200	Unit International	2017-	Deal signed June 2016
Power plant (25km off Zanjan), transmission lines + gas injection station	na	500	TAVANIR, Hyundai Engineering Company	na	Contract scheduled to be signed Q216

na = not available. Source: BMI

Competitive Landscape

BMI View: *Having been dominated for so long by state-owned power utility Tavanir, Iran's electricity market, following the signing of the Joint Comprehensive Plan of Action in July 2015 is now being opened up to new competition. Over the last few months, a raft of agreements have been signed with companies in Europe, Middle East and Russia and Asia, aimed at taking advantage of the country's considerable demand for electricity. Plans to break up Tavanir as part of a broader privatisation package have long been in the pipeline and some steps towards greater levels of privatisation in the sector have been taken over the past year.*

An amendment to Article 44 of the Iranian Constitution in 2004 allowed for the privatisation of state-owned companies, and in 2007 Supreme Leader Ayatollah Ali Khamenei called for the process to be sped up. In spite of this constitutional mandate, privatisation has historically proceeded very slowly, in large part due to resistance among parts of the regime to ceding control of the state-dominated economy to the private sector.

Nevertheless, the move towards increased involvement of the private sector has gathered steam in recent years. In June 2009, Iran's first build, operate, transfer (BOT) power plant became fully operational, when the last of six 159MW open-cycle gas turbine generating sets in the Chehelsotun power plant in South Isfahan were brought online. The 950MW gas-fired plant - the first to be completed in Iran under a BOT agreement, was developed by a 50:50 joint venture (JV) between Iranian investment house **IHAG** and local power contractor **Mapna**.

In February 2010, Iran's Deputy Energy Minister Mohammad Behzad announced plans to privatise 20 power plants by September 2010, the end of the first half of the 2010/11 Iranian calendar year. Behzad said a proposal for privatising six new power plants had been submitted to the Iranian Privatization Organization and a further four would be proposed by the end of the year, according to the Mehr News Agency. These 10 joined 10 other power plants that were already approved for privatisation.

The power plants were privatised via an initial public offering (IPO). This is the method which has been used to privatise stakes in other state-owned companies over the past few years.

The signing of the Joint Comprehensive Plan of Action in July 2015 should further facilitate liberalisation of the power sector, and prospects for increased private sector participation in the Iranian power sector have also been boosted by government hints that it will relax rules allowing private sector companies to export some of the power they produce.

Major developments in the power sector include:

- Turkey's **Unit International** announcing in June 2016 that it had secured a contract to establish seven gas-fired power plants in Iran, which will provide over 6,000MW of power.
- Germany's **Siemens** announced in March 2016 that it had signed a deal with Iran's **Mapna Group**, with the latter acquiring technology to manufacture over 20 gas turbines. The two firms also signed a memorandum of understanding (MoU) for further work in Iran's power sector.
- Iran's Atomic Energy Organization announced in March 2016 that it was seeking to co-operate with Japan in building several small nuclear plants, according to the Tehran Times.
- Iran in February 2016 announced that it was evaluating a potential project, in co-operation with Hungary, to design a 25MW nuclear reactor, which would then be marketed across Africa and Asia. If successful, a 100MW reactor may then be launched, again for sale across continents.
- Greece's energy ministry stated in February 2016 that it was in talks with Iran to secure a supply of natural gas for local needs, which could be followed by further shipments through Greece to other European markets. This news followed an agreement between Greece's **Hellenic Petroleum** and Iran for the latter to supply the former with crude oil, which would be refined by the Greek entity, with some refined output finding its way back to Iran.
- Russia's **Rosatom State Nuclear Energy Corporation** confirmed in February 2016 that work would soon get underway on building two more nuclear power units at Bushehr, after a deal was signed to carry out this work in November 2014.
- An October 2015 memorandum of understanding (MoU) between Germany's **Green Energy** 3000 GmBH and the **Khuzestan District Electricity Company** (KDEC) to install 100MW of solar power in the southwestern city of Ahvaz, as announced by head of the KDEC Mahmoud Janqorban. German companies have been at the forefront of movement to take advantage of the opening up of the Iranian electricity market. The Ahvaz MoU follows the signing of an agreement in August between the German and Iranian governments, which aims to generate 100MW of wind power, plus 400MW of solar in Khuzestan.
- Since the signing of the Joint Comprehensive Plan of Action, the Iranian government has also signed a deal with Indian and South Korean companies, also aimed at establishing energy parks in Khuzestan. Theoretically, these agreements could result in the generation of 1GW of solar power.
- Italy's **Fata**, part of **Finmeccanica**, has also signed a preliminary agreement with the **Ghadir Investment Company** to build a power plant in Iran. The agreement could be worth up to USD543mn.

Regional Overview

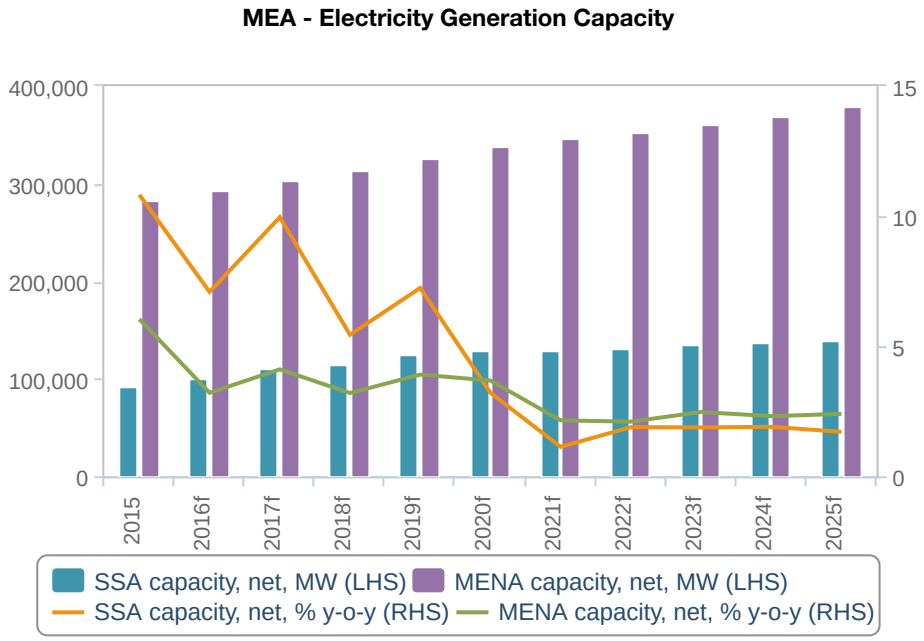
Middle East And Africa - Regional Overview

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

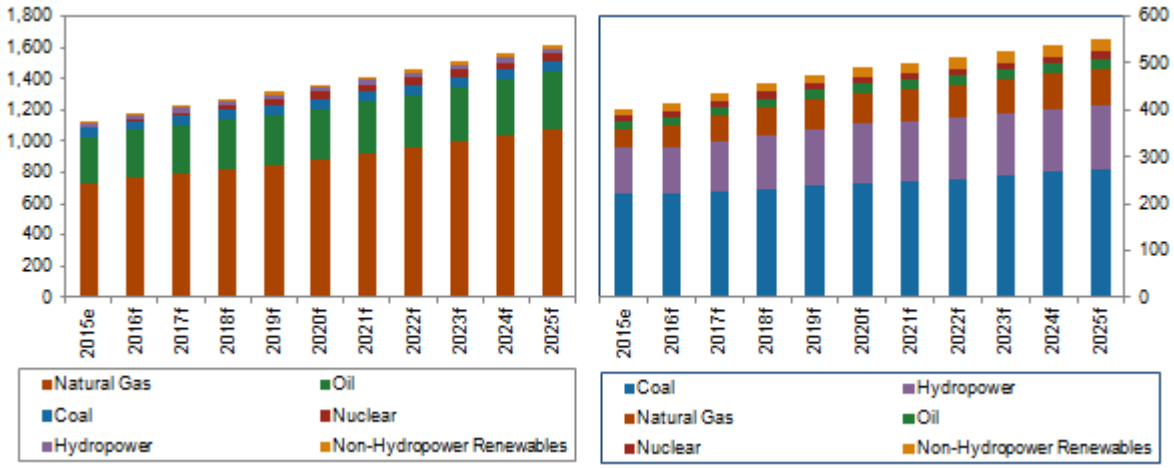


e/f = estimate/forecast. Source: EIA, BMI

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

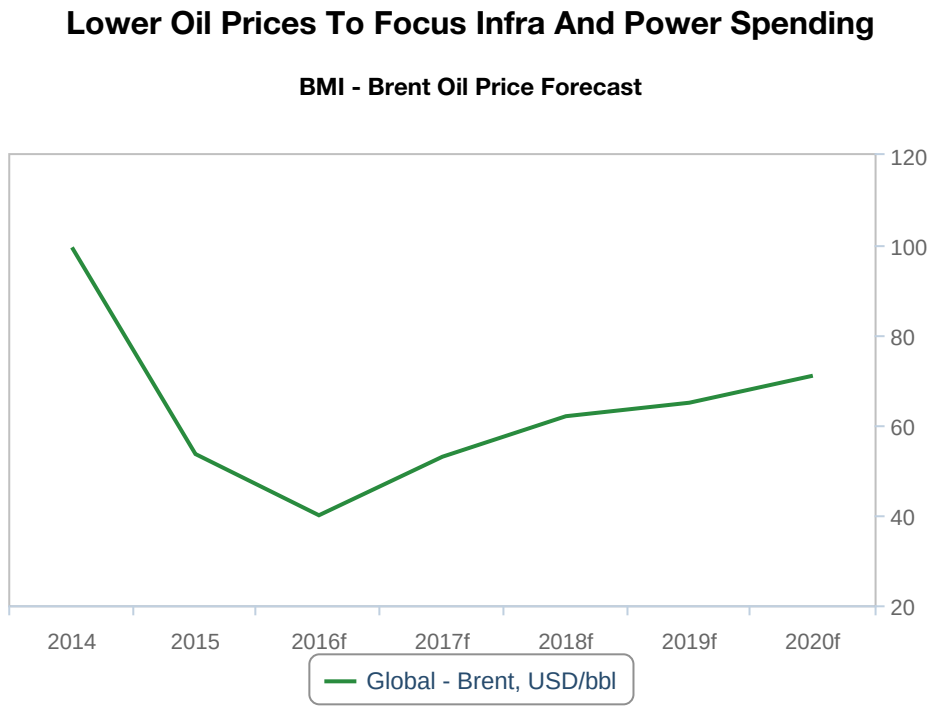


e/f = estimate/forecast. Source: EIA, BMI

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.



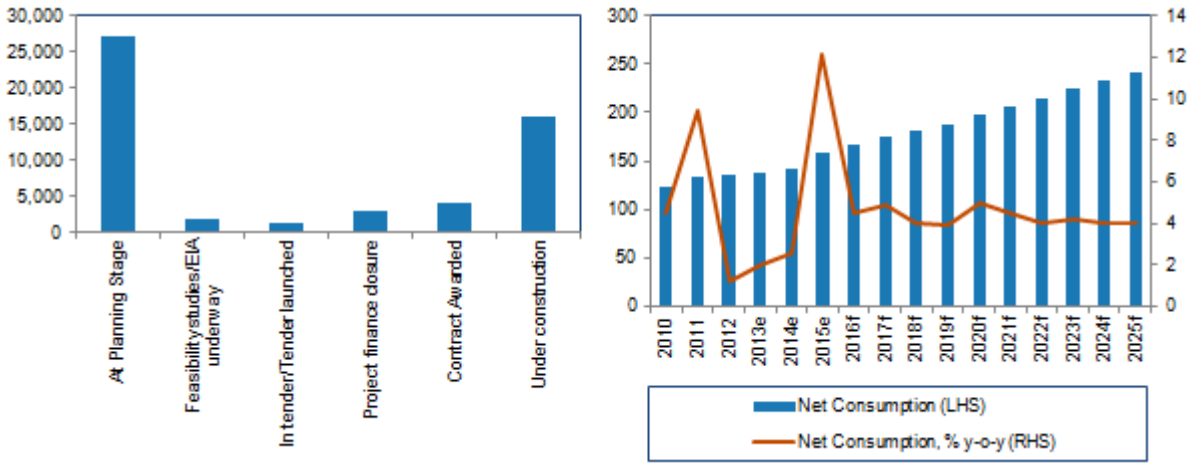
f = forecast. Source: BMI

- **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)

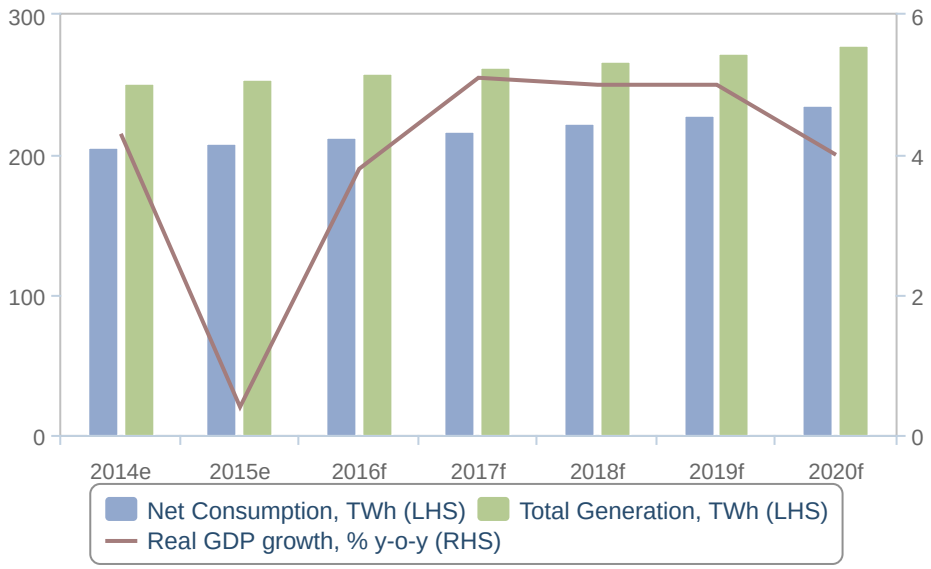


Source: BMI Key Projects Database, EIA, BMI

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

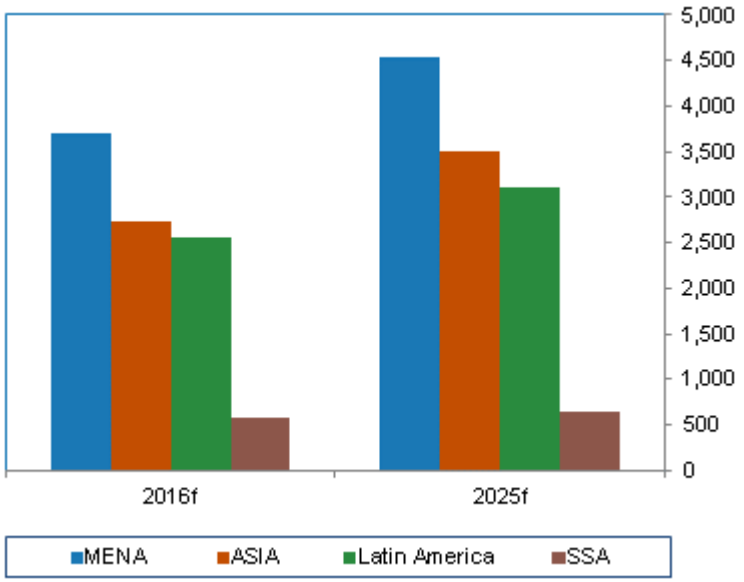
Key Themes In The SSA Power Market:

- **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



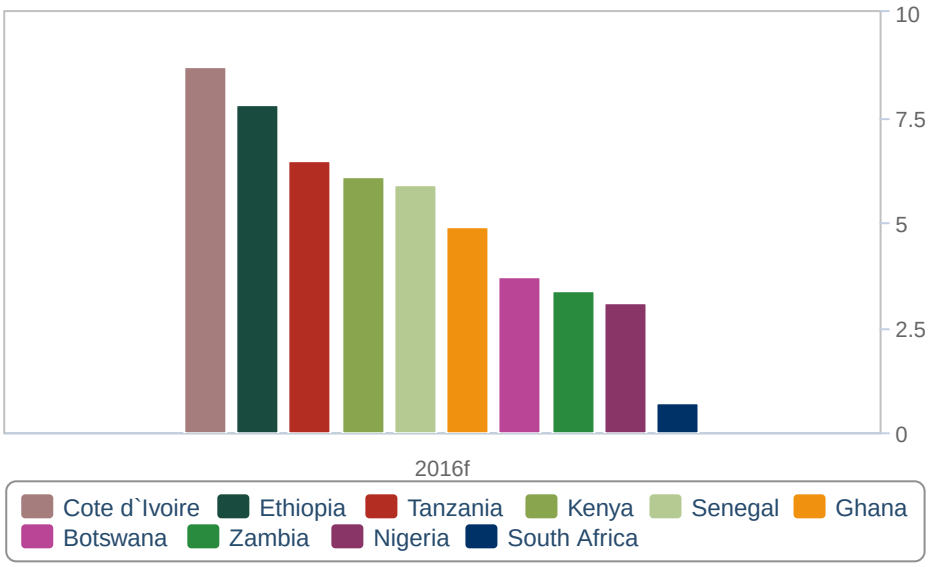
Source: EIA, BMI.

- **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