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Q1 2016

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IRAN

POWER REPORT

INCLUDES 10-YEAR FORECASTS TO 2024

Published by:BMI Research

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Part of BMI's Industry Report & Forecasts Series

Published by: **BMI Research**

Copy deadline: December 2015

ISSN: 1755-7054

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BMI Industry View

The signing of the Joint Comprehensive Plan of Action between the Iranian government and the PG+1, comprised of the five permanent members of the Security Council and Germany, an agreement aimed at bringing an end to sanctions on Iran through agreement on the country's nuclear programme, has precipitated considerable activity among foreign investors looking to take advantage of the country's considerable market for electricity, both in terms of domestic supply and export.

Since the signing of the agreement, several companies, many of them European, and several government delegations have visited Iran, signing agreements with the government aimed at installing a number of new power plants in the country.

BMI forecasts Iran's total power generation to be 258.11TWh in 2016, an increase of 1.55% on 2015's 254.17TWh. Between 2017 and 2024, **BMI** forecasts this output to increase at a year-on-year (y-o-y) average rate of 2.34% to 310.52TWh in 2024. This represents a slight revision on **BMI**'s previous forecast for the period, when research suggested generation would increase by an average y-o-y rate of 2.73%.

According to **BMI**'s research, Iran will have 80,864.37MW of installed capacity in 2016, representing a 0.37% increase on 2015's 80,409.30MW. During the period 2017 to 2024, this figure will increase at an average y-o-y rate of 1.9%, reaching 93,957MW by 2024.

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.

However, since the signing of the Joint Comprehensive Plan of Action trend is at play which will see foreign investment increase in the country's power sector, with accompanying growth in capacity and output. In terms of the Iranian power sector, the signing of the agreement has paved the way for the signing of a raft of deals with governments and companies in Europe, Russia and Asia, who plan on investing substantial capital in new developing new power plants to supply the country's 80m people, as well as for export.

According to **BMI**'s research, these agreements are likely to bear fruit from 2019, when the first plants will be commissioned. This can be seen in the sharp rise in installed capacity from this date. This sharp rise can

be seen in the contrast between the y-o-y percentage increase between 2016 and 2019, which **BMI** forecasts to be an average of 0.63%, versus an increase between 2019 and 2024 of 2.31%. This represents y-o-y average additions of 354.12MW and 1,711MW for each respective period.

Signs of increased foreign investor confidence were apparent during the holding of the 15th International Electricity Exhibition in early November in Tehran, in which some 200 foreign firms (alongside 341 Iranian firms) were represented. During 2014, only 110 foreign companies attended.

In addition, there are hints that the Iranian government will seek to relax its strict rules on private companies exporting part of the electricity they produce. In October 2015, the Ministry of Energy announced it was considering reforming these regulations, providing added incentives for foreign companies to invest. Energy Minister Hamid Chitchian announced recently the government was seeking USD50bn of new investment in its electricity market.

However, despite growing investor confidence, **BMI**'s research suggests Iran will fall short of its ambitious targets during the period 2017-2024. Even when new investments begin to be commissioned after 2019, the government will fall short of its stated target of adding 5GW per year.

Key Trends And Developments

- 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, which aimed at developing renewables plants. The companies reportedly included **Hyundai**, **Tucson**, and **LSLC** companies, as well as the Export-Import Bank of Korea.
- Several government delegations have visited Tehran with a view to fostering 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%.

Table: Headline Power Forecasts (Iran 2014-2020)

	2014e	2015e	2016f	2017f	2018f	2019f	2020f
Generation, Total, TWh	250.836	254.169	258.109	262.237	267.329	272.720	278.931
Consumption, Net Consumption, TWh	206.0	209.1	212.9	217.4	222.8	228.8	235.1
Capacity, Net, MW	80,051.4	80,409.3	80,864.4	81,214.1	81,926.7	83,685.4	85,656.4

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

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 potential market for sale of electricity.

Weaknesses

- The price of natural gas to residential and industrial consumers is state controlled at extremely low prices, encouraging rapid consumption growth and replacement of fuel oil, kerosene and liquefied petroleum gas (LPG) demand. Following the signing of the Joint Comprehensive Plan of Action on the country's nuclear ambitions, international sanctions should be lifted and areas of the economy opened up to private sector investment. If the government is able to raise electricity prices, potential rewards for foreign investors could be enormous.
- 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.
- The country is surrounded by nearby states, such as India and Pakistan, which face a shortage of electricity, providing an opportunity for Iran to increase production for export. Iran currently trades power with Afghanistan, Armenia, Azerbaijan, Iraq, Pakistan, Turkey and Turkmenistan.
- Iran's government has mooted that it intends to allow foreign power developers to export a portion of the power they produce to neighbouring countries. This is a potentially enormous market which could be opened up to private companies if the government makes good on its promise.

Iran Power SWOT - Continued

Threats

- The Joint Comprehensive Plan of Action represents a major step towards Iran's reintegration with the West, however, there is still potential for things to go wrong. The US Congress has still to approve the agreement, and it is possible that Iran will not stick to its side of the deal.
- With government finances in a perilous state, cutbacks to social spending have already been implemented, and there is a risk of political unrest emerging in the near term. In such an eventuality, it will be tempting for the government to focus on short term efforts to boost its popularity (such as abandoning plans to reduce subsidies) over long-term projects to invest in the country's infrastructure.

Industry Forecast

Iran Snapshot

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

	2014	2015e	2016f	2017f	2018f	2019f
Nominal GDP, USDbn	490.0	396.6	397.7	428.7	463.2	497.6
GDP per capita, USD	6,243	4,990	4,942	5,264	5,624	5,976
Real GDP growth, % y-o-y	-0.5	0.6	2.9	4.2	4.9	5.6
Population, mn	78.1	79.1	80.0	80.9	81.8	82.6

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

Table: Country Snapshot: Economic and Demographic Data (Iran 2019-2024)

	2019f	2020f	2021f	2022f	2023f	2024f
Nominal GDP, USDbn	497.6	531.4	561.2	596.1	628.6	662.1
GDP per capita, USD	5,976	6,315	6,602	6,947	7,259	7,581
Real GDP growth, % y-o-y	5.6	4.8	4.1	4.3	4.3	3.9
Population, mn	82.6	83.4	84.1	84.8	85.4	86.0

f = BMI forecast. Source: National sources, BMI

Table: Country Snapshot: Power Sector

Access to Electricity, % of population	**97.9**
Quality of Electricity Supply (Value)	4.7/7
Quality of Electricity Supply (Rank)	72/144

Source: World Economic Forum - Global Competitiveness Report 2012-2013, World Bank, BMI

Iran Power Forecast Scenario

BMI View: BMI *forecasts Iran's total power generation to be 258.11TWh in 2016, an increase of 1.55% on 2015's 254.17TWh. Between 2017 and 2024, BMI forecasts this output to increase at a year-on-year (y-o-y) average rate of 2.34% to 310.52TWh by 2024. This represents a slight revision on BMI's previous forecast for the period, when research suggested generation would increase by an average y-o-y rate of 2.73%.*

Electricity Generation And Power Generating Capacity

Table: Total Electricity Generation Data And Forecasts (Iran 2013-2018)

	2013	2014	2015f	2016f	2017f	2018f
Generation, Total, TWh	247.434	250.836	254.169	258.109	262.237	267.329
Generation, Thermal, % of total generation	91.939	91.923	92.008	91.946	91.868	91.928
Generation, Coal, TWh	0.451	0.449	0.459	0.464	0.469	0.477
Generation, Coal, % y-o-y	0.100	-0.599	2.230	1.100	1.250	1.720
Generation, Coal, % total electricity generation	0.182	0.179	0.180	0.180	0.179	0.179
Generation, Natural Gas, TWh	167.013	169.853	172.910	176.195	179.631	184.337
Generation, Natural Gas, % y-o-y	1.100	1.700	1.800	1.900	1.950	2.620
Generation, Natural Gas, % of total electricity generation	67.498	67.715	68.030	68.264	68.500	68.955
Generation, Oil, TWh	60.024	60.275	60.486	60.663	60.811	60.935
Generation, Oil, % change y-o-y	0.503	0.419	0.350	0.292	0.244	0.204
Generation, Oil, % of total electricity generation	24.258	24.030	23.798	23.503	23.189	22.794
Generation, Nuclear, TWh	6.400	6.413	6.413	6.420	6.421	6.424
Generation, Nuclear, % y-o-y	381.928	0.200	0.010	0.100	0.022	0.040
Generation, Nuclear, % of total electricity generation	2.587	2.557	2.523	2.487	2.449	2.403
Generation, Hydropower, TWh	13.309	13.375	13.405	13.699	13.863	14.113
Generation, Hydropower, % change y-o-y	8.000	0.500	0.220	2.193	1.200	1.800
Generation, Hydropower, % total electricity generation	5.379	5.332	5.274	5.307	5.287	5.279
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	0.237	0.471	0.496	0.669	1.041	1.043
Generation, Non-Hydropower Renewables, % change y-o-y	3.142	98.545	5.262	34.890	55.693	0.182
Generation, Non-Hydropower Renewables, % of total electricity	0.096	0.188	0.195	0.259	0.397	0.390

f = BMI forecast. Source: National sources, BMI

Table: Total Electricity Generation Data And Forecasts (Iran 2019-2024)

	2019f	2020f	2021f	2022f	2023f	2024f
Generation, Total, TWh	272.720	278.931	285.940	293.629	301.816	310.525
Generation, Thermal, % of total generation	92.077	92.235	92.398	92.556	92.710	92.864
Generation, Coal, TWh	0.484	0.489	0.499	0.514	0.524	0.534
Generation, Coal, % y-o-y	1.410	0.980	2.000	3.000	2.000	2.000
Generation, Coal, % total electricity generation	0.178	0.175	0.174	0.175	0.174	0.172
Generation, Natural Gas, TWh	189.591	195.658	202.506	209.999	217.979	226.480
Generation, Natural Gas, % y-o-y	2.850	3.200	3.500	3.700	3.800	3.900
Generation, Natural Gas, % of total electricity generation	69.519	70.146	70.821	71.518	72.222	72.935
Generation, Oil, TWh	61.038	61.125	61.198	61.259	61.310	61.353
Generation, Oil, % change y-o-y	0.170	0.143	0.119	0.100	0.083	0.070
Generation, Oil, % of total electricity generation	22.381	21.914	21.402	20.863	20.314	19.758
Generation, Nuclear, TWh	6.430	6.433	6.435	6.438	6.441	6.443
Generation, Nuclear, % y-o-y	0.100	0.040	0.040	0.040	0.040	0.040
Generation, Nuclear, % of total electricity generation	2.358	2.306	2.251	2.193	2.134	2.075
Generation, Hydropower, TWh	14.127	14.169	14.240	14.354	14.490	14.635
Generation, Hydropower, % change y-o-y	0.100	0.300	0.500	0.800	0.950	1.000
Generation, Hydropower, % total electricity generation	5.180	5.080	4.980	4.889	4.801	4.713
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	1.050	1.057	1.062	1.066	1.073	1.079
Generation, Non-Hydropower Renewables, % change y-o-y	0.645	0.644	0.499	0.367	0.660	0.615
Generation, Non-Hydropower Renewables, % of total electricity	0.385	0.379	0.371	0.363	0.356	0.348

f = BMI forecast. Source: National sources, BMI

Table: Electricity Generating Capacity Data And Forecasts (Iran 2013-2018)

	2013	2014	2015f	2016f	2017f	2018f
Capacity, Net, MW	79,578.0	80,051.4	80,409.3	80,864.4	81,214.1	81,926.7
Capacity, Net, % y-o-y	1.6	0.6	0.4	0.6	0.4	0.9
Capacity, Conventional Thermal, MW	67,335.0	67,617.8	67,922.1	68,173.4	68,446.1	69,130.6
Capacity, Conventional Thermal, % y-o-y	0.5	0.4	0.5	0.4	0.4	1.0
Capacity, Conventional Thermal, % of total capacity	84.6	84.5	84.5	84.3	84.3	84.4
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	1.1	1.1	1.1
Capacity, Hydropower, MW	10,676.0	10,732.6	10,786.2	10,810.0	10,837.0	10,865.2
Capacity, Hydropower, % y-o-y	9.5	0.5	0.5	0.2	0.3	0.3
Capacity, Hydropower, % of total capacity	13.4	13.4	13.4	13.4	13.3	13.3
Capacity, Non-Hydroelectric Renewables, MW	652.0	786.0	786.0	966.0	1,016.0	1,016.0
Capacity, Non-Hydroelectric Renewables, % y-o-y	2.4	20.6	0.0	22.9	5.2	0.0
Capacity, Non-Hydroelectric Renewables, % of total capacity	0.8	1.0	1.0	1.2	1.3	1.2

f = BMI forecast. Source: National sources, BMI

Table: Electricity Generating Capacity Data And Forecasts (Iran 2019-2024)

	2019f	2020f	2021f	2022f	2023f	2024f
Capacity, Net, MW	83,685.4	85,656.4	87,470.6	89,450.1	91,608.4	93,957.0
Capacity, Net, % y-o-y	2.1	2.4	2.1	2.3	2.4	2.6
Capacity, Conventional Thermal, MW	70,858.8	72,800.3	74,584.0	76,530.6	78,650.5	80,955.0
Capacity, Conventional Thermal, % y-o-y	2.5	2.7	2.5	2.6	2.8	2.9
Capacity, Conventional Thermal, % of total capacity	84.7	85.0	85.3	85.6	85.9	86.2
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	1.0	1.0	1.0	1.0
Capacity, Hydropower, MW	10,895.6	10,925.0	10,955.6	10,988.5	11,026.9	11,071.0
Capacity, Hydropower, % y-o-y	0.3	0.3	0.3	0.3	0.4	0.4
Capacity, Hydropower, % of total capacity	13.0	12.8	12.5	12.3	12.0	11.8
Capacity, Non-Hydroelectric Renewables, MW	1,016.0	1,016.0	1,016.0	1,016.0	1,016.0	1,016.0

Electricity Generating Capacity Data And Forecasts (Iran 2019-2024) - Continued						
	2019f	2020f	2021f	2022f	2023f	2024f
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	1.1	1.1	1.1

f = BMI forecast. Source: National sources, BMI

According to **BMI**'s research, Iran will have 80,864.37MW of installed capacity in 2016, representing a 0.37% increase on 2015's 80,409.30MW. During the period 2017 to 2024, this figure will increase at an average year on year rate of 1.9%, reaching 93,957MW by 2024.

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.

BMI's research forecasts thermal generation to account for some 237.32TWh during 2016, a 1.48% increase on 2015's 233.85TWh. This is equivalent to around 92% of Iran's total electricity output. In terms of installed capacity, thermal generation options make up 68,173MW.

Between the period 2016 and 2024, **BMI** forecasts thermal's share of total generation output in Iran to increase to 288.37TWh, generated from almost 80,955MWs' worth of units. This represents a y-o-y average increase of 2.35% in terms of generation output. Measured by percentage of Iran's total electricity output, thermal generation will account for almost 93% of total generation by 2024.

Of this thermal capacity, natural gas fired generation will comprise some 74.24% in 2016, equivalent to 176.2TWh. This is equivalent to 68.26% of total electricity generated. As a percentage, natural gas' share of generation output will steadily increase during the period 2016 to 2024. By the end of the period, Iran will generate 226.48TWh from natural gas, equivalent to a y-o-y average increase of just over 3%. According to **BMI**'s research, 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 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 mid-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 60.66TWh in 2016, a figure which will increase slightly to 61.35TWh by 2024, equivalent to a y-o-y average increase of nearly 0.16%. As a percentage of output, oil based fuel accounts for 25.56% of total thermal output and 23.50% of total output. This will decline to 21.28% and 19.76% by 2024, 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** forecasts its use to decline slightly during 2016 to 2024, from 0.18% to 0.17%.

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, **BMI**'s research does not suggest nuclear will play a more prominent role in the country's generation makeup than it currently does. **BMI** forecasts Iran's output from nuclear in 2016 will be 6.42TWh, equivalent to some 2.5% of total generation capacity. However, **BMI**'s research suggests this figure will not substantially increase between 2016 and 2024, reaching only 6.44TWh by the end of the period. This is equivalent to an average year on year increase of just over 0.05%. To a large extent, this conservative forecast is because the international community remains hostile to further nuclear development in Iran. Also, despite the fact that several preliminary agreements have been signed with Russia, rhetoric advocating increased use of nuclear has been common in Iranian government circles during the past five years, however, there has been little concrete progress towards closing on a particular deal. This also leads us to forecast the increase in natural gas generation as the primary driver of capacity.

Output from hydropower is forecast to increase by just under an average y-o-y increase of 1% between 2016 and 2024, from 13.7TWh to 14.64TWh. In terms of installed capacity, this represents an increase from 10,809MW to11, 071MW.

BMI does not forecast there to be a substantial increase in generation from non-hydropower renewables sources between 2016 and 2024. Generation from non-hydropower renewables during 2016 is forecast to be 0.67TWh, equivalent to just 0.26% of total generation output. **BMI** forecasts this figure to reach 1.08TWh by 2024, representing an increase to 0.35% of total generation capacity. Iran's current hydro capacity is comprised of the 2GW Karun 3 plant, the 2GW Godar-e Landar facility and a 1GW station in Upper Gorvand.

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. However, international sanctions have prevented international developers from investing.

As pointed to in the **BMI** Iran Power report from last quarter, 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**'s last report pointed to several indicators that companies were 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.

Since, several new 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.

During 2016, **BMI** forecasts wind capacity will make up some 89.86% of Iran's total non-hydropower renewables output, equivalent to 0.60TWh from 400MWs' worth of units. However, despite the signing of the above mentioned deals since the Joint Comprehensive Plan of Action, **BMI** does not forecast output from wind power to increase substantially by 2024, increasing to just 0.63TWh, equivalent to a y-o-y average increase of just over 0.5%.

Contributions from solar and biomass to Iran's overall generation matrix are only marginal. Solar projects currently supply 0.06TWh, a figure which **BMI** estimates to remain the same going through to 2024. Iran's biggest solar plant is in Mashad. It produces about 72,000kWh annually, which is sufficient power to meet the requirements of Razavi Khorasan Province. Electricity from biomass is also currently 0.01TWh. This figure will double by 2024.

Electricity Consumption

Table: Total Electricity Consumption Data And Forecasts (Iran 2013-2018)

	2013	2014	2015e	2016f	2017f	2018f
Consumption, Net Consumption, TWh	201.2	206.0	209.1	212.9	217.4	222.8
Consumption, Net Consumption, % y-o-y	3.0	2.4	1.5	1.8	2.1	2.5
Consumption, Net Consumption, KWh per capita	2,607.6	2,636.6	2,643.4	2,659.6	2,685.2	2,723.2

f = BMI forecast. Source: BMI, EIA

Table: Total Electricity Consumption Data And Forecasts (Iran 2019-2024)

	2019f	2020f	2021f	2022f	2023f	2024f
Consumption, Net Consumption, TWh	228.8	235.1	241.6	248.4	255.5	263.1
Consumption, Net Consumption, % y-o-y	2.7	2.8	2.8	2.8	2.9	3.0
Consumption, Net Consumption, KWh per capita	2,769.0	2,818.8	2,872.3	2,929.5	2,991.3	3,060.1

f = BMI forecast. Source: BMI Calculation, EIA

BMI forecasts Iran's net electricity consumption in 2016 will be 212.88TWh, a 1.8% increase on 2015's 209.12TWh. This figure will rise to 263.09TWh by 2024, equivalent to a y-o-y average increase of 2.58%.

Measured per capita, **BMI** forecasts Iran's electricity consumption will be 2,659.63TWh, representing a slight increase on 2015's 2,643.44TWh. By 2024, this figure will rise to 3,060.13TWh, according to **BMI**'s research.

According to **BMI**'s research, industry and construction will account for 34.75% of total consumption in 2016, equivalent to 73.97TWh. This figure will increase at a y-o-y average rate of 3.1%, rising to 95.3TWh by 2014, equivalent to 36.22% of total consumption.

Industry and construction is followed by households as the next highest consumer group, which accounts for 29.45% of consumption, or 62.69TWh. **BMI** forecasts consumption by households to increase somewhat over the next nine years, reaching 72.47TWh, equivalent to 27.55% of total consumption.

During 2016, agriculture will account for 13.8% of total consumption, equivalent to 29.39TWh. This figure is forecast to increase rapidly during the period, reaching 40.27TWh by 2024, equivalent to 15.31% 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 are raised.

Transmission And Distribution, Imports And Exports

Table: Electric Power T&D Losses Data And Forecasts (Iran 2013-2018)

	2013	2014	2015e	2016f	2017f	2018f
Electric power distribution losses, TWh	38.0	37.7	37.8	38.1	39.2	39.7
Electric power distribution losses, % of output	15.3	15.0	14.9	14.8	14.9	14.8

f = BMI forecast. Source: BMI

Table: Electric Power T&D Losses Data And Forecasts (Iran 2019-2024)

	2019f	2020f	2021f	2022f	2023f	2024f
Electric power distribution losses, TWh	40.2	40.9	41.2	41.4	41.5	41.4
Electric power distribution losses, % of output	14.8	14.7	14.4	14.1	13.7	13.3

f = BMI forecast. Source: BMI Calculation

Table: Trade Data And Forecasts (Iran 2013-2018)						
	2013	2014	2015e	2016f	2017f	2018f
Total Net Imports, TWh	-8.3	-7.1	-7.2	-7.1	-5.7	-4.9

f = BMI forecast. Source: BMI, EIA

Table: Trade Data And Forecasts (Iran 2019-2024)						
	2019f	2020f	2021f	2022f	2023f	2024f
Total Net Imports, TWh	-3.7	-2.9	-3.1	-3.8	-4.9	-6.0

f = BMI forecast. Source: BMI Calculation, EIA

BMI forecasts transmission and distribution losses during 2016 to be 14.75% of total electricity produced, or equivalent to 38.09TWh. In terms of electricity lost, **BMI** forecasts this figure to rise to 41.44TWh by 2024, although as a percentage of total power produced, this figure will fall slightly, to 13.35%.

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. Iran has three main power distribution networks and the government's goal is to join these to form one national grid. 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 25billion KWh in the next three years, from about 8 billion KWh now. 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 fuel power plants.

Since the signing of the Joint Comprehensive Plan of Action in July 2015, these plans have progressed well. In November, 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. Iranian Deputy Energy Minister Houshang 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 negotiated for raising 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 2004, the two governments signed an agreement which contracted Iran to provide some 2.4bn cubic metres of gas to Armenia in exchange for imports of electricity. In March 2015, the Armenian energy minister Armen Movsisian said Armenia planned to increase its imports of gas from Iran to two billion 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.

Because of these developments, **BMI** forecasts Iran's net electricity imports to remain roughly static during the period 2017 to 2024. 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, delegates from Iran and Pakistan met in Tehran to finales 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. The agreement has received a significant boost with the signing of the recent deal with the P5+1 on Iran's nuclear programme. Shortly after the deal was signed, the Iranian Ambassador to Pakistan, Ali Raza said his government was not ready to export 3,000MW to Pakistan.

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

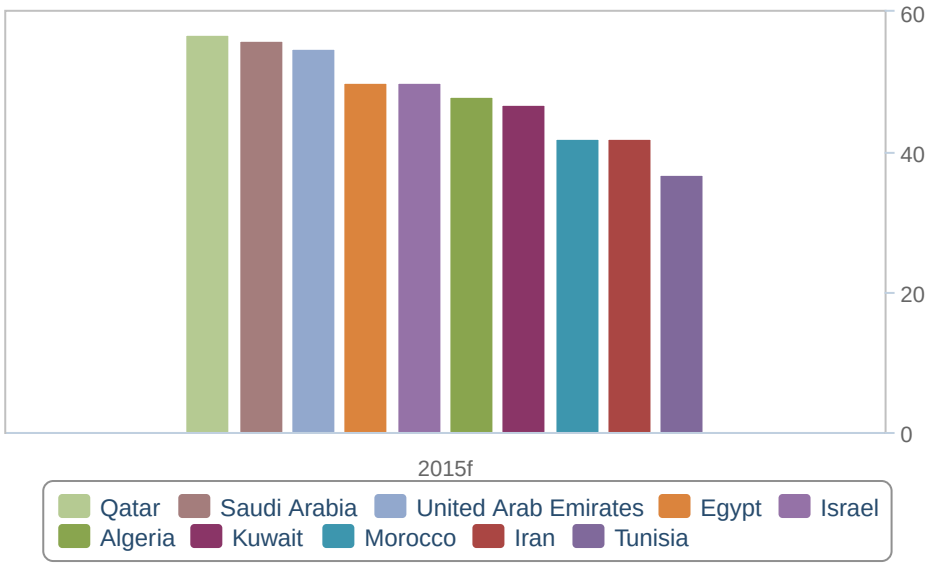
MENA Power Risk/Reward Index

***BMI View**: Qatar, Saudi Arabia and the UAE continue to lead our MENA Power Risk/Reward Index thanks to their relatively high political stability and continued investment into strategic power projects even amid a prolonged period of lower oil prices. We maintain our optimistic outlook on Egypt and Iran, as greater political stability and the unwinding of sanctions translate into better growth prospects for their power sectors.*

The overall outlook for Risks and Rewards offered by the power sector of the countries included in our coverage of Middle East and North Africa (MENA) remains unchanged this quarter, with no shifts in the regional rankings. We maintain that a prolonged period of low oil prices will be the dominant dynamic governing developments in the region's power markets. We expect oil exporters in the Middle East to adopt greater fiscal prudence and focus on key strategic power projects, while cheaper energy imports will bolster economic growth among North African oil importers, thus lifting electricity consumption.

GCC Continuing To Outperform

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



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

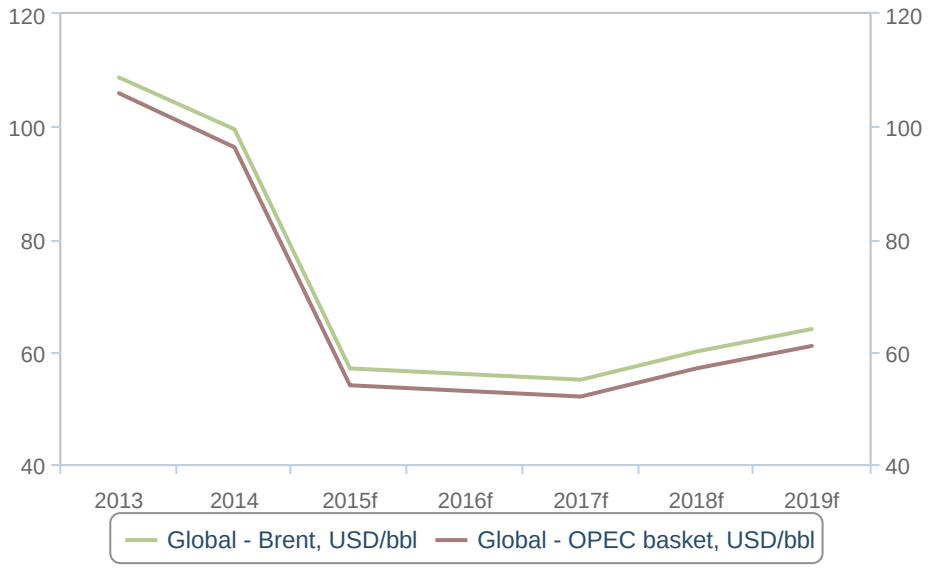
GCC Resilient To Lower Oil Prices

Qatar, Saudi Arabia and the UAE maintain their position at the top of our MENA Power Risk Reward index (RRI), due to a number of factors giving them the region's most attractive combination of low Risks and relatively high Rewards. Such factors include surging demand for electricity, boosted by robust economic growth and favourable demographics; energy mix diversification efforts, as these countries attempt to ensure lucrative hydrocarbons are preserved for export rather than burned domestically; and continued government investment in much-needed new power capacity.

Critically, we maintain that the GCC countries will be able to withstand low oil prices without significantly altering their model of government-driven economic development, which has translated into a significant expansion in power generating capacity over the past few years. This will be possible thanks to abundant foreign reserves and the issuance of more debt, and will be accompanied by greater use of private-public partnership (PPPs) to attract foreign investment. That said, with our Oil & Gas team expecting a sustained period of lower prices due to a continued glut in global oil supply (*see chart below*), we expect GCC spending to focus on a smaller number of strategically important power projects.

Low Oil Prices Will Focus Investment On Strategic Projects

BMI - Brent And OPEC Basket Oil Price Forecasts



f = BMI forecast. Source: BMI

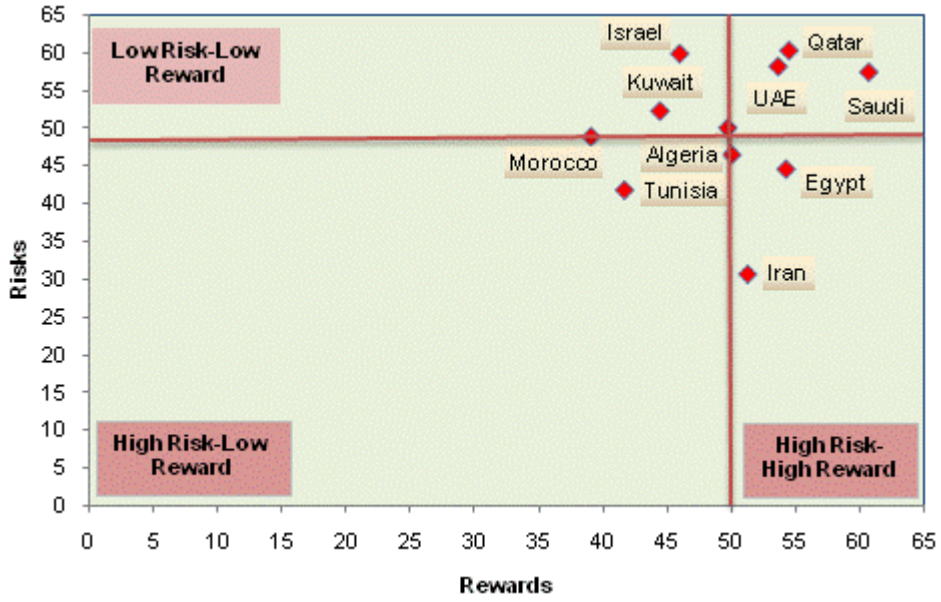
Looking at the outlook for individual countries, we continue to highlight **Qatar** as MENA's outperformer, based on its relatively high political stability and our view that the country's vast financial resources and position as the world's preeminent liquefied natural gas (LNG) exporter will see it register strong macroeconomic growth and continue to expand gas-fired power capacity. In particular, the implementation of a small number of mega-projects will allow Qatar to meet strong electricity demand growth. On a more negative note, the wide availability of natural gas feedstock will limit investment in segments like renewables, despite government plans to diversify into solar power. As a result, Qatar's focus on only a handful of large projects and the dominant position of state-owned players in the market will limit the number of contracts available to private investors.

Meanwhile, we expect **Saudi Arabia** to remain an attractive destination for power sector investors due to the kingdom's solid macroeconomic trajectory, growing population and robust power sector capacity expansion plans, supporting the country's second place position in our index. The government's commitment to diversifying the power sector to reduce domestic oil consumption in power generation will continue to create investment opportunities. We highlight, however, that fiscal pressures will result in a

more cautious and rationalised approach to ambitious nuclear and solar power expansion plans compared to the past.

Low Risks, High Rewards Support GCC Outperformance

MENA Power Risk*/Reward Index, Scores Out Of 100



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

We expect the **UAE** to also be resilient to lower oil price as its macroeconomic growth outlook is positive and well balanced. Similarly to the rest of the GCC, the government has significant fiscal buffers and foreign reserves to continue to finance spending on new installed capacity and the diversification of the electricity mix. Growing power generation and consumption, coupled with a low level of political risk, continue to account for the country's third position in our index. Within the country, we highlight that Dubai is positioning itself as a major investment destination for international solar power developers, underpinning our broader outlook for strong growth in solar capacity in the UAE.

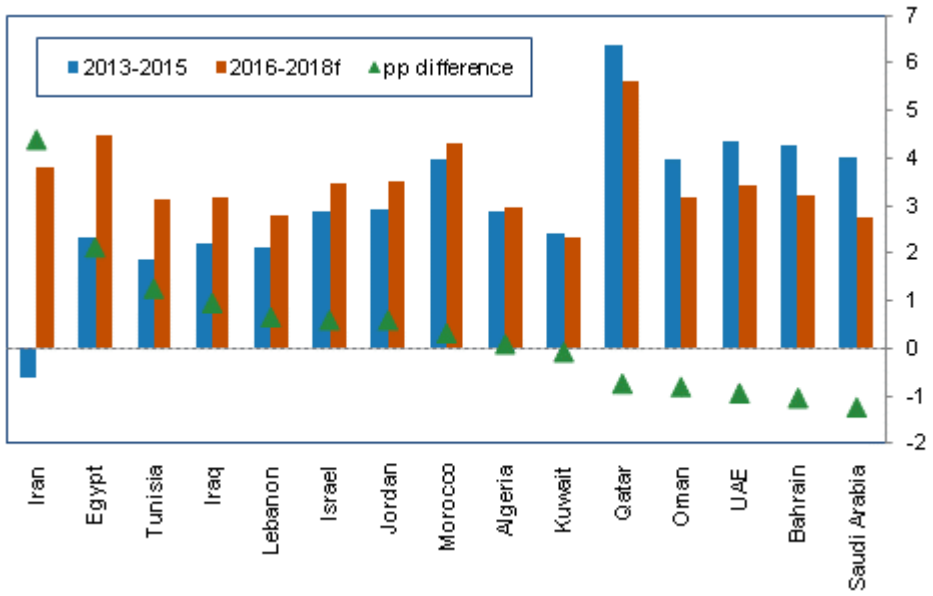
Outlook For Egypt And Iran Will Continue To Brighten

Beyond the GCC, our forecast for prolonged weakness in oil prices continues to support our view that many North African oil importers will see an improvement in their macroeconomic outlook over the coming quarters. In turn, this could create additional opportunities for power sector investment. **Morocco** - whose overall score improved this quarter - is a case in point, with the government pledging to slash fossil fuel subsidies and implementing a tendering process for renewables capacity which is attracting notable interest from international project developers.

Among oil importers, however, **Egypt** is the power market for which our outlook is the most positive - as reflected in the country's fourth position in our RRI. Barring Iran, Egypt will register the strongest acceleration in real GDP growth over the coming years, according to **BMI**'s Country Risk team (*see chart below*). This will be the result of greater political stability, strong demand and a weak currency. Growth will be increasingly driven by fixed investment - with this investment leading to an uptick in the number of power projects in the pipeline and a recent surge in investment pledges from international investors, including **Siemens** in June 2015. The outlook for gas-fired capacity has been lifted by the discovery of the Zohr gas field, the largest ever discovered in the Mediterranean, which is set to make the country a net gas exporter again when it comes online in 2020/21.

Iran And Egypt Stand Out

MENA - Real GDP Growth % y-o-y

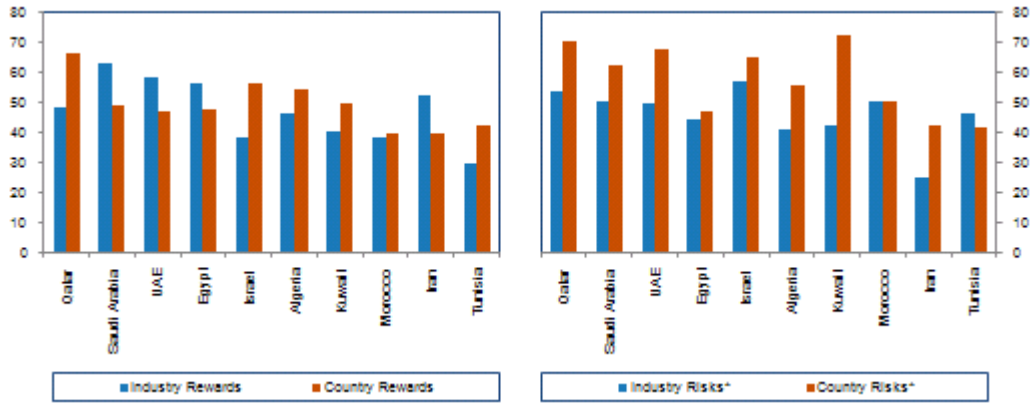


Source: BMI, Respective Statistical Agencies

The achievement of a deal between the P5+1 powers (the US, Russia, China, France, the UK and Germany) and **Iran** over its nuclear programme in July has strengthened our optimistic outlook for the growth prospects of the country's power sector. The lifting of sanctions on the country as it complies with the deal's term will generate fast economic growth over the coming quarters (*see chart above*), boosting Iran's score for Country Rewards and lifting Industry Rewards via stronger electricity demand growth. While significant risks will remain, we highlight that the power sector is set to be a major beneficiary of the removal of sanctions. In particular, a number of European companies such as Denmark's **Vestas**, as well as a number of German financiers, have already indicated that they are interested in investing into Iran's nascent wind power sector. Iran also has plans to construct the Middle East's first geothermal power project in north-western Meshgin Shahr - in line with targets to install 5,000MW of renewables capacity by 2020. Progress in these areas would notably boost the country's renewables outlook and lift its Industry Rewards profile.

A Diverse Landscape Of Rewards And Risks

MENA Power Industry RRI, Scores Out Of 100



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

Iran Power Risk/Reward Index

BMI View: *Despite the signing of the Joint Comprehensive Plan of Action on Iran's nuclear programme in July 2015, and accompanying prospects for increased foreign investment in industry, ran scores roughly the same as the previous quarter in terms of both industry and country risk and reward. The low oil price means economic growth continues to be sluggish. The government is struggling to raise the price of electricity for fear of popular protest, a factor which may adversely affect the government's ability to attract foreign investment. That said, things may change if international sanctions are lifted for an extended period and if there is an upturn in the global price of oil.*

Rewards

Industry Rewards

During Q1 2016, **BMI**'s research forecasts Iran's Industry Reward score rating to remain the same as during the previous quarter. As yet, forecasts for percentage growth in power generation over the next five years has not reflected renewed foreign investor interest in the sector, and the country's score in this regard remains lower than the regional average. That said, Iran scores higher than the regional average in terms of overall power generation, capacity and consumption, although there is no improvement on its score for these criteria compared with the previous quarter. The Iranian power sector's greatest asset remains its near complete coverage of the population in terms of access. However, owing to the fact there is limited room for expansion in this regard, forecasts for growth in consumption over the coming five year period are low, bringing down the country's overall Industry Reward Score to just below the regional average.

Country Rewards

Iran's Country Reward score also remains the same as last quarter, according to **BMI**'s research. The country scores very low on predictions for economic growth over the coming five years - measured both by capita and real GDP - dragging down its overall Country Reward rating. 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. Growth remains sluggish because the relaxing of international sanctions has yet to take effect. Similarly, Iran also scores very low in terms of predictions for inflation levels during the next five years. Again, there is no change from the previous quarter in this regard, but this low rating drags the country's overall Country Reward rating down. That said, the country continues to score well on its import dependency rating, 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 slightly less favourably than during the previous quarter, according to **BMI**'s research. This mild change is primarily driven by a marginally less favourable outlook for renewables, an area in which Iran fares less well than other countries in the region. The country continues to score poorly on the transparency of the tendering process, although no more so than in Q4 2015. The country score for access to finance also remains poor, as does the outlook for increased liberalisation; despite government promises that it will open its power sector up to foreign and private competition, little has actually been accomplished.

Country Risks

Iran's Country Risk Score remains the same as during the previous quarter. 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 favour positively on lack of external risk and on policy continuity. Again, 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, and thus, the country scores averagely compared to its neighbours on short term political stability.

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 will see external sanctions on Iran reduced, there is potential for a rise in international investment over the coming years. That said, until a more substantive agreement is reached, such an outcome remains far from certain.

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 addition to BOT plants, Iran has attempted to promote a build-own-operate (BOO) model for the 2GW Zanjan 1-4 independent power project (IPP). In September 2004, the BOO plan was dealt a setback due to a lack of bidders. Overall, Iran is planning 5.8GW of BOT projects and 7GW of BOO projects.

In June 2005, the World Bank was invited by the government of Iran to engage in a dialogue on reform of the power sector, as well as to identify areas of cooperation. In January 2006, a workshop was held in Tehran to discuss private sector participation in the power sector and the development of a power exchange. During this workshop, the World Bank presented international lessons learned and was further informed of the government's plans for power sector reform.

In February 2010, Iran began the process of privatising a number of the country's power plants. Iran's deputy energy minister, Mohammad Behzad, announced plans to privatise 20 power plants in the first half of the 2010/11 Iranian calendar year, and to date 18 plants have been sold off to the private sector.

The power plants have so far been privatised via IPO. 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.

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, perhaps in large part due to resistance among elements of the regime to ceding control of the state-dominated economy to the private sector.

Majid Salehi, the Managing Director of Iran Power Development Company, has revealed that around 28 new power plants will begin production by the end of the government's tenure in the next Iranian year, starting March 2013. Investment of approximately IRR50trn (USD4.1bn) will be required for the projects, which will be developed as part of the energy ministry's Mehr Mandegar programme. The 648MW Kermanshah Power Plant will be the first to start production, while the gas-fired units of the Zanjan, Semnan and Shahround power plants should become operational in the coming months. The ministry has granted permits for the private sector construction of renewable energy power plants, with a combined production capacity of 12GW, according to **Iran Renewable Energy Organization**'s Managing Director, Yousef Armodeli.

In October, a deputy minister was quoted as saying that the Iranian government was considering permitting private companies to export part of the electricity they produce in the country.

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 falling, 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: 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
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

Key Power Projects Database - Continued

Project	Value, USDmn	Capacity, MW	Companies	Time-frame	Status
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

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. The past three months have seen the signing of a raft of agreements with companies in Europe, 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**. The first unit at the Chehelsotun plant was brought online in 2005.

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.

Construction of 10 power plants was transferred to the private sector, state-utility Tavanir stated in June 2010, according to a report in Iran Daily, although no further details were disclosed. The country needs 5GW of new electrical power every year, which requires private participation, according to Tavanir's Deputy Head, Gholam Reza Khoshkholq.

The signing of the Joint Comprehensive Plan of Action has facilitated the privatisation process, 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.

Agreements signed between the Iranian government and foreign power companies or governments relating to the power sector since July 2015 include:

- 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 in August, 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;
- In early November, the government announced it had signed an agreement worth USD6bn with an unnamed European company to install 4,250MW of new capacity in the country. Iranian press quoted government spokesman Mohammed Baqer Nobakht as saying the deal could see the Euopean firm establish up to 3,250MW of wind power plants in the country. The developer has not yet been named, but the government has approved establishing plants totalling 3,250MW at Tabriz, Miyaneh and Aras in northwestern Iran, and Zahedan in southeast Iran;
- 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

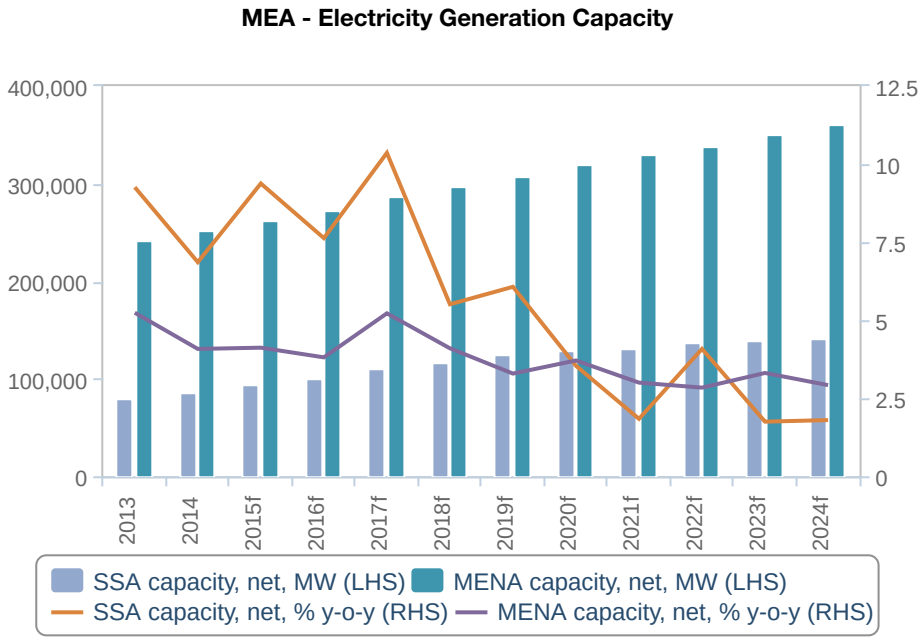
Regional Overview

MEA Power: Key Regional Themes

BMI View: *MENA will outperform the SSA across our 10-year power generation, consumption and capacity forecasts. Government-led spending in MENA markets will be more circumspect in the face of lower prices but we expect it to remain robust and for Egypt and Iran to offer growing opportunities for foreign investors. SSA will continue to be blighted by deteriorating fiscal and financing conditions due to lower commodities prices - curbing government infrastructure spending and prolonging power crises.*

Within the broader Middle East and Africa (MEA) region, there are clear distinctions between the power markets in Middle East and North Africa (MENA) sub-region and the markets in Sub Saharan Africa (SSA). These differences are based on the size and maturity of the component power markets, the level of development, potential growth on offer and the generation mix within the sub-regions. MENA power markets - particularly those in the Gulf Cooperation Council (GCC) - are far more developed than their SSA counterparts and have strong project pipelines. Conversely, SSA power markets are characterised by insufficient power infrastructure, power shortages and a history of underinvestment.

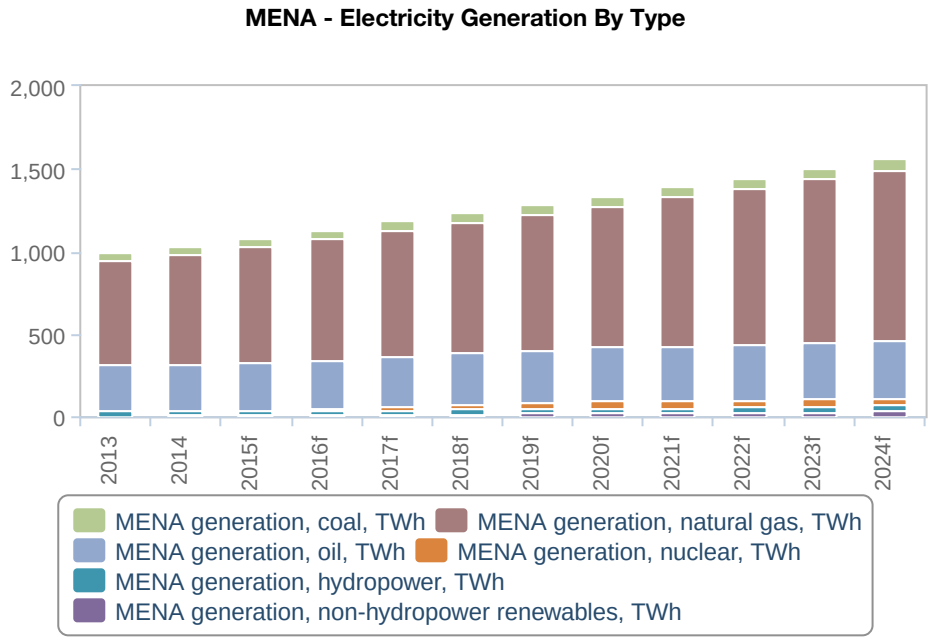
Middle East Racing Ahead Of Africa In Terms Of Capacity



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

Thermal fuels dominate both the MEA and SSA electricity generation mix. However, coal is the fuel of choice in the SSA region (largely on account of South Africa's relatively developed coal power sector), whereas gas is the key fuel powering the MENA electricity sector. We expect this trend to continue over the next decade, with coal accounting for nearly 50% of SSA's power mix in 2024, and natural gas accounting for 67% of total generation in MENA by 2024.

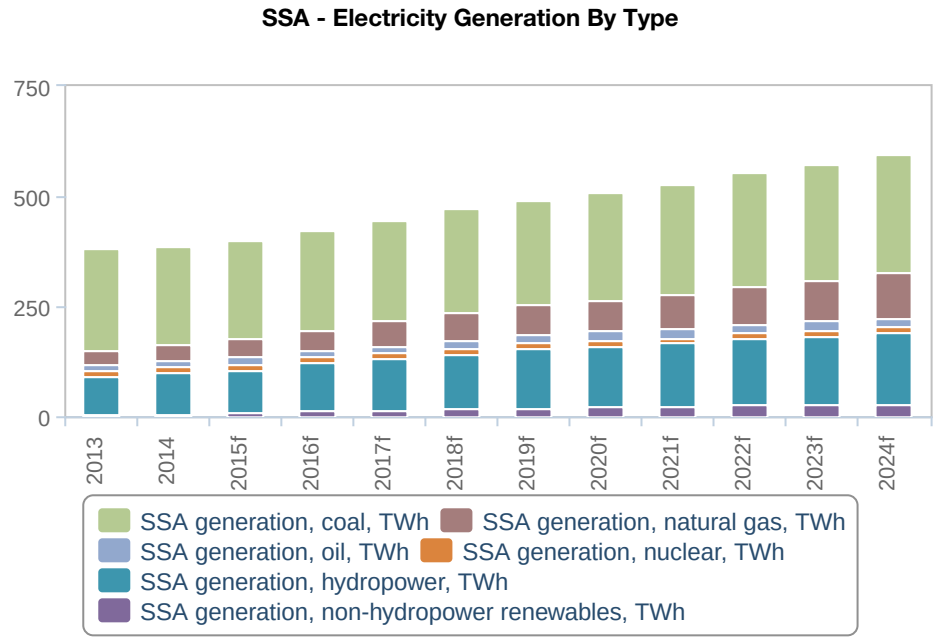
MENA Aiming To Gradually Cut Reliance On Oil



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

That said, coal in SSA will lose some share in the mix over the forecast period, as a result of countries like Nigeria, Ghana and Cote d'Ivoire gradually ramping up gas-fired capacity. We also note that oil will decrease its share in the power markets across the whole MEA region, particularly in the Gulf Cooperation Council (GCC). This is a result of countries wanting to preserve oil for export rather than burning it in domestic power generation.

SSA - Gas Growing But Coal Dominates



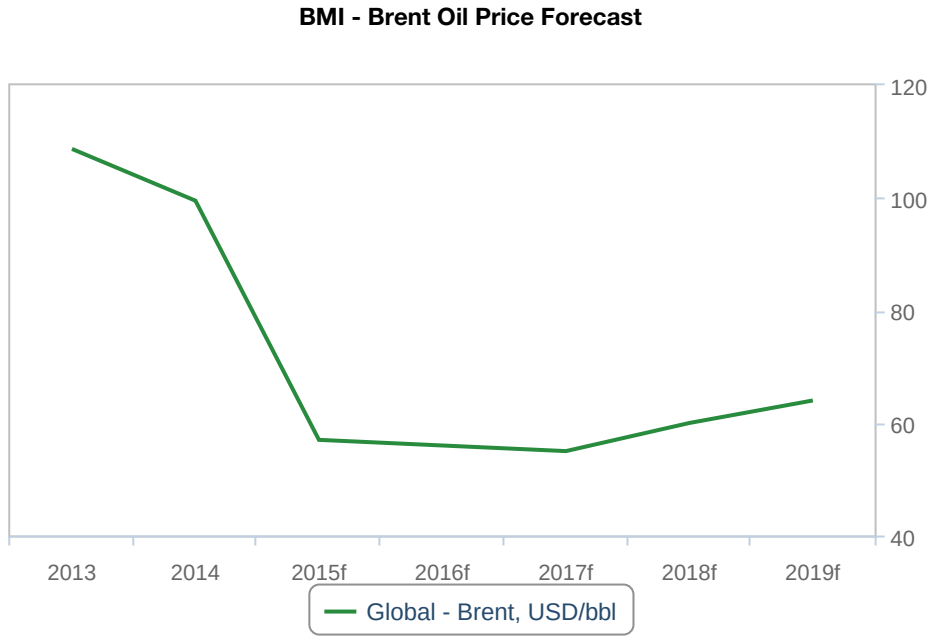
e/f = BMI estimate/forecast. Source: EIA, BMI

Key trends in the MENA power sector include:

- **Lower Oil Prices To Restrain Spending On Infra And Power**

Lower global oil prices will have a varying impact on the MENA region as both net oil importers and net oil exporters adjust to a sustained period of lower prices. We maintain that many of the biggest Middle Eastern markets (the exporters) - particularly Saudi Arabia, UAE and Kuwait - will remain resilient to lower prices owing to their significant fiscal buffers and large foreign reserves. Qatar is most insulated from lower prices thanks to its position as the world's number one gas exporter.

Lower Oil Prices To Focus Infra And Power Spending



f = forecast. Source: BMI

Nevertheless, our Oil & Gas team has revised down its oil price forecasts this quarter on the basis that global supply growth will outstrip growth in global consumption growth for the next two years. We anticipate a sustained period of lower prices whereby Brent will average USD55/bbl in 2017. As a consequence, countries like Saudi Arabia, which rely heavily on government spending to drive growth in power infrastructure, will adopt a more cautious and rationalised approach to more ambitious nuclear and solar power expansion plans as a result of fiscal pressures. Although spending will remain elevated, this bigger focus on fiscal diligence will mean that countries like Saudi Arabia will focus on a smaller number of strategically important projects. The Fadhili gas project is a prime example - as the kingdom gradually attempts to cut oil use in power generation so as to conserve it for more lucrative export.

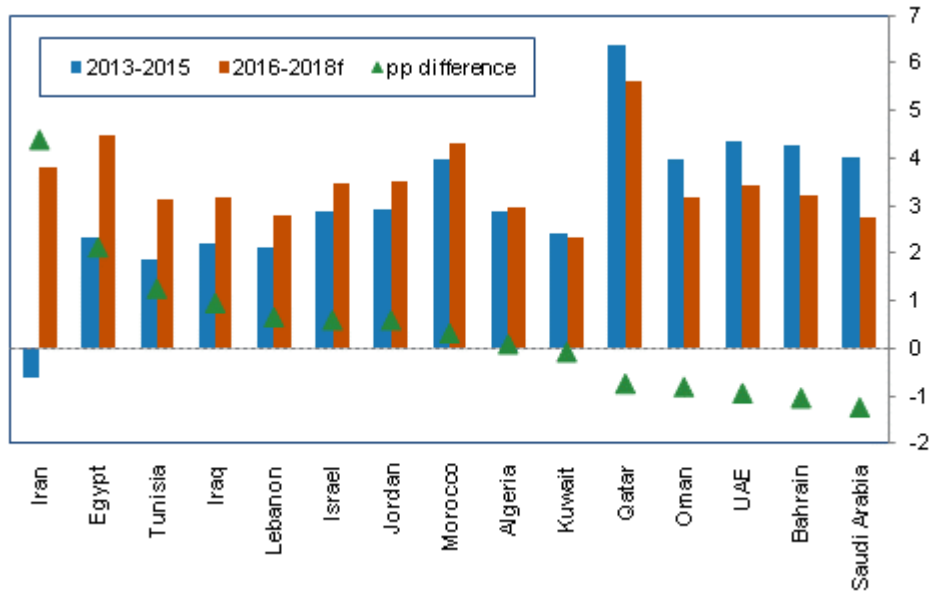
- **Egypt And Iran Set To Entice Investors**

Greater political stability in Egypt and the unwinding of sanctions on Iran mean that, while many emerging markets are facing economic headwinds, we are optimistic on the growth prospects for both countries. Iran's economy will post the largest uptick in growth among MENA countries over the coming years and we expect almost all sanctions to be lifted by the end of Q116 as the country complies with inspections of its

nuclear programme. A number of major structural challenges will remain, but the removal of sanctions will unlock significant foreign investment opportunities - with the power sector set to be a major beneficiary. A number of European companies such as Denmark's **Vestas**, as well as a number of German financiers, have already indicated that they are interested in investment in Iran's nascent wind power sector. Iran also has plans to construct the Middle East's first geothermal power project in north-western Meshgin Shahr - in line with targets to install 5,000MW of renewables capacity by 2020.

Iran And Egypt Stand Out

MENA - Real GDP Growth % y-o-y



Source: BMI, respective government statistics agencies

Similarly, we expect Economic growth in Egypt to gather steam due to relative political stability, pent-up demand and a weak currency. Growth will be increasingly driven by fixed investment as consumer and government spending remain weighed down by fuel subsidy reform - with this investment leading to an uptick in the number of power projects in the pipeline and a recent surge in investment pledges from international investors, including Siemens in June 2015. The outlook for gas-fired capacity has been lifted by the discovery of the Zohr gas field, the largest ever discovered in the Mediterranean, which is set to make the country a net gas exporter again when it comes online in 2020/21.

Key trends in the SSA power sector include:

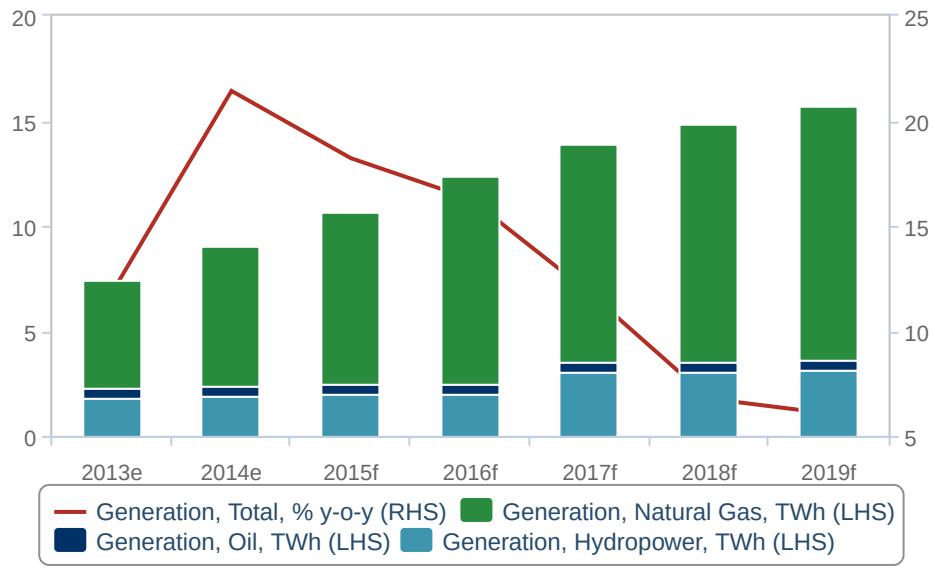
- **Tougher Economic Conditions Expose Absence Of Reform**

Global headwinds such as slowing Chinese growth, weak commodities prices and a strong USD will ensure sovereign risk remains elevated in SSA - with tougher financing and fiscal conditions set to limit government spending on power infrastructure. Our Commodities team has long held below-consensus price forecasts for most commodities and expects any rebound in prices after a 2015-2016 to be gradual and unimpressive. This implies a 'lost decade' for commodities prices, which started in 2011 and will last over the medium term.

In this environment, resource-dependent economies such as Angola, Nigeria and Zambia will continue to bear the brunt of global economic headwinds. They will have to contend with deteriorating external and fiscal balances and face inevitable currency devaluations, which will limit government spending and deter private investors who will be needed to help plug SSA's huge power infrastructure deficit. Rising US interest rates will add to these pressures, driving yields on SSA eurobonds higher and making external debt more costly to service. Again, these tougher financing conditions will weigh on state-led investment in infrastructure.

Reforms Bode Well For Cote d'Ivoire

Cote d'Ivoire - Electricity Generation By Type

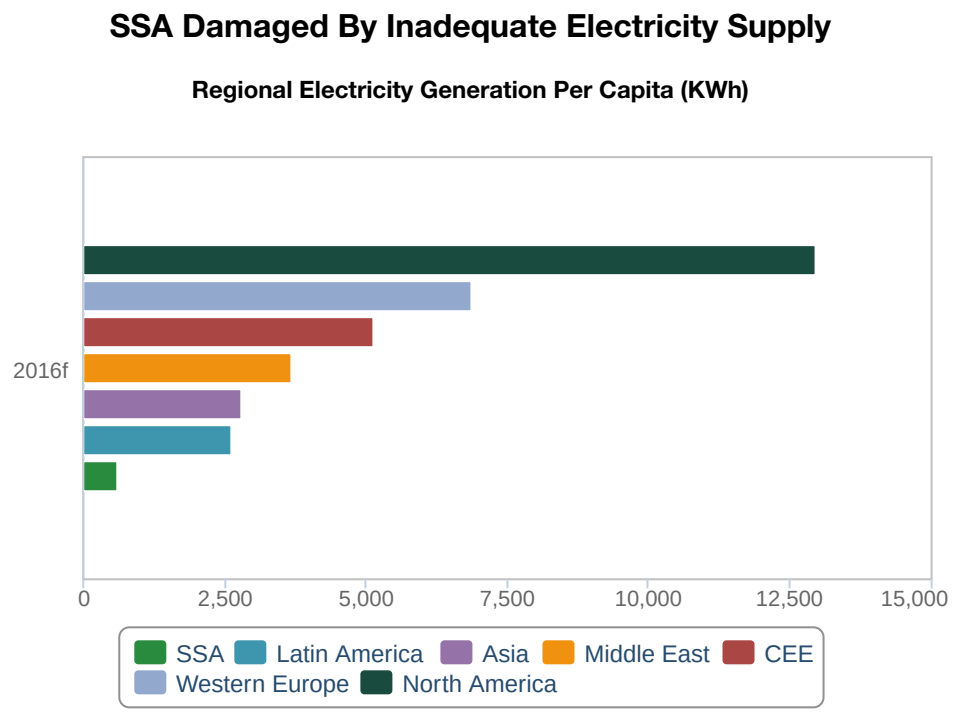


e/f = BMI estimate/forecast. SourcesEIA,BMI

In our view, the markets that will remain more resilient to these external headwinds include Cote d'Ivoire, which has one of the most attractive and stable power sectors in SSA. Cote d'Ivoire will be boosted by the fact that cocoa, its major export, is one of the few commodities that we expect to increase in price over the coming years. From a sector-specific viewpoint, the country has undertaken significant reform in order to attract independent power producers (IPPs) and its pro-business environment will help to encourage private investment even as the economic environment in other SSA countries worsens.

- **Power Crises To Have Economic And Political Ramifications**

In addition to the deteriorating economic environment, a number of major SSA markets will continue to suffer from power crises, which will have economic and political ramifications in 2015 and beyond. Although SSA is chronically underserved in terms of electricity supply, our forecasts for electricity generation in many countries have deteriorated due to drought and its effects on hydropower, underinvestment in new capacity, mismanagement at state-owned utilities, fuel shortages and a failure to enact reforms to encourage private investment.



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

Countries suffering power crises include South Africa, Ghana, Zambia, Botswana, Nigeria and Senegal, meaning that the issue is not restricted to one particular region - although East African markets are largely unaffected at present. While there are other factors at play, such as limited exposure to commodities exports, strong growth in power supply is one of the reasons that economic growth in countries like Ethiopia and Kenya will outpace all of those countries mentioned 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