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IRAN

POWER REPORT

INCLUDES 10-YEAR FORECASTS TO 2024

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BMI Industry View

BMI View: *Iran's power sector development received a boost in July 2015 following the signing of the Joint Comprehensive Plan of Action on the country's nuclear programme between the PG + 1, comprised of the five permanent members of the UN Security Council and Germany, and Iran. If implemented successfully, the deal will open up Iran's considerable market of 79.5mn people to foreign investment and provide a boon to the Iranian economy by removing sanctions.*

Following the signing of the deal, the Iranian government signified its intention to open up various elements of its economy to foreign private sector investment. In terms of the power sector, Iran is particularly attractive to foreign investors. Historically, government subsidies to the power sector have kept electricity prices artificially low, meaning access rates are near 100%. In addition to this considerable market, many of Iran's neighbours, most notably Pakistan and Turkey, suffer from considerable electricity deficits. In the wake of the recent nuclear deal, Iran has been looking to enhance cooperation on energy issues with its neighbours, negotiating interconnection deals with the governments of Pakistan and Armenia.

The government has its own investment programme for the sector, including ambitious plans to add around 1GW of new capacity each year, plus a further and perhaps unrealistic target of increasing renewable generation capacity by 5GW by 2020. **BMI**'s research suggests that the majority of this new capacity will come from natural gas, rather than utilising other generation technologies. Aside from new capacity being constructed, the government also plans to convert much of its simple cycle technology to combined cycle, which will result in a considerable increase in efficiency.

The lifting of economic sanctions on Iran will provide a considerable fillip to these plans. The government's plans to boost generation capacity would require a considerable capital injection of at least USD4.4bn. Such investment was not feasible when the government was under international sanctions; however, following the signing of the nuclear deal, the government should have additional capital to spend on new generation projects.

The government also plans to dramatically reduce the subsidies it pays to the power sector, which keep electricity prices artificially low. In 2014, it reduced subsidies by 25%, then again in early 2015 by a further 25%. It is likely to continue with this policy if it can. Under international sanctions, this proved difficult because given constraints elsewhere in the economy, the raising of electricity prices - a necessary condition when lowering subsidies - were unpopular. If the economy does better once sanctions are removed, raising

prices could prove easier. Higher electricity prices are vital if the government wants to attract foreign private investment in its power sector.

Sanctions will not be lifted until the International Energy Agency verifies that the Iranian government is sticking to its side of the Comprehensive Plan of Action. International Energy Agency officers are to be granted regular access to Iran's nuclear facilities. However, it is unlikely to be able to verify Iran's compliance until year end at the earliest.

The Iranian government has long planned for nuclear capacity to make up a significant part of its power matrix. Currently it accounts for about 915MW, but plans to develop new capacity had been obstructed during negotiations on the country's nuclear programme. In theory, Iran could push ahead with plans to generate a great deal more electricity from nuclear than it currently does. The government wants to develop a further two reactors, equivalent to about 2GW at its Bushehr facility, and signed several agreements with the Russian government to achieve this. The Comprehensive Plan of Action allows Iran to enrich Uranium to 3.67%, enough for power generation, but insufficient to develop a nuclear weapon. However, **BMI**'s research on the issue does not point to the country successfully developing new nuclear capacity between 2016-2024.

Key Trends And Developments

- Following the signing of the Joint Comprehensive Plan of Action on Iran's nuclear programme, the Iranian government announced plans to open its economy for the first time to foreign private investment. It will take some time for the US Congress to approve the agreement, and for the International Energy Agency to verify that Iran is honouring its side of the bargain. However, the country's power sector could prove particularly lucrative for private companies looking to invest.
- The signing of the Joint Comprehensive Plan of Action has also boosted Iranian plans to export power to its electricity hungry neighbours. In August, the Export Development Bank of Iran agreed to fund USD91m a third power line to Armenia, raising capacity to 1GW, and a Pakistani delegation visited Tehran to negotiate a power purchase agreement for a 1GW interconnection project. This is a trend **BMI** expects to continue. In the aftermath of the nuclear deal, Iranian ambassador to Pakistan Ali Raza announced his government planned to boost exports to Pakistan to 3GW in the next few years.
- **BMI** estimates Iran's total power generation to be 255.24TWh per annum, an increase of 1.55% on 2014's 251.35TWh. During the period 2016-2024, the country's total power generation is expected to rise by an average of 2.73% per year, to 325.3TWh. This new capacity will be driven mainly by development of new gas fired power stations, but also through converting simple cycle power plants to combined cycle technology.
- Iran's 2015 real GDP is estimated by **BMI** to have grown by 1.4%, slightly less than 2014's 1.7%. However, both these figures represent a substantial improvement on 2013's contraction of 1.9%, and 2012's 6.6% contraction. According to **BMI**'s research, Iranian economic growth will increase gradually between 2016 and 2024 at an average y-o-y rate of 2.5%.

- Iran's population is expected to grow from 79.5mn in 2015 to 87.3mn in 2024, representing an average y-o-y increase of just over 1%. Power consumption will see considerable gains between 2016 and 2024, increasing from 209.76TWh in 2015, to 276.43TWh in 2024. This is an average y-o-y increase of 3.11%.

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.

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.

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

Iran Power SWOT - Continued

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)

	2014e	2015f	2016f	2017f	2018f	2019f
Nominal GDP, USDbn	492.0	417.1	434.8	478.6	522.5	572.1
GDP per capita, USD	6,269	5,248	5,404	5,877	6,343	6,870
Real GDP growth, % y-o-y	-0.5	0.6	2.9	3.9	4.6	5.6
Population, mn	78.5	79.5	80.5	81.4	82.4	83.3

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	572.1	609.8	644.0	684.9	722.8	762.3
GDP per capita, USD	6,870	7,246	7,576	7,981	8,347	8,728
Real GDP growth, % y-o-y	5.6	4.8	4.1	4.3	4.3	3.9
Population, mn	83.3	84.1	85.0	85.8	86.6	87.3

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

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	246.70	251.35	255.24	261.22	266.97	273.38
Generation, Total, % y-o-y	3.11	1.89	1.55	2.34	2.20	2.40
Generation, Total, KWh per capita	3,185.33	3,203.15	3,211.51	3,246.51	3,278.84	3,319.35
Generation, Thermal, TWh	227.49	231.76	235.49	241.07	246.61	252.77
Generation, Thermal, % y-o-y	0.94	1.88	1.61	2.37	2.30	2.50
Generation, Thermal, KWh per capita	2,937.33	2,953.45	2,963.04	2,996.14	3,028.75	3,069.13
Generation, Thermal, % of total generation	92.21	92.21	92.26	92.29	92.37	92.46
Generation, Coal, TWh	0.45	0.46	0.47	0.48	0.48	0.49
Generation, Coal, % y-o-y	0.10	2.23	2.23	1.10	1.25	1.72
Generation, Coal, KWh per capita	5.83	5.88	5.93	5.93	5.93	5.96
Generation, Coal, % of thermal electricity generation	0.20	0.20	0.20	0.20	0.20	0.19
Generation, Coal, % total electricity generation	0.18	0.18	0.19	0.18	0.18	0.18
Generation, Natural Gas, TWh	167.01	171.02	174.53	179.93	185.32	191.35
Generation, Natural Gas, % y-o-y	1.10	2.40	2.05	3.09	2.99	3.26
Generation, Natural Gas, KWh per capita	2,156.48	2,179.45	2,196.05	2,236.27	2,275.97	2,323.32
Generation, Natural Gas, % of thermal electricity generation	73.42	73.79	74.12	74.64	75.15	75.70
Generation, Natural Gas, % of total electricity generation	67.70	68.04	68.38	68.88	69.41	69.99
Generation, Oil, TWh	60.02	60.28	60.49	60.66	60.81	60.94
Generation, Oil, % change y-o-y	0.50	0.42	0.35	0.29	0.24	0.20
Generation, Oil, KWh per capita	775.03	768.13	761.06	753.95	746.85	739.86
Generation, Oil, % of thermal electricity generation	26.39	26.01	25.69	25.16	24.66	24.11
Generation, Oil, % of total electricity generation	24.33	23.98	23.70	23.22	22.78	22.29
Generation, Nuclear, TWh	6.40	6.41	6.41	6.42	6.42	6.42
Generation, Nuclear, % y-o-y	381.93	0.20	0.01	0.10	0.02	0.04
Generation, Nuclear, KWh per capita	82.64	81.72	80.70	79.79	78.86	78.00
Generation, Nuclear, % of total electricity generation	2.59	2.55	2.51	2.46	2.41	2.35
Generation, Hydropower, TWh	12.57	12.73	12.87	13.09	13.30	13.54
Generation, Hydropower, % change y-o-y	2.00	1.29	1.10	1.68	1.65	1.81
Generation, Hydropower, KWh per capita	162.30	162.25	161.96	162.66	163.38	164.45

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

	2013	2014	2015f	2016f	2017f	2018f
Generation, Hydropower, % total electricity generation	5.10	5.07	5.04	5.01	4.98	4.95
Hydro-Electric Pumped Storage, TWh	0.00	0.00	0.00	0.00	0.00	0.00
Hydro-Electric Pumped Storage, KWh per capita	0.00	0.00	0.00	0.00	0.00	0.00
Hydro-Electric Pumped Storage, % total electricity generation	0.00	0.00	0.00	0.00	0.00	0.00
Generation, Non-Hydropower Renewables, TWh	0.24	0.45	0.46	0.64	0.64	0.64
Generation, Non-Hydropower Renewables, % change y-o-y	3.14	89.37	2.95	37.87	0.17	0.24
Generation, Non-Hydropower Renewables, KWh per capita	3.06	5.73	5.82	7.93	7.84	7.77
Generation, Non-Hydropower Renewables, % of total electricity	0.10	0.18	0.18	0.24	0.24	0.23

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	279.71	289.44	298.21	307.63	316.29	325.30
Generation, Total, % y-o-y	2.32	3.48	3.03	3.16	2.82	2.85
Generation, Total, KWh per capita	3,359.13	3,439.63	3,508.60	3,585.06	3,652.84	3,724.60
Generation, Thermal, TWh	258.69	267.85	276.18	285.26	293.58	302.23
Generation, Thermal, % y-o-y	2.34	3.54	3.11	3.29	2.92	2.95
Generation, Thermal, KWh per capita	3,106.61	3,183.01	3,249.33	3,324.42	3,390.55	3,460.43
Generation, Thermal, % of total generation	92.48	92.54	92.61	92.73	92.82	92.91
Generation, Coal, TWh	0.50	0.50	0.51	0.53	0.54	0.55
Generation, Coal, % y-o-y	1.41	0.98	2.00	3.00	2.00	2.00
Generation, Coal, KWh per capita	5.98	5.98	6.03	6.16	6.22	6.29
Generation, Coal, % of thermal electricity generation	0.19	0.19	0.19	0.19	0.18	0.18
Generation, Coal, % total electricity generation	0.18	0.17	0.17	0.17	0.17	0.17
Generation, Natural Gas, TWh	197.15	206.22	214.47	223.47	231.73	240.33
Generation, Natural Gas, % y-o-y	3.03	4.60	4.00	4.20	3.70	3.71
Generation, Natural Gas, KWh per capita	2,367.60	2,450.64	2,523.27	2,604.35	2,676.26	2,751.67
Generation, Natural Gas, % of thermal electricity generation	76.21	76.99	77.66	78.34	78.93	79.52
Generation, Natural Gas, % of total electricity generation	70.48	71.25	71.92	72.65	73.27	73.88

Total Electricity Generation Data And Forecasts (Iran 2019-2024) - Continued						
	2019f	2020f	2021f	2022f	2023f	2024f
Generation, Oil, TWh	61.04	61.13	61.20	61.26	61.31	61.35
Generation, Oil, % change y-o-y	0.17	0.14	0.12	0.10	0.08	0.07
Generation, Oil, KWh per capita	733.02	726.40	720.02	713.91	708.07	702.47
Generation, Oil, % of thermal electricity generation	23.60	22.82	22.16	21.48	20.88	20.30
Generation, Oil, % of total electricity generation	21.82	21.12	20.52	19.91	19.38	18.86
Generation, Nuclear, TWh	6.43	6.43	6.44	6.44	6.44	6.44
Generation, Nuclear, % y-o-y	0.10	0.04	0.04	0.04	0.04	0.04
Generation, Nuclear, KWh per capita	77.22	76.45	75.72	75.03	74.38	73.77
Generation, Nuclear, % of total electricity generation	2.30	2.22	2.16	2.09	2.04	1.98
Generation, Hydropower, TWh	13.95	14.51	14.94	15.27	15.60	15.95
Generation, Hydropower, % change y-o-y	3.00	4.00	3.00	2.15	2.21	2.25
Generation, Hydropower, KWh per capita	167.53	172.41	175.82	177.89	180.19	182.66
Generation, Hydropower, % total electricity generation	4.99	5.01	5.01	4.96	4.93	4.90
Hydro-Electric Pumped Storage, TWh	0.00	0.00	0.00	0.00	0.00	0.00
Hydro-Electric Pumped Storage, KWh per capita	0.00	0.00	0.00	0.00	0.00	0.00
Hydro-Electric Pumped Storage, % total electricity generation	0.00	0.00	0.00	0.00	0.00	0.00
Generation, Non-Hydropower Renewables, TWh	0.65	0.65	0.66	0.66	0.67	0.68
Generation, Non-Hydropower Renewables, % change y-o-y	0.99	1.01	0.75	0.57	1.07	0.93
Generation, Non-Hydropower Renewables, KWh per capita	7.77	7.76	7.74	7.71	7.73	7.73
Generation, Non-Hydropower Renewables, % of total electricity	0.23	0.23	0.22	0.22	0.21	0.21

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	79,836.0	81,757.7	83,658.8	85,650.8	87,791.7	90,200.0
Capacity, Net, % y-o-y	2.0	2.4	2.3	2.4	2.5	2.7
Capacity, Conventional Thermal, MW	68,440.5	70,124.1	71,975.4	73,767.2	75,766.3	77,933.2
Capacity, Conventional Thermal, % y-o-y	2.2	2.5	2.6	2.5	2.7	2.9
Capacity, Conventional Thermal, % of total capacity	85.7	85.8	86.0	86.1	86.3	86.4
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	1.0	1.0
Capacity, Hydropower, MW	9,843.5	9,961.6	10,011.4	10,131.5	10,273.4	10,514.8
Capacity, Hydropower, % y-o-y	1.0	1.2	0.5	1.2	1.4	2.4
Capacity, Hydropower, % of total capacity	12.3	12.2	12.0	11.8	11.7	11.7
Capacity, Non-Hydroelectric Renewables, MW	637.0	757.0	757.0	837.0	837.0	837.0
Capacity, Non-Hydroelectric Renewables, % y-o-y	0.0	18.8	0.0	10.6	0.0	0.0
Capacity, Non-Hydroelectric Renewables, % of total capacity	0.8	0.9	0.9	1.0	1.0	0.9

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	92,875.7	95,277.0	97,530.1	99,917.1	102,446.9	105,130.1
Capacity, Net, % y-o-y	3.0	2.6	2.4	2.4	2.5	2.6
Capacity, Conventional Thermal, MW	80,388.1	82,590.8	84,614.3	86,822.7	89,227.7	91,842.0
Capacity, Conventional Thermal, % y-o-y	3.2	2.7	2.5	2.6	2.8	2.9
Capacity, Conventional Thermal, % of total capacity	86.6	86.7	86.8	86.9	87.1	87.4
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	1.0	1.0	0.9	0.9	0.9	0.9
Capacity, Hydropower, MW	10,735.6	10,934.2	11,163.8	11,342.5	11,467.2	11,536.0
Capacity, Hydropower, % y-o-y	2.1	1.9	2.1	1.6	1.1	0.6
Capacity, Hydropower, % of total capacity	11.6	11.5	11.4	11.4	11.2	11.0
Capacity, Non-Hydroelectric Renewables, MW	837.0	837.0	837.0	837.0	837.0	837.0

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	0.9	0.9	0.9	0.8	0.8	0.8

f = BMI forecast. Source: National sources, BMI

BMI forecasts Iran's total power generation to be 255.24 TWh in 2015, an increase of 1.55% on 2014's 251.35TWh. During the period 2016-2024, the country's total power generation is expected to rise by an average of 2.73% per year, to 325.3 TWh. This will be primarily driven by new gas-fired capacity, and through conversion of older simple cycle units to combined cycle technology. **BMI**'s research does not suggest significant amounts of new nuclear or renewable capacity will come online during 2016-2024.

Iran's government plans to invest substantially in the country's power sector during 2016 to 2024, with an estimated USD4.4bn required. Owing to the fact its economy has been hit by international sanctions during the past two years, meaning industry has required less power, the country has coped relatively well. However, following the recent signing of the Joint Comprehencive Plan of Action on Iran's nuclear ambitions in mid-July, the country's economy is expected to grow, meaning there will be more demand for electricity from industry.

A central challenge for the Iranian government will be to reduce power subsidies, which historically have ensured that electricity remains cheap across the country, but has also meant that consumption is extremely high. During the past two years, the government has sought to reduce these subsidies, with a view to taking the pressure off the country's generation facilities. In 2014, it reduced subsidies by 25%, followed by a further 20% this year. As yet, it is unclear as to whether this will have a substantial impact on consumption.

BMI's research estimates that thermal power generation amounts to 92.96% of Iran's total power generation, a figure which is expected to rise slowly, reaching 92.91% by 2024. Given its abundant reserves, natural gas plays a dominant role in the country's thermal generation makeup. **BMI** estimates the country's natural gas generation to be 174.53TWh during 2015, up some 2.05% on 2014. This is equivalent to 74.11% of Iran's thermal generation capacity and 68.38% of the country's total generation capacity. We forecast gas generation to increase by an average y-o-y rate of 3.62%, reaching 240.33TWh by 2024. Natural gas' share of total generation capacity will rise to 73.88% by 2024, equivalent to 79.52% of thermal generation capacity.

This increase in generation from gas-fired projects will be driven both by new projects coming online, and by conversion of older simple cycle units to combined cycle facilities. 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.

Since September 2011, when Iran began commissioning of the 1,000MW Bushehr power plant, nuclear power has played a key role in the country's generation makeup. The plant had been operated jointly by Iranian and Russian technicians since its inauguration, but was handed over to full Iranian management in October. The reactor entered full commercial operation at the end of 2013, and provided some 6.4TWh during that year.

The Iranian government also intends for nuclear power generation options to play an increasingly important role in the future. 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.

Despite these ambitions, however, **BMI** does not anticipate a substantial increase in Iran's nuclear generation capacity during the period 2016 to 2024. Despite the recent sanctions negotiations breakthrough, the international community remains hostile to Iran's nuclear ambitions and a question mark remains over the country's use of nuclear for power generation. There is also a question mark over the timing of any future nuclear expansion.

Our research suggests that output from nuclear power plants will increase only marginally, from 6.41TWh in 2015 to 6.44TWh by 2024. As a percentage of the country's total installed capacity, this will result in a small decrease, from 2.51% in 2015, to 1.98% in 2024. This also leads us to forecast the increase in natural gas generation as the primary driver of capacity.

Iran's government also plans to reduce its reliance on expensive oil based fuels, such as diesel and heavy fuel oil. During 2015, oil based fuels accounted for 60.49TWh of generation. Though **BMI** forecasts this figure to increase gradually to 61.35TWh by 2024, oil based fuels' share of the country's overall generation capacity will fall from 23.7% in 2015 to 18.86% in 2024.

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%.

Hydropower as a proportion of Iran's generation matrix is also expected to remain steady at about 5% between 2016 and 2024. This, however, is equivalent to an increase from 2.87TWh in 2015 to 15.97TWh in 2024, equal to a year on year increase of 2.42%.

Currently, non-hydro renewables represent just 0.18% of Iran's installed capacity, a figure which is expected to rise to 0.21% by 2024, from 0.46TWh to 0.68Th, according to **BMI**'s research.

However, the government's targets are more ambitious, planning to add 5GW of new renewable capacity by 2020. Iran has promoted its renewable potential for some time, 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.

However, following the successful signing of the Joint Comprehensive Plan of Action, the situation could change, with international developers eager to gain first mover advantage and exploit the country's reported 30GW of wind energy potential. In July 2015, Bloomberg reported Berlin based **GI Umweltconsult**, a developer, planned to invest EUR300mn in wind projects from 2016. Bloomberg also reported turbine supplier **Nordex SE** was also looking to enter the market. **MAPNA Generator Company** had been looking to construct nine wind turbines and manufacture 2.5MW generators by mid-2014, according to Hamid Amini, the company's deputy managing director, but this project looks to have been delayed. In May 2015, the government unveiled the country's first materials production line for wind turbines, its first 2MW turbine, as well as its first crane for turbine repairs.

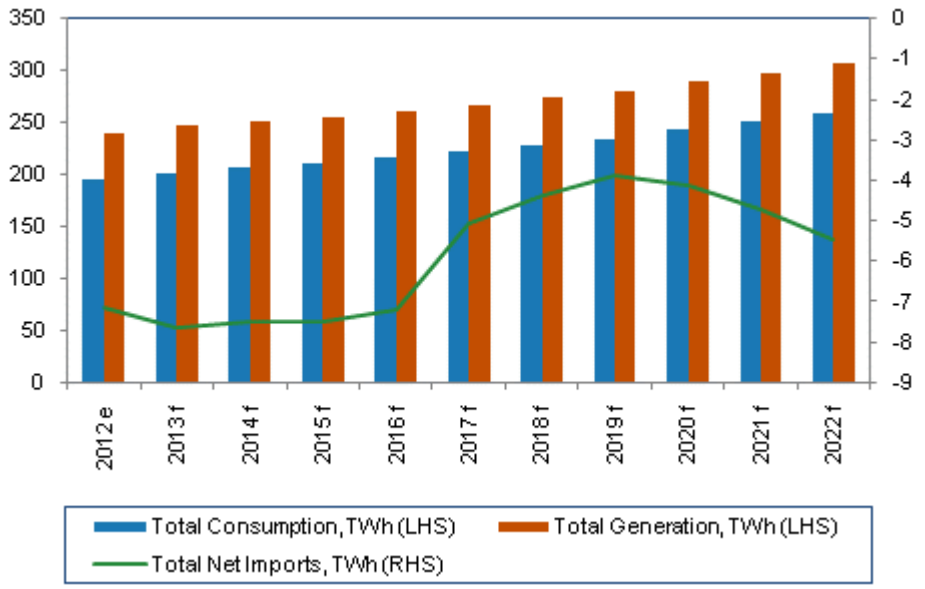
Of Iran's non-hydro renewable capacity, wind makes up the majority of projects at 94.39%. During 2015, Iran produced 0.44TWh from wind power, a figure which will increase to 0.61TWh by 2024, according to **BMI**'s research. Iran's current hydro capacity is comprised of the 2GW Karun 3 plant, the 2GW Godar-e Landar facility and a 1GW station in Upper Gorvand.

Contributions from solar and biomass to Iran's overall generation matrix are only marginal. Solar projects currently supply 0.01TWh, 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.

Given the tensions between Iran and the developed nations, Iran has often sought allies in other large countries, such as China and Russia. This has come in the form of awarding contracts to companies from these countries and the choice to use their technology and equipment, as opposed to Korean or Japanese. Yet, these relationships have not always been smooth. In late May 2012, Iran's government terminated a contract which had been awarded to China for the construction of the south-western Bakhtiari hydropower plant, according to Energy Minister Majid Namjou. China's proposed USD2bn financial package for the 1,500MW plant was rejected by the Iranian central bank, with the project having now been awarded to the Iranian Revolutionary Guard Corps' engineering arm, Khatam al-Anbiya. The cancellation of the contract could have an adverse impact on the economic relationship between China and Iran.

Iran Total Capacity (MW)

2012-2022



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

Electricity Consumption

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

	2013	2014	2015f	2016f	2017f	2018f
Consumption, Net Consumption, TWh	201.2	206.0	209.8	215.5	222.0	228.4
Consumption, Net Consumption, % y-o-y	3.0	2.4	1.8	2.7	3.0	2.9
Consumption, Net Consumption, KWh per capita	2,597.7	2,625.6	2,639.3	2,678.3	2,726.3	2,773.3

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	234.6	242.8	250.5	258.8	267.4	276.4
Consumption, Net Consumption, % y-o-y	2.7	3.5	3.2	3.3	3.3	3.4
Consumption, Net Consumption, KWh per capita	2,817.3	2,885.9	2,947.5	3,015.5	3,088.3	3,165.0

f = BMI forecast. Source: BMI Calculation, EIA

Iran's net electricity consumption in 2015 was 209.76TWh, a 1.81% increase on 2014's 206.76TWh. Five years ago, this figure was 182.70TWh and is set to rise to 276.43TWh by 2024. Between 2016 and 2024, this represents a y-o-y average increase of 2.73%, according to **BMI**'s research.

Iran's electricity consumption per capita in 2015 was 2,639.28KWh, considerably higher than the regional average. This figure is set to rise to 3,164.97KWh by 2024.

By sector, industry and construction accounts for 34.56% of consumption, equivalent to 72.5TWh. This figure is set to rise to 100.13TWh by 2024, equal to a y-o-y increase of 3.65%. By 2024, industry and construction will account for 36.22% of total consumption.

The next highest consumption grouping is households, which accounts for 29.69% or 62.27KWh during 2015. This figure will increase to 76.14KWh by 2024. This represents an average y-o-y increase of 2.26% and as a percentage of total consumption, will represent 27.55% a slight decrease on 2016's figure.

In 2015, agriculture accounted for 13.62% of total consumption, or 28.56TWh. This figure will increase to 42.31TWh, or 15.31%, according to **BMI**'s research. This would represent an average y-o-y increase of 4.46%.

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 one hundred percent 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 & Distribution, Imports & Exports

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

	2013	2014	2015f	2016f	2017f	2018f
Electric power distribution losses, TWh	37.9	37.8	38.0	38.5	39.9	40.6
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	41.3	42.5	43.0	43.4	43.5	43.4
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	2015f	2016f	2017f	2018f
Total Net Imports, TWh	-7.6	-7.5	-7.5	-7.2	-5.1	-4.4

f = BMI forecast. Source: BMI, EIA

Table: Trade Data And Forecasts (Iran 2019-2024)

	2019f	2020f	2021f	2022f	2023f	2024f
Total Net Imports, TWh	-3.9	-4.1	-4.7	-5.5	-5.4	-5.5

f = BMI forecast. Source: BMI Calculation, EIA

Transmission and distribution losses during 2015 were 38.1TWh, equivalent to 14.89% of total electricity produced. In terms of electricity lost, **BMI** expects this figure to rise to 43.42TWh. However, as a percentage of power output, losses will reduce 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. .

During Q4 2015, Iran will push ahead with development of two new interconnections, with Armenia and with Turkey.

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 $91m of $117m, with the Armenian government committed to make up the difference. The interconnection is expected to be commissioned within an eighteen month period.

During the same month, 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

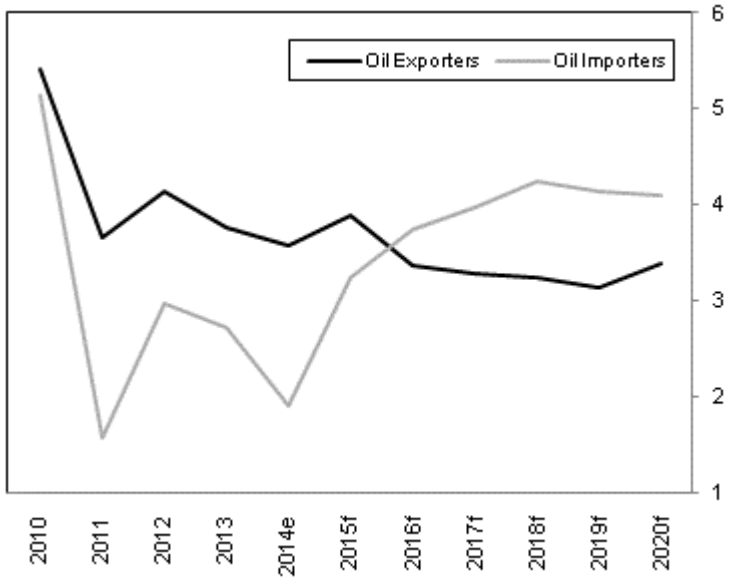
MENA Power Risk/Reward Index

BMI View: *Qatar, Saudi Arabia and the UAE maintain the top positions in our MENA Power Risk/Reward Index, with the GCC offering investors the best combination of risks and rewards even as lower oil prices place a bigger emphasis on fiscal diligence. Countries such as Egypt and Iran could climb higher as political stability attracts fixed investment into the former and rapprochement with the West boosts the outlook for the latter.*

A sustained period of lower oil prices remains the most important dynamic governing our Middle East and North Africa (MENA) Risk/Rewards Index (RRI) this quarter. Lower oil prices will continue to buoy the region's oil importers (bolstering Country Rewards scores for Egypt and other countries in North Africa) but will weigh on regional oil exporters - particularly those in the Gulf Cooperation Council (GCC).

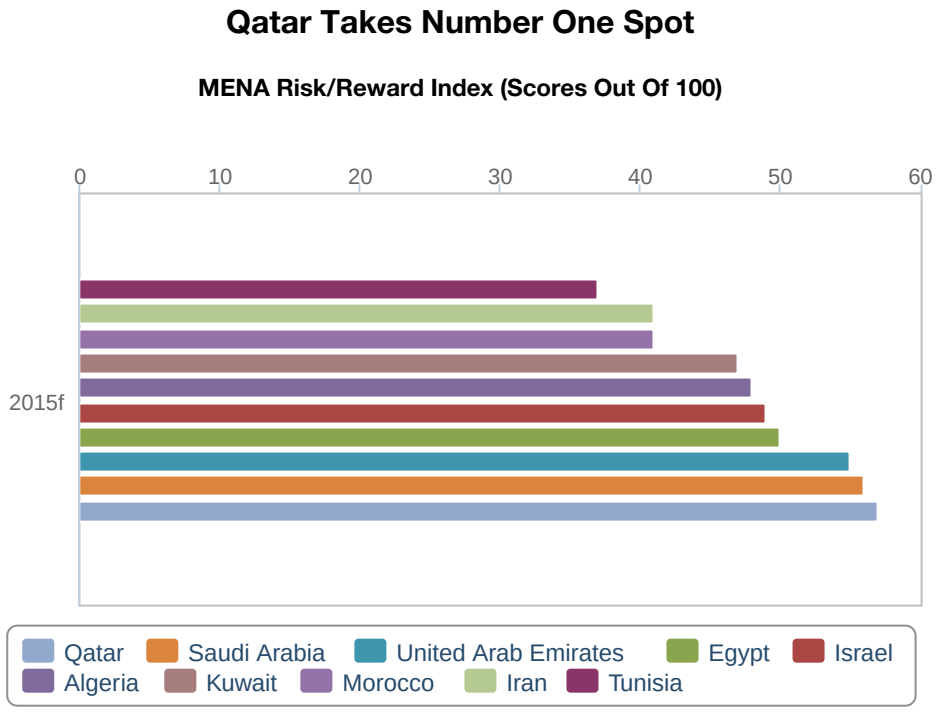
Real GDP Converging From 2015

MENA - Average Real GDP Growth (% y-o-y)



Note: Simple average of MENA countries excluding Libya and Syria; e/f = BMI estimate/forecast. Source: National statistics agencies, UN, BMI

Our core view remains that Saudi Arabia - along with Kuwait, Qatar, and the UAE - can withstand the ongoing slump in oil prices without significantly altering its model of government-driven economic development (which also drives growth in new power capacity) or affecting economic growth rates. Lower oil prices will, however, bring about significant fiscal and current account deficits in the UAE and Saudi Arabia, which will continue to be financed through international reserves as opposed to tapping international debt markets. In this economic environment it is inevitable that lower prices will lead to a bigger focus on fiscal diligence, sapping some of the economic momentum that was in place when oil was above a USD100 per barrel (bbl) - and raising the risk that some ambitious power projects could be delayed.



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

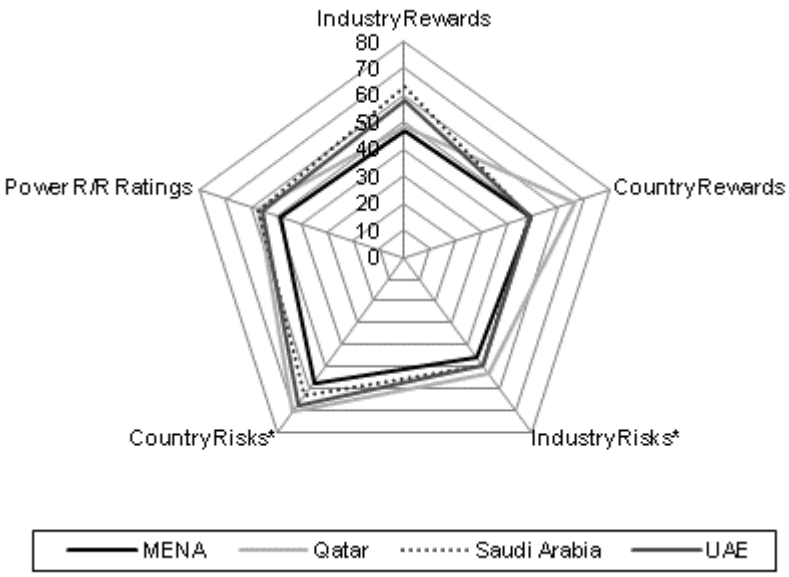
GCC: Qatar Retains Top Spot

Among the top-ranked countries in our MENA RRI - Our Country Risk team now forecasts that economic growth will slow slightly in many countries - dragging on Country Rewards scores. At a sub-regional level, we emphasise that we retain our buoyant view of the GCC power sector - underpinned by an attractive blend of low Risks and relatively high Rewards. Robust economic growth, favourable demographics and

surging demand for electricity all present significant opportunities for investment. Government stimulus efforts and high levels of government spending (supporting investment in much-needed new power capacity) will continue to bolster Industry Risk scores. Energy mix diversification efforts, as many countries attempt to ensure lucrative hydrocarbons are preserved for export rather than burned domestically, will also spur investment.

GCC Out In Front

MENA Power RRI, Scores Out Of 100



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

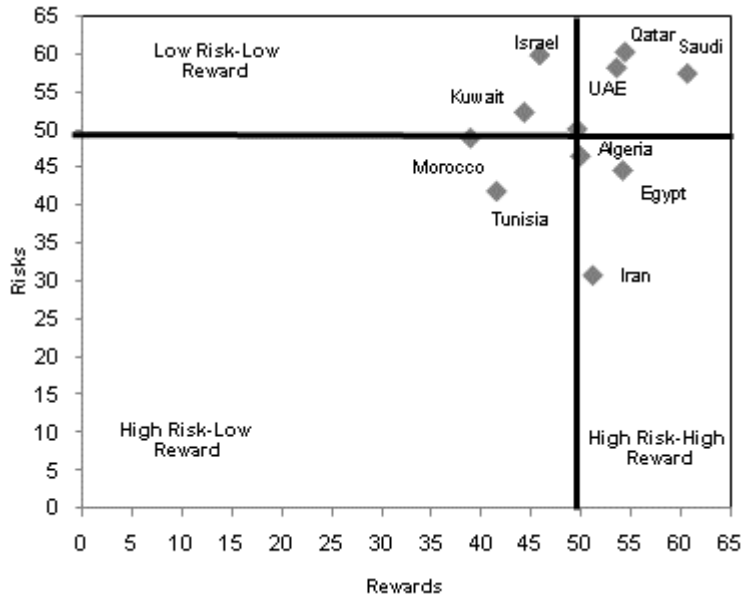
Qatar has retained its position as the regional outperformer, based on our view that the country's vast financial resources and position as the world's preeminent liquefied natural gas (LNG) exporter will allow it to move through a period of lower oil prices largely unscathed. Investigations by the US and Swiss authorities into the football's governing body, FIFA, and its awarding of the 2022 football World Cup To Qatar - leading to concerns that the country could be stripped of the World Cup over alleged corruption during the bidding process - are a pertinent risk to the country's Rewards scores in future. However, our baseline scenario assumes the tournament will go ahead as planned.

Saudi Arabia's Country Rewards score remains flat, cementing the country's position of second place in our RRI. Lower oil prices will bring about significant fiscal and current account deficits in the country, which

will continue to be financed through international reserves as opposed to tapping international debt markets. As a consequence, Saudi Arabia's economic outlook for the rest of 2015 remains favourable in spite of the continuing slump in oil prices: strong fiscal stimulus and high oil production will support economic activity and company earnings over coming quarters. That said, we expect these forces to dissipate from 2016 and beyond, as the government adopts a more cautious fiscal stance, leading to a moderation in growth. In line with this view, the government announced in early 2015 it would push back its hugely ambitious (and costly) solar and nuclear targets by eight years - a move that has curbed Saudi Arabia's Industry Rewards score.

GCC Retains Low Risk, High Reward Status

MENA Power RRI, Scores Out Of 100



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

The **UAE**, which remains in third place, is in a similar position to Saudi Arabia and our Country Risk team expects lower oil prices to mean it also finances its fiscal and current account deficits using its international reserves - limiting the negative impact of lower oil prices on investment spending. The country remains an attractive destination with power and renewables investors and will continue to score highly for the renewables component of its Industry Risks score. This score could rise as the UAE establishes its status as a regional solar power hub - owing to a strong track record in project realisation and significant government

support. The issuance of the first green energy sukuk in the UAE in early 2015 could spearhead the wider use of this funding instrument, enhancing scores for availability of financing.

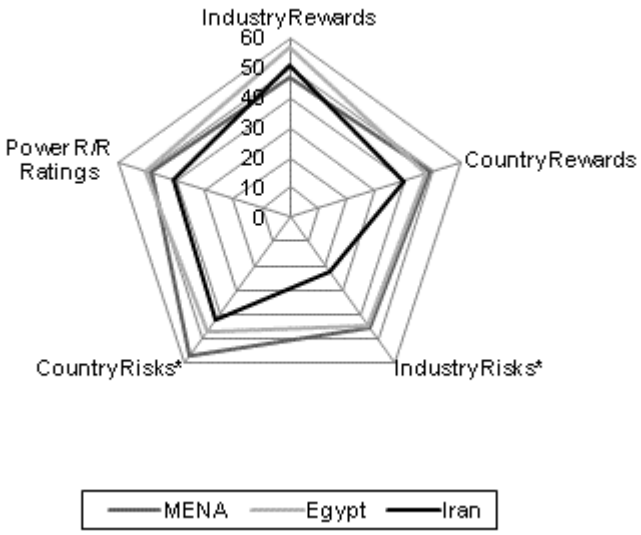
Egypt And Iran: Ready To Climb Higher

Beyond the GCC, many of the countries in North Africa that are net oil importers are likely to get a significant economic boost from lower oil prices - potentially leading to convergence in Country Rewards scores with their GCC counterparts over a longer timeframe. We emphasise that lower oil prices will reduce pressure on fiscal accounts and will provide a supportive backdrop for energy subsidy in **Egypt**, **Morocco** and **Tunisia** in particular - boosting Rewards for private investors in the power sector if reform momentum gathers pace.

We highlight that the economic outlook for Egypt is likely to continue to improve as social and political stability returns under President Abdel Fattah el-Sisi. We have upwardly revised our forecasts for the Egyptian power sector due to an uptick in the number of power projects in the pipeline and a surge in investment pledges from international investors. Not all of the pledged investment will translate into projects amid the uncertain political environment, but relative stability under President Abdel Fattah el-Sisi creates upside to our long-term forecasts.

Egypt And Iran - Outlook Brightening

MENA Power RRI, Scores Out Of 100



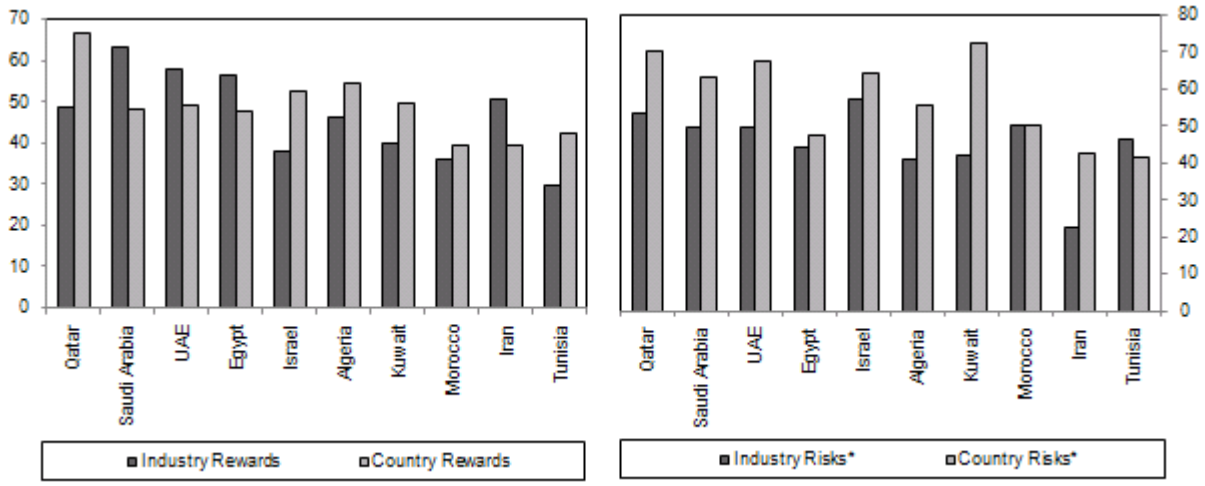
**Higher Score = Lower Risk. Source: BMI*

Similarly, our Country Risk (CR) team expects growth in the Egyptian economy to pick up steam in coming quarters due to an uptick in fixed investment, but does not believe the conditions necessary for a more aggressive pick up in investment have materialised yet. Economic expansion on par with the early 1990s is off the cards until 2017 at the earliest. This is partly due to the fact that Egypt's fiscal and current accounts are experiencing significant strains, while policy levers available to authorities are minimal. Nevertheless, RRI scores are likely to rebound as economic momentum gathers pace.

We also flag our expectation that an agreement between **Iran** and the P5+1 countries - over the Islamic Republic's nuclear programme - will occur in Q315. While the content of the negotiations has remained secret, significant progress seems to have been made over the past few months. We believe there is significant political will on the part of the main powerbrokers in Washington, the EU and Tehran for an agreement to be made, and this will override opposition from hardliners on both sides. We emphasise that rapprochement could have a profound impact on Iran's Risk/Reward score - especially if it leads to a partial relaxation of sanctions on oil exports and the banking sector. It could also boost Industry scores as the power and renewables sectors gradually open up to international competition.

Industry Vs Country

MENA Power Industry RRI, Scores Out Of 100



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

Risks Elevated Elsewhere

Elsewhere in MENA, we remain cognisant of the threats to broader regional political and economic stability. Political violence in the most fragile MENA countries will remain elevated in 2015. Although many of the markets included in our Power RRI are not crisis states, the violent collapse of Syria and Libya, and the resilience of Islamic State (IS) in Iraq (and Syria) raises risks over the political stability of the region. The escalation of the role played by GCC countries in tackling the threat of IS, as well as intervention in Yemen, could lead to retaliatory action from militant groups - potentially raising risk scores.

Iran Power Risk/Reward Index

International sanctions continue to weigh heavily on Iranian economic growth, meaning the government, in the short term at least, may struggle to raise electricity prices and to continue cutting expensive power subsidies. However, a growing population and demand from energy hungry neighbours mean the potential exists. For the first time in years, observers are optimistic that a genuinely sustainable agreement has been reached to finally lift economic sanctions on the country - if Iran keeps to its side of the deal. This could open huge opportunities for private sector companies in a power industry which is in dire need of investment.

Rewards

Industry Rewards

During Q415, Iran's Industry Reward segment will fair marginally better than during the previous quarter. Its strongest asset remains its near access rates of nearly 100% and it has access to other nearby markets, many of which suffer from electricity shortfalls, giving it the opportunity to export any surplus electricity produced - an opportunity it has exploited in recent years. However, it fares less well in terms of overall power generation, capacity and consumption, although the country fared well on the last of these, hence its slightly better overall score. The country has a below-average score for five-year growth in power generation, generating capacity and demand.

Country Rewards

Continued low import dependency and sustained high growth rate boosts Iran's Country Rewards score. However, despite the success of negotiations on Iran's nuclear programme, international sanctions continue to act as a check on Iranian real GDP growth, as does persistent political unrest in the region and a poor showing in terms of inflation outlook. In the short term, lower economic growth, meaning lower electricity demand from industry, will benefit the government, which plans to make substantial investments in new generation capacity. However, lower growth will also mean the government will find it hard to raise electricity prices, which will adversely affect investment. This will mean the government may find it difficult to reduce the subsidies it pays to keep electricity prices low. Consumption, therefore, is likely to remain high.

Risks

Industry Risks

Iran's Industry Risk profile remains relatively unattractive. The country scores very badly on liberalisation and transparency of the tendering process. Its score for renewable outlook and transparency is also lower than average. These failings constitute considerable risks for private sectors looking to enter the market in the wake of a new deal which, if the International Energy Agency verifies the Iranian government is complying with an agreement to curb its nuclear ambitions, could open an enormous market for foreign investment. Following the signing of the deal in July, the Iranian government announced it planned to allow foreign private companies to buy some state assets. In consequence, Iran's industry risk score could fare considerably better in the near future.

Country Risks

Iran's Country Score is adversely affected by very low scoring on corruption and institutions, although this is balanced by high scoring in terms of policy continuity and external risks. It fares relatively well on short term political stability. A low oil price has had a negative impact on the country's budget, forcing it to rein in its food and energy subsidy bill. This could cause political unrest. However, this may be counteracted by a boon in foreign investment coming in to the country, if the International Energy Agency verifies the Iranian government is complying its side of the recently signed deal to curb the country's nuclear ambitions.

Market Overview

Key Policies And Market Structure

Regulation And Competition

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.

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.

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 Name	Value (USDmn)	Capacity	Companies	Time-frame	Status
Gas-fired power plant	10,000	6,000MW	Power Grid Corporation of India Ltd (PGCIL), National Thermal Power Corporation (NTPC)	2009-	At planning stage (The project also includes a 1,500km high voltage transmission link to transfer power to India. 5,000MW may be transmitted to India and balance 1,000MW may be transmitted to Pakistan)
177 Dams Construction Project, Iran	-	-	-	-	Approved (November 2008-Government has approved construction)
Gas-fired power plant near to the Zahedan	-	1,000MW	-	2009-	Announced (2010)
8 electricity power plants in Khuzestan	-	6,000MW	-	2008-	Announced
Bushehr Nuclear Power Plant	11,000	700MW	Rosatom, Atomstroyexpert	1994-2011	Completed (September 2011 - Connected to National grid)
Iran-Russia electricity grid link	-	-	-	2008-	Contract Awarded (Letter of intent signed, RAO UES seeking the project)
Cycle Power Plant, Heris, East Azerbaijan province	675	1,200MW	Zenel Company, Tavanir	2008-	Contract Awarded (Expected to complete within two years)
Iran-Turkey Transmission Line	1,500	2,000MW	-	-	Contract Awarded (Memorandum signed)

Key Power Projects Database - Continued

Project Name	Value (USDmn)	Capacity	Companies	Time-frame	Status
Rudbar-E-Lorestan Hydropower Project on Rudbar River, Zagros Mountain	9.52	450MW	PAPyry Infrastructure & Environment business group	2011-2014	Under construction (December 2011- Excavation of Rudbar-e-Lorestan Tunnel Spillways Began)
Ghadir Solar and Wind Power Plant	4,500	1,000MW	-	-	Contract Awarded (January 2011)
Iran-Armenia 3rd electricity transmission line	110	650MW	-	-	At planning stage (June 2011- At final planning stages)
Tehran Biomass Plant	-	2MW	-	2010	Announced
Jarandaq wind power plant, Qazvin	-	60MW	-	-	Feasibility studies/EIA under way
Karachilare (Ghareh Chilar) Hydropower Plant, Aras River	-	130MW	Farab Company Iran	-	At planning stage (February 2013)
Electricity transmission line to Iran from Armenia	-	1,200MW	Sanir	-	Approved (A consortium of Iran's private sector companies to provide financial assistance of USD571mn)
Expansion of Aras River hydropower plant to 1.7GW	-	-	-	-	-

**Where blank = not available. Source: BMI*

Competitive Landscape

Iran's power sector is controlled by state-owned **Tavanir**, which has authority over power generation and electricity transmission. 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.

Regional Overview

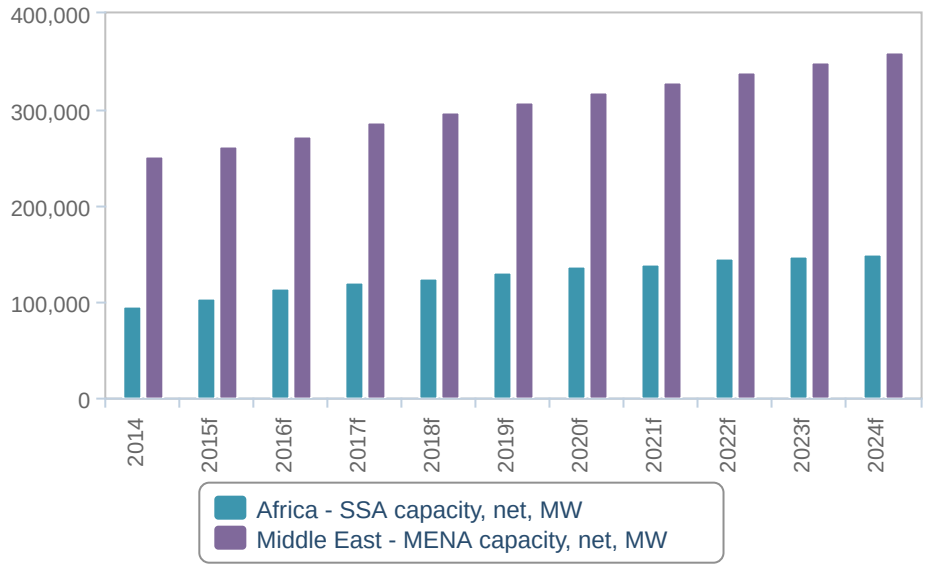
MEA Regional Overview

BMI View: *The MEA power sector continues to be characterised by the vast differences between the MENA and SSA sub regions, in terms of size, growth prospects and generation mix. The lower oil price environment and improving risk profiles for Egypt and Iran are the key themes in our MENA coverage this quarter; whereas power shortages and protracted reform efforts typify the SSA power market.*

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 of 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. SSA power markets on the other hand are characterised by insufficient power infrastructure, power shortages and a history of underinvestment.

MENA Dwarfing SSA

Total Electricity Capacity By Region, 2014-2024

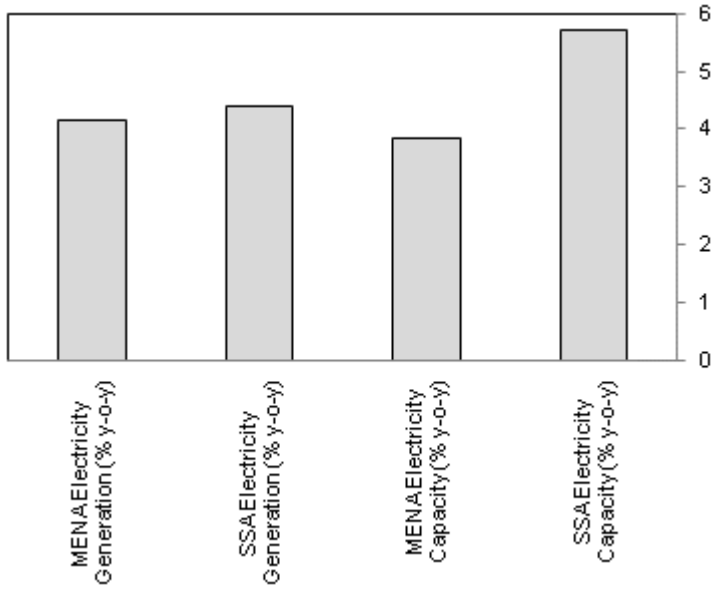


f = BMI forecast. Source: EIA, BMI

However, due to the undeveloped nature of the power markets in SSA and the largely positive demographic and economic fundamentals that are driving demand in the sub region, we expect growth in power generation and capacity in SSA to outperform that in MENA.

SSA Growth Outperforming

MENA/SSA Electricity Generation And Capacity (Annual Average Growth, 2014e-2024f)



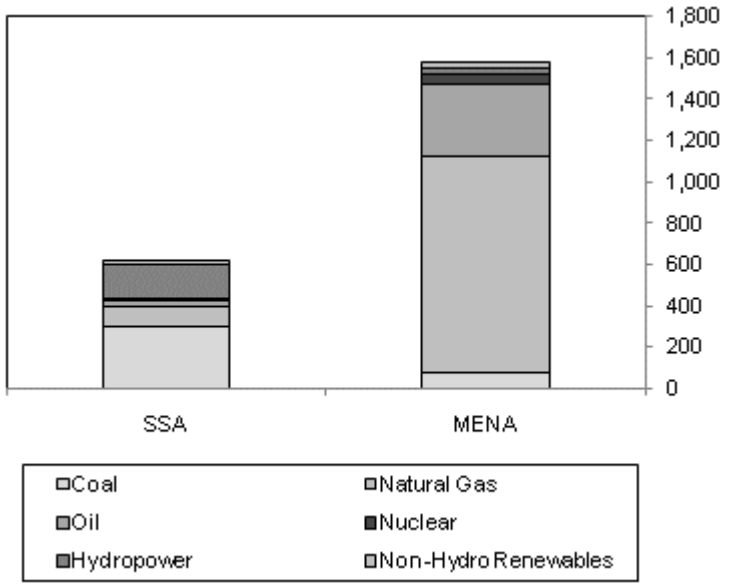
e/f = BMI estimate/forecast. Source: EIA, BMI

Thermal fuels dominate both the MEA and SSA electricity generation mix; however, coal is the fuel of choice in the SSA sub region, whereas gas is the key fuel powering the MENA electricity sector. We expect this trend to continue over the next decade, with coal contributing nearly 50% to SSA's power mix in 2024, and natural gas contributing 67% to total generation in MENA by 2024.

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), despite the recent fall in oil prices. This is a result of countries wanting to preserve oil for export rather than burning it in domestic power generation.

Thermal Dominant Across The MEA Region

MENA/SSA - Electricity Generation By Type (TWh), 2024f



f = BMI forecast. Source: EIA, BMI

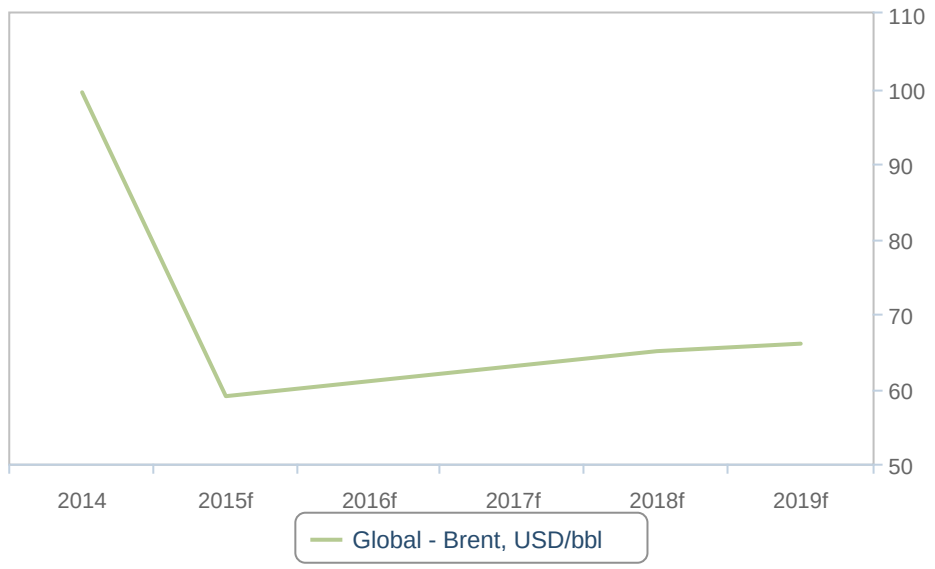
Key developments and themes across the MENA region:

- **Lower Oil Price Environment**

Lower global oil prices will have a varying impact on the MENA region as 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 significant fiscal buffers and large foreign reserves. Qatar is the country most insulated from lower prices owing to its position as the world's number one gas exporter. Nevertheless, we have seen signs that countries like Saudi Arabia will adopt a more circumspect approach to ambitious government expansion plans, which could have an impact on the pace of power sector capacity expansion. Saudi Arabia announced in early 2015 it will push back its solar and nuclear capacity targets by eight years to 2040 - indicating that although government spending will remain high, there will be a bigger focus on fiscal diligence.

Lower Oil Price Environment

BMI Brent Forecast (USD/bbl), 2014-2019



f = BMI forecast. Source: BMI

In North Africa, which predominantly contains net oil importers, the economic outlook for Morocco and Egypt is particularly bright, as both will see household consumption bolstered by lower international food and oil prices, as well as improvements in the external sector and investment outlook.

- **'Risk' Countries Growing In Attractiveness**

A more stable investment climate and brightening economic outlook in Egypt and Iran's improving relations with the P5+1 countries (China, France, Russia, US, UK and Germany), which we expect will yield a gradual lifting of some sanctions during H215, has helped improve the risk profiles for both countries. As such, we expect investor interest to pick up across both markets - and we have seen this to be the case already in Egypt. In fact, we upwardly revised our forecasts for the Egyptian power sector this quarter, due to an uptick in the number of power projects in the pipeline and a surge in investment pledges from international investors, including **Siemens** in June.

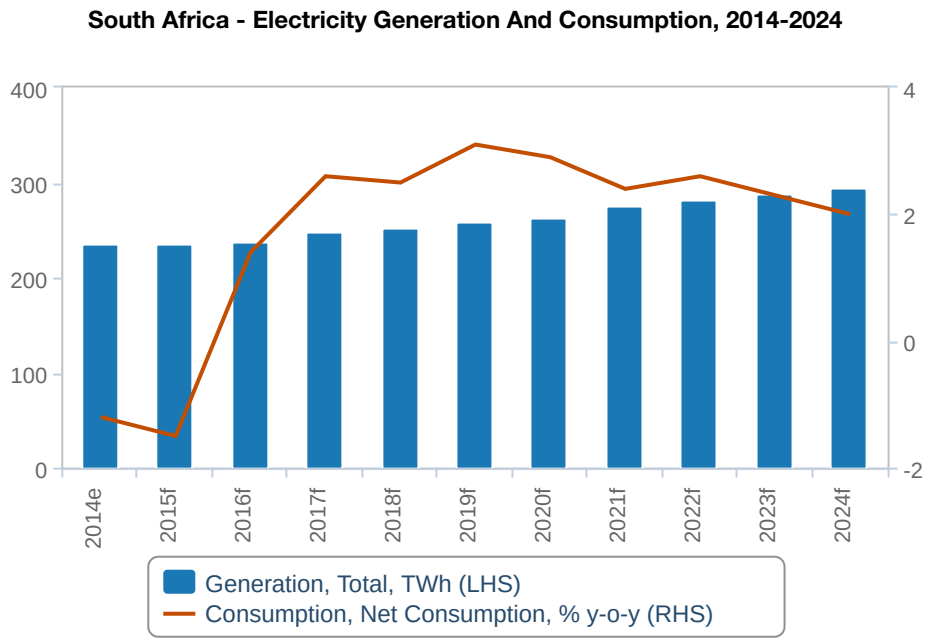
Key developments and themes across the SSA region:

- **Power Shortages Plaguing SSA Markets**

The outlook for the entire SSA region has been clouded by a series of power crises in some of the region's most developed markets this quarter - particularly South Africa and Ghana.

The energy situation in Ghana is precarious as widespread power shortages, leading to blackouts and load-shedding, continue to hit the country. Issues stemming from an overreliance on weather-dependent hydropower, insufficient gas supply and the government's ongoing shake-up at the **Electricity Company of Ghana** (ECG), which has been criticised for failing to actually tackle the energy crisis, underpin the malaise in the power market. The outlook for South Africa's power sector over the next few years is similarly bleak, characterised by crisis management (by state utility **Eskom**) and electricity shortages. The ongoing inadequate electricity supply will weigh on industrial output, erode investor sentiment and ultimately curb economic growth. The impact of the crisis is largely reflected in our power forecasts. We forecast electricity consumption and generation to grow by an annual average of just 2.0% and 2.2% respectively, between 2014 and 2024.

South Africa's Ongoing Power Crisis



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

- **Regional Giant Preparing For Reform**

President-elect Muhammadu Buhari and his All Progressive Congress (APC) party's comprehensive victory in the April 2015 Nigerian election grant him a strong platform from which to implement his ambitious reform agenda in the country - including power sector reform. Reform in the power sector will be fundamental to address the major structural issues plaguing the power market, including gas supply bottlenecks, the dilapidated grid infrastructure and addressing the need for greater private investment in generation assets.

For progress to be registered and to ensure sustained momentum behind the reform process, the new government will need to demonstrate commitment to continued reform of the power sector. If this is successful, the next step will be channelling the private capital that enters Nigeria on the back of reforms into areas of the power sector where it is most needed.

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 (1012 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