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IRAN
POWER REPORT

INCLUDES 10-YEAR FORECASTS TO 2024

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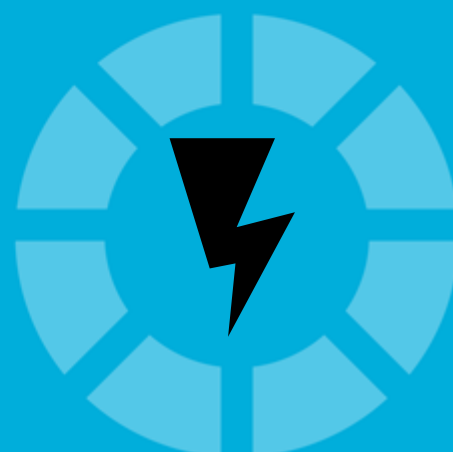
Iran Power Report Q3 2015

INCLUDES 10-YEAR FORECASTS TO 2024

Part of BMI's Industry Report & Forecasts Series

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BMI Industry View

BMI View: Iran's plans to expand its energy sector continue to be hampered by ongoing uncertainty over the outcome of international talks to loosen sanctions on the country. It appears clear that the government intends to press ahead with the construction of nuclear power stations, but perilous government finances could threaten its ability to fund new power infrastructure projects. That said, if a deal is reached and Tehran continues investing in the sector, there is significant potential for rapid growth in the years ahead.

Despite ongoing controversy over the country's pursuit of nuclear power, the Iranian energy sector is in reasonably good shape. With abundant supplies of natural resources, Iran will continue to rely largely on conventional thermal sources for electricity generation for the foreseeable future, and many of the power projects that are currently under construction are slated to increase the nation's natural gas generation capacity. At the same time, the government appears committed to plans to increase its nuclear capacity - plans which has been boosted by progress in talks between Iran and the international community, which could see the US, the EU and other nations ease sanctions on Iran in return for the country ending its pursuit of military nuclear capability. Although the Bushehr plant (at present the country's only nuclear reactor) has suffered from significant teething problems, it has now become fully operational. That said, progress towards a more wide-ranging deal remains elusive, and as a result the outlook for the country's nuclear ambitions remains uncertain. In particular, with the recent dip in international energy prices forcing the government to cut back on social spending, there is a risk of greater political unrest in the coming months. As pressure on the government mounts, there is potential that it may decide to adopt a more belligerent position in international talks in an effort to boost its popularity, making a deal more difficult to envisage.

Further challenges face the sector. For one, the government has long harboured plans to scale back energy subsidies, and introduced a hike in energy prices early in the year, in an effort to boost its precarious fiscal position. Further moves are likely to prove necessary over the coming years. While challenging from a political standpoint, such a move would be positive from an overall macroeconomic standpoint and would ease domestic demand for electricity, allowing Iran to continue to increase electricity exports to neighbouring countries. In any case, we expect the government to continue investing heavily in capacity expansion over the coming years, creating opportunities across the sector.

Key Trends And Developments

- The government has announced a further 20% increase in electricity prices, to be implemented in early 2015, on top of the 25% increase that was announced last year. The move is a response to a quickly-worsening budget position (the result of the fall in oil prices), though remains in line with Tehran's broader goal of reducing its energy subsidy bill. The energy ministry announced plans to build 35 new dispersed power stations in the next calendar year (which begins in March 2015). The plants will be strategically located across the country's electricity grid in order to overcome bottlenecks in power supply and prevent shortages and outages. The ministry has allocated USD250mn for the construction of the power stations.

- Mohammad Ja'fari, an official with the energy ministry, has announced ambitious targets for Iranian electricity exports. He claims that Iran has the capacity to export more than USD20bn worth of electricity and power equipment to neighbouring countries, a figure which is approximately equal to the value of Iranian oil exports. In recent months Iran has announced several deals with its neighbours for the export of electricity, including Turkey, Pakistan and Armenia.

- During the period 2015-2024, Iran's overall power generation is expected to increase by an annual average of 3.3%, to 295.1TWh. Driving this growth in the near term is the output from the country's first nuclear power facility, which was connected to the national grid in early 2013, and which became fully operational in late 2013.

- Iran's 2014 real GDP is estimated by **BMI** to have grown by 1.2%, following an estimated contraction of 1.9% in 2013. We forecast growth to recover to an average of around 3.5% between 2014 and 2024. The population is expected to rise from an estimated 78.5mn in 2014 to 87.3mn by 2024, while net power consumption looks set to see far greater gains, increasing from an estimated 189.9TWh in 2014 to 254.1TWh in 2024. Over 2015-2024, electricity demand is forecast at to grow at an average annual rate of around 3%.

- Owing partly to the projected rise in net generation, growth of which falls below underlying demand trend, Iran's power supply surplus is likely to increase slightly over the medium term, although the country is keen to develop its power export capability. A decline in the percentage of transmission and distribution (T&D) losses from an estimated 15% in 2014 to 13.4% by end-2024 will further support the widening of the surplus. The forecast net export capability in 2024 is put at around 7TWh.

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.

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.

- The country's status in the international community has constrained its ability to pursue its nuclear ambitions, with suspicions about Tehran's desire to produce nuclear weapons causing Western countries to impose economic sanctions on Iran.

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 Power SWOT - Continued

Threats
- Although the preliminary deal that was agreed between Iran and the international community is a step in the right direction, a more substantive and long-term deal has yet to be reached and the deadline for ongoing international talks to reach agreement is approaching.

- 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)						
	2014e	**2015f**	**2016f**	**2017f**	**2018f**	**2019f**
Nominal GDP, USDbn	492.0	417.1	434.7	477.5	518.3	560.9
GDP per capita, USD	6,269	5,248	5,402	5,864	6,293	6,735
Real GDP growth, % y-o-y	-0.5	0.6	2.9	3.6	3.9	4.1
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	560.9	595.4	627.4	665.9	701.4	740.0
GDP per capita, USD	6,735	7,075	7,381	7,760	8,100	8,472
Real GDP growth, % y-o-y	4.1	4.1	3.8	3.9	4.0	4.0
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	**2014e**	**2015f**	**2016f**	**2017f**	**2018f**
Generation, Total, TWh	223.561	227.561	231.152	236.491	241.792	247.700
Generation, Total, % y-o-y	1.300	1.789	1.578	2.310	2.242	2.443
Generation, Total, KWh per capita	2,886.626	2,899.967	2,908.444	2,939.230	2,969.593	3,007.524
Generation, Thermal, TWh	206.625	210.289	213.464	218.308	223.136	228.539
Generation, Thermal, % y-o-y	-1.070	1.773	1.510	2.269	2.212	2.421
Generation, Thermal, KWh per capita	2,667.950	2,679.861	2,685.883	2,713.239	2,740.465	2,774.880
Generation, Thermal, % of total generation	92.425	92.410	92.348	92.311	92.284	92.265
Generation, Coal, TWh	0.401	0.410	0.419	0.424	0.429	0.436
Generation, Coal, % y-o-y	0.300	2.205	2.230	1.100	1.250	1.720
Generation, Coal, KWh per capita	5.177	5.223	5.271	5.264	5.267	5.297
Generation, Coal, % of thermal electricity generation	0.194	0.195	0.196	0.194	0.192	0.191
Generation, Coal, % total electricity generation	0.179	0.180	0.181	0.179	0.177	0.176
Generation, Natural Gas, TWh	150.507	154.119	157.252	162.065	166.868	172.248
Generation, Natural Gas, % y-o-y	-1.500	2.400	2.032	3.061	2.964	3.224
Generation, Natural Gas, KWh per capita	1,943.350	1,964.046	1,978.596	2,014.226	2,049.406	2,091.410
Generation, Natural Gas, % of thermal electricity generation	72.841	73.289	73.667	74.237	74.783	75.369
Generation, Natural Gas, % of total electricity generation	67.323	67.727	68.029	68.529	69.013	69.539
Generation, Oil, TWh	55.717	55.760	55.794	55.819	55.839	55.854
Generation, Oil, % change y-o-y	0.100	0.077	0.060	0.046	0.036	0.027
Generation, Oil, KWh per capita	719.423	710.592	702.015	693.750	685.792	678.173
Generation, Oil, % of thermal electricity generation	26.965	26.516	26.137	25.569	25.025	24.440
Generation, Oil, % of total electricity generation	24.923	24.504	24.137	23.603	23.094	22.549
Generation, Nuclear, TWh	5.256	5.440	5.725	6.010	6.282	6.565
Generation, Nuclear, % y-o-y		3.500	5.230	4.990	4.522	4.500
Generation, Nuclear, KWh per capita	67.866	69.325	72.027	74.697	77.152	79.706
Generation, Nuclear, % of total electricity generation	2.351	2.391	2.477	2.541	2.598	2.650
Generation, Hydropower, TWh	11.478	11.624	11.750	11.944	12.138	12.355

Total Electricity Generation Data And Forecasts (Iran 2013-2018) - Continued						
	2013	**2014e**	**2015f**	**2016f**	**2017f**	**2018f**
Generation, Hydropower, % change y-o-y	-1.448	1.269	1.086	1.651	1.621	1.787
Generation, Hydropower, KWh per capita	148.209	148.132	147.846	148.449	149.073	150.010
Generation, Hydropower, % total electricity generation	5.134	5.108	5.083	5.051	5.020	4.988
Hydro-Electric Pumped Storage, TWh	0.000	0.000	0.000	0.000	0.000	0.000
Hydro-Electric Pumped Storage, KWh per capita	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	0.202	0.208	0.214	0.229	0.236	0.241
Generation, Non-Hydropower Renewables, % change y-o-y	8.928	3.199	2.784	7.098	3.291	2.058
Generation, Non-Hydropower Renewables, KWh per capita	2.601	2.649	2.689	2.844	2.903	2.929
Generation, Non-Hydropower Renewables, % of total electricity	0.090	0.091	0.092	0.097	0.098	0.097

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

Table: Total Electricity Generation Data And Forecasts (Iran 2019-2024)						
	2019f	**2020f**	**2021f**	**2022f**	**2023f**	**2024f**
Generation, Total, TWh	253.479	262.387	270.437	279.037	286.914	295.108
Generation, Total, % y-o-y	2.333	3.514	3.068	3.180	2.823	2.856
Generation, Total, KWh per capita	3,044.087	3,118.139	3,181.790	3,251.885	3,313.556	3,378.872
Generation, Thermal, TWh	233.731	241.905	249.345	257.470	264.856	272.544
Generation, Thermal, % y-o-y	2.272	3.498	3.075	3.259	2.869	2.903
Generation, Thermal, KWh per capita	2,806.924	2,874.740	2,933.632	3,000.545	3,058.803	3,120.516
Generation, Thermal, % of total generation	92.209	92.194	92.201	92.271	92.312	92.354
Generation, Coal, TWh	0.442	0.447	0.456	0.469	0.479	0.488
Generation, Coal, % y-o-y	1.410	0.980	2.000	3.000	2.000	2.000
Generation, Coal, KWh per capita	5.313	5.309	5.361	5.469	5.529	5.591
Generation, Coal, % of thermal electricity generation	0.189	0.185	0.183	0.182	0.181	0.179
Generation, Coal, % total electricity generation	0.175	0.170	0.169	0.168	0.167	0.166
Generation, Natural Gas, TWh	177.422	185.583	193.007	201.113	208.485	216.160
Generation, Natural Gas, % y-o-y	3.004	4.600	4.000	4.200	3.666	3.681

Total Electricity Generation Data And Forecasts (Iran 2019-2024) - Continued						
	2019f	2020f	2021f	2022f	2023f	2024f
Generation, Natural Gas, KWh per capita	2,130.702	2,205.425	2,270.796	2,343.763	2,407.783	2,474.949
Generation, Natural Gas, % of thermal electricity generation	75.909	76.717	77.406	78.111	78.717	79.312
Generation, Natural Gas, % of total electricity generation	69.995	70.729	71.369	72.074	72.665	73.248
Generation, Oil, TWh	55.866	55.875	55.882	55.888	55.892	55.895
Generation, Oil, % change y-o-y	0.021	0.016	0.013	0.010	0.008	0.006
Generation, Oil, KWh per capita	670.909	664.006	657.475	651.312	645.492	639.976
Generation, Oil, % of thermal electricity generation	23.902	23.098	22.412	21.707	21.103	20.509
Generation, Oil, % of total electricity generation	22.040	21.295	20.664	20.029	19.480	18.941
Generation, Nuclear, TWh	6.775	6.994	7.204	7.384	7.564	7.744
Generation, Nuclear, % y-o-y	3.200	3.240	3.000	2.500	2.440	2.380
Generation, Nuclear, KWh per capita	81.358	83.117	84.757	86.054	87.359	88.669
Generation, Nuclear, % of total electricity generation	2.673	2.666	2.664	2.646	2.636	2.624
Generation, Hydropower, TWh	12.725	13.234	13.632	13.921	14.224	14.541
Generation, Hydropower, % change y-o-y	3.000	4.000	3.000	2.120	2.183	2.224
Generation, Hydropower, KWh per capita	152.823	157.275	160.379	162.229	164.276	166.486
Generation, Hydropower, % total electricity generation	5.020	5.044	5.041	4.989	4.958	4.927
Hydro-Electric Pumped Storage, TWh	0.000	0.000	0.000	0.000	0.000	0.000
Hydro-Electric Pumped Storage, KWh per capita	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	0.248	0.253	0.257	0.262	0.270	0.280
Generation, Non-Hydropower Renewables, % change y-o-y	2.951	1.899	1.476	2.177	2.878	3.582
Generation, Non-Hydropower Renewables, KWh per capita	2.983	3.008	3.022	3.058	3.118	3.202
Generation, Non-Hydropower Renewables, % of total electricity	0.098	0.097	0.095	0.094	0.094	0.095

f = BMI forecast. Source: National sources, BMI

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

	2013	2014e	2015f	2016f	2017f	2018f
Capacity, Net, MW	59,648.7	60,994.1	62,409.9	63,739.6	65,336.1	67,133.3
Capacity, Net, % y-o-y	1.8	2.3	2.3	2.1	2.5	2.8
Capacity, Conventional Thermal, MW	50,744.0	51,992.3	53,364.9	54,595.8	56,075.4	57,679.1
Capacity, Conventional Thermal, % y-o-y	2.2	2.5	2.6	2.3	2.7	2.9
Capacity, Conventional Thermal, % of total capacity	85.1	85.2	85.5	85.7	85.8	85.9
Capacity, Nuclear, MW	1,000.0	1,000.0	1,000.0	1,000.0	1,000.0	1,000.0
Capacity, Nuclear, % y-o-y	0.0	0.0	0.0	0.0	0.0	0.0
Capacity, Nuclear, % of total capacity	1.7	1.6	1.6	1.6	1.5	1.5
Capacity, Hydropower, MW	7,787.7	7,881.2	7,920.6	8,015.6	8,127.9	8,318.9
Capacity, Hydropower, % y-o-y	0.0	1.2	0.5	1.2	1.4	2.4
Capacity, Hydropower, % of total capacity	13.1	12.9	12.7	12.6	12.4	12.4
Capacity, Non-Hydroelectric Renewables, MW	117.0	120.6	124.4	128.1	132.8	135.4
Capacity, Non-Hydroelectric Renewables, % y-o-y	3.9	3.1	3.2	3.0	3.7	1.9
Capacity, Non-Hydroelectric Renewables, % of total capacity	0.2	0.2	0.2	0.2	0.2	0.2

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

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

	2019f	2020f	2021f	2022f	2023f	2024f
Capacity, Net, MW	69,128.9	70,918.9	72,600.6	74,379.5	76,262.0	78,256.0
Capacity, Net, % y-o-y	3.0	2.6	2.4	2.5	2.5	2.6
Capacity, Conventional Thermal, MW	59,496.0	61,126.2	62,623.8	64,258.3	66,038.2	67,973.1
Capacity, Conventional Thermal, % y-o-y	3.2	2.7	2.5	2.6	2.8	2.9
Capacity, Conventional Thermal, % of total capacity	86.1	86.2	86.3	86.4	86.6	86.9
Capacity, Nuclear, MW	1,000.0	1,000.0	1,000.0	1,000.0	1,000.0	1,000.0
Capacity, Nuclear, % y-o-y	0.0	0.0	0.0	0.0	0.0	0.0
Capacity, Nuclear, % of total capacity	1.4	1.4	1.4	1.3	1.3	1.3
Capacity, Hydropower, MW	8,493.6	8,650.7	8,832.4	8,973.7	9,072.4	9,126.8
Capacity, Hydropower, % y-o-y	2.1	1.9	2.1	1.6	1.1	0.6
Capacity, Hydropower, % of total capacity	12.3	12.2	12.2	12.1	11.9	11.7
Capacity, Non-Hydroelectric Renewables, MW	139.3	142.0	144.4	147.5	151.4	156.0

Electricity Generating Capacity Data And Forecasts (Iran 2019-2024) - Continued						
	2019f	2020f	2021f	2022f	2023f	2024f
Capacity, Non-Hydroelectric Renewables, % y-o-y	2.9	1.9	1.7	2.2	2.6	3.0
Capacity, Non-Hydroelectric Renewables, % of total capacity	0.2	0.2	0.2	0.2	0.2	0.2

f = BMI forecast. Source: National sources, BMI

Iranian power generation in 2014 is estimated by **BMI** to have reached 227.6TWh, up an estimated 1.8% from the previous year. Overall thermal generation is expected to have risen by 1.8% and is forecast to accelerate over the course of our forecast period to 2024. We forecast total generation to come in at 231.2TWh in 2015, up 1.6% on 2014 as new power projects come online.

During the period 2015-2024, Iran's overall power generation is expected to increase by an annual average of 3.3%, to 295.1TWh. Driving this growth in the near term is the output from the country's first nuclear power facility, which was connected to the national grid in early 2013, and became fully operational in late 2014. Over the longer term, an increase in natural gas generation is likely to be the main driver of generation growth, and we forecast natural gas to account for 73.2% of total generation in 2024 (versus 68% in 2015). Non-hydro renewables are expected to deliver average annual supply growth of 2.5% over the 2015-2024 period.

Recent growth has been driven by significant state investment in the sector, with a number of new power plants having coming online recently, mostly using hydro and combined cycle power generation. In the first two months of 2013, Iran inaugurated three power plants, with the Shirkouh power plant - a 484MW combined cycle power plant in the central province of Yazd - the most recent. The other two plants are the Shahid Bastami power plant in the city of Shahrood and Quds power plant in the city of Semnan, both of which have a production capacity of 324MW.

India has been assessing plans to build a 6GW gas-fired power plant in Iran. This would be connected to India via a 1,500km high-voltage transmission line. Indian power company NTPC and Indian transmission company **PGCIL** have been evaluating the project, which is estimated to cost USD10bn. The power plant would be located in Iran, and the majority of electricity generated (approximately 4GW of the 6GW) would then be exported to India. While little has been heard from their Indian counterparts, Mehr news agency quoted Iranian Energy Minister, Majid Namjou, in November 2012, suggesting that India is likely to go ahead with the plan.

Iran Total Capacity (MW)

2012e
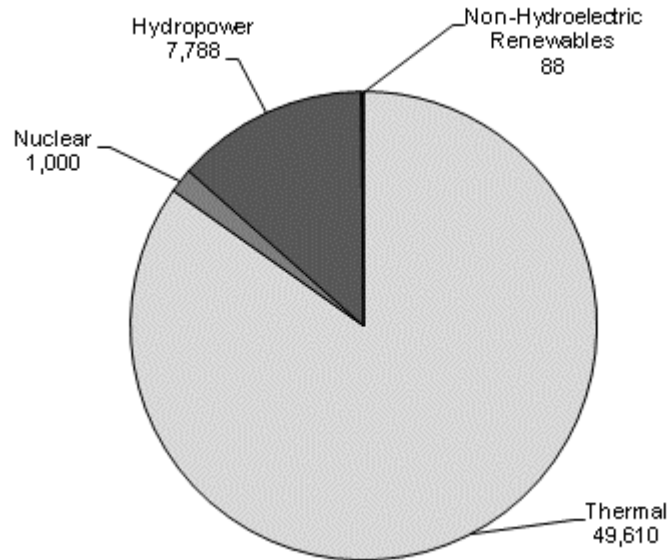
e = BMI estimate. Source: UN Data, EIA, BMI

In December 2012, Iran saw its first private combined cycle power plant, with a capacity of 968MW, inaugurated in Reshvanshahr. The former Iranian Energy Minister, Majid Namjou, announced in 2013 that the government is intending to begin more such projects, and plans to convert 12 more thermal plants to combined-cycle facilities. With its neighbours in need of electricity imports, the openness of the country's energy ministry for the private sector to build and export electricity will help grow this sector and meet its aim to export electricity to Lebanon, while expanding trade with several other economies in the region. Namjou stated that the necessary permissions for the building of 80 new power stations.

In September 2011, Iran connected its Bushehr nuclear power plant to the national electricity grid, according to the Atomic Energy Organization of Iran (AEOI). 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. Although the plant was forced to shut in late May in the aftermath of an earthquake, full operation resumed in June. The plant has been shut for refuelling for two months in early 2015, however, this is a planned outage in order to prepare for peak of

demand which occurs during the summer months. The government has also recently signed an agreement with Russia for the country to continue supplying services to the plant.

Reports in December 2013 suggested that the Iranian and Russian authorities are in talks to begin the construction of a second reactor at Bushehr, with construction to begin in 2014. In September Iran announced that it will push ahead with the construction of two new plants in Bushehr. In a statement it claimed to have reached an agreement with **Rosatom** to build the plants, which will have an estimated capacity of 2,000MW, though the initial target of beginning construction in 2014 appears unlikely to be reached.

In November 2010, Iran opened a new gas power plant in Aliabad Katoul, IRNA reported. The 1GW Aliabad Katoul gas power plant was officially opened on November 17 2010, according to Mehdi Motevallian, the managing director of **Iran Power Plant Investment Company**. The gas power plant, near the northern Iranian city of Gorgan, Golestan province, is equipped with six 162MW units and can generate a total of 972MW. Given the international community's hostile reaction to Iran's nuclear ambitions, and stalling of international talks to reach an agreement over the future of the country's nuclear ambitions, there is a question mark over the timing and scale of Iran's decision to introduce nuclear capacity. We have assumed that the first plant will be scaled gradually up to its full design capacity during the forecast period, but have not included any additional nuclear power stations in our forecasts, despite the government announcing plans for another research reactor to be set up. This also leads us to forecast the increase in natural gas generation as the primary driver of capacity.

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.

That said, the government announced in September 2014 that it had reached a deal with Russia for the construction of eight new power plants in the country. The preliminary contract, which is worth an estimated USD10bn, will see two power plants built in Tabas in the South Khorasan, two in Tabriz in the

East Azarbaijan province and four in Bandar Abbas in Hormuzgan. Russian companies will be invited to submit their proposals in the next stage of the process, with the plants expected to generate up to 2,800MW.

Apart from conventional generation sources, the country is also looking into expanding its renewable generation. The largest hydropower projects are the 2GW Karun 3 plant, the 2GW Godar-e Landar facility and a 1GW station in Upper Gorvand. In July 2006, Abbas Aliabadi, director of **Iran Power and Water Resources Development Company** (IWPCO), announced that Iran planned to add 6.4GW of hydroelectric power generating capacity over five years.

The Karoun-4 Roller-Compacted Concrete (RCC) dam, which sits across the Karoun River in Chaharmahal-Bakhtiari province in Iran, was inaugurated by former president Mahmoud Ahmadinejad on July 6 2011. The IRR12.8bn (USD1.19mn) dam will generate power and provide water for industrial and agricultural purposes in the province. The completion of the dam marks the fact that the country's dam-building industry has become self-sufficient.

Iran is believed to have the potential to produce some 6.5GW of electricity with wind energy. It also has solar power potential, but non-hydro renewables do not currently form a major part of Iranian energy policy. However, there are companies looking to capitalise on this opportunity by indigenise the technology and manufacture of various parts. MAPNA Generator Company is one such company, which is looking to construct nine wind turbines, and manufacture 2.5MW generators by mid-2014, according to Hamid Amini, the company's deputy managing director.

Iran has launched commercial operations at its biggest solar power plant in Mashhad, reports IRNA. The plant, likely to produce 72,000kWh of electricity annually, will produce enough power to meet the requirements of Razavi Khorasan province, according to the plant's CEO, Gholam Reza Karamian. The plant, which has 216 solar panels, has been designed and constructed by native experts. Moreover, the plant has been fitted with solar trackers to improve efficiency.

In May, 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.

Electricity Consumption

Table: Total Electricity Consumption Data And Forecasts (Iran 2013-2018)						
	2013	**2014e**	**2015f**	**2016f**	**2017f**	**2018f**
Consumption, Net Consumption, TWh	185.4	189.9	193.3	198.5	204.5	210.3
Consumption, Net Consumption, % y-o-y	1.3	2.4	1.8	2.7	3.0	2.9
Consumption, Net Consumption, KWh per capita	2,394.0	2,419.8	2,431.9	2,467.1	2,511.3	2,553.9

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

Table: Total Electricity Consumption Data And Forecasts (Iran 2019-2024)						
	2019f	**2020f**	**2021f**	**2022f**	**2023f**	**2024f**
Consumption, Net Consumption, TWh	216.0	223.5	230.5	238.0	245.9	254.1
Consumption, Net Consumption, % y-o-y	2.7	3.5	3.1	3.3	3.3	3.3
Consumption, Net Consumption, KWh per capita	2,593.7	2,656.0	2,711.8	2,773.6	2,839.7	2,909.4

f = BMI forecast. Source: BMI Calculation, EIA

The Iranian population is expected to rise from an estimated 78.5mn in 2014 to 87.3mn by 2024, while net power consumption looks set to see far greater gains, increasing from an estimated 189.9TWh in 2014 to 254.1TWh in 2024. Over 2015-2024, electricity demand is forecast to grow at an average annual rate of around 3%.

That said, significant reforms to the country's elaborate system of electricity subsidies have been introduced in recent years, with further reductions in government spending on subsidies possible in the near term. If the government succeeds in cutting spending on subsidies, our consumption forecasts could prove optimistic.

Transmission & Distribution, Imports & Exports

Table: Electric Power T&D Losses Data And Forecasts (Iran 2013-2018)						
	2013e	2014e	2015f	2016f	2017f	2018f
Electric power distribution losses, TWh	34.2	34.2	34.4	34.8	36.2	36.9
Electric power distribution losses, % of output	15.3	15.0	14.9	14.7	15.0	14.9

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

Table: Electric Power T&D Losses Data And Forecasts (Iran 2019-2024)						
	2019f	2020f	2021f	2022f	2023f	2024f
Electric power distribution losses, TWh	37.5	38.6	39.1	39.5	39.5	39.5
Electric power distribution losses, % of output	14.8	14.7	14.5	14.1	13.8	13.4

f = BMI forecast. Source: BMI Calculation

Table: Trade Data And Forecasts (Iran 2013-2018)						
	2013	2014e	2015f	2016f	2017f	2018f
Total Net Imports, TWh	-3.9	-3.5	-3.5	-3.2	-1.1	-0.5

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

Table: Trade Data And Forecasts (Iran 2019-2024)						
	2019f	2020f	2021f	2022f	2023f	2024f
Total Net Imports, TWh	0.0	-0.3	-0.9	-1.6	-1.5	-1.5

f = BMI forecast. Source: BMI Calculation, EIA

Owing partly to the projected rise in net generation, which falls short of the underlying demand trend, Iran's power supply surplus is likely to record slight increases - in line with the country's ambition to develop its power export capability. A decline in the percentage of transmission and distribution (T&D) losses from an

estimated 15.0% in 2014 to 13.4% in 2024 will help balance the market to an extent, though this proportion of losses remains high by international standards. The estimated net export capability in 2023 is put at 6.9TWh, and with many of the country's neighbours suffering from energy shortfalls and growing demand, this will present significant opportunities for the sector in the coming years.

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.

In December 2004, a protocol was reached on synchronising the power grids of Iran, Azerbaijan and Russia, with 500MW being exchanged at the beginning of 2006. In August 2004, Turkmenistan had started power exports to Iran via a new transmission line (Sarahs). This line added to previous power export capacity from Turkmenistan to Iran via the Balkanat-Gonbad line, which was started in June 2006. Another line is also to be constructed. With more such infrastructure in place, Iran would be in a better position to grow its energy exports to its energy-hungry neighbours.

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.

Further extending their energy cooperation, Iran and Russia have signed a letter of intent to accelerate the construction of shared power grids, both between them and regionally, according to a report from the Iranian News Agency.

The Iranian government has entered into agreements with the governments of Russia and Turkey to jointly construct power plants in Iran, with the aim of exporting electricity to other countries, according to Iranian Energy Minister Majid Namjou. Under the terms of the agreement, the Turkish companies will be permitted to construct new power plants and invest in Iran's power sector. In addition, Tehran and Moscow have decided to form a joint venture (JV) to build new power plants. Iran's electricity exports exceeded 5.5TWh in the Iranian year ended March 20 2011.

News agency IRNA has reported that the **Lebanese Electricity Company** has decided to purchase electricity from Iran, as of April 15 2012. Lebanese Prime Minister Najib Mikati referred to a decision by his cabinet to permit the purchase of electricity from Iran and the subsequent participation of Lebanon's representative in a multilateral meeting to be attended by representatives from Syria, Iraq and Iran.

Lebanese sources wrote that Lebanon had started purchasing electricity from Iran - with the first consignment comprising 25MW, which will be increased to 100MW. The sources said that Iran's electricity will be exported to Lebanon via Iraq and Syria. They also noted that since Iran is facing US-imposed economic and financial sanctions, Lebanon's Electricity Company had received the necessary permits from Lebanon's Foreign Ministry.

In addition, Pakistan's Ministry of Power and Water has agreed to extend a contract to import electricity from Iran, it emerged in September. The contract, which runs until 2032, had previously involved the export of 32MW of electricity, but has been increased to 76MW. The decision is an indication of Iran's strengthening relationship with its eastern neighbour, and could signal further export deals in the years ahead.

Qatar, Oman and the United Arab Emirates (UAE) are likely to buy up to USD2bn of Iranian electricity once a gas field in the Arabian Gulf is operational, a senior Iranian energy minister has said, according to Al-Arabiya.

The gas field is to be developed under a USD3.8bn deal between **Iran Offshore Oil Company** and **Iran's Power Projects Management Company**. Exports to the Gulf states are probable.

'The field will result in 3GW of power production, largely available as exports to the UAE, Oman and Qatar,' Iranian deputy energy minister Mohammad Behzad told the Fars news agency in March 2012.

Iraqi news agency Aswat al-Iraq has reported that a new Iranian electricity supply line has started operations, carrying 100MW of imported electricity from Iran. The new line is aimed at meeting the 550MW of power demanded by Wasit province, in the centre of Iraq. The province currently only receives less than 150MW from Iraq's national grid, and consequently suffers from regular electricity blackouts.

Iran will establish two new power transmission lines to boost electricity exports to Turkmenistan, reported the Tehran Times.

Abdolhamid Farzam, an official with the Iranian Energy Ministry, said that the two 400kV lines will provide the opportunity to exchange electricity among Iran, Turkmenistan, Kyrgyzstan and Uzbekistan. Iran plans to connect its power grid to the six countries of the Caspian Sea and the Caucasus region.

Former Minister Namjou said in May 2012 that the government plans to turn the country into a centre for the transit of electricity in the region. The government is following up development plans outside the country pertaining to power and energy and seeks to emerge as the regional power transit hub. He added that Iran seeks to provide countries including, Iraq, Turkey, Afghanistan and Pakistan with electricity.

Namjou said that by the end of the Fifth Five-Year Economic Development Plan (2015), Iran will boost its electricity generation capacity by 25GW to reach 73GW.

Industry Risk/Reward Index

MENA Power Risk/Reward Index

__BMI View:__ The GCC presents the best combination of risks and rewards for investors within the MENA power sector - with Qatar emerging as the regional outperformer as a consequence of superior economic resilience in the face of lower global oil prices. The country's position as the world's top LNG exporter will shelter it from falling oil revenues - supporting investment as other countries such as Saudi Arabia become more circumspect on ambitious power sector expansion plans.

Falling global oil prices have had the biggest impact on our Middle East and North Africa (MENA) Risk/ Reward Index (RRI) this quarter - triggering a wide-ranging fall in Country Rewards scores as economies across the region adjust to a sustained period of lower prices. Our core view remains that many of the biggest Middle Eastern oil producers - particularly within the Gulf Cooperation Council (GGC) - are in a strong position to withstand lower oil prices thanks to significant fiscal buffers. Nevertheless, 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).

# In For A Sustained Period Of Low Oil Prices

BMI - Oil Price Forecast (USD/bbl)
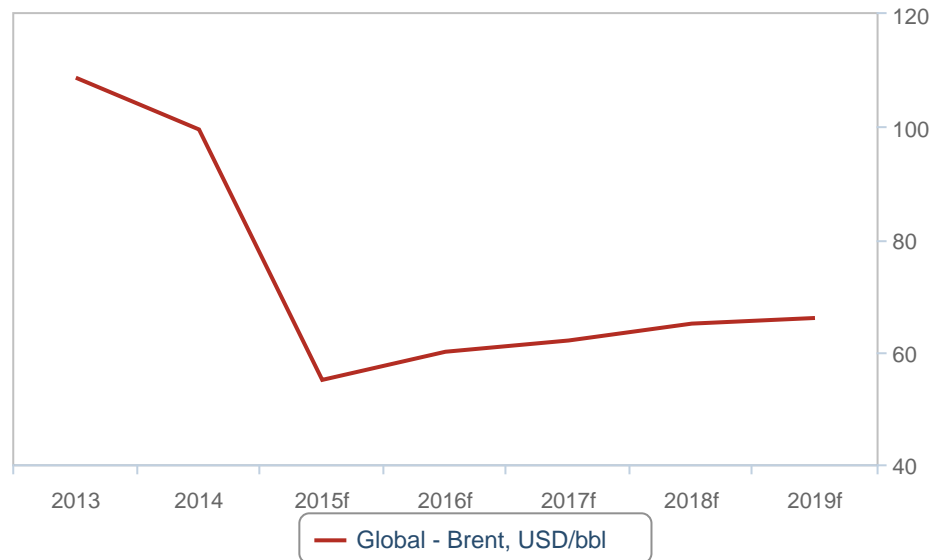
e/f = BMI estimate/forecast. Source: BMI

GCC: Qatar Takes Top Spot

This has certainly been the case amongst the top-ranked countries in our MENA RRI - with economic growth now forecast to slow slightly in many countries - leading to a fall in Country Rewards scores. Most notably, **Qatar** has now overtaken **Saudi Arabia** to achieve regional outperformer status - a consequence of these changing dynamics. The primary reason for Qatar's rise to top spot is that it is the only country in the top half of our table to register an improvement in its Country Rewards score. This is 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.

Qatar - Unscathed By Lower Oil Prices

MENA Risk/Reward Index, Overall Power Risk/Reward Score (Scores Out Of 100)
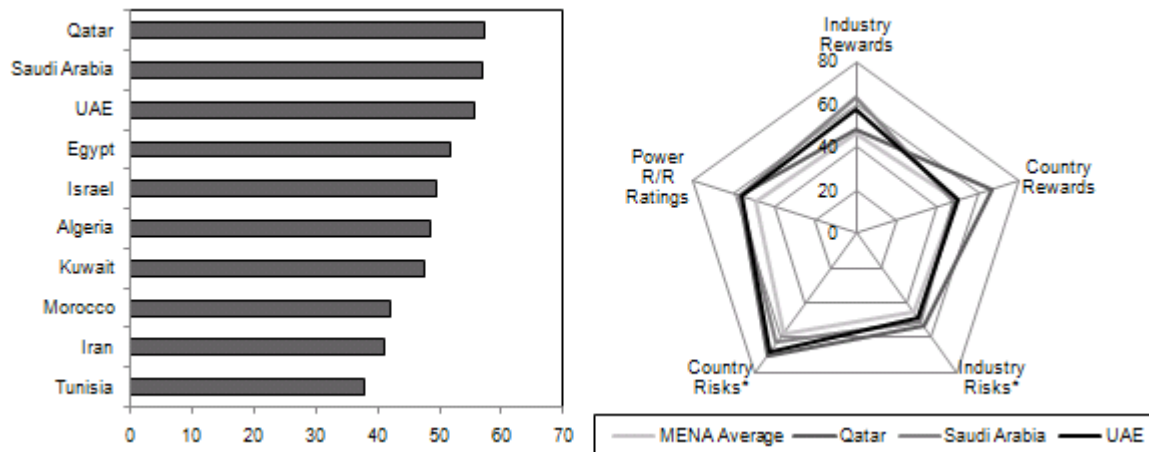
*Higher score=Lower risk. Source: BMI

Saudi Arabia's Country Rewards score on the other hand has fallen. Loose fiscal policy and increased government spending will insulate the kingdom's economy from lower hydrocarbons revenues, but lower prices will nevertheless weigh on consumer and business sentiment to some extent. Although our power sector forecasts for Saudi Arabia remain robust, this slight deterioration in economic sentiment has been negative for our forecasts. In early 2015, the government announced it had pushed back its solar and nuclear targets by eight years - something that has led to a fall in the Industry Rewards score this quarter.

At a sub-regional level, we emphasise that (despite the slight fall in Country Rewards scores) our buoyant view of the GCC power sector is firmly in play - 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 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.

The **UAE**, which remains in third place, is forging ahead with plans to diversify its energy mix rather than burning oil in domestic power generation - something that will lift Industry scores over the quarters to come. We expect growth in the solar sector to cement the country's status as a regional renewables hub -

thanks to a strong track record in project realisation and significant government support. The issuance of the first green energy sukuk in the UAE could further enhance scores for availability of financing.

GCC - Low Risk/High Rewards

MENA Risk/Reward Index, Overall Power Risk/Reward Score (Scores Out Of 100)
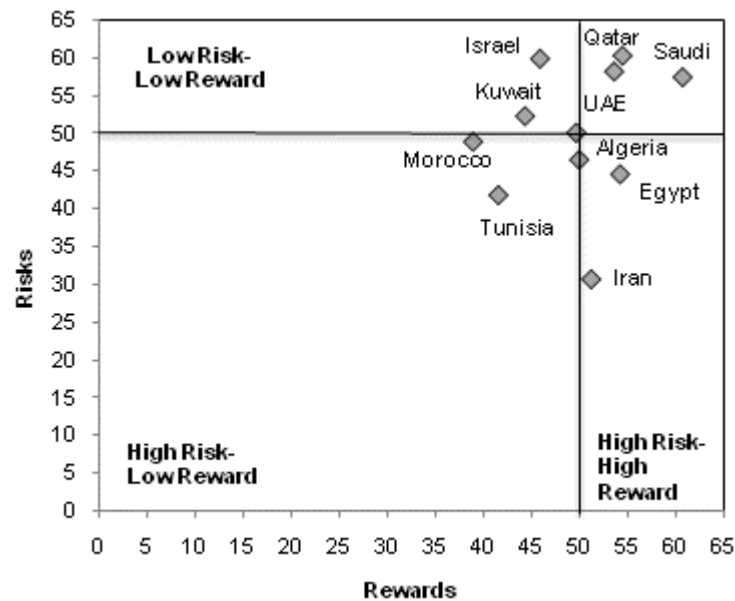
Higher score = Lower risk. Source: BMI

Egypt And Iran: A Brightening Outlook

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 subsidy reform 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 - underscored by promises of fixed investment from a host of Gulf States and private players in early 2015. The economic outlook for Egypt is the most positive

since the onset of the Arab Spring, laying the foundations for sustained growth and policy continuity - potentially boosting Country Risks scores. Infrastructure development will remain a top priority for the government and the introduction of feed in tariffs (FiTs) in September 2014 has the potential to galvanise investment in renewables.

On a similarly positive note, our Country Risk team believe that a possible nuclear deal between **Iran** and the West could be reached in June 2015. We have grown more optimistic on a deal due to a confluence of factors. Firstly, much lower oil prices and a stagnant economy mean there greater pressure on Iran to agree a deal. Second, the rise of Islamic State and the collapse of the Yemeni state have increased the West's sense of urgency with regards to bringing Iran in from the cold to help resolve regional challenges. Lastly, President Obama will desire a deal to cement his legacy as he serves out his final two years in office. 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 if a civilian nuclear programme proceeds.

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 themselves, the violent collapse of Syria and Libya and the resilience of Islamic State in Iraq (and Syria) raises risks to the political stability of the wider Middle East region. The escalation of the role played by GCC countries in tackling the threat of Islamic State (IS) could lead to retaliatory action from the jihadist groups - potentially raising risk scores. Additionally, our CR team highlights that there are other lesser-known risks that could surface in 2015, such as a GCC intervention in Yemen following the rise of the Houthis.

Table: MENA - Power Risk/Reward Index (Scores Out Of 100)							
	Industry Rewards	Country Rewards	Rewards	Industry Risks*	Country Risks*	Risks*	Power R/R Ratings	Rank
Qatar	48.75	66.40	55.54	53.31	70.46	60.66	57.33	1
Saudi Arabia	63.25	48.20	57.46	51.24	63.07	56.31	57.06	2
UAE	58.00	49.80	54.85	48.90	68.29	57.21	55.67	3
Egypt	58.50	49.20	54.92	45.14	47.23	46.04	51.81	4
Israel	38.00	52.60	43.62	57.20	64.13	60.17	49.41	5
Algeria	46.00	54.40	49.23	40.99	55.60	47.25	48.54	6
Kuwait	40.00	49.40	43.62	42.08	72.31	55.04	47.61	7
Morocco	36.00	41.20	38.00	49.43	49.58	49.49	42.02	8
Iran	50.75	39.60	46.46	22.48	42.51	31.06	41.07	9
Tunisia	29.50	42.20	34.38	46.37	41.75	44.39	37.89	10
Regional Average	46.88	49.30	47.81	45.71	57.49	50.76	48.84	

*higher score = lower risk. Source: BMI

Iran Power Risk/Reward Index

Sizeable demand from its energy-hungry neighbours, coupled with a large and growing population, leave Iran with significant potential in terms of industry rewards. However, international sanctions on the economy - and on the energy industry in particular - continue to weigh on its overall score, while risks are high in both industry and country terms.

Rewards

Industry Rewards

Iran's strongest asset in the Industry Rewards segment is its good market coverage, with almost all of the population having access to electricity. Moreover, it has access to other nearby markets, many of which suffer from net energy shortfalls, giving it the opportunity to export any surplus electricity that is produced - an opportunity it has exploited well in recent years. It fares less well in terms of overall power consumption, generation and capacity. The country has a below-average score for five-year growth in power generation, generating capacity and demand.

Country Rewards

Boosting the score for Country Rewards is the low level of electricity import dependency. There is above-average growth in population. However, a poor showing in terms of the inflation outlook and real GDP growth, coupled with persistent political unrest in the region, suggests the government may find it hard to raise prices, which will be necessary to stave off overconsumption and encourage new investment.

Risks

Industry Risks

The country's Industry Risk profile is generally unattractive. Iran scores badly for liberalisation levels, financing, the transparency of the tendering process and the outlook for the renewables sector. Weaknesses in these areas create much uncertainty for private firms and are likely to hinder the propensity of the private sector to contribute to growth.

Country Risks

Policy continuity helps support Iran's Country Risks score, but the country fares poorly in terms of short-term political stability, institutions and corruption. International opposition to the country's plans to develop its nuclear industry further weigh on the government's domestic power sector, although with international

talks to broker an agreement on the issue still ongoing, risks in this regard are to the upside. Moreover, falling oil prices have hit the government's budget badly, forcing it to rein in its food and energy subsidy bill, which could cause political unrest.

Note: scores correct at time of publishing and subject to change.

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 the investors to build and operate the generating facility for a period of typically 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					

blank space = 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 stated that a proposal for privatising six new power plants had been submitted to the Iranian Privatization Organization and that 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 Power Regional Overview

BMI View: Within the Middle East and Africa region, MENA power markets will be the relative outperformers. GCC spending plans remain resilient to falling oil revenues, the Egyptian market has stabilised and rapprochement between the West and Iran is looking more likely. SSA, meanwhile, is at risk from political instability due to elections, while some of its more developed power markets are in the grip of 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 and the potential growth on offer. MENA power markets - particularly those in the Gulf Cooperation Council (GCC) - are far more developed than their SSA counterparts and have strong project pipelines to tempt investors. SSA power markets on the other hand, are characterised by insufficient power infrastructure, power shortages and a history of underinvestment.

MENA - More Mature Markets

## MENA And SSA Power Generation Capacity, 2015-2023
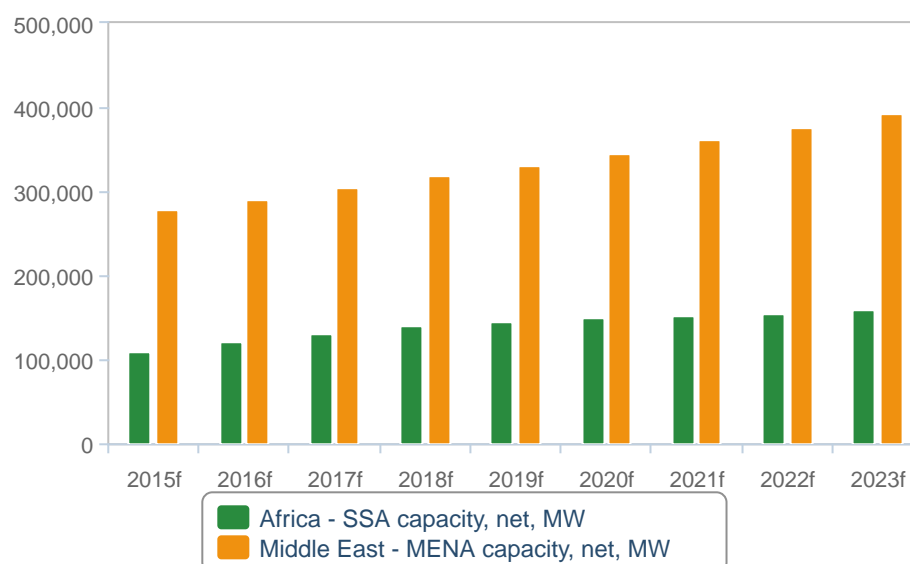
e/f = BMI estimate/forecast. Source: BMI/EIA

MENA power capacity is double the size of SSA's total installed capacity base; however, SSA power markets will register much more rapid growth.

The average annual growth rate for capacity expansion in MENA between 2015 and 2018 is 4.1%, compared to 6.5% for SSA. The growth in capacity in SSA will be driven by positive demographic trends, robust economic growth from a low base, as well as more rapid growth in electricity consumption.

SSA: Set To Record Higher Growth Rates

**MENA And SSA - Growth In Power Capacity (% Change y-o-y)**
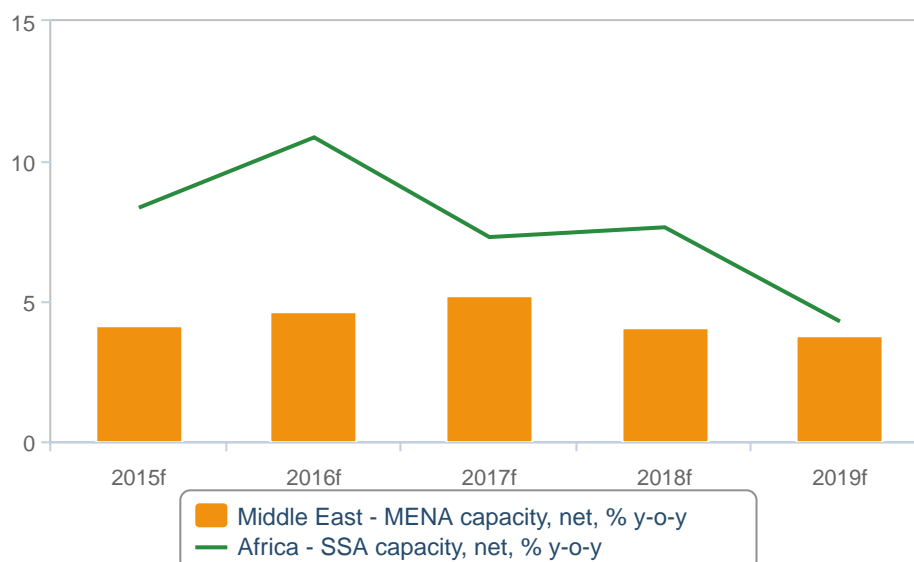
e/f = BMI estimate/forecast. Source: EIA/BMI

In terms of electricity generation, thermal fuels will dominate the mix in both MENA and SSA to the end of our 10-year forecast in 2024. In MENA, natural gas generation will grow at an annual average rate of 4.5% to account for 66% of total electricity generation in 2024, with growth driven by a desire to preserve oil for export rather than burning it in domestic power generation - particularly amongst the Gulf states. Oil will gradually cede share falling from 27% of the generation mix to 22.5% in 2024. Renewables generation will grow rapidly from a low base, but will only account for around 2% of total generation in 2024.

MENA - Gas To Gradually Displace Oil

## MENA - Electricity Generation By Type, 2014-2023
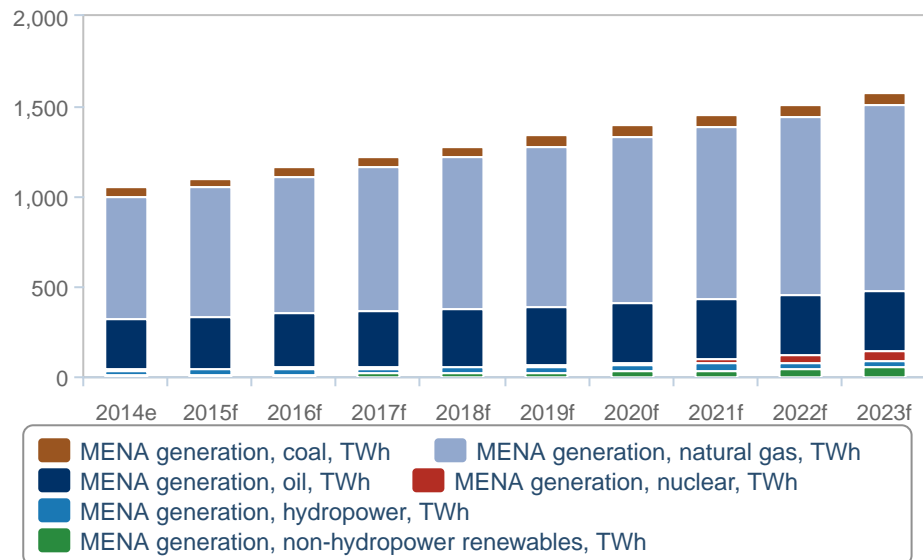
e/f = BMI estimate/forecast. Source: EIA/BMI

In SSA, thermal will also dominate - with coal retaining the biggest share of the electricity generation mix (largely due to the amount used to generate electricity in South Africa) but gradually losing share to gas as countries like Nigeria, Ghana and Cote d'Ivoire gradually ramp up gas-fired capacity. Hydropower will account for 25% of total generation - boosted by mega hydropower projects in Ethiopia in particular. Like MENA, we also expect SSA to register strong growth in renewables from a low base. We are particularly upbeat on off-grid distributed renewable energy, as it negates the problems associated with crumbling or non-existent grid infrastructure.

SSA - Gas To Gradually Displace Coal

SSA - Electricity Generation By Type, 2015-2023
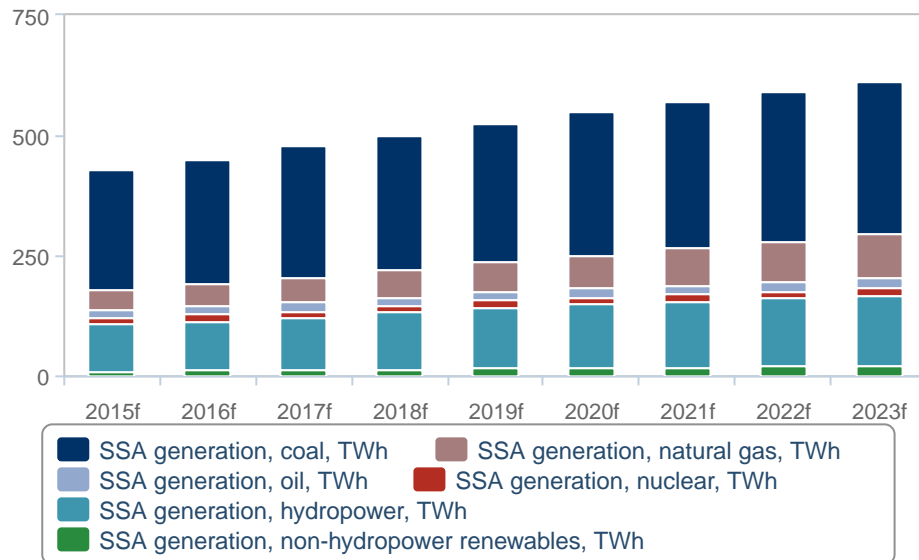
e/f = BMI estimate/forecast. Source: EIA/BMI

MENA Power: Key themes

- **Some Markets More Resilient To Lower Oil Prices Than Others**

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. **BMI**'s Oil & Gas team is below consensus on global oil prices, forecasting that the trading range for Brent will be between USD40-65/bbl in 2015 - with the assumption that we could see some Iranian crude come to market and maintain prices towards the lower end of this range (see chart below).

We maintain that many of the biggest Middle Eastern markets (the exporters) - particularly Saudi Arabia, UAE and Kuwait - will remain resilient to lower prices thanks to significant fiscal buffers and large foreign reserves. Qatar is the country that is most insulated from lower prices thanks 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. To this end, Saudi Arabia announced in early 2015 that 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.

A Sustained Period Of Lower Oil Prices

BMI Brent Price Forecasts, 2014-2019
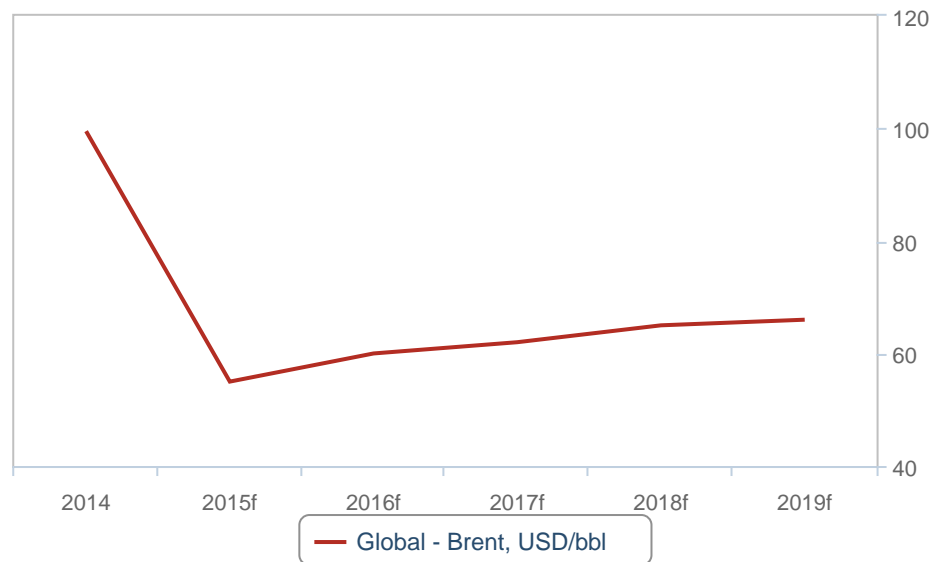
e/f = BMI estimate/forecast. Source: BMI

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. Rising consumption levels and strong economic growth will ensure demand for electricity continues to grow - and the governments in these respective countries will have to attract private investment into their respective power sectors in order to keep pace with surging demand.

▪ **Upside Risk To Investment In Egypt And Iran**

The outlook for the Egyptian economy is improving significantly under President Abdel Fattah el-Sisi. Crucially, infrastructure development is a top priority for the government and we expect investment to flow into all areas of the power sector as the government attempts to meet growth in demand for electricity in the MENA region's most populous market. In MENA's second most populous market, Iran, economic

deterioration due to falling oil prices has raised the pressure to agree a nuclear deal with the West. Our Country Risk team believe that a deal could be reached by June 2015 - with the rise of Islamic State and the collapse of the Yemeni government having increased the West's sense of urgency with regards to normalising relations with Iran to help resolve regional challenges. Any deal would likely lead to a partial relaxation of sanctions and could lay the foundations for greater foreign investment in Iran's creaking power infrastructure.

- **Energy Mix Diversification Driven By Renewables**

Countries across the MENA region are looking to exploit their domestic non-hydro renewables resources in a bid to improve energy security, diversify their power mixes and in some cases, conserve oil for export as opposed to burning domestically. While we think much of negative sentiment towards the global renewables industry is overdone in the current weak oil price environment (based largely on the fact that solar and wind do not often compete directly with oil in power generation), we do note that we could see renewables expansion lose some momentum in the Middle East - evidenced by Saudi Arabia's decision to push back its solar capacity expansion plans. Nevertheless, the project pipeline will remain strong - with the UAE set to establish itself as a renewable energy hub within the GCC region and a series of project announcements in Egypt and Morocco underpinning our forecasts for strong growth in renewables capacity.

UAE To Lead Renewables Revolution

MENA - Renewables Capacity By Type, 2015-2023
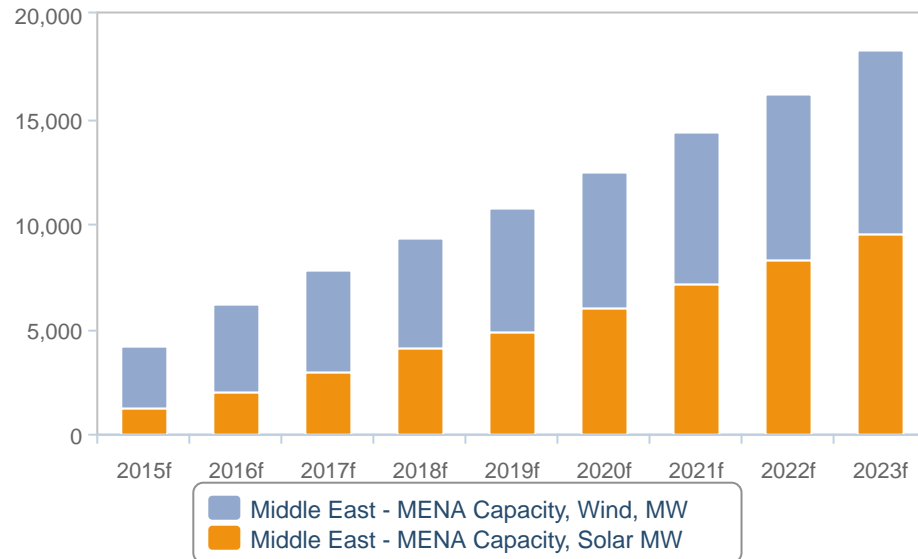
e/f = BMI estimate/forecast. Source: EIA/BMI

SSA Power: Key Themes

- **Mixed Impact Of Weak Oil Prices**

The impact of lower oil prices on SSA economies will not be uniform and we expect East Africa to outperform based on is status as a predominantly fuel importing region. Lower fuel prices will have a disinflationary impact and will benefit consumers in **Ethiopia** and **Kenya** in particular - markets where we already expect robust economic growth to spur demand for electricity. In net oil exporting countries such as **Nigeria** and **Angola**, however, we expect the fall in oil prices to have a negative impact on the economy, and highlight that falling oil prices could hit government revenues hard. This would limit government spending in the power sector, but could create added impetus with regards to attracting private investment into Nigeria's power sector.

- **Power Crises Underscore Need For Investment, Reform**

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**. Ghana has long suffered shortages due to an inability to secure gas and low reservoir levels at hydropower facilities. We expect pressure to continue to build on President John Mahama and forecast that inadequate power supply will curb real GDP growth and hit output from the power intensive mining industry. Meanwhile, the situation in South Africa has also deteriorated due to the parlous financial position of state-owned utility **Eskom**. Power outages are similarly curbing economic growth and we believe the situation is escalating to the point where there could be serious political ramifications for the African National Congress (ANC). More broadly, these problems in the power sector highlight that reform of the power sector in SSA has been slow, with state-owned entities dominating domestic markets and tariffs failing to reflect the true cost of generation, which have constrained investment.

- **Elections To Raise Political Tensions Deter Power Sector Investment**

There is significant scope for political tensions to rise across SSA in 2015, with Nigeria, Cote d'Ivoire and Tanzania holding elections. This raises the political risk premium and is a downside risk to investment in these power markets. At the time of writing, Nigeria's incumbent President Goodluck Jonathan appears to have lost to his main rival Muhammadu Buhari in the March 2015 presidential election. This could lead to a protracted period of uncertainty in the power sector - on the basis that Buhari could make alterations to the power sector reform process that gained momentum under his predecessor.

SSA To Register Renewables Growth

SSA - Renewables Capacity By Type, 2015-2023
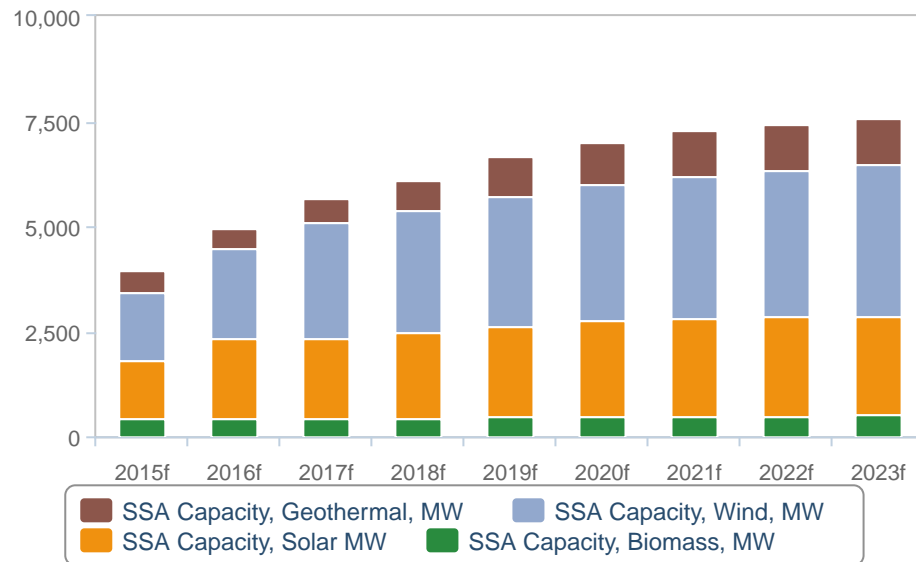
e/f = BMI estimate/forecast. Source: EIA/BMI

- **SSA Set To Register Strong Growth In Renewables**

Countries in the Sub-Saharan Africa (SSA) region are increasingly turning to their largely untapped renewable energy potential, as the technology is presenting an attractive option for power generation. Unlike many developed markets, in which the growth of renewable energy is often driven by environmental concerns and regulations governing emissions, renewable energy in SSA is emerging as an economically feasible option as technology costs fall and it becomes cost-competitive with diesel. Ethiopia, Kenya and South Africa are set to be the regional outperformers - although we highlight that concerns about the financial viability of Eskom could damage the outlook for South Africa.

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

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