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Egypt

Power Report

Includes 10-year forecasts to 2033

Contents

Key View

Key View: *We have a bullish view on Egypt's power market, particularly in the non-hydropower renewables sector, forecasted to grow rapidly due to the government's aim for a 42% renewable energy share by 2035. In line with the Egyptian Integrated Sustainable Energy Strategy, we foresee an 78.1% increase in renewables capacity, translating to an additional 18.2GW over the next decade. Despite current disruptions, Egypt's significant green hydrogen initiatives promise to boost its renewable generation capabilities. Market growth is expected to be driven by private investments, spurred by privatisation and an uptick in renewable projects, which will notably enhance capacity and output. The sector's expansion is reinforced by the construction of Egypt's inaugural nuclear facility and the creation of power interconnectors, setting the stage for Egypt to become a potential regional power exporter. These developments suggest a pivotal shift towards a diversified energy mix, emphasising renewables and nuclear energy, and affirm Egypt's position as a rising leader in renewable energy.*

Headline Power Forecasts (Egypt 2023-2028)

Indicator	2023e	2024f	2025f	2026f	2027f	2028f
Generation, Total, TWh	216.2	223.9	236.7	247.5	257.1	267.3
Consumption, Net Consumption, TWh	181.5	186.4	195.5	203.7	211.6	220.5
Capacity, Net, MW	59,775.8	60,909.6	65,098.5	68,137.1	69,476.3	70,948.8

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

Latest Updates And Structural Trends

- Over the next decade, we expect that total power generation in Egypt will increase by an annual average of 4% from 223.9TWh in 2024 to 320.6TWh in 2033. Total capacity is expected to increase by 21GW over the next decade. Net consumption will rise from 186.4TWh in 2024 to 265.9TWh in 2033. Consumption growth will be driven by increased electrification from hydrogen, an increase in the use of cooling systems and urbanisation.
- Non-hydropower renewables will be the fastest growing segment of Egypt's power market. Our forecast shows an increase of 18.2GW over the next decade, with onshore wind contributing over 11.0GW to the non-hydropower renewables capacity growth. As Egypt diversifies its power market, we expect thermal power capacity, of which gas power is dominant, to decrease its share in total capacity.
- Wind power growth will be supported by projects such as the ACWA Power and Hassan Allam Utilities's 1.1GW wind project. The companies have signed a 25-year land usufruct agreement with the New and Renewable Energy Authority for the wind power project. The USD1.5bn power plant will come up at the Gulf of Suez and Gebel El Zeit. Under the agreement, the consortium will work during the development phase to complete site studies and secure project finance.
- The New and Renewable Energy Authority and the Sovereign Fund of Egypt are preparing to launch the Phase II of the Zafarana wind farm for bidding in H2 2024. The tender process is part of Egypt's broader efforts to advance its renewable energy capabilities, including the agreements with Siemens and Jabal Al-Zeit stations, estimated at USD350.0mn. The project includes wind farms with a 545MW capacity and 700 turbines, developed through international collaborations.
- Amea Power has finalised installation of the first wind turbine in its Amunet wind farm, located in Egypt's Gulf of Suez. The USD709.0mn project, situated in Ras Ghareb 318km south of Cairo, will house a total of 70 wind turbines. Amea Power has collaborated with a consortium of Huadong PowerChina Engineering and PowerChina for the engineering, procurement and construction of the wind farm. The wind farm's output will be integrated into the National Electricity Transmission grid under a 25-year power purchase agreement. The project is backed by international financial institutions and commercial banks.
- Solar power is expected to be driven by Norwegian Scatec ASA having signed an agreement for a 1GW solar power and 200MW battery. Scatec ASA signed the agreement with the Egyptian Electricity Holding Company during the UN Climate Change Conference in Dubai (COP28).

SWOT

Strengths

- Substantial natural gas resources provide the basis for increased gas-fired power capacity.
- The government plans to attract greater international investment, demonstrating its commitment to boosting competitiveness in the market.
- Financial institutions have proven supportive of Egypt's thermal and non-hydropower renewables development in recent years.
- The expanding transmission interconnection network enables Egypt to export significant volumes of electricity.

Weaknesses

- The state-owned Egyptian Electricity Holding Company dominates the market, limiting opportunities for private sector participation.
- Subsidies are still in place despite ongoing reductions.
- Egypt has a poor track record of developing projects cost-efficiently, a downside that is acute in nuclear power projects such as El-Dabaa.

Opportunities

- Egypt offers a great wealth of potential renewable energy resources, particularly solar.
- Rapid economic and demographic growth will drive continued growth in electricity demand.
- Increasing private sector participation in the power sector is boosting competitiveness and ease of access to the market.
- Government plans to invest heavily in new transmission interconnection projects in order to capitalise on its vast and still-growing excess generation.

Threats

- Thermal power generation costs in Egypt are well below those of renewable energy schemes, which may inhibit diversification.
- Historically unstable political and security environment, which acts as deterrent for foreign investors.
- Despite recent stabilisation of the government's financial situation, its room for fiscal manoeuvring remains constrained.
- The vast oversupply of electricity may prompt the suspension or cancellation of projects in the pipeline.

Industry Forecast

Egypt Snapshot

Market Snapshot: Economic And Demographic Data (Egypt 2022-2027)

Indicator	2022	2023e	2024f	2025f	2026f	2027f
Nominal GDP, USDbn	409.3	330.7	310.1	340.3	370.7	403.9
Real GDP growth, % y-o-y	6.7	3.8	3.2	4.2	4.0	4.0
GDP per capita, USD	3,687	2,933	2,708	2,927	3,140	3,370
Population, mn	110.99	112.72	114.48	116.28	118.06	119.84

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

Market Snapshot: Economic And Demographic Data (Egypt 2028-2033)

Indicator	2028f	2029f	2030f	2031f	2032f	2033f
Nominal GDP, USDbn	440.5	480.6	524.7	573.1	626.2	684.6
Real GDP growth, % y-o-y	4.0	3.9	3.9	4.0	4.0	4.1
GDP per capita, USD	3,621	3,895	4,192	4,515	4,865	5,245
Population, mn	121.61	123.38	125.15	126.92	128.71	130.51

f = BMI forecast. Source: National sources, BMI

Market Snapshot: Power Sector

Access to electricity, % of population	100
Quality of electricity supply (score)	91.8/100
Quality of electricity supply (rank)	77/124

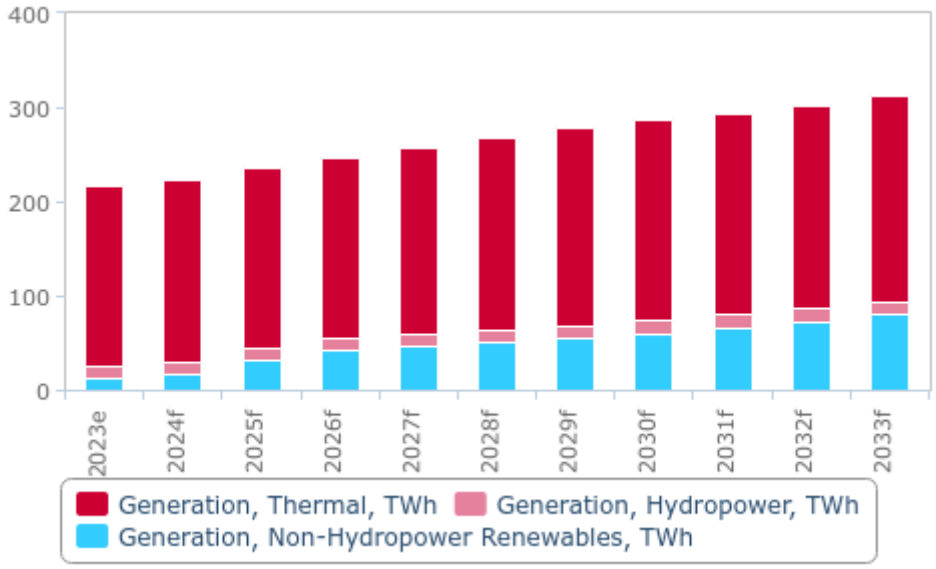
Source: World Economic Forum - Global Competitiveness Report 2019, World Bank, BMI

Egypt Power Forecast Scenario

Key View: *We have a positive outlook about Egypt's power sector, given its substantial growth potential and a government initiative targeting a 42% renewable energy mix by 2035 under its Integrated Sustainable Energy Strategy. This strategy focuses on expanding non-hydropower renewables and reducing gas reliance, with non-hydropower renewables expected to be the fastest-growing segment. Egypt, leading the MENA region with the largest green hydrogen project pipeline, will likely see green hydrogen significantly impact its power sector. The construction of the El Dabaa nuclear plant will boost capacity later on in our forecasts. We expect that investments in grid enhancements and cross-border interconnections will strengthen Egypt's energy infrastructure. Partnerships with the EU are projected to elevate generation capacity, positioning Egypt as a key regional energy transition leader.*

Thermal Power To Remain Dominant, But Renewables Growing

Egypt - Total Generation By Type (2023-2033)



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

Thermal Forecasts

Latest Updates

- Egypt is expected to increase LNG exports in 2024 as lower gas production output and increased electricity demand in the summer of 2023 resulted in very low LNG exports. In November 2023, the Egyptian government announced that it would extend the national power cuts introduced in 2023; the increase in LNG exports poses a downside risk to power generation given Egypt's power dependence on natural gas.
- The Sidi Krir and El-Atf power plants are expected to be upgraded to improve gas turbine efficiency. The plant upgrades will be conducted by Mitsubishi Power. Upon completion of plant upgrades, the gas turbine efficiency is expected to improve by 2.5% an average with an increase in power generation of 6.0%.

Structural Trends

In Egypt, the focus for thermal power generation is firmly on the gas-fired sector, as the nation takes steps to reduce the use of oil domestically and steer clear of coal-fired power. We expect gas power to maintain its dominance in thermal power generation. During the COP27 event, the country unveiled its Energy Wealth Initiative, which sets a target to decommission around 5,000MW of

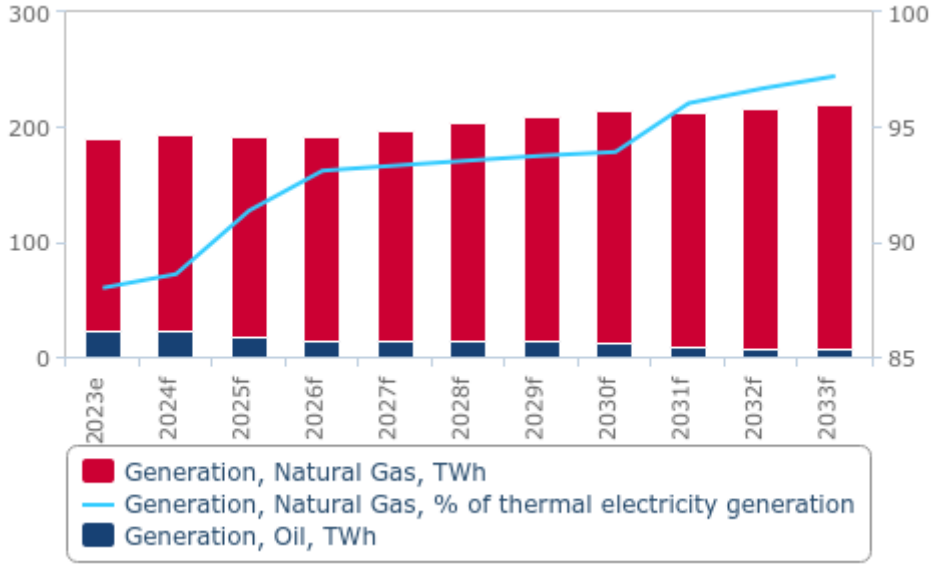
gas-powered generation that is considered inefficient by 2035. Gas-fired generation was responsible for approximately 77.0% of Egypt's electricity production by the end of 2022, a figure that is projected to diminish to 68.0% by 2032. Nevertheless, potential future deficits in Egypt's gas output represent a persistent concern for the power generation landscape.

Our outlook for coal-fired power in Egypt is bearish, with the sector falling out of favor and not anticipated to feature in the country's energy mix for the foreseeable future. This shift has been propelled by advancements in the development of the Zohr Gas Field, which is expected to enhance Egypt's natural gas supply, thus reducing any reliance on coal for electricity generation.

In terms of oil-fired power, Egypt generated an estimated 22.8TWh from this sub-sector at the end 2022. Despite the presence of an established oil-fired power segment, the Egyptian government has not indicated any major intentions to expand this area. The strategy aligns with the broader goal to curtail domestic consumption of crude oil and mitigate the need for a substantial increase in oil imports over the coming years. In light of these factors, our projections indicate a gradual decrease in oil-fired power generation, anticipating a drop to 6.1TWh by 2033, which would represent a fall less than 2.0% of the total electricity generated, from 10.8% in 2022.

Natural Gas To Remain Primary Source Power In Egypt

Egypt - Thermal Power Generation By Type & Natural Gas' Share Of Total Generation (2022-2032)



f = BMI forecast. Source: CEA, EIA, local sources, BMI

Nuclear Forecasts

Latest Updates

- The Governments of Egypt and Russia have laid the foundation stone for the fourth and final unit at the 4.8GW Dabaa nuclear power plant in Egypt. Russia-based Rosatom is responsible for the construction of the USD30.0bn power plant, which will consist of four power units.

Structural Trends

In November 2015, Russian state nuclear corporation Rosatom and the Nuclear Power Plants Authority (NPPA) signed a preliminary agreement for the construction of the El Dabaa nuclear power plant 160km west of Alexandria. Under the agreement, Russia would

build the plant and extend USD25.0bn in export financing to cover 85% of the construction costs, with the remainder financed by the Egyptian government. The loan will be paid back over a period of 35 years starting in October 2029, with electricity sales covering the costs of the loan. In October 2018, the USD700.0mn contract to deliver the turbine island equipment was awarded to AAEM - a limited liability company wholly owned by General Electric and Atomenergomash - representing a significant milestone in the planning and development of El Dabaa. In early 2020, Rosatom awarded contracts for the project's construction to Egypt-based firms Petrojet, Hassan Allam Holding and Arab Contractors.

The war between Russia and Ukraine poses a significant risk to the plant's progress, especially with the early stage of development. Having been disconnected from the SWIFT banking system, experts have highlighted a significant risk to Russia's ability to distribute finances to Egypt for the project. The possibility of more wide-reaching global sanctions may pose a challenge to the project, as stakeholders may face similar ultimatums to either cut ties with Russian nuclear and energy firms and avoid payments to the Russian government, or face sanctions themselves. In the absence of these ultimatums, the Egyptian and Russian governments have reiterated their commitment to the project and stated that work will continue as planned.

In November 2022, construction began for the 1.2GW second unit of the 4.8GW Russia-based Rosatom El-Dabaa nuclear power plant. The current schedule for the project states that completion will only be reached in 2030. We have featured the nuclear power plant in the later years of our forecast period, as we do not anticipate that the project would have to run completely on schedule without any delays, as nuclear power projects are prone to delays and cost-overruns. In March 2023, ENRRA granted the construction permit for the third 1.2GW power unit of a nuclear plant in El-Dabaa, Egypt. The power plant consists of four power units each with a capacity of 1.2GW, with VVER-1200 reactors (pressurised water reactor) of generation III. Russia's state-owned Rosatom started the construction in July 2022, and the project is expected to be completed by 2030.

Power Storage

Latest updates

- Egyptian Electricity Holding Company has signed an agreement with Scatec to build a 1GW solar and 200MW battery storage facility in Egypt. This project would be the first of its kind in the market. The African Development Bank has also signed a letter of intent to finance the project.
- China Energy has signed a contract to prepare a technical and financial study for a power storage and pumping station in Egypt. The 2GW battery energy storage system will be developed on a build-own-operate basis.

Structural Trends

Egypt is proactively advancing its energy sector towards enhanced sustainability and efficiency, with energy storage emerging as a pivotal component. The country has initiated an ambitious introduction of pumped hydro storage into its energy infrastructure. Central to this is the proposed 2GW pumped hydropower plant, for which a feasibility study agreement with China Energy has been signed. This study will assess various facets of the project, which, if approved, will be developed using the build-own-operate (BOO) model, reflecting Egypt's receptiveness to novel financing mechanisms.

Moreover, the Egypt Electricity Holding Company (EEHC) has signed a contract with China's Sinohydro to develop a 2,400MW pumped storage hydro project in the Suez area, set to commence construction in June 2024. This initiative, financed entirely through a concession agreement, represents Egypt's first foray into pumped hydro storage, supplementing its longstanding reliance on hydroelectric power from the Aswan High Dam and other hydro plants.

On the battery storage front, Egypt is exploring solutions to its significant electricity oversupply, which threatens to constrain renewable energy generation and hinder renewable targets. Despite the potential benefits of lithium-ion battery technology for grid integration of renewables, its widespread adoption in Egypt faces hurdles. These include the high costs associated with large-scale

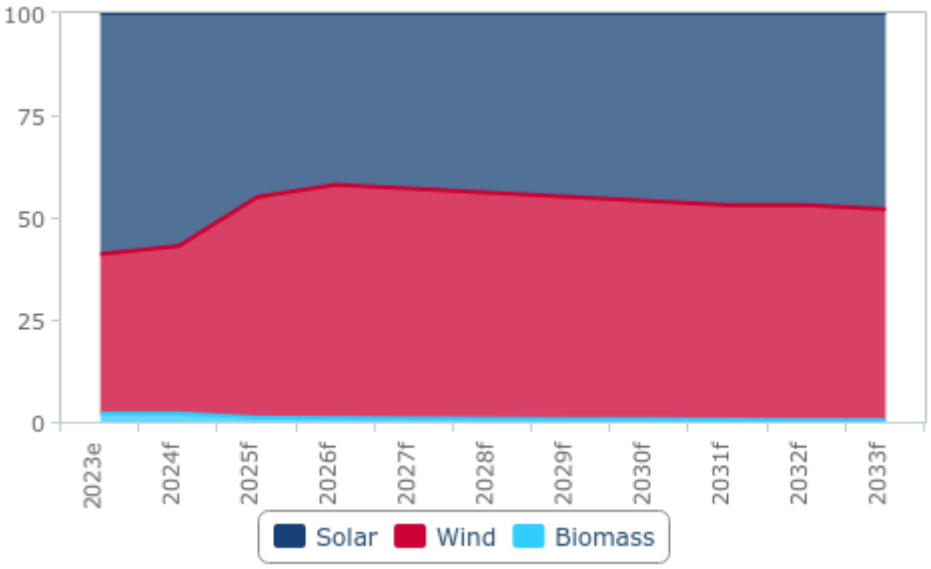
deployment, the technology's nascent development stage and the questionable necessity in the context of Egypt's current energy surplus.

However, the anticipated increase in renewable energy's share to 40%-50% of the energy mix signals that battery storage will eventually become critical. Presently, it could be particularly viable in remote, grid-isolated areas.

Non-Hydropower Renewables

Wind Power Leads Renewables Generation

Egypt - Non-Hydropower Renewables Generation By Type, % share of mix (2023-2033)



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

Solar Forecasts

Latest Updates

- Scatec has signed a deal for the development of a 1GW solar project to supply clean energy for the operation of Egypt Aluminium's complex in the city of Nagaa Hammadi in Egypt. Under the terms of the agreement, the solar park will be built in two phases, each with a capacity of 500MW. Phase I is expected to be completed within 18 months from the date of signing and Phase II within 24 months.
- China Electric Power Equipment and Technology has signed a memorandum of understanding (MOU) with New and Renewable Energy Authority and Egyptian Electricity Holding to develop a 10GW solar energy project in Egypt. The proposed facility is expected to produce 29.7TWh of electricity per year.
- Norwegian Scatec ASA has signed an agreement for a 1GW solar power and 200MW battery. Scatec ASA signed the agreement with the Egyptian Electricity Holding Company (EEHC) during the UN Climate Change Conference in Dubai (COP28).
- ACWA power is expected to complete construction on its 200MW Kom Ombo solar project in Egypt by April 2024. The construction of the solar farm, totalling approximately USD182.0mn (EUR167.1mn), achieved financial close in August 2023. Once up and running, Kom Ombo will supply 130,000 households and offset 280,000 tonnes of carbon dioxide per year.

Solar Power To See Robust Growth

Egypt's renewable sector is expected to see robust growth, with solar power poised to become a significant contributor to the nation's energy mix. Supported by the Integrated Sustainable Energy Strategy, Egypt aims to achieve a 42% renewable power capacity by 2035, with non-hydropower renewables expected to grow by 82%, or 21.3GW, over the next decade. This ambitious target is supported by the Egyptian Solar Plan, which seeks to install 3.5GW of solar power by 2027, with two-thirds of this capacity driven by private investment through competitive bidding and other incentivising schemes. The country's natural advantages, including high solar irradiance and extended sunlight hours, coupled with growing private sector engagement, are key drivers of this growth. Notably, Elsewedy Electric T&D's contract for the 36MW phase of the D'jermaya solar PV complex in Chad exemplifies Egypt's expanding influence in the African renewable energy sector.

Egypt's renewable energy ambitions are bolstered by the Nexus of Water, Food and Energy programme, which aims to channel USD10.0bn into renewable projects, targeting the installation of 10GW over the next five years. These projects are part of a strategic initiative to replace 5GW of thermal power stations with renewable sources, thus facilitating Egypt's goal of a 42% renewable share by 2030. The programme's innovative financing mechanisms, including grants, debt swaps and concessional loans, demonstrate Egypt's commitment to leveraging diverse funding sources to realise its renewable energy potential. As of now, 3.7GW of capacity has been initiated under this programme, underscoring Egypt's serious strides towards a greener future. This proactive approach is expected to solidify Egypt's status as a regional leader in renewable energy and contribute significantly to global sustainability efforts.

Wind Forecasts

Latest Updates

- Amea Power has finalised installation of the first wind turbine in its Amunet wind farm, located in Egypt's Gulf of Suez. The USD709.0mn project, situated in Ras Ghareb 318km south of Cairo, will house a total of 70 wind turbines. Amea Power has collaborated with a consortium of Huadong PowerChina Engineering and PowerChina for the engineering, procurement and construction of the wind farm. The wind farm's output will be integrated into the National Electricity Transmission grid under a 25-year power purchase agreement. The project is backed by international financial institutions and commercial banks.
- The New and Renewable Energy Authority and the Sovereign Fund of Egypt are preparing to launch the Phase II of the Zafarana wind farm for bidding in H2 2024. The tender process is part of Egypt's broader efforts to advance its renewable energy capabilities, including the agreements with Siemens and Jabal Al-Zeit stations, estimated at USD350.0mn. The project includes wind farms with a 545MW capacity and 700 turbines, developed through international collaborations.
- A consortium of ACWA Power and Hassan Allam Utilities have signed a 25-year land usufruct agreement with the New and Renewable Energy Authority for a 1.1GW wind project in Egypt. The USD1.5bn power plant will come up at the Gulf of Suez and Gebel El Zeit. Under the agreement, the consortium will work during the development phase to complete site studies and secure project finance.

Wind Power Growth Surge

Egypt's wind power sector is on a trajectory to become a dominant force within the renewable energy landscape, reflecting a broader trend in the MENA region's shift towards sustainable power sources. The Egyptian Integrated Sustainable Energy Strategy is the driving force behind this shift, targeting 42% renewable power capacity by 2035. Within this framework, non-hydropower renewables are anticipated to see an 82.0% capacity growth, or 21.3GW, over the next 10 years. Notably, the wind power segment is receiving significant attention, with the Egyptian Cabinet approving a 500MW wind project by AMEA Power LLC in Ras Ghareb. In tandem, Maersk International's acquisition of a 51% stake in the Zaafarana wind farm highlights the growing confidence and investment from global conglomerates in Egypt's renewable potential.

Strategic partnerships and large-scale projects are at the forefront of Egypt's wind power expansion. The Ministry of Electricity and Renewable Energy's collaboration with Orascom Construction, ENGIE and Toyota Tsusho for a 3GW wind farm in West Sohag exemplifies the sector's scale and ambition. Additionally, the Red Sea Wind Energy project, with its 500MW capacity, is set to become a regional benchmark as the largest wind farm in MENA. The project, backed by a consortium of international and local companies, underscores the strategic importance of wind power in Egypt's renewable mix. Moreover, the land allocation for a monumental 10GW wind power project by ACWA Power and a similar agreement for a 10GW onshore wind farm by Masdar, Infinity Power and Hassan Allam Utilities marks a significant leap towards realising one of the world's largest wind farms. These developments indicate a clear trend: Egypt is not only prioritising renewable energy within its borders but is also establishing itself as a hub for renewable energy innovation and investment on a global scale.

Electricity Generation And Power Generating Capacity

Total Electricity Generation Data And Forecasts (Egypt 2022-2027)

Indicator	2022e	2023e	2024f	2025f	2026f	2027f
Generation, Total, TWh	211.7	216.2	223.9	236.7	247.5	257.1
Generation, Coal, TWh	0.000	0.000	0.000	0.000	0.000	0.000
Generation, Coal, % of total electricity generation	0.000	0.000	0.000	0.000	0.000	0.000
Generation, Natural Gas, TWh	164.11	167.23	171.91	175.52	179.03	184.58
Generation, Natural Gas, % of total electricity generation	77.525	77.340	76.765	74.168	72.341	71.791
Generation, Oil, TWh	22.833	22.821	22.137	16.602	13.282	13.216
Generation, Oil, % of total electricity generation	10.786	10.554	9.885	7.015	5.367	5.140
Generation, Nuclear, TWh	0.000	0.000	0.000	0.000	0.000	0.000
Generation, Nuclear, % of total electricity generation	0.000	0.000	0.000	0.000	0.000	0.000
Generation, Hydropower, TWh	13.484	13.214	13.082	13.213	13.372	13.532
Generation, Hydropower, % of total electricity generation	6.370	6.111	5.842	5.583	5.403	5.263
Generation, Hydro-Electric Pumped Storage, TWh	0.000	0.000	0.000	0.000	0.000	0.000
Generation, Hydro-Electric Pumped Storage, % total electricity generation	0.0	0.0	0.0	0.0	0.0	0.0
Generation, Non-Hydropower Renewables, TWh	11.260	12.961	16.815	31.319	41.797	45.783
Generation, Non-Hydropower Renewables, % of total electricity generation	5.3	6.0	7.5	13.2	16.9	17.8
Generation, Total, % y-o-y	3.5	2.1	3.6	5.7	4.6	3.9
Generation, Wind, TWh	6.280	7.147	9.576	21.451	30.075	32.571
Generation, Wind, % of total electricity generation	2.967	3.305	4.276	9.064	12.152	12.668
Generation, Solar, TWh	4.635	5.469	6.891	9.510	11.364	12.853
Generation, Solar, % of total electricity generation	2.190	2.529	3.077	4.018	4.592	4.999
Generation, Biomass and Waste, TWh	0.345	0.345	0.347	0.357	0.358	0.359
Generation, Biomass and Waste, % of total electricity generation	0.163	0.160	0.155	0.151	0.145	0.139

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

Total Electricity Generation Data And Forecasts (Egypt 2028-2033)

Indicator	2028f	2029f	2030f	2031f	2032f	2033f
Generation, Total, TWh	267.3	278.2	288.1	298.6	309.0	320.6
Generation, Coal, TWh	0.000	0.000	0.000	0.000	0.000	0.000
Generation, Coal, % of total electricity generation	0.000	0.000	0.000	0.000	0.000	0.000
Generation, Natural Gas, TWh	190.31	196.20	200.72	204.73	208.83	213.00
Generation, Natural Gas, % of total electricity generation	71.190	70.539	69.672	68.573	67.581	66.442
Generation, Oil, TWh	13.149	13.084	13.018	8.462	7.193	6.114
Generation, Oil, % of total electricity generation	4.919	4.704	4.519	2.834	2.328	1.907
Generation, Nuclear, TWh	0.000	0.000	0.000	5.000	6.000	7.200
Generation, Nuclear, % of total electricity generation	0.000	0.000	0.000	1.675	1.942	2.246
Generation, Hydropower, TWh	13.694	13.859	14.025	14.165	14.307	14.450
Generation, Hydropower, % of total electricity generation	5.123	4.982	4.868	4.745	4.630	4.507
Generation, Hydro-Electric Pumped Storage, TWh	0.000	0.000	0.000	0.000	0.000	0.000
Generation, Hydro-Electric Pumped Storage, % total electricity generation	0.0	0.0	0.0	0.0	0.0	0.0
Generation, Non-Hydropower Renewables, TWh	50.171	55.004	60.329	66.200	72.674	79.819
Generation, Non-Hydropower Renewables, % of total electricity generation	18.8	19.8	20.9	22.2	23.5	24.9
Generation, Total, % y-o-y	4.0	4.1	3.6	3.6	3.5	3.7
Generation, Wind, TWh	35.274	38.202	41.373	44.807	48.526	52.554
Generation, Wind, % of total electricity generation	13.196	13.734	14.361	15.008	15.704	16.393
Generation, Solar, TWh	14.537	16.441	18.595	21.031	23.786	26.902
Generation, Solar, % of total electricity generation	5.438	5.911	6.455	7.044	7.698	8.392
Generation, Biomass and Waste, TWh	0.359	0.360	0.361	0.362	0.362	0.363
Generation, Biomass and Waste, % of total electricity generation	0.134	0.129	0.125	0.121	0.117	0.113

f = BMI forecast. Source: National sources, BMI

Electricity Generating Capacity Data And Forecasts (Egypt 2022-2027)

Indicator	2022e	2023e	2024f	2025f	2026f	2027f
Capacity, Net, MW	59,250.5	59,775.8	60,909.6	65,098.5	68,137.1	69,476.3
Capacity, Net, % y-o-y	0.1	0.9	1.9	6.9	4.7	2.0
Capacity, Conventional Thermal, MW	52,971.0	52,971.0	52,971.0	53,103.4	53,257.4	53,422.5
Capacity, Conventional Thermal, % y-o-y	0.0	0.0	0.0	0.2	0.3	0.3
Capacity, Nuclear, MW	0.0	0.0	0.0	0.0	0.0	0.0
Capacity, Nuclear, % y-o-y	0.0	0.0	0.0	0.0	0.0	0.0
Capacity, Hydropower, MW	2,832.0	2,832.0	2,832.0	2,832.0	2,832.0	2,832.0
Capacity, Hydropower, % y-o-y	0.0	0.0	0.0	0.0	0.0	0.0
Capacity, Non-Hydroelectric Renewables, MW	3,440.0	3,965.3	5,099.1	9,155.6	12,040.2	13,214.4
Capacity, Non-Hydroelectric Renewables, % y-o-y	1.5	15.3	28.6	79.6	31.5	9.8
Capacity, Wind, MW	1,637.5	1,862.0	2,494.7	5,569.4	7,797.2	8,436.6
Capacity, Wind, % y-o-y	0.2	13.7	34.0	123.2	40.0	8.2
Capacity, Solar MW	1,724.0	2,024.9	2,525.9	3,477.8	4,134.7	4,669.5
Capacity, Solar, % y-o-y	2.9	17.5	24.7	37.7	18.9	12.9
Capacity, Biomass, MW	78.5	78.5	78.5	108.3	108.3	108.3
Capacity, Biomass, % y-o-y	0.0	0.0	0.0	38.0	0.0	0.0

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

Electricity Generating Capacity Data And Forecasts (Egypt 2028-2033)

Indicator	2028f	2029f	2030f	2031f	2032f	2033f
Capacity, Net, MW	70,948.8	72,562.5	74,332.2	77,474.8	79,608.8	81,955.0
Capacity, Net, % y-o-y	2.1	2.3	2.4	4.2	2.8	2.9
Capacity, Conventional Thermal, MW	53,598.8	53,781.1	53,969.2	54,163.5	54,364.0	54,570.8
Capacity, Conventional Thermal, % y-o-y	0.3	0.3	0.3	0.4	0.4	0.4
Capacity, Nuclear, MW	0.0	0.0	0.0	1,200.0	1,200.0	1,200.0
Capacity, Nuclear, % y-o-y	0.0	0.0	0.0	0.0	0.0	0.0
Capacity, Hydropower, MW	2,832.0	2,832.0	2,832.0	2,832.0	2,832.0	2,832.0
Capacity, Hydropower, % y-o-y	0.0	0.0	0.0	0.0	0.0	0.0
Capacity, Non-Hydroelectric Renewables, MW	14,510.5	15,941.9	17,523.5	19,271.8	21,205.3	23,344.7
Capacity, Non-Hydroelectric Renewables, % y-o-y	9.8	9.9	9.9	10.0	10.0	10.1
Capacity, Wind, MW	9,128.4	9,876.9	10,686.8	11,563.1	12,511.3	13,537.2
Capacity, Wind, % y-o-y	8.2	8.2	8.2	8.2	8.2	8.2
Capacity, Solar MW	5,273.8	5,956.7	6,728.4	7,600.4	8,585.7	9,699.2
Capacity, Solar, % y-o-y	12.9	12.9	13.0	13.0	13.0	13.0
Capacity, Biomass, MW	108.3	108.3	108.3	108.3	108.3	108.3
Capacity, Biomass, % y-o-y	0.0	0.0	0.0	0.0	0.0	0.0

f = BMI forecast. Source: National sources, BMI

Electricity Consumption

Structural Changes

Egypt's economic recovery after the Arab Spring boosted electricity demand beyond the level of its total supply, necessitating power imports over recent years. The el-Sisi government's drive to boost electricity output began to register success from 2017 with the completion of a number of large-scale power projects.

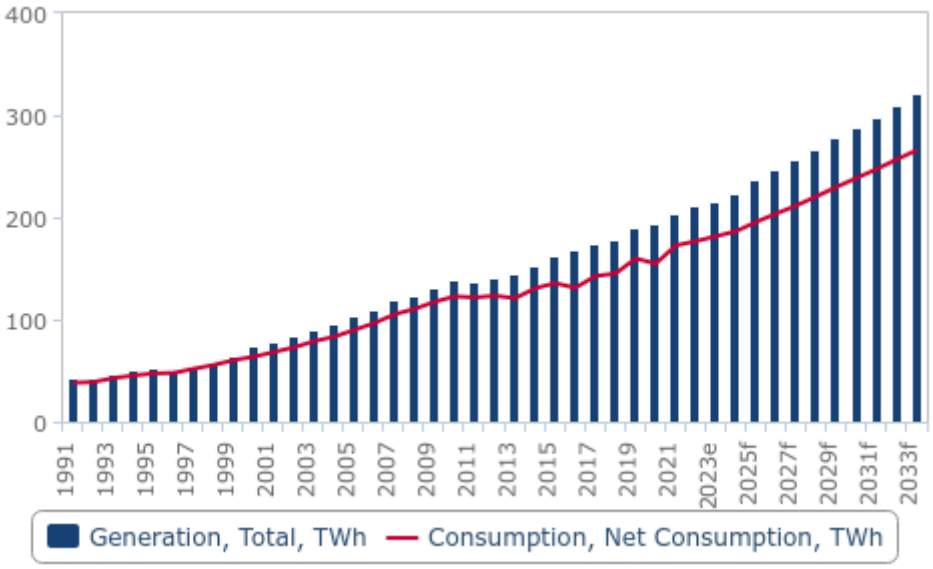
Egypt received record-high heatwaves in the summer of 2023, with temperatures reaching 40 degrees Celsius and higher. The heatwaves have increased electricity consumption through the use of cooling systems and air conditioning. We expect an increase in electricity consumption of 3.7% in 2024 as the country grapples with the heatwaves and power outages. We estimate that electricity consumption year-on-year growth will rise by 3.9% to reach 267.3TWh by 2033. This increase in electricity consumption will be primarily driven by an increase in cooling system installations as Egypt experiences increasingly warmer weather in the summer seasons as well as increasing urbanisations rate in the market. Generation outpaces consumption and we expect that the country will maintain an excess in electricity generation through the continuous expansion of its power capacity, exporting power through its expanding cross-border transmission interconnection network over the coming decade.

In February 2016, the Ministry of Electricity and Renewable Energy of Egypt issued a statement outlining the plan to cut energy subsidies by 50% by 2020 and to remove electricity subsidies altogether by 2025. Subsidy reforms raised household electricity prices considerably, which accounts for more than 40% of the country's total energy consumption prior to the initiative's execution. In August 2016, the government announced that price hikes ranging between 25% and 40% would be retroactively implemented from July that year. The announcement came as the government was in talks with the IMF for a USD12.0bn bailout, with subsidy reforms making up part of the loan conditions. In October 2022, the government confirmed that the planned increase in electricity bills would be postponed until June 30 2023, against a backdrop of rising global energy prices.

We highlight that technological developments in energy-efficient electrical appliances (such as air conditioning) could dampen growth in the demand for power. However, strong demand from the energy-intensive desalination plants will remain, maintaining a positive growth trend for electricity consumption.

Electricity Consumption To Expand Strongly Although Still Below Generation Output

Egypt - Electricity Generation & Consumption, TWh & % y-o-y (1991-2033)



f = BMI forecast. Source: National sources, BMI

Transmission And Distribution, Imports And Exports

Latest Updates

- The European Bank for Reconstruction and Development is considering a sovereign loan of up to EUR165.0mn to help Egypt to enhance its electricity grid and accommodate new renewable energy sources. This loan will be directed to the Egyptian Electricity Transmission Company for infrastructure development. About 60% of the funds are earmarked for constructing a 200km high-voltage transmission line in the Gulf of Suez to connect approximately 2.1GW from new wind energy projects. The remaining portion will finance upgrades to a major substation in Cairo, ensuring network stability, as part of Egypt's Nexus Water, Food & Energy initiative.

Structural Trends

We expect that Egypt's power supply surplus will remain high over our 10-year forecast period, attributable to rapid increases in net generation, which significantly outperforms the underlying demand trend. In December 2018, the Egyptian Electricity Transmission Company temporarily ceased operations at power plants, totalling 18GW of its operational capacity due to an oversupply of electricity and a lack of infrastructure to export the surplus. While we note that this fell within Egypt's low-demand winter season (December to March), we expect that the country will prioritise the development of new power interconnection projects to boost its export capacity and maintain demand for growth in the sector.

Egypt has high- and extra high-voltage (132kV to 500kV) transmission lines stretched 27,266km, with 118,850MVA total transformer capacity in place. Its electricity grid is currently interconnected with those of Jordan, Syria, Iraq, Turkiye, Libya and Sudan. Egypt is cooperating with other African countries to build connections under the Nile Basin Initiative, whose membership includes Burundi, Eritrea, Ethiopia, Kenya, Rwanda, Sudan, Tanzania and Uganda. With the completion of the interconnection network, Egypt will significantly broaden its electricity export potential through access to the East African Power Pool.

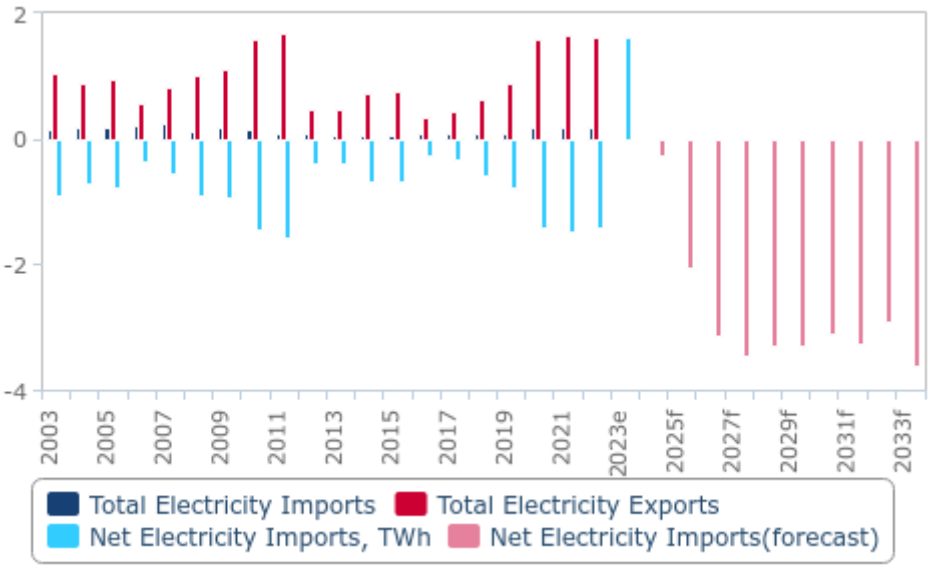
The Egypt-Saudi and EuroAfrica transmission interconnector projects, each rated at 500kV, are potentially the largest projects. The Egypt-Saudi interconnection project will be undertaken by the Egyptian Electric Holding Company (EEHC) and Saudi Electricity

Company (SEC), planning to link the two markets via a 3,000MW interconnection cable. The SEC and EEHC will share the cost of the 500kV cable, 20km of which will run undersea. Despite making early progress in planning, the project was delayed numerous times between 2016 and 2019. By early 2020, the Egyptian Electricity Transmission Company and SEC agreed to suspend the invitation for technical and financial offers due to Covid-19. By late-2021, the project registered new progress, and by May 2022 contracts were awarded. The project is scheduled for completion in 2025. Once completed, we expect that it will alleviate both Saudi Arabia's and Egypt's necessity for load shedding during times of peak power demand. Both have suffered from shortages at peak periods in the recent past. Consumption in Saudi Arabia is greatest between noon and midnight (when air conditioning is needed most), while Egypt's peak time is after sunset, making the two markets ideally suited for on-demand electricity trading. The project will enable electricity trading between Egypt and the Gulf Cooperation Council once new Middle Eastern interconnections are completed, expanding Egypt's potential export capacity and driving demand for continued investment in new power capacity. In this regard, the project will create opportunities for infrastructure and power companies, enabling them to gain a foothold in two markets that generate a large proportion of the region's electricity.

Progress also continues to be made on the 500kV EuroAfrica transmission interconnection, linking Egypt to mainland Greece. Stakeholders in the USD2.7bn Egypt Cyprus transmission interconnection project - which forms the first leg of the EuroAfrica Interconnector - invited bids for the tender on its EUR650.0mn EPC contract in early 2020. This first phase was scheduled to reach completion by December 2022, with stage two connecting Cyprus and Greece (via Crete and Attica) scheduled online one year later by December 2023. Projects such as these are exceptionally important to the Egyptian government, who recognise that the expansion of their electricity exports not only generates revenue for the country but will also drive future growth in the country's power sector. Damco Energy and Elica Mediterranean Interconnection signed a MoU with Infinity Power to develop a project to supply renewable power to Europe via a planned subsea transmission project between Egypt and Greece. The GREGY 3GW transmission project will include the installation of a 950km-long submarine cable to supply electricity, from 9.5GW of renewable projects to be deployed in Egypt to Greece.

Net Electricity Exports To Increase In The Market As Generation Outpaces Consumption

Egypt - Total Electricity Imports & Exports, & Net Electricity Imports, TWh



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

Electric Power T&D Losses Data And Forecasts (Egypt 2022-2027)

Indicator	2022	2023e	2024f	2025f	2026f	2027f
Electric power distribution losses, TWh	35.9	36.3	37.3	39.1	40.6	42.0
Electric power distribution losses, % of output	17.0	16.8	16.7	16.5	16.4	16.3

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

Electric Power T&D Losses Data And Forecasts (Egypt 2028-2033)

Indicator	2028f	2029f	2030f	2031f	2032f	2033f
Electric power distribution losses, TWh	43.5	45.0	46.4	47.9	49.4	51.0
Electric power distribution losses, % of output	16.3	16.2	16.1	16.1	16.0	15.9

f = BMI forecast. Source: EIA, BMI

Industry Risk/Reward Index

MENA Power RRI: UAE Remains Regional Top-Performer While Oman Moves To Second-Place Ranking

Key View

- The MENA region remains a strong-performing region in our Power Risk/Reward Index (RRI) this quarter, outperforming against the global average.
- The UAE remains the regional top-performing MENA market, outperforming the regional and global averages across all four pillars of our Power RRI.
- Oman is the most improved market this quarter, following a strengthened power sector outlook.
- Saudi Arabia is the least improved market this quarter, having moved down two ranks in the region and 13 ranks globally.

GCC Markets Outperform In The MENA Region

MENA - Power Risk/Reward Index Heat Map

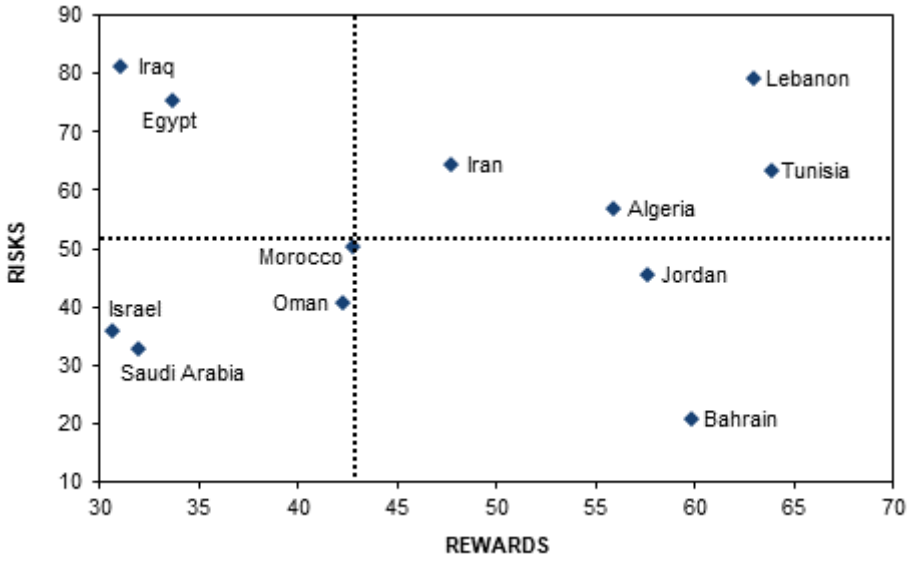
Note: Scores out of 100; lower score = more attractive market. Source: BMI Power Risk/Reward Index

Regional Features And Latest Updates

- The MENA region continues to outperform against the global average and other regional averages, coming after North America and Western Europe (NAWE) and Asia.
- The region's Rewards profile is the best-performing profile in our RRI. This is supported by a large and expanding power generation from MENA's largest power markets, namely Saudi Arabia, Egypt and Iran.
- The region's Risks profile performs poorly against the global average. This is due to the short- and long-term economic risks, as well as slower uptake of clean energy policy and liberalisation of markets.
- The UAE remains the best-performing market in the MENA region. Oman is the most improved market, moving up in ranking from third place to second, outperforming Saudi Arabia.

UAE Leads While Lebanon Lags Behind

MENA - Power Risk/Reward Index



Note: Scores out of 100; lower score = more attractive market. Source: BMI Risk/Reward Index

MENA Outperforms Against Global Average In Our RRI Due To Strong Rewards Profile, Despite Risks Weighing On RRI Score

The MENA region's strong Rewards scores are supported by a large installed electricity capacity as well as strong forecasted growth between 2024 and 2028. This growth forecast will be driven by the region's large power markets namely Saudi Arabia, Iran, Egypt and the UAE. These markets all have significant thermal power sources which take advantage of domestic reserves. In addition, these markets have plans to expand the renewables segment of their power markets, presenting an upside risk to electricity generation growth in the region and a boost to the Industry Rewards score. In addition, the region's Country Rewards segment performs well against the global average. This is due to the market's electricity consumption and electricity access scores which are low, meaning that there are opportunities to expand the region's power generation and capacity.

The region's Risks profile weighs on the region's RRI score, its performance in the competitive landscape, long- and short-term economic risks, and the political risks scores contribute to this score. While many markets are making reforms to liberalise their power markets, power generation is still largely dominated by state-owned utilities. This pulls down the competitive landscape score in the region. The economic challenges facing markets such as Jordan, Tunisia and Lebanon contributed to a weaker Risk profile. Furthermore, the ongoing conflict in Israel and the subsequent attack by Iran elevate the political risk in the MENA region, which weighs down the regional Risk profile.

MENA Is Third In Global Ranking

MENA - Power Risk/Reward Index

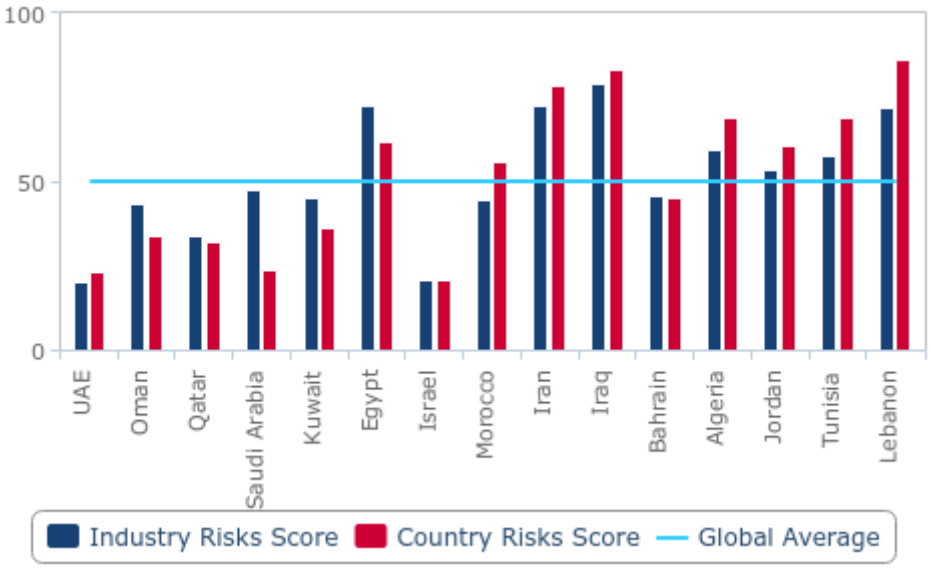
Note: May include territories, special administrative regions, provinces and autonomous regions. Scores out of 100; lower score = more attractive market. Source: BMI Risk/ Reward Index

UAE Remains Best-Performing Market In The MENA Region

The UAE boasts the top ranking in the MENA region's RRI due to its large and rapidly expanding power market, with the region's highest operational capacity exceeding 40GW, and a diverse competitive landscape. The UAE has one of the fastest-growing power markets in the MENA region, underpinned by its conventional thermal capacity and rapidly expanding renewables segment. We forecast an additional 11.2GW between 2024 and 2028, split among conventional thermal (31%), renewables (64%) and nuclear power (5%). This growth trajectory, coupled with the UAE's strategic location, political stability, diversified economy, supportive government policies and strong commitment to sustainability and technological innovation, culminates in its top Industry Rewards score of 26.7 in the regional index (with lower rankings signifying higher score), which cements its position as an attractive investment destination for power market investment.

UAE's Strong Performance Boosts The Region's Country Risks Scores

MENA - Power Risk/Reward Index



Note: Scores out of 100; lower score = more attractive market. Source: BMI Risk/Reward Index

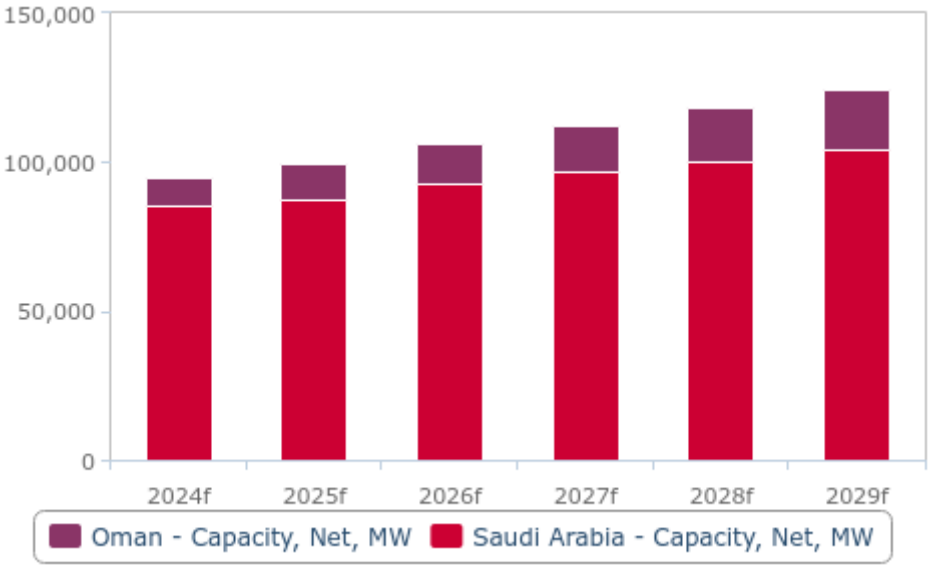
Oman Overtakes Saudi Arabia As The Second-Best Performing Market In The Region

This year, Oman ranks second in the MENA region owing to the market's strong power market growth outlook. According to Oman's Ministry of Energy and Minerals, renewable installations will increase by 3.1GW by 2025. We expect Oman to meet this target. Between 2024 and 2028, we forecast a capacity growth of 5.4GW. This growth will be supported by solar power growth. Although the market's transmission and distribution losses and financial barriers weigh down the Country Risk score, the market's energy policy and competitive landscape boost the overall Risks score. While the privatisation of the state-owned power utility Muscat Electricity Distribution Company has been placed on hold, Oman has seen an increase in private power investments, particularly in the renewable segment.

Saudi Arabia has moved down two rankings in the region and 13 ranks globally. The market's electricity consumption as well as the short-term economic risks weigh on the market's Rewards profile. We expect Saudi Arabia to begin exporting electricity over our five-year period, in line with the government's plans. This means that electricity generation is sufficient to meet demand, thereby limiting opportunities to expand the power market. Furthermore, Saudi Arabia's economy's dependence on hydrocarbons places the market at risk of price volatilities.

Saudi Arabia & Oman Expected To See Strong Growth In Electricity Sectors

Selected Markets - Total Electricity Generation, TWh (2024-2029)



f = BMI forecast. Source: National sources, BMI

MENA Power Risk/Reward Index

	Industry Rewards	Country Rewards	REWARDS	Industry Risks	Country Risks	Risks	RRI	Regional Rank	Global Rank
UAE	26.72	43.10	15.52	20.43	26.72	16.38	24.23	1	6
Oman	21.34	1.72	39.66	43.62	21.34	12.93	32.34	2	23
Qatar	29.96	4.31	40.52	33.79	29.96	32.76	32.36	3	24
Saudi Arabia	29.53	38.79	9.48	47.84	29.53	40.52	32.73	4	26
Kuwait	45.47	42.24	37.93	45.00	45.47	45.69	41.64	5	39
Egypt	23.92	37.93	10.34	72.33	23.92	17.24	44.21	6	43
Israel	68.75	77.59	60.34	21.03	68.75	81.90	44.27	7	44
Morocco	38.79	20.69	49.14	44.74	38.79	33.62	45.76	8	49
Iran	34.27	64.66	8.62	72.59	34.27	31.90	50.36	9	58
Iraq	20.47	37.07	11.21	79.14	20.47	30.17	51.09	10	59
Bahrain	72.84	95.69	54.31	45.86	72.84	36.21	52.83	11	66
Algeria	51.08	81.90	26.72	59.74	51.08	18.97	54.41	12	70
Jordan	56.03	44.83	67.24	53.45	56.03	39.66	56.30	13	76
Tunisia	62.93	76.72	62.93	58.02	62.93	43.97	63.72	14	91
Lebanon	73.49	80.17	68.97	72.24	73.49	58.62	69.45	15	102
Global Average	50	50	50	50	50.0	50.0	50.0	~	~
Regional Average	43.7069	49.82759	37.52874	51.32184	43.7	36.0	46.4	~	~

Note: Scores out of 100; lower score = more attractive market. Source: BMI Power Risk/Reward Index

MENA Power Industry Rewards

	Electricity Capacity Additions (MW)	Electricity Capacity (%)	Electricity Generation Additions (TWh)	Electricity Generation (%)	Industry Rewards	REWARDS
UAE	23.28	43.10	15.52	25.00	26.72	25.82
Oman	25.86	1.72	39.66	18.10	21.34	28.02
Qatar	32.76	4.31	40.52	42.24	29.96	31.98
Saudi Arabia	13.79	38.79	9.48	56.03	29.53	30.60
Kuwait	44.83	42.24	37.93	56.90	45.47	42.24
Egypt	17.24	37.93	10.34	30.17	23.92	28.88
Israel	57.76	77.59	60.34	79.31	68.75	59.83
Morocco	36.21	20.69	49.14	49.14	38.79	42.72
Iran	20.69	64.66	8.62	43.10	34.27	33.62
Iraq	30.17	37.07	11.21	3.45	20.47	31.03
Bahrain	95.69	95.69	54.31	45.69	72.84	57.63
Algeria	60.34	81.90	26.72	35.34	51.08	47.72
Jordan	61.21	44.83	67.24	50.86	56.03	55.86
Tunisia	72.41	76.72	62.93	39.66	62.93	63.88
Lebanon	85.34	80.17	68.97	59.48	73.49	62.93
Global Average	50	50	50	50	50.0	50.0
Regional Average	45.17	49.83	37.53	42.30	43.71	42.85

Note: Scores out of 100; lower score = more attractive market. Source: BMI Power Risk/Reward Index

MENA Power Country Rewards

	Electricity Consumption (%)	Electricity Consumption (TWh)	Generation/ Consumption Ratio	Access to Electricity (%)	Country Rewards	REWARDS
UAE	16.38	24.14	25.86	31.47	24.46	25.82
Oman	12.93	52.59	55.17	31.47	38.04	28.02
Qatar	32.76	45.69	30.17	31.47	35.02	31.98
Saudi Arabia	40.52	8.62	48.28	31.47	32.22	30.60
Kuwait	45.69	36.21	36.21	31.47	37.39	42.24
Egypt	17.24	18.10	78.45	31.47	36.31	28.88
Israel	81.90	39.66	32.76	31.47	46.44	59.83
Morocco	33.62	48.28	81.03	31.47	48.60	42.72
Iran	31.90	10.34	56.90	31.47	32.65	33.62
Iraq	30.17	27.59	98.28	31.47	46.88	31.03
Bahrain	36.21	55.17	16.38	31.47	34.81	57.63
Algeria	18.97	33.62	49.14	68.97	42.67	47.72
Jordan	39.66	63.79	52.59	66.38	55.60	55.86
Tunisia	43.97	64.66	86.21	66.38	65.30	63.88
Lebanon	58.62	67.24	31.03	31.47	47.09	62.93
Global Average	50	50	50	50	50.0	50.0
Regional Average	36.03	39.71	51.90	38.62	41.57	42.85

Note: Scores out of 100; lower score = more attractive market. Source: BMI Power Risk/Reward Index

MENA Power Industry Risks

	Competitive Landscape	Financial Barriers	Energy Policy	Legal Risks	T&D Losses	Industry Risks	Risks
UAE	8.62	40.52	9.91	22.41	20.69	20.43	21.85
Oman	40.09	52.59	42.67	33.62	49.14	43.62	38.84
Qatar	2.16	43.97	69.40	27.59	25.86	33.79	32.92
Saudi Arabia	58.62	39.66	59.05	31.03	50.86	47.84	35.92
Kuwait	40.09	28.45	69.40	44.83	42.24	45.00	40.75
Egypt	58.62	81.90	80.60	61.21	79.31	72.33	67.20
Israel	40.09	14.66	22.84	16.38	11.21	21.03	20.93
Morocco	58.62	13.79	22.84	46.55	81.90	44.74	50.32
Iran	92.67	76.72	59.05	77.59	56.90	72.59	75.48
Iraq	58.62	66.38	90.52	80.17	100.00	79.14	81.16
Bahrain	83.19	37.07	69.40	38.79	0.86	45.86	45.63
Algeria	58.62	70.69	42.67	74.14	52.59	59.74	64.46
Jordan	58.62	38.36	69.40	41.38	59.48	53.45	56.97
Tunisia	40.09	62.50	42.67	57.76	87.07	58.02	63.49
Lebanon	92.67	51.72	80.60	92.24	43.97	72.24	79.2
Global Average	50	50	50	50	50.0	50.0	50.0
Regional Average	52.76	47.93	55.40	49.71	50.80	51.32	51.67625

Note: Scores out of 100; lower score = more attractive market. Source: BMI Power Risk/Reward Index

MENA Power Country Risks

	Long-Term Economic Risk Index	Short-Term Economic Risk Index	Political Risk Index	Operational Risk Index	Country Risks	Risks
UAE	32.76	32.76	30.17	6.90	23.28	21.85
Oman	50.00	31.90	31.03	30.17	34.05	38.84
Qatar	43.97	50.00	25.86	23.28	32.04	32.92
Saudi Arabia	18.10	1.72	35.34	26.72	23.99	35.92
Kuwait	42.24	23.28	34.48	42.24	36.49	40.75
Egypt	59.48	76.72	53.45	64.66	62.07	67.20
Israel	4.31	5.17	36.21	21.55	20.83	20.93
Morocco	67.24	66.38	49.14	51.72	55.89	50.32
Iran	79.31	71.98	82.76	76.72	78.38	75.48
Iraq	80.17	55.17	91.38	90.52	83.19	81.16
Bahrain	62.07	74.14	43.97	24.14	45.40	45.63
Algeria	71.55	59.05	62.07	80.17	69.18	64.46
Jordan	89.66	95.69	40.52	48.28	60.49	56.97
Tunisia	91.38	94.83	43.10	70.69	68.97	63.49
Lebanon	95.69	99.14	87.93	73.28	86.21	79.22
Global Average	50	50	50	50	50.0	50.0
Regional Average	59.20	55.86	49.83	48.74	52.03	51.68

Note: Scores out of 100; lower score = more attractive market. Source: BMI Power Risk/Reward Index

Egypt Power Risk/Reward Index

Please Note: *BMI is enhancing its risk analysis with a new scoring system following its acquisition of GeoQuant, a market-leading provider of political risk data. From March 27 2024, risk scores are inverted: zero now represents the lowest risk and 100 represents the highest risk. This allows for clearer, industry-standard assessments. For further details, please refer to our updated methodology document.*

Given the changing power sector landscape, we have revised our Power Risk/Reward Index (RRI) by replacing six indicators within the Rewards profile. In order to represent power sector growth more appropriately within the Industry Rewards profile, we have replaced Electricity Capacity and Electricity Generation with Electricity Capacity Additions and Electricity Generation Additions. We have also revamped the indicators in the Country Rewards profile to consider Electricity Consumption, Electricity Consumption Growth, Generation to Consumption Ratio and Access to Electricity.

Key View: *Egypt ranks sixth regionally and 43rd globally in our Power Risk/Reward Index this quarter. The market's Rewards profile is a better-performing profile. Egypt's large Power market and expected robust growth over the next next five years boost the overall Rewards profile. However, Risks run high, with financial barriers and a lack of clear energy policy and short-term economic stability weighing on Egypt's score.*

Risk/Reward Snapshot

Egypt & Middle East & North Africa Region - Power Risk/Reward Index

Note: Scores out of 100; lower score = more attractive market. Source: BMI Power Risk/Reward Index

Global And Regional Ranks

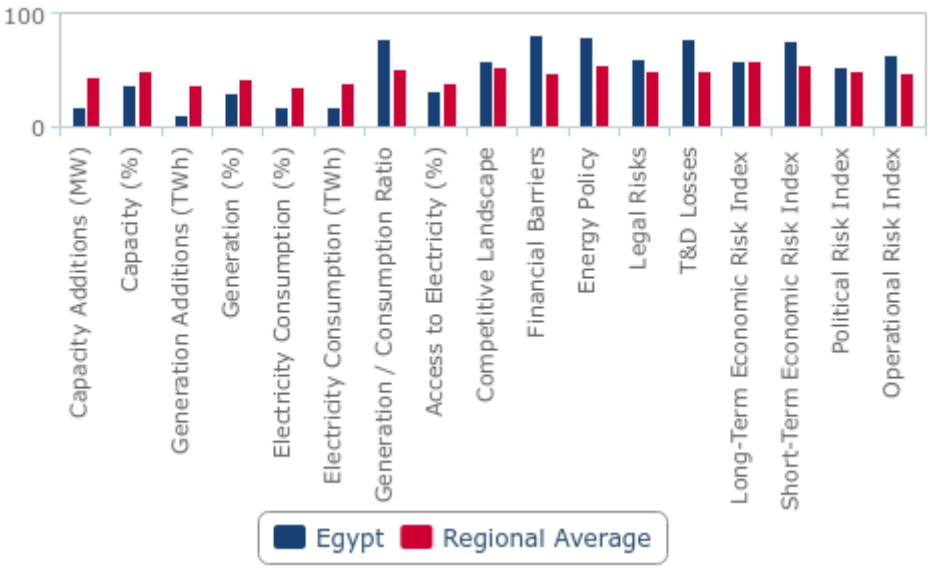
- Regional rank (out of 15): 6th
- Global rank (out of 117): 43rd

Key Features And Latest Updates

- Egypt performs better than the global and regional averages this quarter for its Industry Rewards profile, showing ample opportunity for power sector investment over the next five years. The market will add about 10GW of electricity capacity over 2024-2028, with generation increasing by more then 40TWh within the same period. The Industry Rewards pillar is also the best performing compared to other pillars in our Power Risk/Reward Index (RRI).
- The market's Country Rewards stand better than regional and global averages. Egypt's capacity is set to average about 203TWh through to 2028, while generation will average at 246.5TWh annually until 2028. This indicates that power generation in the market has outpaced overall demand over recent years, leading to a considerable oversupply of electricity. This, as well as high access to electricity rates, makes Egypt's Country Rewards score outperform the regional and global averages.
- Industry Risks in Egypt run higher than the regional and global average. The market's transmission and distribution losses weigh down the Industry Risks profile, and our forecast shows electric power T&D losses of 16.4% between 2024 and 2028. Additionally, financial barriers and lack of clarity and continuity in Egypt's energy policy framework pose a risk to investors in the market.
- As for Country Risks, Egypt's short-term economic risks run high, as Country Risk notes that the market is facing increased pressure on its external position due to elevated external financing needs (current account deficit and external obligations) amid limited capital inflows. Additionally, businesses are expected to continue to face the risk of congestion and supply chain disruption as upgrade work on transport infrastructure will likely create greater levels of traffic congestion, weighing on the market's operational risk shown by the high score of the component.

RRI Matrix Breakdown

Egypt & Middle East & North Africa Region - Power Risk/Reward Index By Component



Note: Scores out of 100; lower score = more attractive market. Source: BMI Power Risk/Reward Index

Market Overview

Key Policies And Market Structure

Latest Updates

- In April 2024, Egypt enacted new rules to bolster private investment in renewables, allowing direct agreements between private entities to enhance the energy market's efficiency and sustainability. The Electricity and Consumer Protection Regulatory Agency's endorsement of these 'Private to Private Projects' signifies a strategic shift, promoting competitive neutrality and reducing state involvement in line with the Supreme Investment Council's decisions.
- In 2023, Egypt updated its Electricity Law, mandating the Egyptian Electricity Transmission Company to manage the transmission system adhering to economic and environmental standards, ensuring fair access for producers and consumers. The law empowers the company to operate and maintain the network, manage energy procurement, and facilitate domestic and cross-border electricity trade, while also engaging in research and development to support network expansion and stability.

Regulation And Competition

Regulation

Two government ministries share responsibility for Egypt's energy sector: the Ministry of Petroleum, which is charged with upstream and downstream oil and gas activities; and the Ministry of Electricity and Renewable Energy (MOEE), which is responsible for electricity generation, transmission and distribution. After nationalising the sector in the 1960s, the state is still the main shareholder in the power industry and the MOEE acts as the owner of the state entities in the power sector. There have been efforts to make the sector more competitive by attracting greater private sector investment.

The industry was vertically integrated under the Egyptian Electricity Authority until 2000, and has been structurally unbundled, vertically (having been divided into generation, transmission and distribution/supply segments) and horizontally (with a number of companies now operating in the generation and distribution/supply segments). The Egyptian Electricity Holding Company (EEHC) is still fully owned by the state, and encompasses the different actors under its umbrella, including 16 subsidiaries:

- One hydropower and five thermal electricity generation companies;
- Nine electricity distribution companies; and
- A transmission-and-dispatch company, the Egyptian Electricity Transmission Company.

The EEHC coordinates the plans and investments in the power sector and manages the sector's overall finances. In addition to the EEHC's affiliates, there are six authorities operating in Egypt's electricity sector. These entities report directly to the MOEE and comprise the Rural Electrification Authority, Hydropower Projects Executive Authority, New and Renewable Energy Authority, Atomic Energy Authority, Nuclear Power Plants Authority and Nuclear Material Authority. Growing demand in the late 1990s spurred industry restructuring and allowed limited privatisation of the sector. As a result of these reforms, Egypt has a number of privately owned power plants that are either independent power projects or financed under build-own-operate-transfer schemes.

Competition

The power market is organised in a single-buyer form, with all generation companies selling to the transmission company. The transmission company sells electricity to customers and eight distribution companies. This single-buyer market does not allow free competition among existing generation companies. However, this is an intermediate step towards the establishment of a liberalised electricity market, as envisioned in the country's Electricity Law.

Power Generation Sector: Egypt's power generation is largely state-run, but reforms are inviting independent producers, particularly in renewables, diversifying the energy mix and signalling a gradual shift towards a more pluralistic market.

Transmission Sector: The Egyptian Electricity Transmission Company monopolizes power transmission, yet the growing renewable sector and infrastructure needs suggest potential openings for future private investment.

Distribution Sector: State-controlled regional companies handle distribution, facing efficiency challenges; however, ongoing reforms hint at possible privatisation to boost performance and reduce state financial burdens.

Reforming The Power Sector

Egypt is transitioning to a privatised power industry from its current state-controlled system. A law privatising energy production, distribution and transmission was approved by the government in February 2015. The new law seeks to shift the state's role from one of direct management of the power sector to one of regulation. In order to separate transportation, production and distribution activities, the new law includes regulations that will allow for free competition in the production, transfer, distribution and sale of energy.

In theory, these legal amendments permit private businesses to transfer and sell electricity directly to customers. The opening of transmission and sales to the private sector is the most important modification to the law. The EEHC now has a dominant purchasing position in the energy industry and currently has a wide scope to set conditions, including energy prices. It will lose this when it opens up the market for competitors to transmit and sell power.

Egypt cannot afford to improve its electricity infrastructure on its own, so the government is appealing to the private sector. These changes should allow for the steady improvement of processes and functions, fostering competition within the electricity market in a way that makes it more appealing for entrants to invest in the generation and trading of electricity.

A new investment law has also been passed with the goal of regaining investor trust, luring in new investments, and protecting both domestic and foreign investors by providing more incentives and guarantees, reducing barriers, and expediting the process. Such incentives include payment facilities in relation to the price of the power required to operate a project or allocating government land at reduced prices. Under the new legislation, customs duties on imported equipment and machinery required for the establishment of a project have been reduced to 5%. Mechanisms of land allocation to investors have been made flexible, allowing the sale of land to investors, while payment by the investor may be postponed until operation of the project takes effect.

In July 2018, Egypt's parliament passed a law to establish a sovereign wealth fund to manage state assets, which it plans to list on the stock exchange. The 'Egypt Fund' was granted EGP5.0bn (USD280.0mn) as start-up capital to be paid over three years, with a capital target of EGP200.0bn (USD11.0bn) in future. The IMF has reportedly encouraged Egypt to increase privatisation in order to increase the state's liquidity and encourage economic growth through private sector investment. The country's power sector is among the targeted industries for increased private sector participation. This has been done in recent years through regulatory reform, which has opened up the market for private investment in power generation and transmission. However, reports highlight the possibility that the state may look to privatise assets in the power sector, either through transfer of ownership to the Egypt Fund,

or through partial listing of operations companies on the open market stock exchange. We note that this would present a significant opportunity for investors and we will continue to monitor developments in this regard.

Energy And Emissions Policies

According to data from the Energy Information Agency, Egypt is among the top five contributors of carbon emissions from energy consumption in the Middle East and North Africa region. According to a report by the African Development Bank, Egypt has one of the fastest-growing greenhouse gas (GHG) emissions markets in the world, ranking in the top 11 globally. The country has seen a sustained increase in energy demand, which has been met by the growing use of fossil fuels.

The Egyptian government has attempted to promote some energy policy actions designed to curb the growth in GHG emissions. In particular, the government unveiled a series of feed-in tariffs in late 2014 to promote the use of renewable energy. Under the scheme, households and commercial producers are offered various rates of compensation per KW of solar or wind energy produced. The scheme has the potential to bolster investment in the sector, which, for the time being, remains relatively small in Egypt.

The country's long-term goals include:

- A 20% share of renewables in overall consumption by 2022.
- A 42% share of renewables in overall consumption by 2035.
- Developing a network of new cross-border transmission interconnections to make Egypt a regional energy exchange hub.
- Modernising and optimising the electricity grid.

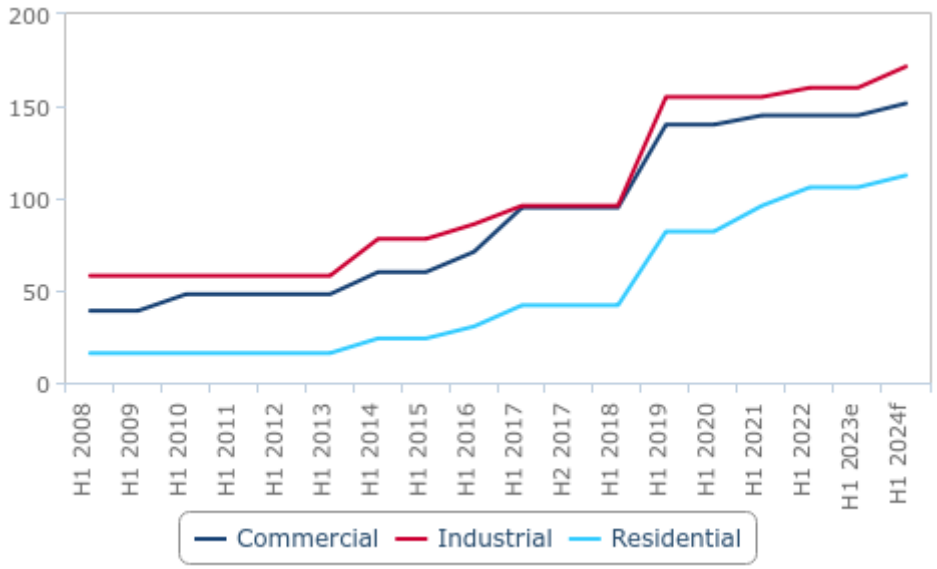
Electricity Prices Market Overview

Latest Updates

- We expect that electricity prices for all user types in Egypt will increase over 2024. The hike is due to the Egyptian Electricity Holding Company's recent announcement of revised tariffs, marking the first adjustment since 2021, effective in January 2024.
- We believe that electricity prices will remain on the elevated in the medium-to-long term. This sustained price level is due to the Egyptian government's decision to eliminate power subsidies, a move delayed since 2021 due to rising inflation amid the pandemic.
- We anticipate increased costs for businesses as Egypt transitions away from electricity subsidies. This change is likely to affect industrial production costs, leading to higher prices for goods and services. Notably, industrial electricity rates have already climbed from 160.0LCU/kWh to 171.5LCU/kWh.

Subsidy Cuts Set To Drive Up Electricity Prices

Egypt - Electricity Prices By Consumer Type, LCU/kWh



e/f = BMI estimate/forecast. Source: Egyptian Electricity Holding Company, local sources, BMI

Structural Trends

Similar to other markets in the Middle East, subsidies and capped prices have undermined profitability and weighed on private sector investment over past years. In 2014, energy subsidies made up about one-third of the government's budget, with 75% of this spent on the energy sector. Since 2016, Egypt's government has made adjustments to reduce energy subsidies, successfully attracting robust investment over recent years.

The Minister of Planning and International Cooperation Ashraf al-Arabi reaffirmed his position that Egypt had 'no time to waste' in tackling the country's growing electricity subsidy bill. The minister promised the international community that energy subsidies would be reduced by 43% over a three-year period. The government sought to reduce subsidies in the electricity sector, raising the electricity prices for households with mid-to-high usage by an average of 19% for FY2016. This was part of a five-year plan to reduce subsidies. The government unveiled increases in electricity prices in August 2016 of between 25% and 40%, with the proposed price hike variations linked to consumption. The move came as the government was locked in negotiations with the IMF over a USD12.0bn bailout package. Price hikes graded between 15% and 42% eventually took effect in July 2017.

In June 2018, the government announced that they would raise electricity prices as part of austerity measures designed to aid in economic recovery and secure a three-year USD12.0bn loan from the IMF, which was initiated in 2016. As of July 2018, industrial consumers paid 42% more for electricity prices, while household tariffs were raised by 21%. In July 2019, the Egyptian government eliminated nearly all electricity subsidies and increased electricity tariffs by a further 15%. One year later on July 1 2020, Egypt's Ministry of Electricity and Renewable Energy announced electricity price hikes between 17% and 30%, beginning in August that year.

In response to the economic challenges posed by the COVID-19 pandemic, Egypt's Minister of Electricity Mohamed Shaker announced in 2021 a decision to extend the deadline to phase out electricity subsidies for consumers from 2022 to 2025. This extension was a part of a larger plan to manage the economic impact on citizens, while also adjusting the subsidy threshold down from 1,000kW to 650kW, making prices subsidy-free beyond this new limit. Consequently, electricity tariffs saw an increase of 18.6%, from EGP 1.18/kWh for the consumption bracket of 351kWh to 650kWh, to EGP 1.40/kWh for consumption above 650kWh. Although the original plan aimed to eliminate subsidies by July 2022, the government opted for a cautious approach to reform, which resulted in tripling the extension of the timeline, with the final adjustments coming into effect at the start of 2024.

Egypt Power Projects Database

Egypt's power project pipeline is extensive, with over 72GW of nuclear, thermal, hydropower and renewables projects captured in our Key Projects Data. The largest projects in terms of capacity are primarily nuclear and gas-fired power projects, with several new power plants at various stages of development. While the largest projects are either thermal or nuclear power projects, Egypt is also developing its hydropower and non-hydropower renewables sectors. In terms of Egypt's non-hydropower renewables project pipeline, there are almost 37GW of projects at various stages of development, comprising a mix of solar, and offshore and onshore wind. While the project pipeline is expansive, a significant number of projects remain at the planning stage, and there is some risk that projects under development will be further delayed.

Egypt - Top 10 Power Projects By Capacity

Project Name	Value (USDmn)	Capacity (MW)	Companies	Status	Fuel Type
FourWinds Coal Fired Power Plant, Sharm El Sheikh, South Sinai	11,000	6,000	Government of Egypt[Sponsor]{Egypt},FourWinds Group[Sponsor]{Switzerland},Egyptian Electricity Holding Company[Sponsor]{Egypt}	Under construction	Coal
Sohag Wind Project, Sohag	5,000	5,000	Scatec Solar[Sponsor]{Norway},Egypt New & Renewable Energy Authority (NREA)[Sponsor]{Egypt}	At planning stage	Wind - Onshore
New El-Dabaa Nuclear Power Plant, Matrouh	30,000	4,800	Nuclear Power Plant Authority (NPPA)[Operator]{Egypt},Rosatom[Sponsor]{Russia},Government of Russia[Sponsor]{Russia},Ministry of Electricity and Renewable Energy of Russia[Sponsor]{Russia},Hassan Allam[Construction]{Egypt},Petrojet[Construction]{Egypt},Government of Egypt[Sponsor]{Egypt},UJV Rez, a. s.[Consultant/Project Management]{Czech Republic},Arab Contractors[Construction]{Egypt}	Under construction	Nuclear
Sidi Shabib Coal-fired Power Plant, West Matrouh	na	4,000	Elsewedy Electric[Construction]{Egypt},Marubeni Corporation[Sponsor]{Japan},Egyptian Electricity Holding Company[Sponsor]{Egypt}	At planning stage	Coal
Engie Wind Power Project, Sohag	na	3,000	Orascom Construction Industries[Sponsor]{Egypt},Egyptian Electricity Transmission Company (EETC)[Sponsor]{Egypt},Engie[Sponsor]{France},Toyota Tsusho[Sponsor]{Japan},Egypt New & Renewable Energy Authority (NREA)[Sponsor]{Egypt}	At planning stage	Wind - Onshore
Ataka Mount Hydropower Plant, Pumped Hydro, Suez	2,600	2,400	Exim Bank of China[Financier]{China},Egypt Ministry of Electricity[Sponsor]{Egypt},AF Consult[Consultant/Project Management]{Sweden},Sinohydro Corporation[Construction]{China},Artelia Group[Consultant/Project Management]{France}	At planning stage	Hydropower
Dairut Combined-Cycle Power Plant, Esna, Luxor	2,300	2,250	ACWA Power International[Sponsor]{Saudi Arabia},PowerChina[Construction]{China (Mainland)}	At planning stage	Gas
Armant Hydroelectricity Project, Qena	2,500	2,000	Egypt Ministry of Electricity[Sponsor]{Egypt}	At planning stage	Hydropower

Project Name	Value (USDmn)	Capacity (MW)	Companies	Status	Fuel Type
North Luxor Hydropower Project, Pumped Hydro, Luxor	2,400	2,000	Egypt Ministry of Electricity[Sponsor]{Egypt}	At planning stage	Hydropower
Safaga Coal-Fired Complex, Red Sea Coast	2,000	2,000	ACWA Power International[Sponsor]{Saudi Arabia},Egyptian Electricity Holding Company[Sponsor]{Egypt}	At planning stage	Coal

na = not available. Source: BMI Key Projects Data

Competitive Landscape

The Egyptian power market is primarily state-controlled. The Egyptian Electric Holding Company (EEHC) is the primary power company in Egypt. It is affiliated with 16 companies: six for electricity generation, nine for distribution and one for transmission. Late 1990s demand challenges prompted industry restructuring, prompting a limited level of sector privatisation and the development of a handful of privately owned power plants functioning in the nation.

Egyptian Electric Holding Company (EEHC)

The EEHC manages the power portfolio on behalf of the government and comprises 16 affiliated companies. Power generation, transmission and distribution activities have been separated; the EEHC includes six generating companies, nine distribution companies and the Egyptian Electricity Transmission Company. Generation units include Cairo Electricity Production Company, East Delta Electricity Production Company, West Delta Electricity Production Company, Upper Egypt Generation Company, Middle Delta Electricity Production Company and Hydro-Power Plants Electricity Production Company. The EEHC controlled a peak load capacity of 58.8GW over 2020-2021 and was able to generate 204.79TWh of electricity, compared with a contribution of 0.0024TWh by independent power projects (IPPs) and 11.18TWh by build-own-operate-transfer (BOOT) projects in the same year. Cairo Electricity Production Company was the largest contributor to total generation, followed by the East Delta Electricity Production Company and the Middle Delta Electricity Production Company.

In 2018, EEHC introduced three new electricity companies, which would be located in Beni Suef, New Administrative Capital and Brulus. The three firms operate a corresponding 4,800MW Siemens CCGT thermal power plant. Furthermore, in 2018 Egypt's parliament passed a law to establish a sovereign wealth fund to manage state assets, which it plans to list on the stock exchange. The 'Egypt Fund' was granted EGP5.0bn (USD280.0mn) as startup capital to be paid over three years, with a capital target of EGP200.0bn (USD11.0bn) in future. The IMF has reportedly encouraged Egypt to increase privatisation in order to increase the state's liquidity and encourage economic growth through private sector investment. The country's power sector is among the targeted industries for increased private sector participation. This has been done in recent years through regulatory reform, which has opened up the market for private investment in power generation and transmission. However, reports highlight the possibility that the state may look to privatise assets in the power sector, either through transfer of ownership to the Egypt Fund or through partial listing of operations companies on the open market stock exchange. We note that this would present a significant opportunity for investors and will continue to monitor developments in this regard.

Privately Owned And Financed Power Plants

Demand pressures in the late 1990s spurred industry restructuring and some limited privatisation efforts in the sector, resulting in several privately owned power plants set up either as IPPs or financed under BOOT schemes.

The construction of the country's first three privately developed power plants was completed at the beginning of the new century, adding a combined capacity of 2,048MW to the grid. The facilities, operated under a BOOT scheme and supported by 20-year power purchase agreements, are the 650MW gas-fired plant located at Sidi Kerir, which began commercial operations in 2001; and two gas-fired plants operated by EDF, near the cities of Suez and Port Said. The two plants, which came online in 2003, have a combined capacity of 1.4GW. These units now belong to Tanjong's Powertek, which formally took control of them in 2006.

Since the successful implementation of these groundbreaking projects, the Egyptian government has repeatedly reiterated its commitment to privately financed power schemes. In March 2013, the ministry announced its intention to tender three local power generation projects with a total capacity of 5,500MW and a combined cost of nearly EGP50bn (USD7bn). Besides the Dairut city project, the capacity would comprise 1,300MW from a steam power project in Qena and 1,950MW from a gas project in Beni Suef, with the latter eventually upscaled to 4,800MW. Germany-based Siemens was the key counterpart for the Beni Suef project and for two other 4,800MW gas plants. Phase-by-phase start-ups began in 2017, with the final inauguration occurring in mid-2018.

Besides the companies engaged in BOOT schemes, the Egyptian Electric Utility and Consumer Protection Regulatory Agency lists several private distributors and generators operating in the country. Private players focusing exclusively on distribution include:

- The Egyptian Chinese Joint Venture Company for Investment: This company is a joint venture between Egyptian and Chinese investors, focusing on various sectors including energy.
- Delta Company for Constructions and Reconstruction: A private company involved in construction and reconstruction projects, including infrastructure for energy distribution.
- Engineering Group For Electric Energy: This company specialises in engineering solutions for electric energy distribution.
- Madinety Electrochemical Energy: A company focusing on electrochemical energy solutions.
- New Giza Eternal Luxury and City Services: This company is involved in various sectors including energy distribution.
- Global Energy Company: A private company engaged in power generation and distribution.
- Om El Goreifat: A company involved in the energy sector.
- National Electricity Technology Company (Kahraba): This company is involved in power generation and distribution.
- Mirage: A company involved in various sectors including energy.
- Consukorra Company for Commercial Proxies and Technical Consultations: This company provides commercial proxies and technical consultations, including in the energy sector.
- Power House Company: A company involved in power generation and distribution.
- ElGouna Electric: This company is involved in power generation and distribution.
- Generget Company For Renewable Energy: This company focuses on renewable energy solutions.
- Emak for Utilities and Services: This company provides utilities and services, including in the energy sector.

Regional Overview

Middle East And North Africa Regional Overview: Natural Gas And Solar To Lead Power Market Growth

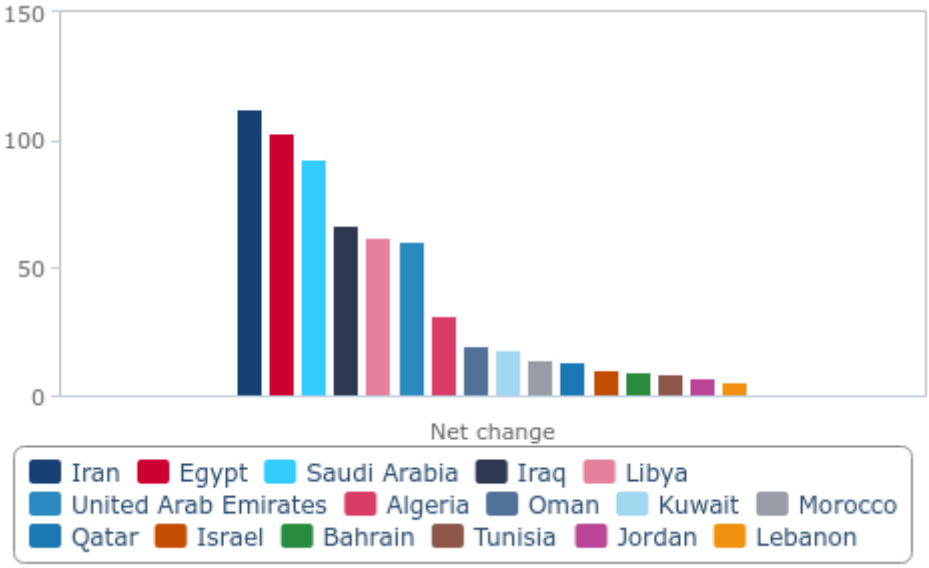
Key View

- We expect robust growth in total electricity generation in the Middle East and North Africa (MENA) region. This growth will be supported by the power market expansion and diversification strategies in the region.
- Thermal power, driven by coal- and oil-fired power, is expected to decline in importance owing to increasing diversification strategies. However, gas will continue growing, retaining thermal power as the dominant power source.
- In terms of power capacity, solar power will be the fastest growing power source in the MENA region as solar power is a key feature in markets' renewables targets and policies.

We expect robust growth in total electricity generation in the Middle East and North Africa region. This growth will be supported by power market expansion and diversification strategies in the region. Over our 10-year forecast period, we expect that total electricity generation will increase by 635.0TWh, increasing by 27.0% from 2023. By the end of our forecast period, total electricity generation in MENA will reach 2,362.5TWh with Iran, Egypt and Saudi Arabia leading this growth. Collectively, these markets account for 48.0% of the new electricity generation expected in the region. These markets, which have the largest installed capacity in the region, plan to expand their power markets in order to meet increasing demand, while incorporate renewable power to diversify their power mixes and increase exports. Overall, the region's increasing population rates, urbanisation and electrification present an opportunity for markets to increase electricity generation.

Iran, Egypt And Saudi Arabia To Lead Total Electricity Generation Growth

MENA – Net Change Total Electricity Generation, TWh (2023e-2033f)



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

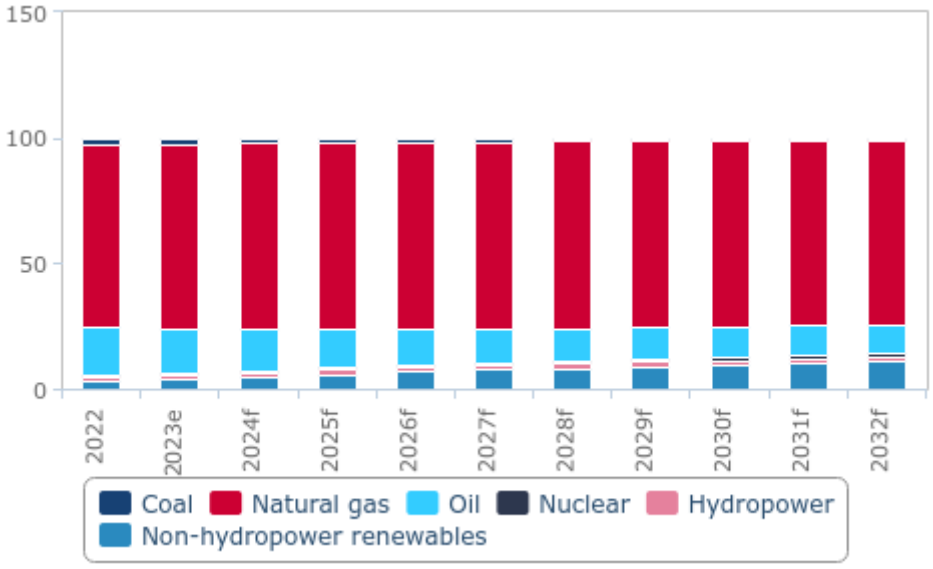
Thermal power, driven by coal and oil-fired power is expected to decline in importance owing to increasing diversification strategies. However, gas will continue growing, retaining thermal power as the dominant power

source. We forecast that thermal power's share of the power mix will decrease from 94.0% in 2023 to 85.0% by 2033, as markets in the region begin to shift strategies to decarbonising their power mixes. Coal- and oil-fired power are expected to see the largest decline in the region, and we expect that coal- and oil-fired electricity generation will decline by 23.0TWh (53.0%) and 88.67TWh (28.0%) by 2033 respectively. North Africa and the Gulf Cooperation Council markets, such as Saudi Arabia, Morocco and Iran are expected to see the largest decline in thermal power as these markets are aggressively pushing to increase the share of non-hydropower renewables in order to free up hydrocarbons for exports and other industrial applications.

Despite markets increasing renewables, thermal power will maintain its dominance in the region, primarily due to the region's plans to increase natural gas power. Furthermore, natural gas growth is expected to be supported by the region's strong natural gas reserves and well-developed gas industries. We expect that natural gas will increase by 408.7TWh (25.0%), and its share of total electricity generation is expected to increase from 78.0% in 2023 to 85.0%. Moreover, our Oil & Gas team believes that the MENA region is a global bright spot for oil and gas production growth as the region has discovered large reserves for conventional and non-conventional gas. Furthermore, the region has a high reserve to production ratio in global terms. This provides scope for further gas output growth, presenting an upside risk to natural gas electricity generation.

Natural Gas To Continue To Dominate MENA's Power Mix

MENA – Share Of Total Electricity Generation By Type, TWh

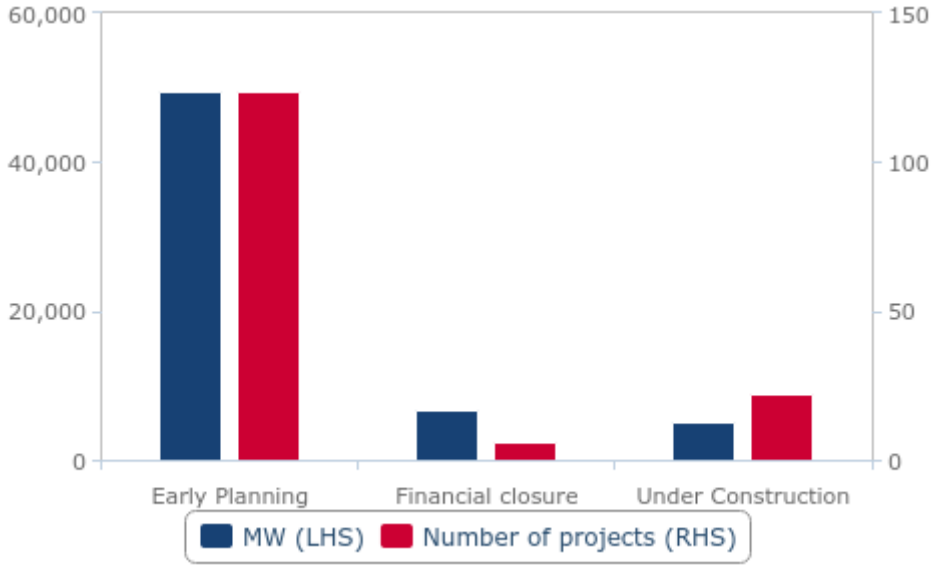


e/f = BMI estimate/forecast. Source: EIA, BMI

In terms of power capacity, solar power will be the fastest growing power source in the MENA region as solar power is a key feature in markets renewables targets and policies. We expect that solar power generation and capacity will increase by 86.0GW by 2033, making solar the fastest growing power source in the MENA region, with wind power adding 30GW of new capacity, and nuclear only 3.9GW. Solar power in the MENA region will be supported by the region's abundance of solar resources, as well as energy policies and low solar power prices. In addition, the MENA region's solar growth will be supported by the region's large solar power project pipeline, which has a combined capacity of 61.3GW with 151 solar projects. Furthermore, the MENA region is home to some of the largest solar power projects, most notably the UAE'S 5GW Mohammed Bin Rashid solar park, Tunisia's 4GW TuNur Solar power plant and Saudi Arabia's 2GW Shuaibah solar power plants. According to the International Renewable Energy Agency, solar power production in the MENA region costs one-fifth the global average. This, coupled with the policy support for solar power, presents an upside risk for solar power growth and will further boost solar power growth in the MENA region.

Solar Project Pipeline To Support Solar Growth Power In MENA

MENA – Solar Power Projects By Status, MW & number of projects



Note: Early planning includes projects which are approved, tender launched, feasibility and planning stages. Source: Key Projects Data, BMI

Power Glossary

	Definition		Definition
bn	billion	IPO	initial public offering
capex	capital expenditure	IPP	independent power producer
CEE	Central and Eastern Europe	km	kilometres
CHP	combined heat and power plants	kW	kilowatt (103 watts)
DoE	US Department of Energy	kWh	kilowatt hour
e/f	estimate/forecast	LNG	liquefied natural gas
EBRD	European Bank for Reconstruction and Development	MEA	Middle East and Africa
EIA	US Energy Information Administration	mn	million
EM	emerging markets	MoU	memorandum of understanding
EU ETS	European Union Emissions Trading System	MW	megawatt (electric) (106 watts)
EU	European Union	MWh	megawatt hour
EWEA	European Wind Energy Association	na	not available/applicable
FDI	foreign direct investment	NGL	natural gas liquids
FiT	feed-in tariff	OECD	Organisation for Economic Co-operation and Development
FTA	free trade agreement	OPEC	Organization of the Petroleum Exporting Countries
GDP	gross domestic product	PV	solar photovoltaic
GHG	greenhouse gas	RES	renewable energy sources
GW	gigawatt (109 watts)	R&D	research and development
GWh	Gigawatt hour (1 GWh = 3.6 TJ)	t	metric ton = tonne (1 t = 1,000 kg)
GWEC	Global Wind Energy Council	TPES	total primary energy supply
IAEA	International Atomic Energy Agency	trn	trillion
IEA	International Energy Agency	TW	terawatt (1012 watts)
IMF	International Monetary Fund	TWh	terawatt hour (1 TWh = 3.6 PJ)

Power Methodology

Connected Thinking

BMI employs a unique methodology known as 'Connected Thinking'. This means that our analysis captures the inter-relatedness of the global economy, and takes into account all of the relevant political, macroeconomic, financial market and industry factors that underpin a forecast and view. We then integrate them so as to explain how they interact and affect each other. Our Connected Thinking approach provides our customers with unique and valuable insight on all relevant macroeconomic, political and industry risk factors that will impact their operations and revenue-generating potential in the industry/industries within which they operate.

We use a transparent forecasting model as a base for our industry forecasts, but rely heavily on our analysts' expert judgement to

ensure our forecasts capture all of the insights we derive using our unique Connected Thinking approach. We believe analyst expertise and judgement are the best ways to provide the most accurate, up-to-date and comprehensive insight to our customers.

Power Methodology

For the Power industry we have historical data and 10-year forecasts for 19 core industry variables, including electricity generation, by fuel/technology, net electricity consumption, generation capacity by fuel/technology and transmission & distribution losses, and electricity trade.

Our forecasts are a combination of regression modelling and analyst expert judgement. Our Power analysts interact with other analytical teams, including Country Risk, Autos (in the case of electricity vehicles), Mining and Oil & Gas. By considering related industries, the Power team ensures that factors such as political trends, feedstock price outlooks and technology trends are considered in forecasts. In addition to this, the Power team draws on qualitative assessments of political risk, regulatory outlook and specific projects to adjust model outputs as necessary.

There is a constant rolling cycle of data monitoring, with databases being updated at a quarterly interval. Analysts will use their expert judgement outside of these cycles to implement changes when necessary outside the regular update cycle.

Total Electricity Consumption (Net)

Total electricity consumption is expressed in terawatt hours (TWh).

Electricity consumption is defined as electricity available in a market or network through generation, net of trade, on grid. Therefore, it does not provide a picture of total demand, some of which is not met.

Historical figures for electricity consumption are based on data published by the US Energy Information Administration (EIA), national transmission system operators, national statistics, and other relevant and appropriate official sources.

Our electricity consumption forecasts are based on a regression model, using a market's own historical time series and key macroeconomic explanatory variables, such as real GDP growth, from our Country Risk service. Our consumption forecasts also consider end-use electrification in markets through factoring in future demand from energy transition technologies such as electric vehicles, green hydrogen electrolysers and heat pumps. In addition, we also apply analyst expert judgement to refine and finalise the electricity consumption forecast based on exogenous and endogenous variables or events not captured by our regression model.

Electricity Generation (Net)

Total generation is defined as the process of producing electric energy or the amount of electric energy produced by transforming other forms of energy, expressed in TWh. Our generation data, historical and forecasts, capture solely on-grid generation.

Our power generation statistics are displayed as net generation. 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 generation is defined as gross power generation less own use of power plants.

Historical figures for electricity generation are based on data published by the EIA, the International Renewable Energy Agency (IRENA), national transmission system operators, national statistics and other official sources.

Our electricity generation forecasts examine the industry with a bottom-up approach, forecasting electricity production for each fuel/technology in order to calculate the value of total generation in each market.

Fuels and technologies that make up total electricity generation are:

- Conventional Thermal
    - Coal
    - Natural gas
    - Oil
- Nuclear
- Hydropower
- Pumped hydropower storage
- Non-hydropower renewables
    - Wind (onshore and offshore)
    - Solar (CSP and PV)
    - Biomass & waste
    - Geothermal
    - Tidal & wave

The regression model used to calculate generation considers key macroeconomic variables, relying heavily on real GDP growth. In addition, for our electricity generation forecasts we rely extensively on analyst expert judgement. Things taken into consideration are:

- Technology and resource costs, and their expected evolution
- Monitoring of regulatory changes
- Hydrological and weather information for the short-term outlook

Transmission & Distribution Losses

Transmission & distribution (T&D) losses include electric energy lost due to the T&D of electricity. Much of the loss is thermal in nature.

Our historical figures for electricity T&D losses are estimated as:

T&D loss = (electricity generation + net imports) - electricity consumption

T&D losses are forecast using an auto-regression model taking into account historical trends.

Net Electricity Imports

Historical figures for net imports are based on data from the EIA and estimated as:

Net electricity imports = (total consumption - total generation) + T&D losses

Our net import data are a function of the data that we forecast for electricity generation minus electricity consumption and T&D losses, as shown in the formula above. The amount of electricity imported or exported will depend on electricity supply access abroad, with electricity pricing and interconnector access being key variables.

A positive value means a market is a net importer of electricity, whereas a negative value means it is a net exporter.

Electricity Generation Capacity

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

For electricity generation capacity, we forecast:

- Conventional thermal
- Nuclear
- Hydropower
- Power storage
    - Pumped hydropower storage
    - Battery storage
    - Other storage
- Non-hydropower renewables
    - Wind (onshore and offshore)
    - Solar (CSP and PV)
    - Biomass & waste
    - Geothermal
    - Tidal & wave

Historical figures for electricity generation capacity are based on data published by the EIA and IRENA for Non-Hydropower Renewables, as well as data published by government/ministry sources and official data from companies operating in each market.

Our electricity generation capacity forecasts examine the industry with a bottom-up approach, forecasting capacity for each fuel/technology to calculate the total value of capacity in each market. This process is overwhelmingly based on analyst expert judgement. Our analysts rely on BMI's Key Projects Data, a comprehensive catalogue of the largest transport and power & utilities projects around the world, to look at investment trends in power generation capacity in different markets, by technology/fuel, to assess the project pipeline and its viability. We also consider technology costs and regulatory frameworks that will influence the outcome of projects.

Electricity Prices

Electricity prices are expressed as a common unit LCU/KWh and USD/KWh for three benchmarks: residential, commercial and industrial users.

Forecasts examine price dynamics in the market using a bottom-up approach, based on analyst expert judgement of outside impacts on prices, current tariffs and historical trends.

Historical data for electricity prices are collected from primary government, grid operator and utility sources.

Power Risk/Reward Index

Our Power Risk/Reward Index (RRI) quantifies and ranks a market's attractiveness within the context of the power industry, based on the balance between the **Risks** and **Rewards** of entering and operating in different markets.

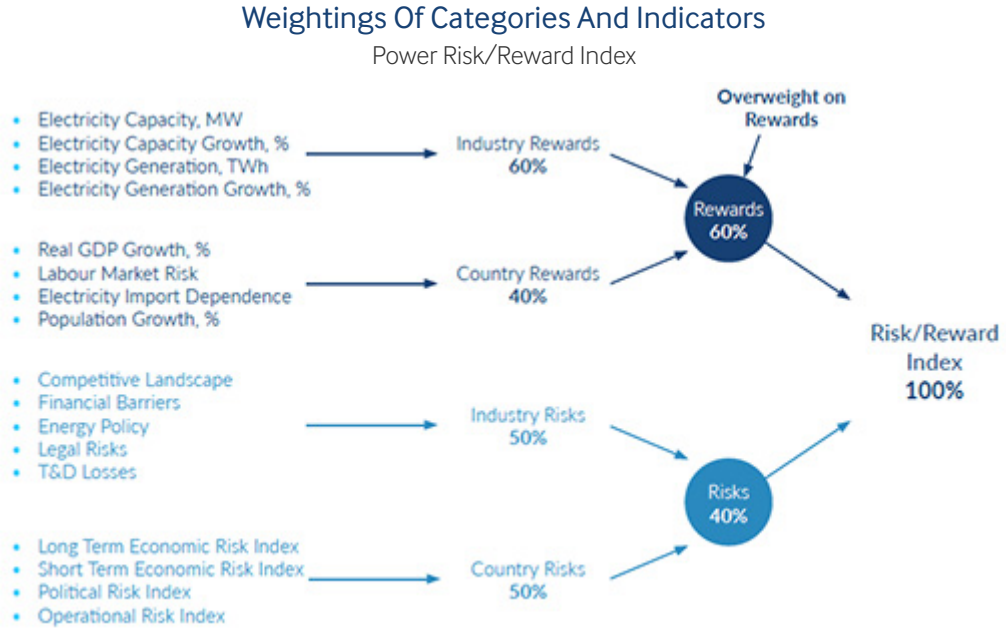
We combine industry-specific characteristics with broader economic, political and operational market characteristics. We weight these inputs in terms of their importance to investor decision-making in a given industry. The result is a nuanced and accurate reflection of the realities facing investors in terms of first the balance between opportunities and risk and second between industry-specific and broader market traits. This enables users of the index to assess a market's attractiveness in a regional and global context.

The index uses a combination of our proprietary forecasts and analyst assessment of the regulatory climate. As regulations evolve and forecasts change, so the index scores change, providing a highly dynamic and forward-looking result.

The Power RRI universe comprises **117 markets**.

Benefits Of Using Our Power RRI

- **Global Rankings:** One global table, ranking all the markets in our universe for Power from most attractive (closest to zero) to most risk (closest to 100).
- **Accessibility:** Easily accessible, top-down view of the global, regional or sub-regional Risk/Reward profiles.
- **Comparability:** Identical methodology across 117 markets allows users to build lists of markets they wish to compare, beyond the confines of a global or regional grouping.
- **Scoring:** Scores out of 100 with a wide distribution provide nuanced investment comparisons. The higher the score, the less favourable the profile.
- **Quantifiable:** Quantifies the Rewards and Risks of doing business in the power industry in different markets around the world and helps identify specific flashpoints in the overall business environment.
- **Comprehensive:** Comprehensive set of indicators, assessing industry-specific risks and rewards alongside political, economic and operating risks.
- **Entry Point:** A starting point to assess the outlook for the power industry, from which users can dive into more granular forecasts and analysis to gain a deeper understanding of the market.
- **Balanced:** Multi-indicator structure prevents outliers and extremes from distorting final scores and rankings.
- **Methodology:** The index is a combination of proprietary BMI forecasts, analyst insights and globally acceptable benchmark indicators



Source: BMI

The RRI matrix divides into two distinct categories:

Rewards: Evaluation of an industry's size and growth potential (**Industry Rewards**), and macro industry and/or market characteristics that directly impact the size of business opportunities in a specific industry (**Country Rewards**).

Risks: Evaluation of micro, industry-specific characteristics, crucial for an industry to develop to its potential (Industry Risks) and a quantifiable assessment of the political, economic and operational profile (**Country Risks**).

Assessing Our Weightings

Our matrix is deliberately overweight on **Rewards** (60% of the final RRI score for a market) and within that, the **Industry Rewards** segment (60% of final Rewards score). This is to reflect the fact that when it comes to long-term investment potential, industry size and growth potential carry the most weight in indicating opportunities, with other structural factors (demographic, labour statistics and infrastructure quality) weighing in, but to a slightly lesser extent. In addition, our focus and expertise in emerging and frontier markets has dictated this bias towards industry size and growth to ensure we are able to identify opportunities in markets where regulatory frameworks are not as developed and industry sizes not as big as in developed markets, but where we know there is a strong desire to invest.

Power RRI Indicators - Explanation And Sources

	Source	Rationale
Rewards		
Industry Rewards		
Electricity Capacity	BMI Forecast	Installed power capacity indicates market size and scale of operations. The larger the sector, the greater the opportunities available. MW, five-year average forecast.
Electricity Capacity Growth	BMI Forecast	Changes in installed power capacity indicate potential for business opportunities as a reflection of the market's pace of expansion. % change y-o-y, five-year average forecast.
Electricity Generation	BMI Forecast	Volume of electricity output indicates the size of the market and the level of supply volatility. TWh, five-year average forecast.
Electricity Generation Growth	BMI Forecast	Changes in electricity output indicate the market's pace of growth or exposure to sudden falls in power supply. % change y-o-y, five-year average forecast.
Country Rewards		
Real GDP Growth	BMI Forecast	The more substantial the growth rate, the greater the demand for additional power generation. % change y-o-y, five-year average forecast.
Labour Market Risk	BMI Operational Risk Indicator	Measures the risk to project development based on the labour market, assessing size, education levels and cost of employment.
Electricity Import Dependence	BMI Forecast	Higher exposure to power imports implies a lower level of energy security and provides more incentive to build domestic power capacity.
Population Growth	BMI Forecast	Proxy for extent to which demographic dynamics are favourable to the power industry. The more substantial the growth rate, the greater the demand for additional power generation. % change y-o-y, five-year average forecast.
Risks		
Industry Risks		
Competitive Landscape	BMI Subjective Indicator	Assesses the openness of the power and renewables competitive landscape. Considers saturation of the existing market, ability to compete in fair tenders and barriers to international companies entering the market.
Financial Barriers	BMI Subjective Indicator	Measures difficulties faced by businesses in accessing financing on both domestic and international markets.
Energy Policy	BMI Subjective Indicator	Assesses the market's position in relation to the competing goals of energy security, power sector decarbonisation and economic sustainability, as well as energy policy continuity.
Legal Risk	BMI Operational Risk Index	Risk to operations based on strength of the rule of law, the extent of corruption and investor protection.
Transmission And Distribution Losses	BMI Forecast	Provides an indication of the quality and efficiency of power infrastructure. The higher the losses, the lower the quality of power supply. % of total power output, five-year average forecast.
Country Risks		
Long-Term Economic Risk Index	BMI Country Risk Index	Takes into account the structural characteristics of economic growth, the labour market, price stability, exchange rate stability and the sustainability of the balance of payments, as well as fiscal and external debt outlooks for the coming decade.

	Source	Rationale
Short-Term Economic Risk Index	BMI Country Risk Index	Seeks to define current vulnerabilities and assess real GDP growth, inflation, unemployment, exchange rate fluctuation, balance of payments dynamics, as well as fiscal and external debt credentials over the coming two years.
Political Risk Index	BMI Country Risk Index	The Political Risk Index is a score made up of the mean average across three distinct pillars: Governance Risk, Society Risk and Security Risk. These are aggregated into an overall assessment of Political Risk.
Operational Risk Index	BMI Operational Risk Index	Focuses on existing conditions relating to four main risk areas: Labour Market, Trade & Investment, Logistics, and Crime & Security.

Source: BMI

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