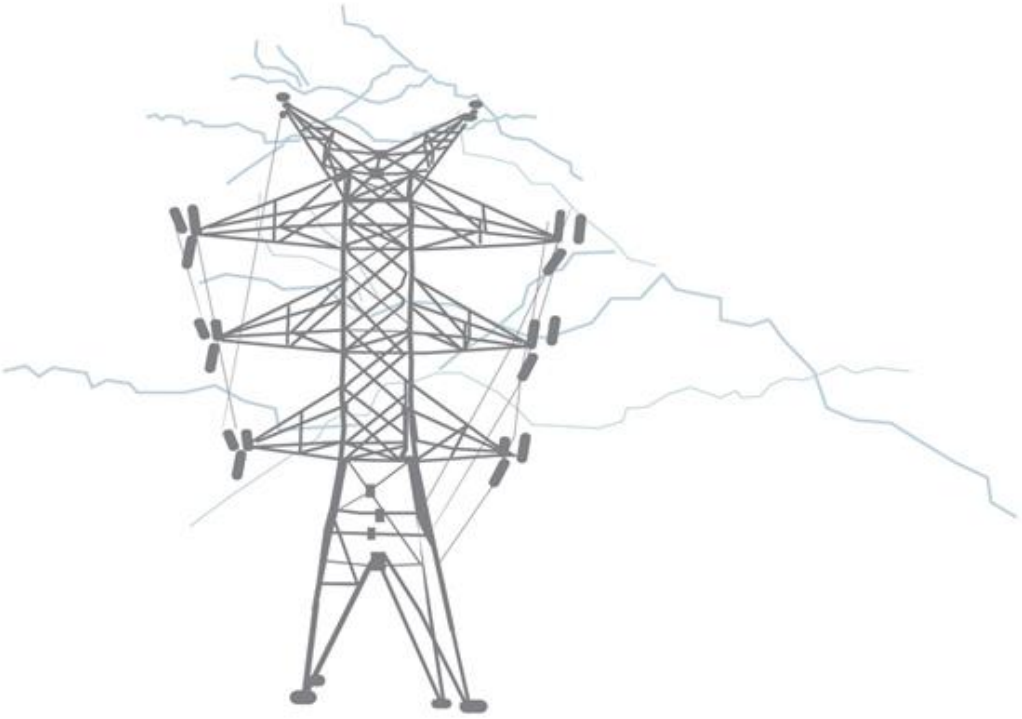
Marmore Infrastructure Report 2016

Kuwait Power

Altering the Fuel Mix



Research Highlights:

Examining and analyzing the status of Kuwait Power Sector highlighting the demand, supply and investment trends. The report also presents growth drivers and key learning points.

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1. Executive Summary

The power consumption in Kuwait is driven by the fast population growth, increased need for desalinated water and the economic development of the country.

Kuwait is one of the leaders in the world, as far as the per capita consumption of power is concerned. Peak demand in 2013 was 12.1 GW and has been increasing each year since 2004. The rate of growth of power generation capacity is not keeping pace with the rate of growth in demand which has averaged around 5% annually over the past decade[1]. The power consumption in Kuwait is driven by the fast population growth, increased need for desalinated water and the economic development of the country.

Currently, 71% of the total electricity generated in Kuwait is by burning liquid fuels. With the unprecedented growth of electricity demand, Kuwait will have to forego its future revenue from oil exports, if it is not trying to alter its energy mix. So far, there have been no significant steps taken by the government in curbing this scenario. Kuwait government is aiming to bring in renewable energy resources that will contribute around 2-3% of the total power demand by 2030.

According to the IMF World Economic Outlook database, Kuwait had a population of 3.36 million at the end of 2013.

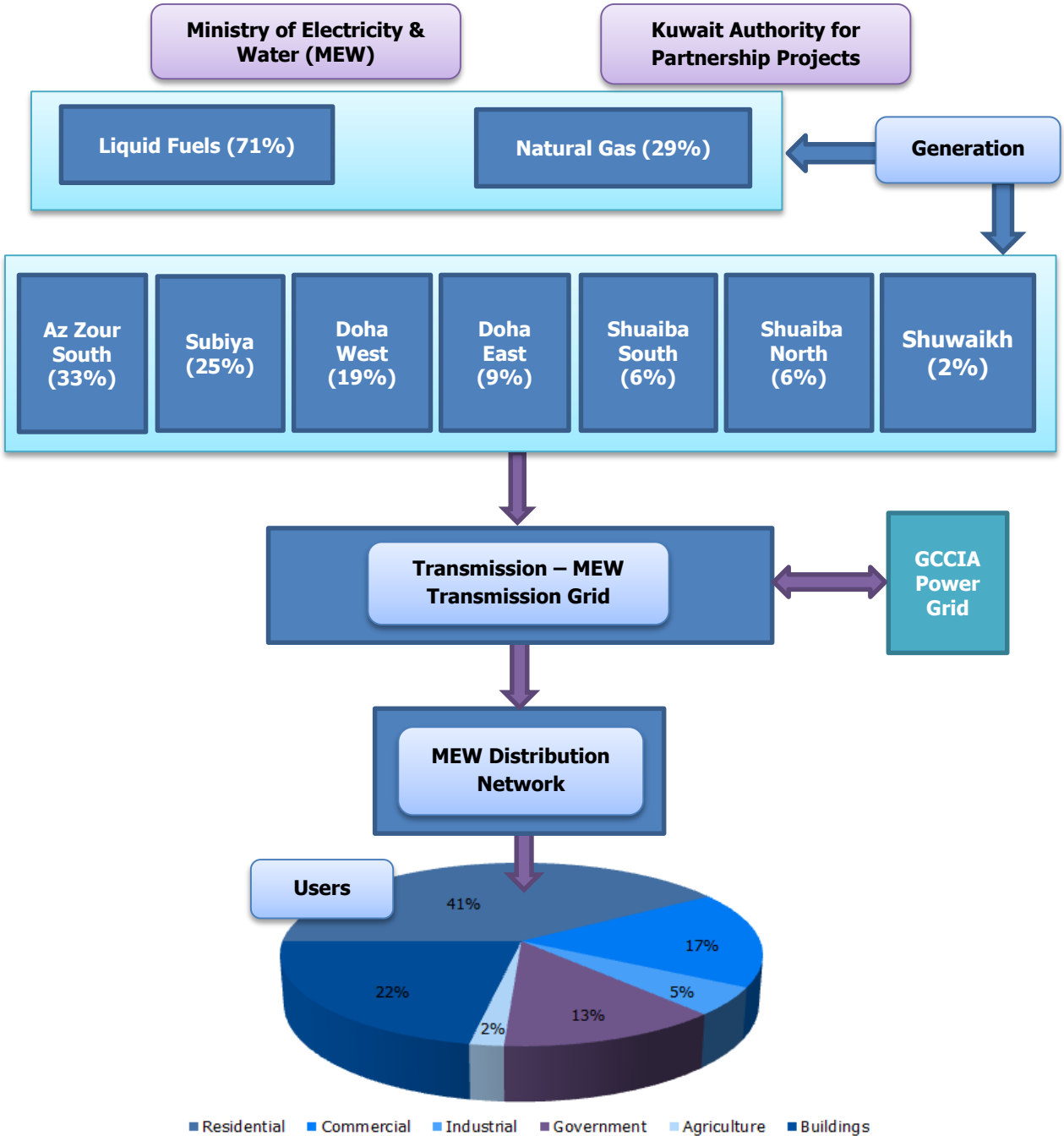
According to the IMF World Economic Outlook database, Kuwait had a population of 3.36 million at the end of 2013. It forecasts the population to be around 4.34 million by the end of 2017. Per capita power consumption will increase from 17,000 kWh in 2011 to 20,000 kWh by 2020. The power capacity in Kuwait is estimated to grow from 13,500 MW in 2011 to 23,810 MW by 2020.[2] With this scenario, we could expect an investment of USD 23bn within 2020.[3]

MEW is the sole utility in Kuwait, providing the power to the entire country. On an average, annual reserve margin is maintained around 20% of the installed capacity in Kuwait. Currently, four various power generation projects are under construction or upgradation, which account for an investment worth USD 5bn. Country's first Independent Water & Power Project (IWPP) has been launched by Kuwait Authority for Power Projects (KAPP) in Al Zour

[1] EIA
[2] MEW Statistics
[3] Markaz Analysis

North. A 1,500 MW power plant will be established as part of the first phase. This is considered to be a good opportunity to test the market, by various contractors in the private sector. KAPP has announced that more power projects of IWPP model will follow after the success of Al Zour North.

Figure 1.1: Kuwait Power Sector in a Snapshot



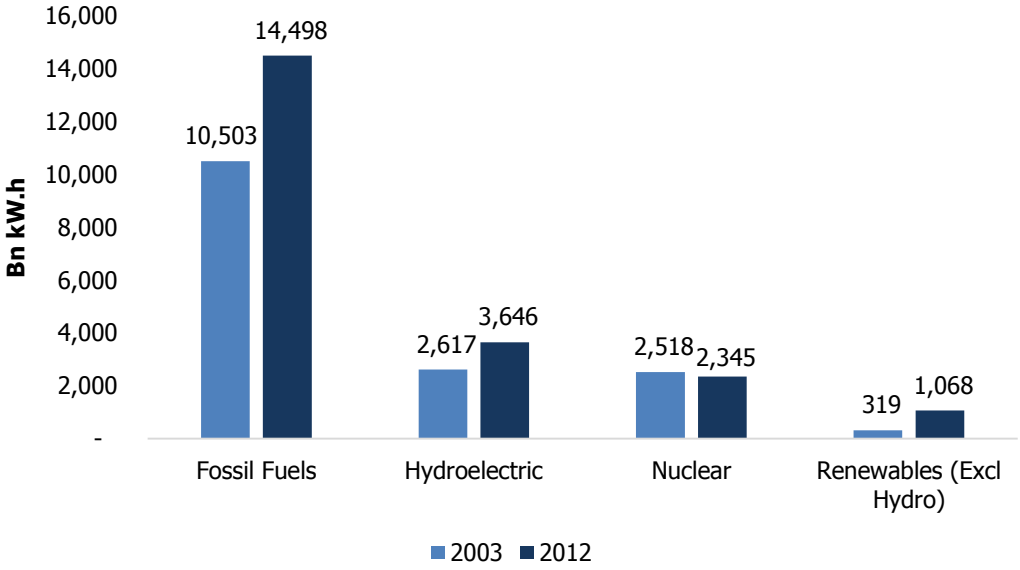
Source: Power plants

2. Global Scenario

2014 witnessed a record increase in the number of renewable power installations, 130GW (Giga Watt) of renewable power was installed during that year.

Globally, energy sector is currently undergoing a tremendous change in many parts of the world. Policies and regulations that support the transition to renewable energies are being increasingly adopted – US clean power plan and China's carbon trading scheme (effective 2017) are some of the recent and most prominent ones that have been announced. 2014 witnessed a record increase in the number of renewable power installations, 130GW (Giga Watt) of renewable power was installed during that year. Collectively renewables came behind coal in terms of power generation. Energy efficiency improvements helped in reducing the growth in energy demand in 2014 to just one-third of the level it would otherwise have been. Globally, energy efficiency regulations coverage has doubled in industry, buildings and transport rising from 14% of the world's energy consumption in 2005 to 27% in 2014.

Figure 2.1: Power generation by source (2003-12)



Source: International Energy Agency

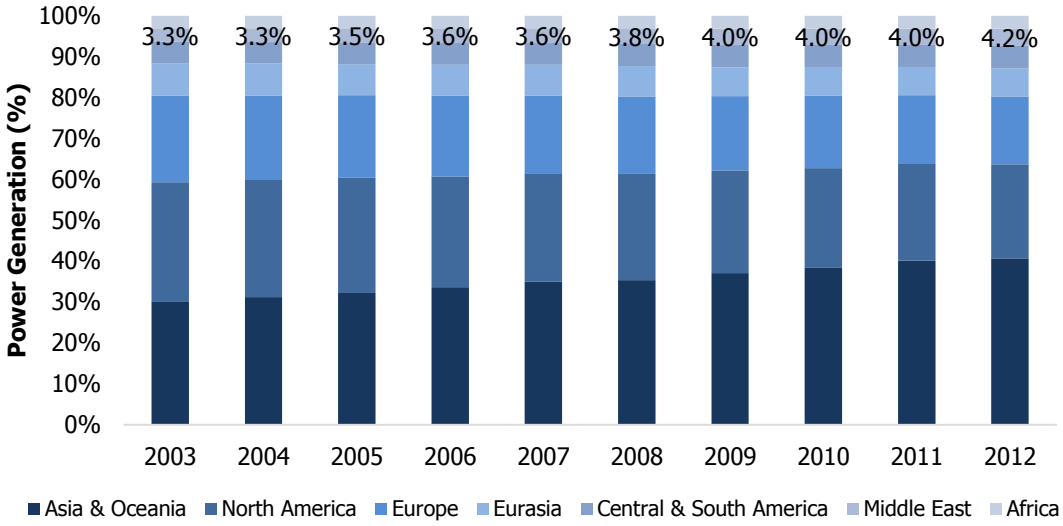
Fossil fuel still accounts for 64.08% of the total power generation slightly down from 64.53% in 2003.

Fossil fuel still accounts for 64.08% of the total power generation slightly down from 64.53% in 2003. Power generation from nuclear energy suffered massively following the Fukushima disaster in 2011. Many developed countries decided to scale-down or even completely eliminate

Kuwait for its part dropped the plan to build four civilian nuclear power plants that was supposed to go online in 2022.

plans for nuclear power post the tragedy. Germany for example took a stance to move towards wind and solar power and shut down its nuclear reactors by 2022. Kuwait for its part dropped the plan to build four civilian nuclear power plants that was supposed to go online in 2022.

Figure 2.2: Power generation Country-wise



Source: Energy Information Administration, Markaz Research

Favorable economic conditions prior to the financial crisis and the incredible resilience of oil prices post the crisis were mainly responsible for growth in power generation.

Power Generation in the Middle East[4] region has been constant throughout the years. From 3.3% of the global power generation in the year 2003 it stands at 4.2% of the total in the year 2012. Power generation in the GCC countries have grown at 7.33% from 2003 to 2013 slightly above the regional average of 6.3%. Favorable economic conditions prior to the financial crisis and the incredible resilience of oil prices post the crisis were mainly responsible for growth in power generation. Constant inflow of expatriates, increase in residential and commercial properties also complemented the growth. Asia and Oceania region had the highest CAGR during 2000 to 2012 of 7% largely as a result of economic boom in China whose total generation increased by 11.4% during the same period.

[4] Middle East region comprises of Bahrain, Kuwait, Oman, Qatar, Saudi Arabia, U.A.E, Iran, Iraq, Israel, Jordan, Lebanon, Palestinian Territories, Syria and Yemen.

Global power capacity for the period 2003-12 is found to have jumped by 35 %.

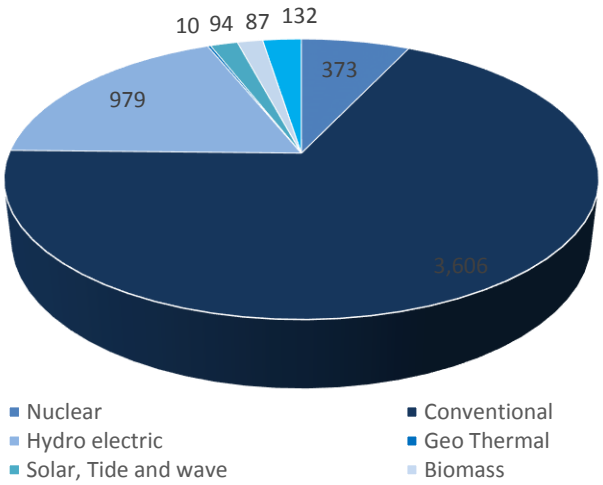
Table 2.1: CAGR of Power Generation – Region Wise

Region	CAGR in % (2003-12)
World Total	3.4
Middle East	6.3
China	11.4
India	6.2
GCC	7.3

Source: Energy Information Administration, Markaz Research

Global power capacity for the period 2003-12 is found to have jumped by 35[5]%. The capacity increase can be attributed to global population growth which increased by 700 million over this period. The consumption of electricity during the period (2003-12) has grown at a CAGR of 3.49%, there by resulting in increased demand.

Figure 2.3: World Power Capacity (Values in Million kW) (2012)



Source: Energy Information Administration, Markaz Research

Bahrain, Kuwait and Qatar have per capita consumption that exceeds the levels of developed economies of US, UK and Germany as well as emerging economies such as China and India.

Bahrain, Kuwait and Qatar have per capita consumption that exceeds the levels of developed economies of US, UK and Germany as well as emerging economies such as China and India. As a result of the constant increase in the consumption, GCC countries witness blackouts and brownouts during peak demand times indicating that it is increasingly difficult for supply in the region to keep pace with the population and demand growth.

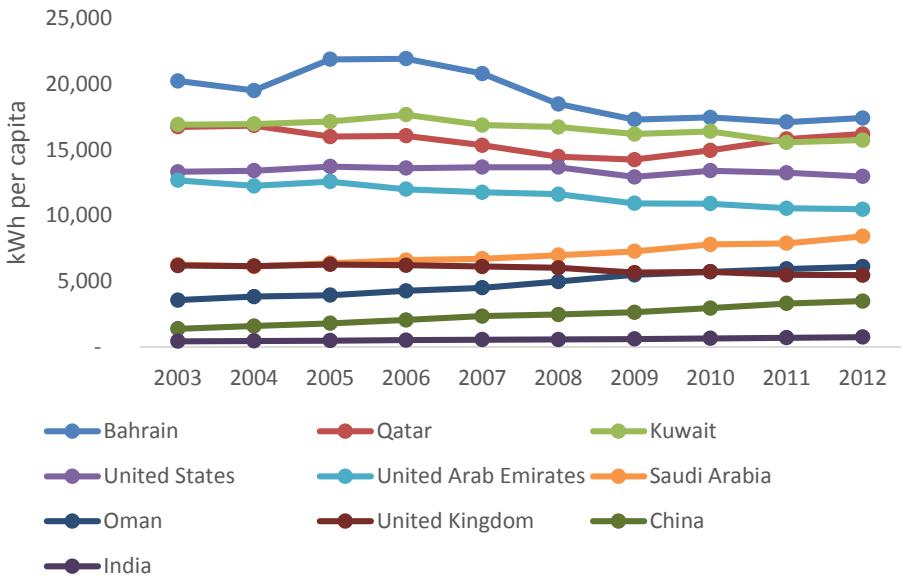
[5] Does not include Hydro-electric Pumped Storage

Almost 47% of the electricity consumption goes into the residential use in GCC economies while the global average is around 25%.

While the consumption rate in the electricity in USA is mainly driven by its industrial and commercial activities, GCC economies have a very high residential electricity usage compared to the rest of the world. Almost 47%[6] of the electricity consumption goes into the residential use in GCC economies while the global average is around 25%. Air conditioning and cooling purposes are the main reasons for the high amount of residential usage in these economies. Energy waste is prevalent in the GCC economies where it is common for people to leave air-conditioning, lighting and other gadgets running. Electricity consumption in China and Germany is mainly driven by its industrial sector contributed roughly around 40-50% of its total consumption. Below figure represents the analysis on the per capita consumption pattern in various regions.

Electricity consumption in China and Germany is mainly driven by its industrial sector contributed roughly around 40-50% of its total consumption.

Figure 2.4: Analysis of World Averages in Per Capita Consumption of Power



Source: Markaz Research, World Bank Data, Energy Information Administration, IMF Data

Even in the present scenario, 65% of total energy demands in the world are met by the fossil fuels.[7] With slight addition to capital cost, new

[6] Energy on demand: The future of GCC energy efficiency Middle East Energy and Resources Managing scarcity for the future - Deloitte, p2
[7] Fossil fuels are hydrocarbons, primarily coal, fuel oil or natural gas, formed from the remains of dead plants and animals.

Natural Gas Combined Cycle (NGCC) power plants are an effective choice over the coal based and liquid fuel based plants.

technologies like Integrated Gasification Combined Cycle (IGCC), Pressurized Fluidized Bed Combustion (PFBC) or Circulating Fluidized Bed Combustion (CFBC) and Hybrid Cycle (Gasification in Combustion) can bring around 40-50% range of energy efficiencies in high-grade coal based power plants. These technologies also offer highly reduced environmental emissions and higher thermal efficiencies. PFBC in particular is advantageous to be used with the flexibility of size and fuel types, as well. The residues generated from the IGCC are very easy to remove and thus the cost for removal could be considerably reduced.

3. Kuwait – Power Sector

Oil price decline since 2014 has brought in a structural shock to the Kuwait government's balance sheet as well as its economy.

Kuwait like most of its regional neighbors heavily depends on oil for its economy. Oil and Gas sector accounts for over 90% of the total exports and roughly 63% of the nominal GDP[8]. It is also responsible for generating 77% of the government revenues. Oil price decline since 2014 has brought in a structural shock to the Kuwait government's balance sheet as well as its economy. Government revenues as a % of GDP has declined by 17.5% during 2013-15 while the fiscal surplus which was hovering above 25% in 2014 is estimated to be around 0.1% in 2016 highlighting the vulnerability of Kuwait's GDP to oil price shocks[9].

IMF has estimated Kuwait real GDP to grow by 2.5% in 2016 and by 2.7% in 2017.

IMF has estimated Kuwait real GDP to grow by 2.5% in 2016 and by 2.7% in 2017 which is much below the growth rates achieved by the country in the past years.

Table 3.1: Kuwait – Rating Statistics

Credit rating companies	Moody's	S&P	Fitch
Long Term rating	*Aa2*	*AA*	*AA*
Real GDP Growth Rate in %	**2015E**	**2016F**	**2017F**
IMF	*1.17*	*2.51*	*2.72*
IIF	*0.59*	*1.28*	*n/a*

Source: Moody's, S&P, Fitch, IMF and IIF

Table 3.2: Kuwait – Key Statistics

Indicators	2014	2015E	2016F
Oil & Gas, as % of exports	93.1%	89.0%	88.6%
Oil & Gas, as % of revenue	73.5%	64.2%	58.9%
Govt Revenues as % of GDP	65.8%	59.7%	62.7%
Fiscal Position as % of GDP	26.3%	1.3%	0.1%

Source: IIF, IMF

The diversification of the Kuwait economy still remains a long-term challenge however the government has made plans to improve on that front. Kuwait Development Plan (KDP) has been given a much needed fillip in its 2nd iteration. Kuwait being a non-arable region depends more on the

[8] Official Statistics as of 2014
[9] Moody's

manufacturing and services sector for its economic growth after oil industry. Kuwait ranks 6th terms of estimated oil reserves with total proven reserves of 104 Bn barrels.

Kuwait has made remarkable progress in its implementation of the five year development plan.

Table 3.3: GDP Growth, Inflation, Population & GDP Contributions

Year	2011	2012	2013	2014	2015e	2016F
Nominal GDP USD bn	154.0	174.1	175.8	172.6	123.2	128.5
Real GDP YoY Change in %	10.6	7.7	0.8	0.1	1.2	2.5
Hydro Carbon GDP (% change)*	na	10.0	-1.8	-1.7	-0.4	0.1
Non Hydrocarbon (% change) *	na	1.8	4.2	2.1	3.0	3.2
Inflation (Average Consumer Prices) in %	4.9	3.2	2.7	2.9	3.3	3.3
Population in millions	3.2	3.4	3.6	3.8	4.0	na

Source: *IIF- Feb 2016 Report, IMF – World Economic Outlook Statistics- October 2015

Kuwait has made remarkable progress in its implementation of the five year development plan. The recent improvement in the relationship between the government and parliament has benefitted Public Private Partnerships. Improvement in the relationship bodes well for the economic diversification plans envisioned by Kuwait. The manufacturing sector in Kuwait accounts for almost 6% of the non-oil economic activity.[10]

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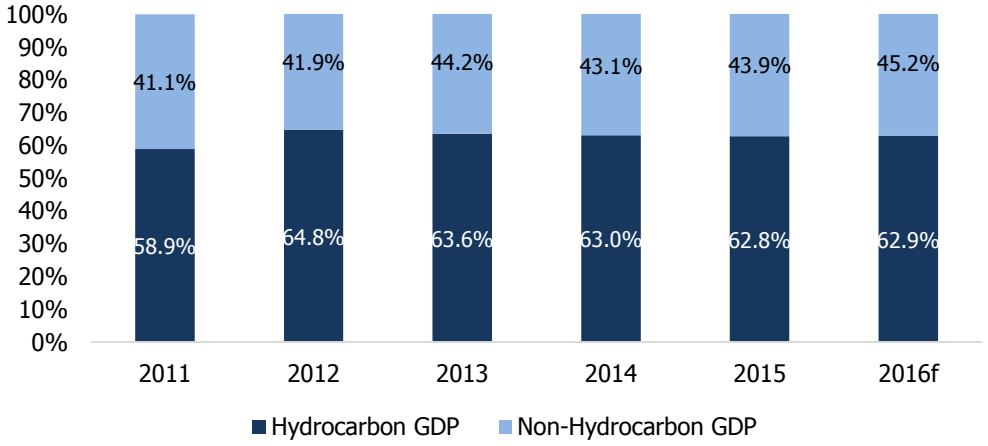
Figure 3.1: GDP - Hydro Carbon v/s Non Hydro Carbon



Source: IIF

[10] Mordor Intelligence

Projects such as new transport, health, education and infrastructure envisaged in the $130 billion KDP are moving ahead, and capital expenditures are gradually rising.

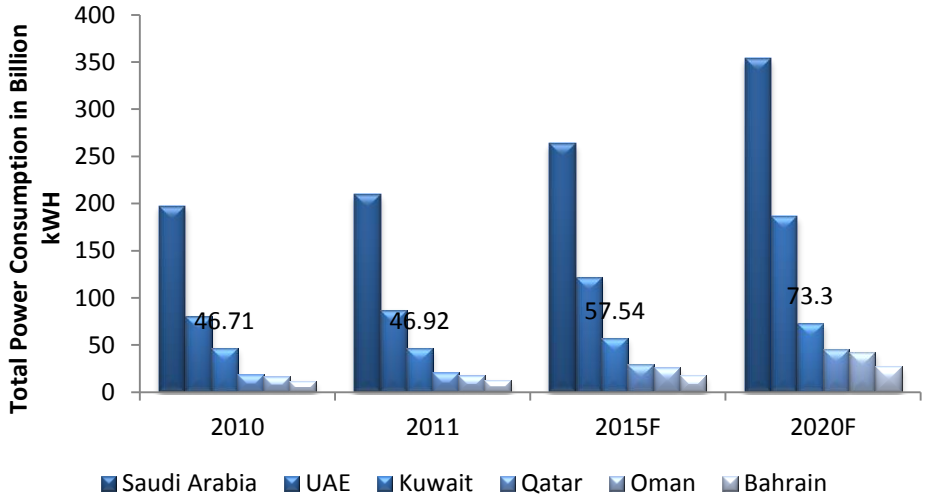
Non-Hydrocarbon GDP is expected to grow at 3.2% in 2016[11]. Growth of non-hydrocarbon sector also augurs well for the diversification efforts of Kuwait. Projects such as new transport, health, education and infrastructure envisaged in the $130 billion KDP are moving ahead, and capital expenditures are gradually rising[12].

Power Consumption

According to Markaz estimates, the growth in the total power consumption will be above 8.5% annually for the economies of UAE, Qatar, Oman and Bahrain. The power consumption growth in Kingdom of Saudi Arabia and Kuwait will be around 6% and 5% respectively on year on year basis. These figures are well in comparison with the BRIC average growth of power consumption which will be around 6% margin YoY. The comparisons of power consumption in the Kuwait with respect to other GCC economies are represented in the figure 9. With these estimates, the total power consumption in Kuwait will cross 100TWh by 2030.

The power consumption growth in Kingdom of Saudi Arabia and Kuwait will be around 6% and 5% respectively on year on year basis.

Figure 3.2: Power Consumption in Kuwait v/s other GCC



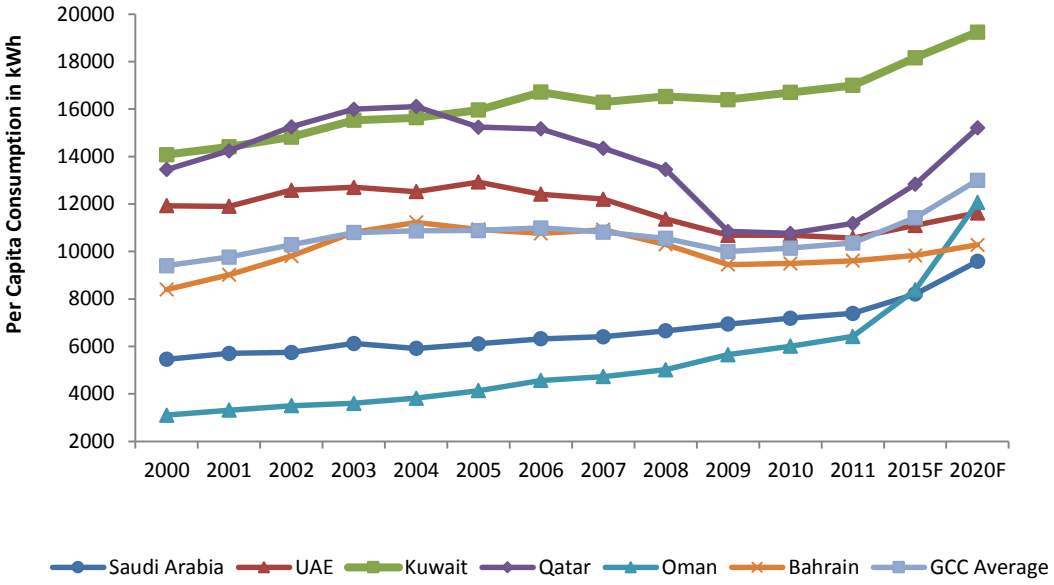
Source: World Bank Data, Energy Information Administration, IMF Data, Markaz Research

[11] IIF – Feb 2016
[12] IIF – Feb 2016

Ministry of Electricity & Water in Kuwait has taken active steps to rationalize the consumption of power.

Compared to its neighboring nations, Kuwait is highest in per capita consumption of power. Ministry of Electricity & Water in Kuwait has taken active steps to rationalize the consumption of power.

Figure 3.3: Per Capita Power Consumption of Kuwait v/s other GCC Economies



Source: World Bank Data, Energy Information Administration, IMF Data, UAE Statistics Bureau, Markaz Research

Qatar looks ahead for higher power consumption, after a slight decrease in the recent period.

According to Markaz estimates, per capita consumption of power in all GCC Economies are poised for a high growth in the coming years. Figure 10 represents the fluctuations in per capita power consumption rate in various GCC economies. From the analysis above, we can see a decreasing trend in the consumption rate in UAE after 2007. This could be attributed to the slowing economic scenario which prevailed in the Dubai after 2008. Qatar looks ahead for higher power consumption, after a slight decrease in the recent period. Being one of the wealthiest nations among the GCC and due to the abundant oil reserves, the per capita power consumption is forecasted to increase further in Kuwait. According to Markaz forecast, per capital consumption levels of Kuwait will have crossed 19,000kWh by 2020.

Table 3.4: Kuwait Electricity Consumption and Demand – Supply Forecasts

Kuwait Figures	2006	2007	2008	2009	2010	2011	2015e	2020f
Electricity Consumption in Billion kWh	39.31	39.88	42.13	43.41	46.71	46.92	57.54	73.30
%Change YoY/CAGR	8.77	1.43	5.65	3.03	7.62	0.46	5.23	4.96
Per Capita Consumption in kWh	16,719	16,291	16,532	16,403	16,706	16,997	18,169	19,248
%Change YoY/CAGR	4.73	-2.56	1.48	-0.78	1.85	1.74	1.68	1.16
Capacity in MW	10,858	10,944	11,641	12,579	13,383	13,500	17,584	23,810
%Change YoY/CAGR	0.00	0.79	6.37	8.06	6.39	0.87	6.83	6.25
Investment Required in USD bn (Explained in the note below)							9.19	14.01

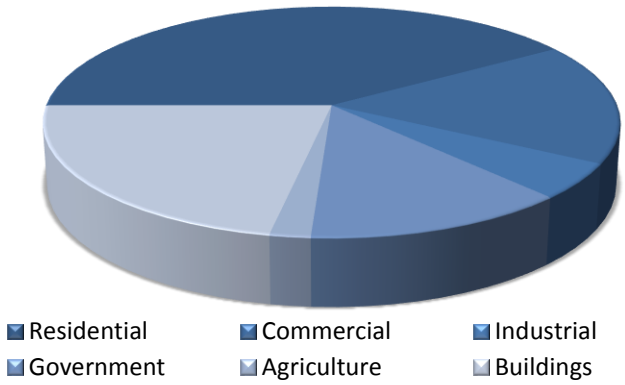
Source: Markaz Research, EIA, IMF, World Bank, MEED Projects, MEW, KAPP
Note: Based on USD 2-2.5mn/MW investment, including the inflation.

According to MEW estimates, the peak capacity demand for power will reach 25,000MW by 2030 from the current levels of 11,000MW. This will require almost doubling the entire installed power capacity in Kuwait. Within 2020, we estimate 10,000MW power capacity to get installed. This will imply an investment of almost USD 25bn.

More than 80% of consumers are in the residential sector, which contribute to 41% of distributed load in Kuwait.

Residential consumption in Saudi Arabia, UAE and Qatar are 51%, 39% and 24% of the total consumption. The situation in Kuwait is not so different. Major consumer of power in Kuwait is residential, in numbers as well as by load distributed. More than 80% of consumers are in the residential sector, which contribute to 41% of distributed load in Kuwait. 22% of the total power consumed is utilised for lighting and cooling systems in buildings. Another 22% of the system load is consumed by the commercial and industrial sectors of Kuwait.

Figure 3.4: Electricity Distribution by Load (MW)



Source: MEW Statistics 2008

Power Generation & Sources of Power

The availability of natural gas in the GCC region is an added advantage.

The availability of natural gas in the GCC region is an added advantage for the implementation of Natural Gas Fired power plants that will help in higher efficiencies and lower carbon emissions. NGCC and CCGT technologies as indicated earlier will contribute much towards the higher power generation efficiencies in this area. Qatar is fully dependent on natural gas for fueling its power plants. Contribution of natural gas as fuel to the power plants in Saudi Arabia is 49% and UAE is 98%. In contrast, 71% of the power generation in Kuwait is through liquid fuels. Kuwait government has not taken active steps to alter its energy mix either. Currently as per estimates, 86 million barrels of oil are being consumed for power generation. That will come around 300,000 barrels of oil per day.[13]

In contrast, 71% of the power generation in Kuwait is through liquid fuels.

Table 3.5: Forecast of the Power Generation by Fuel Type in Kuwait in TWh

Resource Type	2005	2010	2011	2015F	2020F	2030F
Natural gas	12.33	14.88	15.66	18.87	24.35	31.01
Liquid fuels	28.78	36.44	38.35	47.02	59.82	80.39
Renewable Energy	0.00	0.00	0.00	0.33	1.28	3.45

Source: Markaz Research, IMF, Zawya, World Bank, MEW, KAPP

As per the current estimates, the energy mix is likely to continue in favor or liquid fuels as no active steps being taken so far in altering the energy

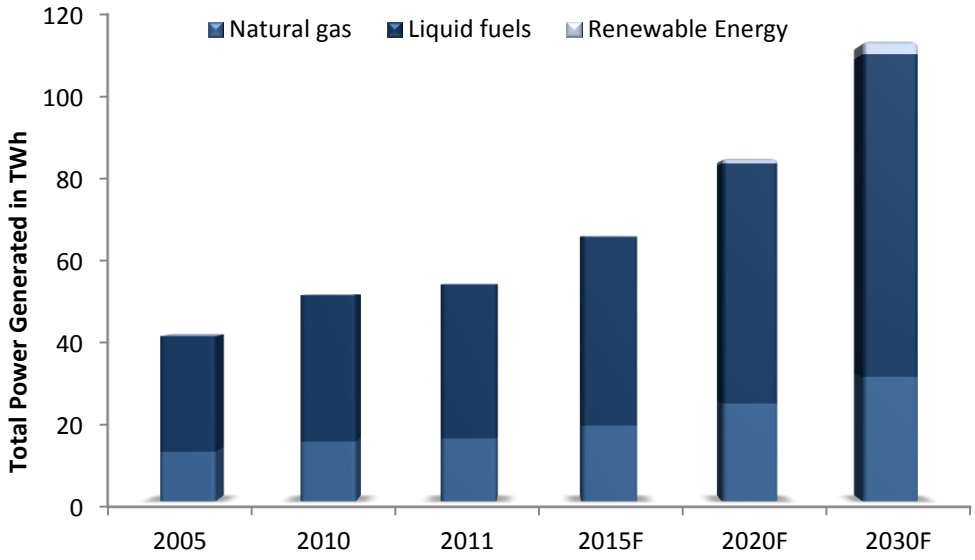
[13] Markaz Estimates – "Powering Kuwait into the 21st Century: Adopting a Sustainable Strategy"

mix. According to the current projects, Kuwait just aims to have renewable energy contribution of 2-3% to the total power demand by 2030. (Detailed analysis on liquid fuel consumption in Key Learning Section)

With this figure, Kuwait will have to go on with increased dependency to hydrocarbon fuels, particularly liquid fuels.

To increase the private participation in an otherwise highly monopolized sector, Kuwait Authority for Power Projects (KAPP) was established in Kuwait, in 2008.

Figure 3.5: Energy Generation by Fuel Type



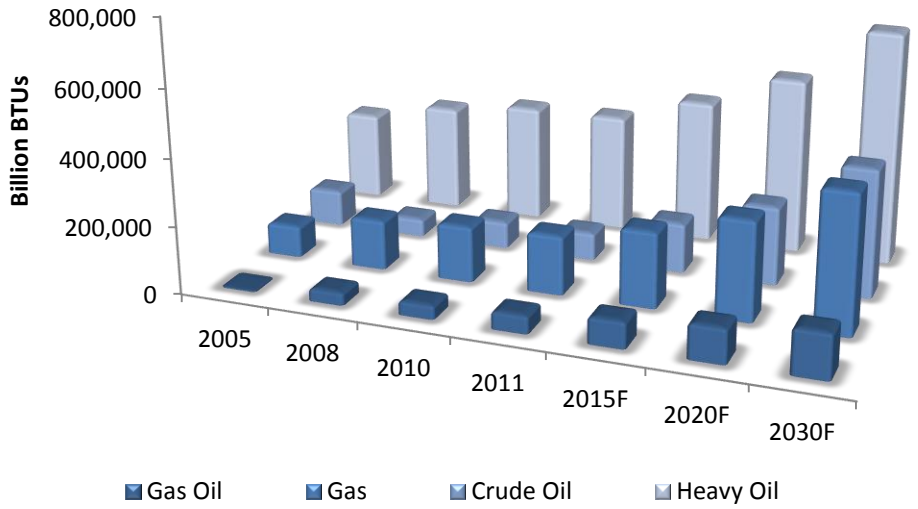
Source: Markaz Research, MEW, KAPP

It would be completed in four phases with a total installed capacity of 4,800MW.

To increase the private participation in an otherwise highly monopolized sector, Kuwait Authority for Power Projects (KAPP) was established in Kuwait, in 2008. Under KAPP, the first Independent Water & Power Project (IWPP) was launched, which is proposed to become operational by 2017 end. The project, which will utilize natural gas as fuel, will be located at Al-Zour North. The project is estimated to cost around USD 5.86bn in total. It would be completed in four phases with a total installed capacity of 4,800MW. Followed by it KAPP has shown interest to open up the second IWPP at Al-Khairan with an estimated investment of USD 2.5bn. The facility is expected to have 2,500MW generation capacity.

On the other hand, Ministry of Electricity & Water (MEW) has already invited bids for the thermal power plant in Subiya. The total installed capacity of the same is expected to be around 2,100MW.

Figure 3.6: Fuel-mix in Kuwait Power Sector over the years



Source: Markaz Research, MEW

In alternative energy, KISR has shown intention to set up a renewable energy park at Al Abdali.

In alternative energy, Kuwait Institute for Scientific Research (KISR) has shown intention to set up a renewable energy park at Al Abdali. The plan comprises of a 10MW wind project, a 10MW photovoltaic solar project and a 50MW concentrated solar power facility. Germany's Fitchner was identified as the adviser for the same.[14] The project will attract an investment around USD 100 million. MEW has also launched its mission for sustainable resources of energy. Integrated Solar Combined Cycle (ISCC) power planed with 65MW from solar power and 163MW by gas-fired technology will come up in the eastern part of Kuwait. The project, which will be set up in Al Abdaliyah, will cost around USD 300 million.

Integrated Solar Combined Cycle (ISCC) power planed with 65MW from solar power and 163MW by gas-fired technology will come up in the eastern part of Kuwait.

Kuwait Oil Company (KOC) is planning to build an integrated Concentrated Solar Power (CSP) plant to produce power and steam for enhanced energy recovery. This facility will be built with USD 100 million investments. Kuwait's Kuwait Authority for Power Projects (KAPP) has conducted a feasibility study on waste-to-energy conversion and looks forward to award the contract by August 2012 to start the construction of the facility. The proposed facility will be set up in Kabd, western region of Kuwait City utilizing the municipal

[14] MEED Projects

Though a handful of projects on renewable energy resources are present in Kuwait power sector, it alone will not be sufficient to meet its ambition to cater 5% of total power demand by 2020.

solid waste. Though a handful of projects on renewable energy resources are present in Kuwait power sector, it alone will not be sufficient to meet its ambition to cater 5% of total power demand by 2020.

Though memorandum of cooperation was signed between the governments of Kuwait and Japan in December 2011, for setting up nuclear power plants, the project was cancelled followed by the tragedy at Fukushima.

Power Distribution & Transmission Utilities

In Kuwait, MEW is the single player in power transmission and distribution sector. Based on the statistics of electricity available for past few years, MEW had been keen to enhance its reach across Kuwait.

Table 3.6: Power Transmission Utilities in Kuwait

Transmission Utilities	2004	2005	2006	2007	2008	CAGR
Power Transmission Substations	551	564	568	578	588	1.64
Transmission Lines (Circuit km)	7,997	8,512	8,743	8,846	9,014	3.06
Power Transformers	1,448	1,490	1,508	1,550	1,604	2.59
Capacity of Power Transformers (MVA)	57,523	58,698	59,253	60,908	63,333	2.44

Source: Markaz Research, MEW

Electricity distribution lines have almost increased by 5.23% in 2008 that is almost same as the power consumption growth rate

Electricity distribution lines have almost increased by 5.23% in 2008 that is almost same as the power consumption growth rate. Consumption is dominated by the residential sector followed by the commercial and industrial sectors.

Table 3.7: Power Distribution Utilities in Kuwait

Distribution Utilities	2004	2005	2006	2007	2008	CAGR
Number of Customers	371,031	375,430	399,554	424,781	432,852	3.96
Number of Residential Customers	310,052	322,278	338,405	359,270	366,586	4.29
Number of Commercial Customers	40,530	41,224	44,818	45,821	46,194	3.37
Distribution Substations	6,224	6,457	6,680	6,854	7,043	3.14
Distribution Transformers	4,218	4,604	4,941	5,349	5,800	8.29
Distribution Lines (Circuit km)	30,906	32,289	33,557	34,291	36,085	3.96

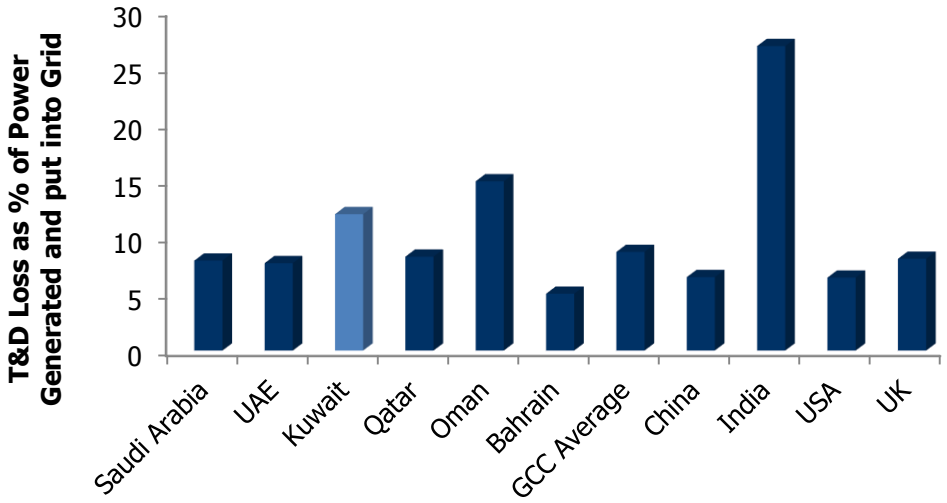
Source: Markaz Research, MEW

Quality of power transmission and distribution in most of the GCC countries seems to be at par with that of the developed countries. Major reasons for

Major reasons for the losses are due to the extreme weather conditions in the summer season and sandstorms that exist in this region.

the losses are due to the extreme weather conditions in the summer season and sandstorms that exist in this region. Over a period of 2000-2010, Kuwait has kept an average Transmission and Distribution loss at 12% of the total power generated, and that put into the grid. The losses in Kuwait power transmission and distribution sector are a bit high when compared with other GCC economies. Average annual power loss during the same period came to 5TWh of electricity.

Figure 3.7: Transmission & Distribution Loss – Comparison



Source: Markaz Research, EIA

Energy Trading

With the aim of optimization and better utilization of the resources of the GCC region, GCC Interconnection Authority (GCCIA) set up GCC power grid.

Based on the fluctuations in the supply and demand over the time period, various countries can trade electricity between themselves on previously agreed rates. With the aim of optimization and better utilization of the resources of the GCC region, GCC Interconnection Authority (GCCIA) set up GCC power grid. In April 2011, the third phase of GCC power grid was completed thus bringing UAE to the network.

In Kuwait, average reserve margins were kept at 20% of total power generated. Hence Kuwait can potentially look at earning revenues through export of its surplus electricity. With the present growth of consumption, that may not be possible in the immediate future. Instead, efficient means

of Demand Side Management[15] (DSM) strategy that can be implemented in Kuwait with not much capital could help it to decide on when to export its surplus power to neighboring GCC countries. Further ahead in the future, it could also potentially consider exporting to the Pan-Arab and European power grid.

The existence of the power grid will help the Independent Power Projects (IPPs), and Integrated Independent Water & Power Projects (IWPPs) to select the strategic geographical locations close to the primary source of energy.

The existence of the power grid will help the Independent Power Projects (IPPs), and Integrated Independent Water & Power Projects (IWPPs) to select the strategic geographical locations close to the primary source of energy. Energy trading in the GCC Power Grid is further regulated through the Power Exchange & Trading Agreement (PETA).[16] GCCIA board will oversee the work of Regulatory Advisory Committee (RAC) which will function as the regulatory body for the power exchanges and trading in the GCC Power grid area.

Growth Drivers

We have identified various strengths and opportunities of the Kuwait power sector.

The population growth of Kuwait for the last decade had an average 3.5% annually.

- The increased growth in demand for oil and the escalation in its prices remain as the fundamental factors which drive the economic growth of Kuwait. Fast paced economic growth in Kuwait influences the power demand heavily.
- The population growth of Kuwait for the last decade had an average 3.5% annually. With this estimates, Kuwait's population might touch nearly 4.34 million by 2017. Residential sector contributes 41% of the total power load distributed across Kuwait.
- Kuwait had the second lowest unemployment rate in the MENA region, in 2008. It has the highest rank in UN's Human Development Index, in the Middle East region. Kuwait is one of the wealthiest nations in the

[15] Demand Side Management (DSM), also known as Energy demand management, is the modification of consumer demand for energy through various methods such as financial incentives and education. Usually, the goal of demand side management is to encourage the consumer to use less energy during peak hours, or to move the time of energy use to off-peak times such as nighttime and weekends. Peak demand management does not necessarily decrease total energy consumption, but could be expected to reduce the need for investments in networks and/or power plants.

[16] The GCC Interconnection Grid: Benefits & Beyond – Hassan K. Al-Asaad & Ahmed A. Ebrahim, MEED Conference, Abu Dhabi, Presentations - p16, p19, p23

GCC. The per capita power consumption in Kuwait is the highest among all the GCC countries.

Ministry of Electricity and Water (MEW) estimates the installed power capacity of Kuwait to be increased by two-fold within the next 10 years to meet the growing demand for electricity.

- Ministry of Electricity and Water (MEW) estimates the installed power capacity of Kuwait to be increased by two-fold[17] within the next 10 years to meet the growing demand for electricity. According to our forecast, that would bring an investment worth USD 25bn within 2020.
- MEW has ambitions to bring in alternate sources of energy which will contribute to 2-3% of the total power demand by 2020. Though the dream seems to be far off, Kuwait ultimately will have to alter its energy mix in the coming future.
- Reconstruction period after the Iraqi invasion in Kuwait had been a period of increased electricity demand.
- Low - pricing and heavy subsidies that the government provides for residential and industrial sectors in Kuwait power sector have also been a driving factor for increased electricity consumption. Recently, MEW has started campaigns to instill the awareness on rationalised electricity consumption rather than squandering around the concessions.[18]
- Kuwait Institute for Scientific Research (KISR) was formed 40 years ago to promote research activities and attain the goals of economic, technological and scientific development in the country. KISR has laid out plans to venture into renewable energy resources for meeting the power demand of the nation. Al Abdali renewable energy complex was planned to set up solar power plant and wind farms with an estimated cost of USD 100 million.

KAPP has already launched the first IWPP of the country to be built in Al Zour North.

- With the ambitions of diversifying the economy and attracting private partnerships, Kuwait Authority for Power Projects (KAPP) was established in Kuwait. KAPP has already launched the first IWPP of the country to be built in Al Zour North. They are also planning for the second IWPP followed by it in Al-Khairan.

[17] MEW 2009 Electricity Statistics
[18] Interlinking the Arab Gulf: Oppurtunities and Challenges of GCC Electricity Market Cooperation – Laura El-Katiri, July 2011

4. Structural Setup

Though electricity entered into the land of Kuwait in 1913, real beginning of electricity services in Kuwait started in 1934.

Electricity has played a basic role in satisfying different needs of the country. Abilities of the vital services, in areas such as social, constructional, educational and economical aspects, have been significantly developed in line with production development of electricity power in Kuwait.[19]

Though electricity entered into the land of Kuwait in 1913, real beginning of electricity services in Kuwait started in 1934 with the setup of a small power generation unit under the name of Electricity National Company. With the continued demand growth of power, in 1951, shares of Electricity National Company were bought by the Kuwait Government and established General Department of Electricity.

Ministry of Electricity & Water (MEW)

Ministry of Electricity & Water (MEW) is responsible for the power generation, transmission and distribution in Kuwait. MEW has seven power plants with a combined capacity of 13,233MW.

MEW has seven power plants with a combined capacity of 13,233MW.

Table 4.1: Power Generation Capacity under MEW

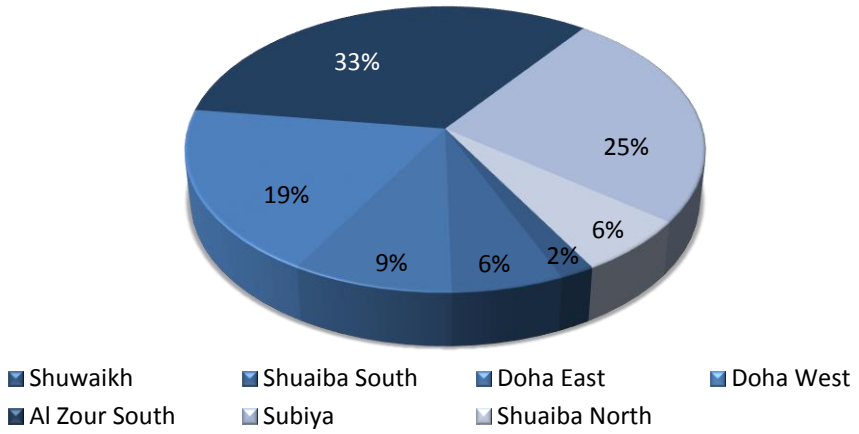
Power Plants under MEW	Year Started	Capacity (MW)
Al Zour South	1986	4,376
Subiya	1998	3,330
Doha West	1982	2,485
Doha East	1977	1,158
Shuaiba North	1965	828
Shuaiba South	1970	804
Shuwaikh	1954	252
Total		**13,233**

Source: MEW Statistics

In 2006 summer, Kuwait power sector was hit by interruptions in power supply and delays in various projects. The Ministry adopted emergency plan by setting up gas turbine generating units in the existing plants at Shuwaikh, Doha West, Subiya and Al Zour South.

[19] MEW Website; http://www.mew.gov.kw/en/?com=content&id=73&act=view

Figure 4.1: Electricity Generation by Power Plants under MEW



Source: MEW Statistics

Reduction of electricity loads by encouraging rationalised electricity consumption.

After the crisis was over, MEW devised a new strategy to meet the requirements of the power sector and to avoid future crisis.

First Axis: Strengthening of productive capacity through the establishment of new stations.

Second Axis: Reduction of electricity loads by encouraging rationalised electricity consumption. The consumers responded to the campaign resulting in reduced electricity load during the peak period. MEW also initiated tariff structure change to control the unnecessary consumption.

Table 4.2: Future Projects of MEW

MEW also initiated tariff structure change to control the unnecessary consumption.

Project Name	Capacity (MW)	Estimated Budget (USD millions)	Expected Completion
Kuwait MEW - Subiyah Gas Fired Power Plant - Phase 2	500	348.03	Q1 2017
Kuwait MEW - Al Zour Water Complex - Phase 2	-	190.00	Q1 2015
Kuwait MEW - Khiran Z 400/132/11 KV Substation	-	180.00	Q3 2017
Kuwait MEW - High Mutlaa Water Reservoirs - Stage 2	-	145.89	Q3 2018
Kuwait MEW - Raudhatain W to Raudhatain X Substations Overhead Transmission Lines	300KV	106.00	Jun 2016

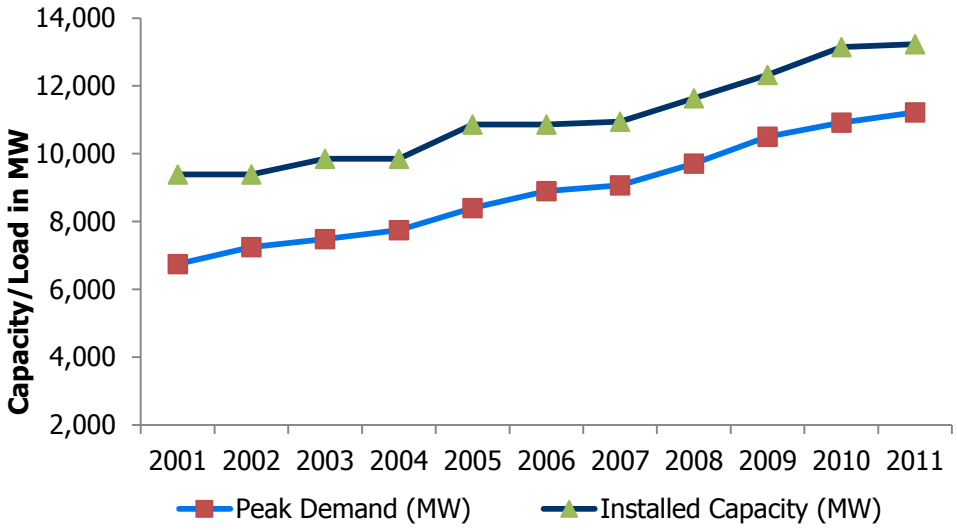
Source: MEW, Zawya Projects
*Doha West Power plant is already in operation. The existing renovation and upgradation will enhance the lifetime of the power plant by another 20 years.

Subiya power plant is expected to come by the end of Q1 2017. This unit will have generation capacity of 500MW. This is part of MEW strategy to alter its energy mix to natural gas in comparison to the less efficient oil-fired thermal power generation technologies[20].

This project was submitted to Kuwait Authority for Power Projects (KAPP) higher committee as part of an unsolicited proposal.

Ministry of Electricity & Water (MEW) plans to build a 228MW Integrated Solar Combined Cycle (ISCC) power plant at Al Abdaliyah area in eastern Kuwait, as part of its Public Private Partnership (PPP) development program. This project was submitted to Kuwait Authority for Power Projects (KAPP) higher committee as part of an unsolicited proposal. MEW is also planning to develop a renewable energy park in collaboration with Kuwait Institute for Scientific Research (KISR) at Al Abdali in the northern part of the country.

Figure 4.2: Peak Demand vs Supply Characteristics in Kuwait



Source: MEW Statistics

MEW has maintained an average reserve margin of 20% throughout the period of analysis in Kuwait.

MEW has maintained an average reserve margin of 20% throughout the period of analysis in Kuwait. This gives Kuwait an opportunity to look forward to electricity exports to its neighboring GCC countries. (Comparative analysis on reserve margin in the power sectors of GCC countries given in Key Learning section).

[20] Please refer annexure for a Full List of "On-going" projects under Ministry of Electricity and Water.

Kuwait Authority for Partnership Projects (KAPP)

The Partnerships Technical Bureau (PTB) was established in 2008 and was later renamed as Kuwait Authority for Partnership Projects, to serve as the main body responsible for PPP projects implementation.

The Government of Kuwait has embarked on an ambitious Public Private Partnership (PPP) program which promotes collaboration between the public and private sectors to develop infrastructure and services for Kuwaiti citizens. The Partnerships Technical Bureau (PTB) was established in 2008 and was later renamed as Kuwait Authority for Partnership Projects, to serve as the main body responsible for PPP projects implementation. As per KAPP, it aims to utilize private sector skills and expertise to maximize the value for money and service quality.[21]

KAPP is embarking on its first Independent Water and Power Project (IWPP), to help it manage the increasing demand for electricity and water. The new gas-fired power and desalination facility proposed will be located at a specific "greenfield" site at Al-Zour North. It is expected that the plant will have an installed capacity of 1,500MW in the first phase. With the completion of four phases, the total capacity of the power plant will reach at 4,800MW.

Table 4.3: Future Projects of KAPP

Project Name	Capacity (MW)	Estimated Budget (USD mn)	Expected Completion
KAPP - Al Zour North IWPP	4,850.00	8,277.4	NA
KAPP - Al Zour North IWPP - Phase 2	1,800.00	2700.0	Q1 2018
KAPP - Al Abduliyah 280MW Hybrid Power Plant	280.00	720.0	2017
Kuwait KAPP - Julai'a IPP	1,000.00	500.0	NA
KOC - Kuwait South East Elevated Substations	-	380.0	Sep 2016
Kuwait MEW - Subiyah Gas Fired Power Plant - Phase 2	500.00	348.0	Q1 2017
KISR - Al Shakaaya Renewable Energy - Phase 1 - Al Shakaaya 132/11 KV Substation	132KV	260.0	Q4 2016
Kuwait MEW - Khiran Z 400/132/11 KV Substation	11KV	180.0	Q3 2017
Kuwait PAHW - Wafra Housing Project 10 Transformer Stations	11KV	154.2	Q2 2017
KISR - Al Shakaaya Renewable Energy - Phase 1 - Al Shakaaya 132 kV Overhead Transmission Lines		110.0	Q3 2016

Source: KAPP, MEED Projects, Zawya Projects

[21] As mentioned in the PTB website; http://www.ptb.gov.kw/en/Who-We-Are

A 1,500 MW power plant will be established as part of the first phase and Approximately 4,850 MW of power generation capacity will be constructed at the Az-Zour North site.

Country's first Independent Water & Power Project (IWPP) has been launched by Kuwait Authority for Power Projects (KAPP) in Al Zour North. A 1,500 MW power plant will be established as part of the first phase and Approximately 4,850 MW of power generation capacity will be constructed at the Az-Zour North site. This is considered to be a good opportunity to test the market, by various contractors in the private sector. KAPP has announced that more power projects of IWPP model will follow after the success of Al Zour North.

In renewable energy sector, KAPP is envisaging an integrated solar and thermal power plant at a site in Al Abdaliyah. The Integrated Solar Combined Cycle (ISCC) power plant is expected to have a solar power generation capacity of 65MW and gas-fired capacity of 163MW. Estimated budget for the project is USD 720 million. KAPP is also planning to construct a waste-to-energy project at Kabd, west of Kuwait City. The project will include incinerators, waste treatment plants, sanitary landfills and associated facilities. About 50% of Kuwait Municipality residential waste is expected to be treated and converted into power at the Kabd site, which covers 500 square metres.

Kuwait Oil Company (KOC)

Kuwait Oil Company was established in 1934 by British Petroleum Company and Gulf Oil Corporation. Later in 1975, Kuwait government took over 100% shares of the KOC.

The plant has a peak capacity of 10 MW, and is designed to provide a minimum of 5 MW during peak hours of summer months.

KOC has looked at using solar energy for a range of small-scale applications including street lighting in western Kuwait. The solar plant uses photovoltaic (PV) panels, which convert light directly into electricity. The plant has a peak capacity of 10 MW, and is designed to provide a minimum of 5 MW during peak hours of summer months under typical weather conditions of the site in Umm-Gudair, West Kuwait. The plant is synchronized to an 11 kV distribution substation that receives electricity from the national grid to provide electricity to 29 electric submersible pumps (ESPs). The project was awarded through a competitive tendering process to Gestamp Solar, a Spanish company that specializes in providing optimal solutions for PV plants.

The PV plant is situated on a 600m x 600 land in Umm Gudair, West Kuwait, and is connected to the nearest distribution substation located 5 km away from the plant through underground cables. Construction has started in the PV Plant, and is targeted to be completed in six months.

Approximately 17,000 MWh are to be produced on average every year from the solar plant, which over the course of 25 years reduces a collective amount of 250,000 tons of CO2 emissions.

Approximately 17,000 MWh are to be produced on average every year from the solar plant, which over the course of 25 years reduces a collective amount of 250,000 tons of CO2 emissions. The project was successfully registered with the United Nations Clean Development Mechanism (CDM) to receive Certified Emission Reduction (CER) certificates[22].

Kuwait Institute for Scientific Research (KISR)

Kuwait Institute for Scientific Research (KISR) was set up 40 years ago, to promote the scientific and applied research in matters related to industry, natural resources and other primary constituents of the national economy. They also advise government on scientific matters and policy issues. KISR had done a recent research on the potential of wind power generation in the State of Kuwait. Based on the research, they have identified that:[23]

1. Kuwait has vast open land and hence great potential of harnessing wind energy for domestic and industrial use.
2. Reduce local and global emissions, making Kuwait a cleaner country, through adopting renewable energy resources.
3. Although wind energy will never replace energy produced by fossil fuel, production of energy from renewable sources will have a positive impact on the economy by preserving valuable national resources.
4. Reduction of long-run energy costs indicating the cost-effectiveness of renewable energy resources.

Reduction of long-run energy costs indicating the cost-effectiveness of renewable energy resources.

Currently KISR has the following facilities under them where renewable energy program is being undertaken.

[22] Arabian Industry

[23] W. Al-Nassar, S. Al-Hajraf, A. Al-Enizi and L. Al-Awadhi. (2005). Potential Wind Power Generation in the State of Kuwait, Renewable Energy, 30: 2149-2161; Scientific Report 2006-08, KISR, p259

The Salmi Mini-wind Farm was established to test and measure the performance of small-sized wind turbines, both on and off-grid,

- **Photovoltaic Test Platform:** The RE Program has developed a 100 KWp test platform that features panels and inverters from a variety of manufacturers and different technologies to assess their performance and viability in Kuwait.
- **Salmi Mini-wind Farm (West of Kuwait City):** The Salmi Mini-wind Farm was established to test and measure the performance of small-sized wind turbines, both on and off-grid, and serve telecommunication towers in remote areas as well as the fire brigade station in Salmi. The farm is located near the future selected site of the first large- scale (70 megawatt) multi-technology Shagaya Renewable Energy Park: a government initiative currently being managed by KISR.
- **Solar and Wind to Hydrogen Plant:** Pilot-scale plant was designed to use photovoltaic panels (10 kilowatts) and wind turbines (6 kilowatts) to produce and store hydrogen (H2) as an energy carrier and use it in a fuel cell to provide electricity. The plant is being used to develop energy management technologies to reduce the cost and increase the reliability of renewable energy technologies in Kuwait.

Reduction of long-run energy costs indicating the cost-effectiveness of renewable energy resources.

Major Projects

Major projects, which are in ongoing phase, in the generation, transmission and distribution sector of Kuwait power industry are described in the given tables.

Table 4.4: On-going, Power Generation Projects (Standalone Projects)

Project Name	Capacity (MW)	Project Value (USD Mn)	Project Status	Completion Date
KAPP - Al Abduliyah 280MW Hybrid Power Plant	280	720	EPC - Bid Submission	2017
Kuwait MEW - Subiyah Gas Fired Power Plant - Phase 2	500	348	Supply & Installation - Execution	Q1 2017
Kuwait MEW - Doha West Main Valves for Distillers Steam Pressure Reducing Station	-	3	Supply & Installation - Awarded	Q2 2016
Kuwait MEW - Khaitan Emergency Electricity Center	-	2	Construction - Awarded	Q4 2016
Kuwait Municipality - 5 Diesel Power Generators	-	1	Supply & Installation - Bid Evaluation	2017

Source: Zawya projects

Table 4.5: On-going, Power Transmission and Distribution Projects (Master Projects)

Project Name	Capacity (KV)	Project Value (USD mn)	Phase	Completion Date
Kuwait MEW - 132 KV XLPE Power Cables and Fiber Optic Cables	132	106	Supply & Installation - Execution	June 2016
Kuwait MEW - Shadadiyah University 132 kV XLPE Cables	132	76	Supply & Installation – Bid Evaluation	Q1 2018

Source: Zawya Projects

Table 4.6: On-going, Power Transmission and Distribution Projects (Standalone Projects)

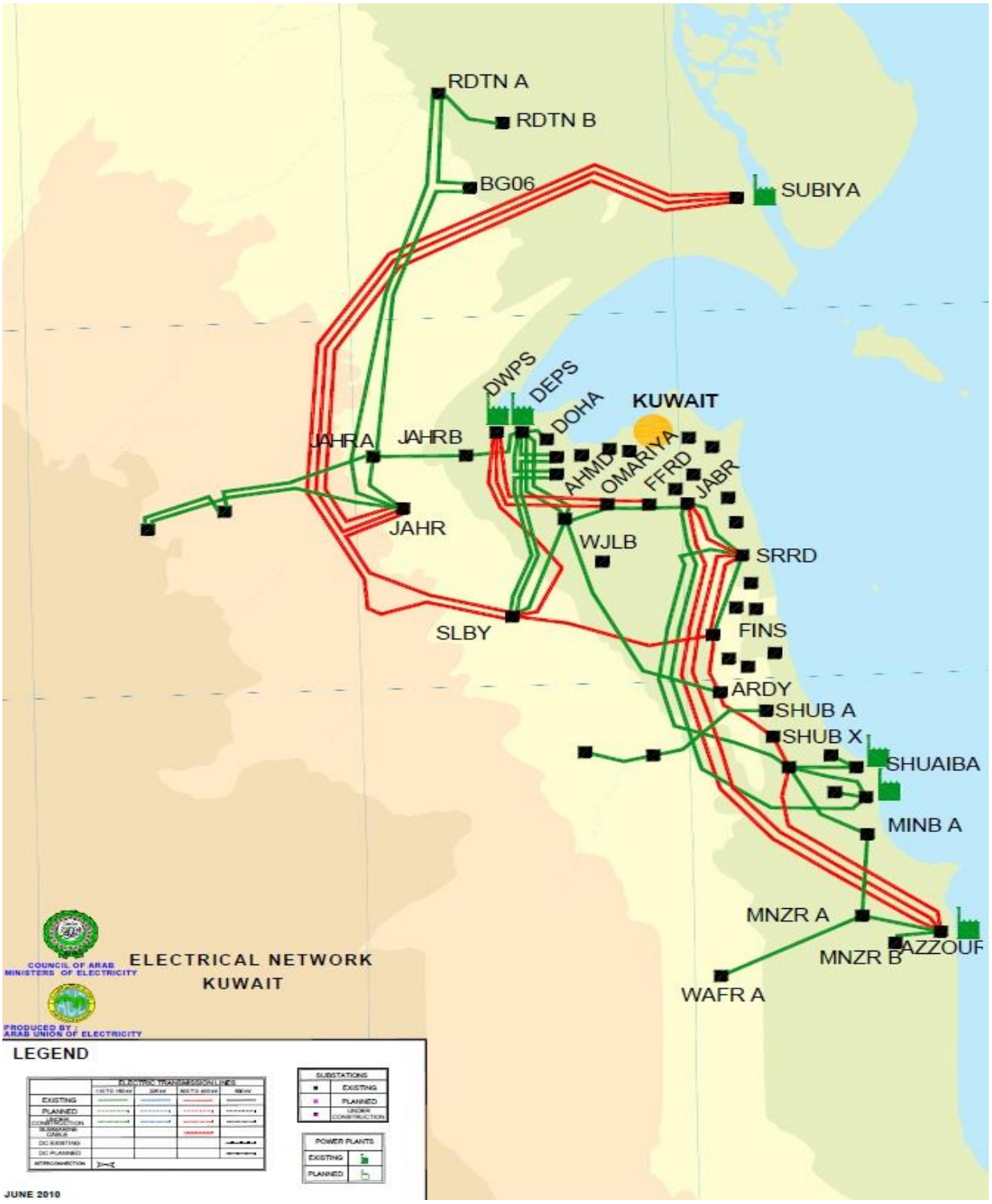
Project Name	Capacity (KV)	Project Value (USD mn)	Phase	Completion Date
Kuwait MEW - Raudhatain W to Raudhatain X Substations Overhead Transmission Lines	300	106	Supply & Installation - Execution	Jun 2016
Kuwait MEW - Sabah Al Ahmad Underground Cables - Phase 5	132	73	Supply & Installation - Execution	Q2 2016
Kuwait MEW - Wafra 400 KV XLPE Power Cables and Fiber Optic Cables	400	44	Supply & Installation - Awarded	Q4 2017
Kuwait MEW - 400 KV Overhead Transmission Lines	400	42	Supply & Installation - Execution	Q4 2016
Kuwait MEW - Kuwait Various Areas High Voltage Overhead Transmission Lines	400	35	Supply & Installation - Awarded	Q2 2017

Source: Zawya projects

Full list of projects in transmission & distribution sector are given in the Appendix Section. The power generation projects which are in the study phase are also given in that section.

Shown below is the electrical network of Kuwait as of June 2010 produced by the Arab Union of Electricity.

Figure 4.3: Electrical Network - Kuwait



Source: Arab Union of Electricity

5. Law & Regulation

Ministry of Electricity & Water (MEW)

The development of power sector in Kuwait can be seen in three phases.[24]

Electricity entered to Kuwait in 1913

1. Electricity entered to Kuwait in 1913, though the real generation of power started only in 1934 through Electricity National Company.
2. Later in 1951 government bought all the shares in the company and established the General Department of Electricity. Several power stations were set up under the department by MEW following it.
3. After ownership of the company had been transferred to Kuwait government and establishing the first generation plant in Shuweikh Area, Electricity General Department, deliberately, raised electrical network pressure of 380 volts to be 11,000 volts and extended its geographical area to cover the increasing number of consumers. The secondary switch plant is established in power of 11KV/415 volts using the earth cables and air lines of 11KV to feed. However, quickly, the network 11KV has reached its technical extend for transferring the energy for the distant places.

In 1951, government bought all the shares in the Electricity National Company

Gulf Co-operation Council Interconnection Authority (GCCIA)[25]

As per GCC Economics Agreement, GCC countries decided to construct an interconnection network for a reliable and robust power supply in the region. It was also decided in view of future trading to distant partners in EJILST and UCTE networks. The objectives of GCCIA are:

1. Connecting the electricity networks of the member states by providing the required investments to exchange energy to overcome the loss of generation capacity in emergency situations.
2. Reduce reserve generation capacity requirements of the national networks of the member states.
3. Enhance dependability of the electricity systems of the member states.

[24] MEW Website
[25] GCCIA Website, MEED Projects

Enhance the contribution of the electricity industry to the GDPs of the member states.

4. Provide the basis for energy exchange between the member states to support their economies and bolster reliability of their electricity supplies.
5. Maintain relations with electricity companies and entities involved in the electricity sectors of the member (and other) states in order to coordinate their activities and enhance their operational efficiencies taking into consideration the special circumstances of each state.
6. Enhance the contribution of the electricity industry to the GDPs of the member states.
7. Monitor international technical developments in the field of electricity with a view to adopting the best and latest technologies to enhance electricity interconnection between the member states.

GCC power grid has three phases:

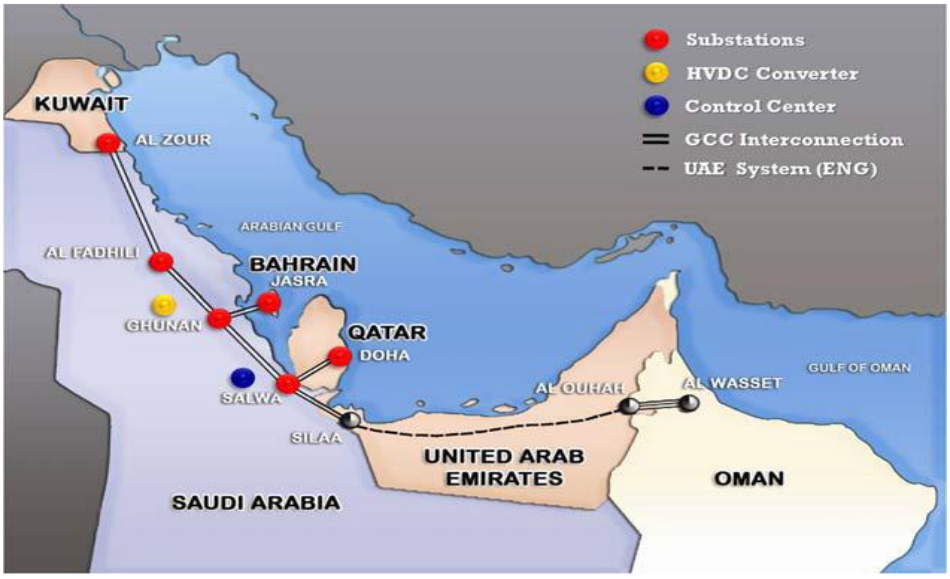
Phase 1: Interconnection of Saudi Arabia, Kuwait, Qatar and Bahrain. This system is the GCC North Grid. This was completed in 2009 mid.

UAE & Oman was connected to the GCCIA in a USD 1.4bn project, which was completed in the April 2011.

Phase 2: UAE & Oman was connected to the GCCIA in a USD 1.4bn project, which was completed in the April 2011.

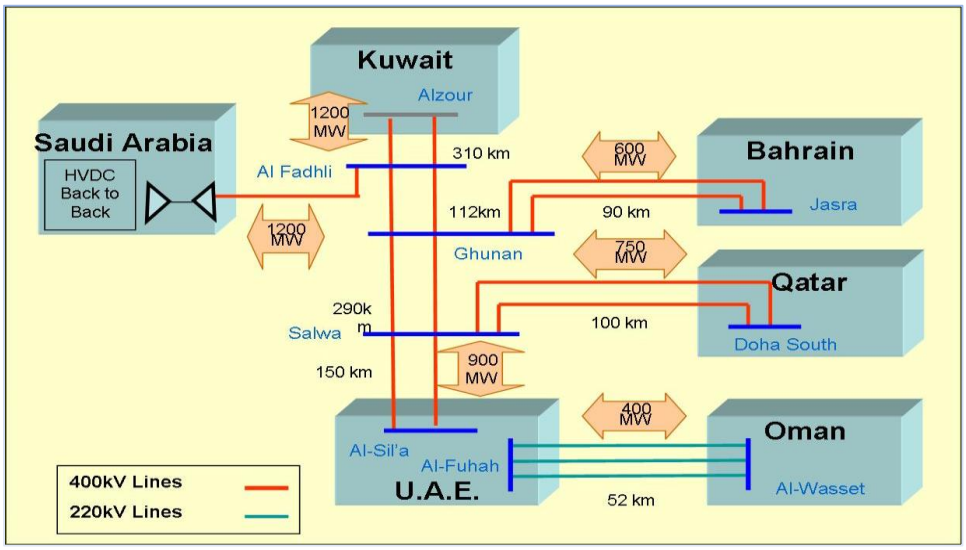
Phase 3: Interconnection of North Grid to South Grid was completed in April 2011.

Figure 5.1: GCCIA Project Map



Source: GCCIA Website

Figure 5.2: GCCIA Power Grid Electrical Map



Source: GCCIA Website

Tariffs & Rates

Main reason for the low prices is the easy availability of primary energy resources in the form of liquid fuels and natural gas. Kuwait, having the sixth largest proven oil-reserves in the world

As a single entity, MEW functions as the regulatory for the power sector in Kuwait. Tariffs and electricity rates are decided by the Ministry. Similar to other GCC economies, Kuwait has one of the lowest tariff structures in the world. Main reason for the low prices is the easy availability of primary energy resources in the form of liquid fuels and natural gas. Kuwait, having the sixth largest proven oil-reserves[26] in the world, gets liquid fuels needed for firing the thermal power stations at very low costs, though the opportunity costs are very high. Additionally, the government provides subsidies for the power consumption to the industrial sector.

These subsidies in the demand side will increase the power consumption. The government will have to provide subsidies in the supply side, for the power plants. Otherwise, the power plants will not be able to cover up the costs of fuel from the electricity sales revenue. The solution at hand, might be to further increase the tariff rates. This will also help in encouraging the conservation of power among the consumers.

[26] OPEC Statistics

Table 5.1: Tariff Rates in Kuwait (kWh)

User Types	Residential			Commercial & Industrial	Agricultural Farms	Chalets & Stables
	0-4,500	4,501-8,000	>8,000			
Tariff	2	7	11	1	2.3	12

Source: MEW (Tariff rates in fils/kWh. 1 fil is one thousand of a Kuwait Dinar.), KISR

Kuwait Authority for Power Projects (KAPP) will be the focal point of the Public Private Partnership (PPP) program.

With the entry of private players into the otherwise monopolized sector of Kuwait, MEW will enter into Energy Conversion and Water Purchase Agreement (ECWPA) with the project companies. Kuwait Authority for Power Projects (KAPP) will be the focal point of the Public Private Partnership (PPP) program. As per IWPP law in Kuwait, KAPP is the delegated government authority to establish the joint stock company to implement the projects.[27]

Trading Regulation & Codes

Energy trading within GCC power grid will be regulated through PETA

As Kuwait maintains a very high reserve margin compared to its neighboring states, it could potentially look forward to electricity exports in the coming future. Kuwait was connected to the Saudi Arabia, Qatar and Bahrain through the GCCIA power grid in the first phase. Energy trading within GCC power grid is governed by the Power Exchange & Trading Agreements (PETA). GCCIA board will oversee the work of Regulatory Advisory Committee (RAC) which will function as the regulatory body for the power exchanges and trading in the GCC Power grid area. The challenge for the Kuwait will be to form standards that are matching the existing legislation and PETA.

PETA mainly covers:[28,29]

- Obligation to maintain minimum installed generation capacity and operation reserves.
- Rights involved with the allocation to interconnector transmission capacity, operation and pricing.

[27] Al-Zour North IWPP Project Brief: PTB, State of Kuwait, September 2010, p10
[28] Opportunities of Exchange & Trade of Power between GCC Interconnected Grids: Ahmed A. Ebrahim, Director, System Operations & Maintenance, GCC Interconnection Authority, p4-p7
[29] The Potential of Regional Power Sector Integration: Gulf Cooperation Council Countries Transmission & Trading Case Study – Economic Consulting Associates, February 2010, p23, p24

- Energy Trading and ancillary services including planned or scheduled transfers and unscheduled transfers.

The PPP law sets the foundation for the implementation of infrastructure Public Private Partnership projects in Kuwait.

The PPP Law[30] sets the foundation for the implementation of infrastructure Public Private Partnership (PPP) projects in Kuwait. The Law combines the objective of attracting private-sector participation based on competitive and transparent rules with the social objective of ensuring that the economic benefits of private investment are shared with Kuwaiti citizens. The PPP Law establishes a legislative framework to promote and facilitate PPPs in public infrastructure and land-based development projects.

In June 2010, IWPP Law[31] establishing Kuwaiti Joint Stock Companies to undertake the building and performance of electric power and water desalination stations in Kuwait was issued. The IWPP Law applies to all electric power and water desalination projects in excess of 500 MW implemented under the PPP Law. The PPP Law will continue to be applicable to all matters not provided for by the IWPP Law.

IWPP Law applies to all power projects in excess of 500 MW

The Energy Conversion & Water Purchase Agreement (ECWPA)[32] will be the principal contract for the project and will be entered into between the project company as a generator and MEW (representing the Government of the State of Kuwait). Under the ECWPA, MEW will be responsible for supplying the project company with its fuel requirements on an energy conversion basis. This agreement will cover the technical and commercial conditions governing the long-term supply of fuel to the plant.[33]

The ECWPA will contain commercial and legal terms and conditions covering,[34]

- The development, financing, design, engineering, procurement, construction, testing and commissioning of the plant and the shared facilities.

[30] Al-Zour North IWPP Project Brief: PTB, State of Kuwait, September 2010, p10
[31] Al-Zour North IWPP Project Brief: PTB, State of Kuwait, September 2010, p10
[32] Al-Zour North IWPP Project Brief: PTB, State of Kuwait, September 2010, p14
[33] Al-Zour North IWPP Project Brief: PTB, State of Kuwait, September 2010, p11, p12
[34] Al-Zour North IWPP Project Brief: PTB, State of Kuwait, September 2010, p14

The ownership, operation and maintenance of the plant by the project company.	• The transfer of the shares in any company incorporated for purposes of the shared facilities and the ownership, operation and maintenance of the shared facilities by such company. • The ownership, operation and maintenance of the plant by the project company. • The terms upon which Project Company will sell and MEW will purchase electricity and water, setting out the basis upon which the project company will receive payments. • The rights and obligations of the parties regarding the supply, delivery, storage and use of fuel. • Deductions, liquidated-damages and other compensation in response to any deviation from the terms and conditions of the ECWPA. • The transfer of assets and personnel at the end of the term, including stated handover requirements.

6. Project Financing

The traditional project financing options are syndicated loans, debt and equity capital markets. However, the Government of Kuwait has embarked on an ambitious program to promote collaboration between the public and private sectors with the introduction of the new PPP law.

In mid-2014, Kuwait enacted the new public private partnership (PPP) law to encourage private investor's participation in projects and reduce the financial burden of the government by limiting spending.

In mid-2014, Kuwait enacted the new public private partnership (PPP) law to encourage private investor's participation in projects and reduce the financial burden of the government by limiting spending.

The New PPP Law was vital to accommodate the ambitious PPP program and to organize some of the practices applied in the Az-Zour North Independent Water and Power Project (Phase 1), the largest ongoing PPP project in Kuwait which began in 2014. As a result, a variety of new PPP projects are under consideration in Kuwait. Additionally, Phase 2 of the Az-Zour North Project is currently open for tenders. Invitations have also been delivered to potential contractors to participate in a waste-to-energy facility in the Kabd area of Kuwait. This activity is partly a result of the enhancements made to the regulatory environment by the New PPP Law.

The legal norms under the New PPP Law is aimed at reducing challenges faced to date in procuring PPP projects in Kuwait, clarifying the law, and bringing it more in line with international standards. Apart from providing a complimentary financial and legal framework, the new PPP law also includes norms that support foreign investors to compete Kuwaiti companies on equal level basis. Under the New PPP Law, Kuwait Authority for Partnership Projects (KAPP) has replaced the Partnerships Technical Bureau (PTB), which was previously the main body responsible for implementation of PPP projects in Kuwait. The Kuwait Authority of Partnership Projects (KAPP), is expected to award PPP projects worth KWD 2bn (USD 6.6bn) in 2016.

Apart from providing a complimentary financial and legal framework, the new PPP law also includes norms that support foreign investors to compete Kuwaiti companies on equal level basis.

The Law prior to the New PPP Law prohibited the mortgage of project land, buildings and even the equipment situated on the land. The lender's

The New PPP Law has relaxed these restrictions and prohibitions and clarified what may be pledged as security.

willingness to provide financing for the project was affected due to this restrictions, limiting the lenders from taking adequate security over the material assets of the project. Due to the nature of limited recourse financing, lenders need to ensure that any and all security available to them is properly registered and perfected. The New PPP Law has relaxed these restrictions and prohibitions and clarified what may be pledged as security. The New PPP Law codifies some of the financing techniques applied in the Phase 1 of the Az-Zour North Project, such as assignment of proceeds, pledge against shares in both the Project Company and the Consortium Company (even during the initial 2-year lock-out period) and mortgages over the assets comprising the project (other than the land). It also provides more clarity on the procedures to be undertaken in the event the project needs to be transferred to a new consortium.

It also provides more clarity on the procedures to be undertaken in the event the project needs to be transferred to a new consortium.

Table 6.1: Future IPPs/IWPPs in Kuwait

Projects	Capacity (MW)	Investment (USD bn)	Financial Close
Future Projects/IPPs/IWPPs			
Al Zour South - MEW	400	0.40	Q1 2014
Al Khairan IWPP - KAPP	2,500	2.50	Q1 2016
Al Abdaliyah ISCC - KAPP	228	0.30	Q2 2016
Nuwaiseeb IPP - KAPP	2,500	2.50	Q2 2017
Al Zour North IWPP - KAPP	4,800	5.86	Q3 2017
Al Abdali Renewable Energy Complex	70	0.10	Q2 2018
New Shuaiba South - KAPP	1,400	1.80	Q4 2018
New Doha East - KAPP	2,300	3.00	Q4 2020
Kuwait KAPP - Julai'a IPP	1,000	N.A	N.A.
Kuwait KAPP - Al Khiran IWPP	1500	N.A	N.A

Source: MEED Projects, Zawya Projects, MEW, KAPP

A 228MW Integrated Solar Combined Cycle (ISCC) power project at Al Abdaliyah area in eastern Kuwait, as part of its public-private partnership (PPP) development programme, was submitted to Kuwait Authority for Power Projects (KAPP) higher committee. Japan Cooperation Center for the

Middle East (JCCME)[35] provided finance for a portion of study through a scheme by Japan Government.

Currently, almost four various projects are under execution in the power generation sector in Kuwait. The estimated consolidated investment on these projects is USD 5.2bn. The transmission and distribution sector is undergoing a large number of projects in various phases, with a total investment around USD 4.3bn.

[35] MEED Projects

7. Key Learning

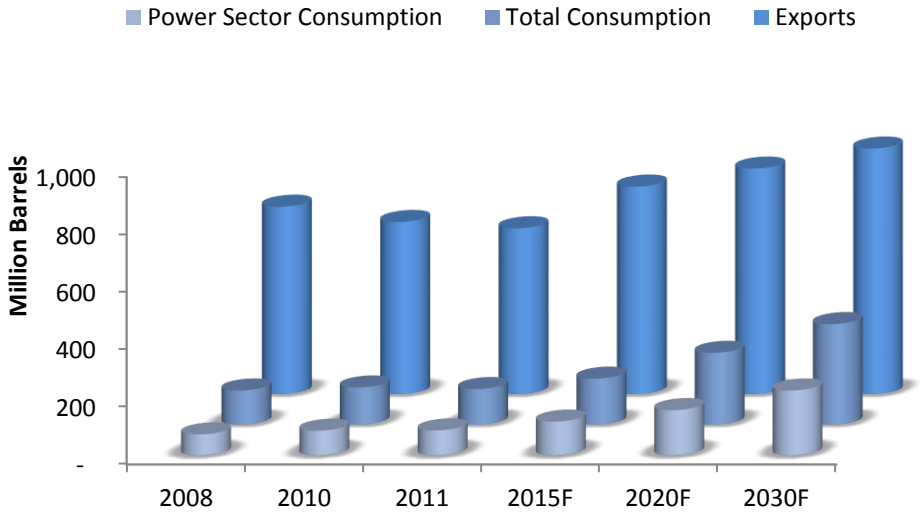
Though Kuwait government is committed for diversification through fund allocation and developmental activities, the activities are not fast enough.

Economic diversification is a huge long-term challenge in front of Kuwait authorities. Though Kuwait government is committed for diversification through fund allocation and developmental activities, the activities are not fast enough. Hence, the Kuwait economy is still highly dependent on its oil sector.

Followed by the Gulf war and the Iraqi invasion, Kuwait saw a huge need of reconstruction across the region, which pushed up the demand for electricity. Hence the power generation sector in Kuwait saw a steady growth of 5% annually for the last 10 years. The current electricity statistics, as per Ministry of Electricity & Water (MEW) of Kuwait, says that the growth in the power sector is yet to continue, in this same pace, for the next 10 years, at the least. This will require the Kuwait power sector to ramp up its capacity by two-fold with in this period.

Figure 7.1: Oil Export vs Consumption Statistics

The current electricity statistics, as per Ministry of Electricity & Water (MEW) of Kuwait, says that the growth in the power sector is yet to continue.



Source: Markaz Research, EIA, MEW

Further, the Kuwait power sector meets 70% of its fuel requirement from liquid fuels rather than efficient, natural gas. With the current level growth forecast, if the Kuwait government does not alter the energy mix, by 2030,

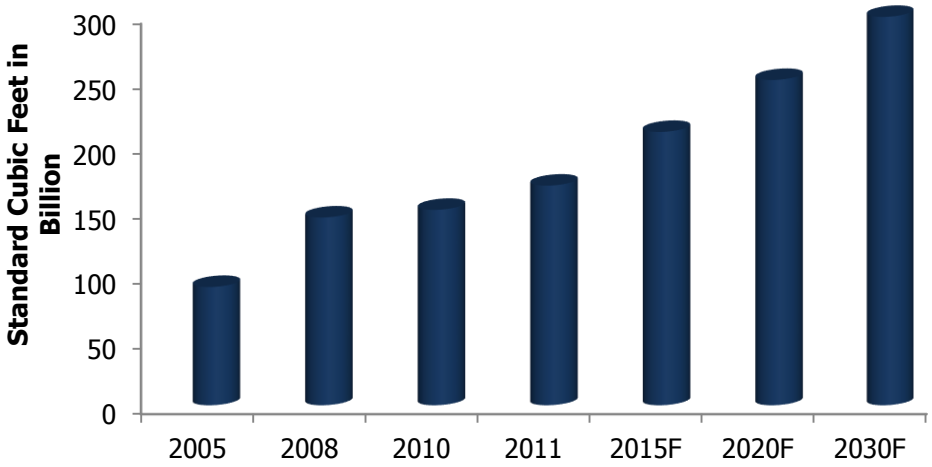
Escalating electricity demand and the lower natural gas prices will naturally challenge this position in long-run.

the economy will have to forego huge revenues on its oil exports. Currently, almost 300,000 barrels of oil per day are consumed by the Kuwait power generating units, to meet its demand.[36] Escalating electricity demand and the lower natural gas prices will naturally challenge this position in long-run. Thus, the country will have to devise a gas strategy to fuel its power sector. From 2009 onwards, Kuwait is importing Liquefied Natural Gas (LNG) to supply to its power plants.

In the above statistics, we have considered the Kuwait government's commitment to increase the oil production to 4 million barrels/day, by 2020. Further, this will be only a partial solution. Kuwait eventually will have to focus on the renewable and sustainable energy resources such as solar and wind power generation.

Figure 7.2: Natural Gas Consumption in Power Generation in Kuwait

Further, this will be only a partial solution. Kuwait eventually will have to focus on the renewable and sustainable energy resources such as solar and wind power generation.

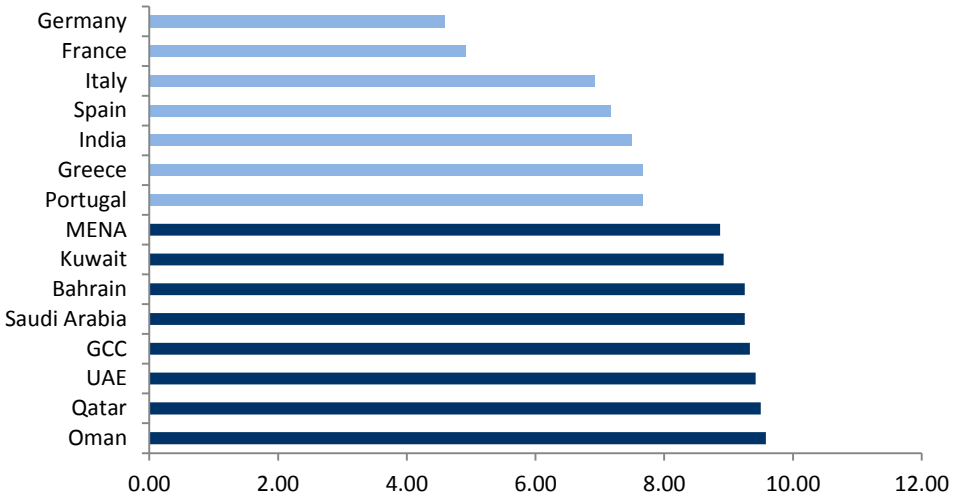


Source: Markaz Research, EIA, MEW

Though Kuwait has one of the lowest sunlight hours among the GCC countries, solar power generation is highly viable in technical and economic sense.

[36] Markaz Estimates – "Powering Kuwait into the 21st Century: Adopting a Sustainable Strategy"

Figure 7.3: Average Daily Sunlight hours

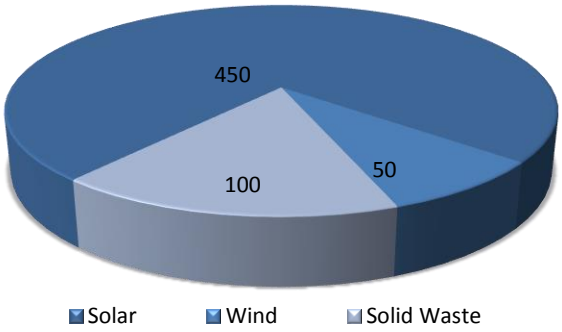


Source: weather2travel.com

It will have CSP plant and wind farm with an estimated investment of USD 100 million.

Ministry of Electricity & Water (MEW) plans to build a 228MW Integrated Solar Combined Cycle (ISCC) power plant at Al Abdaliyah area in eastern Kuwait, as part of its Public Private Partnership (PPP) development programme. Kuwait Authority for Power Projects (KAPP) is reviewing this proposal at present. The project is estimated to cost around USD 300 million. MEW is also planning to develop a renewable energy park in collaboration with Kuwait Institute for Scientific Research (KISR) at Al Abdali in the northern part of the country. It will have CSP plant and wind farm with an estimated investment of USD 100 million. KAPP has also announced a waste-to-energy plant at Kabd, which will process the Kuwait municipal waste. These initiatives alone are not enough to meet the targeted ambitions of 2-3% of renewable energy in Kuwait by 2020.

Figure 7.4: Investments in Alternate Energy in USD Mn. (Till 2020)

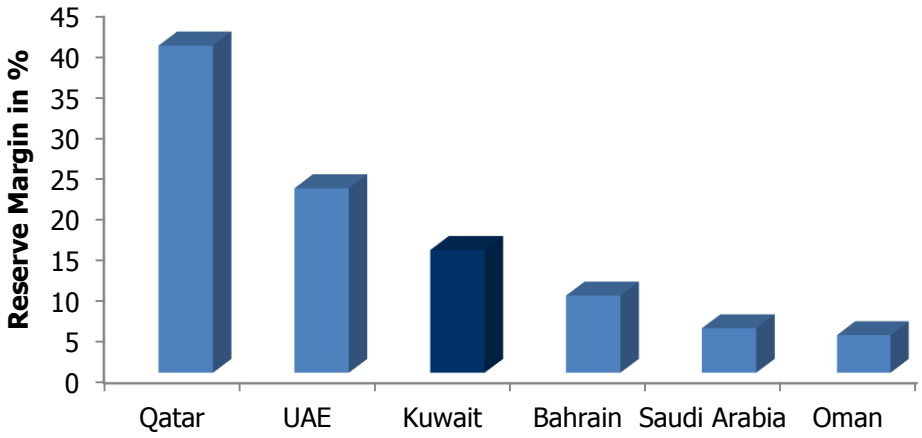


Source: MEED Projects, MEW, KAPP, KISR

Reserve margins in Kuwait power sector, historically, had been very high compared to other GCC countries.

Reserve margins in Kuwait power sector, historically, had been very high compared to other GCC countries. The current level of 15% reserve margin is considerably high. Thus, Kuwait power sector could look forward to electricity exports in the coming future. The private players entering the market could also plan for the energy trading in long-run.

Figure 7.5: Reserve Margins in GCC



Source: MEED Projects, Markaz Research

8. Threats & Challenges

Nearly half of the Kuwait's GDP is dependent on the oil sector.

Heavy dependency on the oil sector is the biggest challenge for Kuwait. 90% of the total exports and 95% of the total government revenue comes from this sector. Nearly half of the Kuwait's GDP is dependent on the oil sector. It is indispensable for Kuwait, to look for faster means, to diversify its economy. Government needs to remain with their commitment in development and fund allocations that will help the economy to diversify.

With the available low-priced liquid fuels, the power sector of Kuwait meets almost 70% of its primary energy needs through heavy oil, crude oil and gas oil. Gas fired power generation technologies, though they are efficient than their oil-fired counterparts are a minority in the Kuwait power generation sector. MEW is committed to altering its energy mix in Kuwait power sector. Otherwise, as mentioned earlier, Kuwait government will have to forego revenues from the oil exports in the future.

Per capita consumption of power in Kuwait is one of the highest in the world. Adding to it, population growth in Kuwait is seen at an unprecedented level, so that the power demand is set to increase to 25,000MW by 2030. This will require Kuwait power sector to add the capacity by two-fold, within this period.

Power subsidy is another threat facing Kuwait. Huge subsidies are given to the residential and industrial sector in Kuwait, resulting in heavy usage.

Power subsidy is another threat facing Kuwait. Huge subsidies are given to the residential and industrial sector in Kuwait, resulting in heavy usage. The policy on rationalizing the usage of electricity has to be strictly enforced to check the wastage and squandering of resources that are precious.

Kuwait has only a very few projects in the sustainable and renewable energy sector in its action plans. There should be a shift in this trend. Kuwait government had ambitions of meeting 2-3% of its power demand through renewable means by 2020. This agenda should be made a high priority item in its future development plans and should try to attract international firms to establish their units in Kuwait.

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10. Appendix

Table 10.1: On-going, Power Transmission and Distribution Projects (Standalone Projects)

Project Name	Capacity (KV)	Project Value (USD Mn)	Phase	Completion Date
Kuwait MEW - Mina Abdullah Water Distribution Complex - Phase 2	350 million g/d water	257	Construction - Execution	H2 2014
KOC - North Kuwait Power Distribution Network		200	EPC - Execution	Sep 2014
Kuwait MEW - Sabah Al Ahmad Underground Cables - Phase 2	400	108	Supply & Installation - Execution	2014
Kuwait MEW - Raudhatain W to Raudhatain X Substations Overhead Transmission Lines	300	106	Supply & Installation - Awarded	May 2015
Kuwait MEW - Sabah Al Ahmad Underground Cables - Phase 5	132	73	Supply & Installation - Execution	Q1 2015
Kuwait MEW - Al Rai E, Al Jiwan A, Al Adan A, Al Ismant A 8 Main Transformer Stations	11	68	Supply & Installation - Awarded	Q4 2013
Kuwait MEW - Sabah Al Ahmad Z1 Main Transformer Station	132	62	Supply & Installation - Execution	Q1 2016
Kuwait MEW - Sabah Al Ahmad Underground Cables - Phase 4	132	45	Supply & Installation - Execution	Q3 2015
Kuwait MEW - 400 KV Overhead Transmission Lines	400	42	Supply & Installation - Execution	Q4 2016
Kuwait MEW - Shadadiyah University City XLPE Underground Cables	300	32	Supply & Installation - Awarded	Q4 2014
Kuwait MEW - Kuwait 132 kV Underground Electricity Distribution Network	132	31	Supply & Installation - Execution	Mar 2014
Kuwait MEW - Shuaibah Underground Cables - Phase 2	132	18	Supply & Installation - Awarded	H2 2013
Kuwait MEW - Rehabilitation and Extension of 11 KV Medium Pressure Ground Cables	11	11	Construction - Awarded	Q4 2016
Kuwait MEW - Kuwait City Low Pressure Ground Cables Extension and Rehabilitation	11	9	Construction - Bid Evaluation	Q4 2016
Kuwait MEW - Kuwait City and Hawalli Medium Voltage Network Emergency Repairs	11	7	Construction - Execution	2016
Kuwait MEW - Kuwait 11 kV Underground Electricity Distribution Network Expansion	11	6	Construction - Execution	H2 2014
Kuwait MEW - North of Kuwait Medium Voltage Electricity Transmission Network	11	6	Supply & Installation - Awarded	2015
Kuwait MEW - Kuwait South 11 kV Medium and Low Voltage Overhead Transmission Lines	11	4	Supply & Installation - Execution	2015
Kuwait MEW - Kuwait South 11 kV Overhead Transmission Line	11	4	Supply & Installation - Execution	Sep 2015
Kuwait MEW - Kuwait North 11 kV Medium and Low Voltage Overhead Transmission Lines	11	3	Supply & Installation - Awarded	H1 2016
Kuwait MEW - Kuwait North Medium and Low Voltage Transmission Lines	11	3	Construction - Execution	2014
Kuwait MEW - Farwaniah Ground Cables Upgrade and Extension	11	0	Supply & Installation - Bid Evaluation	Q1 2017
Kuwait MEW - High & Extra High Voltage Lines in Different Areas in Kuwait City	300	0	Supply & Installation - Bid Evaluation	Q4 2015
Kuwait MEW - Kuwait Various Areas Substations	11	0	Supply & Installation - Bid Submission	Q2 2017

Source: Zawya Projects

Table 10.2: Ongoing projects, Ministry of Electricity and Water

Project Name	Capacity	Project Value (USD Mn)	Project Status	Completion Date
Kuwait MEW - Doha West Power Station Renovation of Steam Turbines and Generators Renovation	NA	308	EPC - Bid Evaluation	2020
Kuwait MEW - 500MW Subiya Power Plant	500MW	287	Supply & Installation - Execution	Mar 2015
Kuwait MEW - Al Zour South 500 MW Power Plant Expansion	500MW	284	Supply & Installation - Execution	Q2 2015
Kuwait MEW - Mina Abdullah Water Distribution Complex - Phase 2	350Mn g/d water	257	Construction - Execution	H2 2014
Kuwait MEW - Sabah Al Ahmad Underground Cables - Phase 2	400KV	108	Supply & Installation - Execution	2014
Kuwait MEW - 132 KV XLPE Power Cables and Fiber Optic Cables	132KV	106	Supply & Installation - Bid Evaluation	Q2 2016
Kuwait MEW - Raudhatain W to Raudhatain X Substations Overhead Transmission Lines	300KV	106	Supply & Installation - Awarded	May 2015
Kuwait MEW - Shadadiyah University 132 kV XLPE Cables	132 KV	76	Supply & Installation - Awarded	Q4 2015
Kuwait MEW - Sabah Al Ahmad Underground Cables - Phase 5	132KV	73	Supply & Installation - Execution	Q1 2015
Kuwait MEW - Al Rai E, Al Jiwan A, Al Adan A, Al Ismant A 8 Main Transformer Stations	11KV	68	Supply & Installation - Awarded	Q4 2013
Kuwait MEW - Sabah Al Ahmad Z1 Main Transformer Station	400/132 KV	62	Supply & Installation - Execution	Q1 2016
Kuwait MEW - Sabah Al Ahmad Underground Cables - Phase 4	132KV	45	Supply & Installation - Execution	Q3 2015
Kuwait MEW - 400 KV Overhead Transmission Lines	400KV	42	Supply & Installation - Execution	Q4 2016
Kuwait MEW - Shadadiyah University City XLPE Underground Cables	300KV	32	Supply & Installation - Awarded	Q4 2014
Kuwait MEW - Kuwait 132 kV Underground Electricity Distribution Network	132KV	31	Supply & Installation - Execution	Mar 2014
Kuwait MEW - Shuaibah Underground Cables - Phase 2	132 KV	18	Supply & Installation - Awarded	H2 2013
Kuwait MEW - Rehabilitation and Extension of 11 KV Medium Pressure Ground Cables	11KV	11	Construction - Awarded	Q4 2016
Kuwait MEW - Kuwait City Low Pressure Ground Cables Extension and Rehabilitation	11KV	9	Construction - Bid Evaluation	Q4 2016
Kuwait MEW - Kuwait City and Hawalli Medium Voltage Network Emergency Repairs	11KV	7	Construction - Execution	2016
Kuwait MEW - Kuwait 11 kV Underground Electricity Distribution Network Expansion	11KV	6	Construction - Execution	H2 2014
Kuwait MEW - North of Kuwait Medium Voltage Electricity Transmission Network	11KV	6	Supply & Installation - Awarded	2015
Kuwait MEW - Kuwait South 11 kV Medium and Low Voltage Overhead Transmission Lines	11KV	4	Supply & Installation - Execution	2015
Kuwait MEW - Kuwait South 11 kV Overhead Transmission Line	11KV	4	Supply & Installation - Execution	Sep 2015
Kuwait MEW - Kuwait North 11 kV Medium and Low Voltage Overhead Transmission Lines	11KV	3	Supply & Installation - Awarded	H1 2016
Kuwait MEW - Kuwait North Medium and Low Voltage Transmission Lines	11KV	3	Construction - Execution	2014
Kuwait MEW - MEW and MPW Rooftop Photovoltaic Solar Plant	1MW	3	Supply & Installation - Execution	Q1 2014
Kuwait MEW - Doha West Main Valves for Distillers Steam Pressure Reducing Station	NA	2	Supply & Installation - Bid Evaluation	Q2 2016

Kuwait MEW - Farwaniah Ground Cables Upgrade and Extension	11KV	0	Supply & Installation - Bid Evaluation	Q1 2017
Kuwait MEW - High & Extra High Voltage Lines in Different Areas in Kuwait City	300KV	0	Supply & Installation - Bid Evaluation	Q4 2015
Kuwait MEW - Kuwait Various Areas Substations	132/11KV	0	Supply & Installation - Bid Submission	Q2 2017

Source: Zawya Projects

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