

Effects of COVID-19 on Electrical Consumption

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I. OVERVIEW

The Coronavirus (COVID-19) outbreak has caused a direct impact on the electricity demand all over the world especially in **KUWAIT**. **COVID-19** can be spread easily among people, so, some precautions have been taken to slow it down and stop it. Governments have launched campaigns to make people stay at home.

Researchers say that the virus could be ended at the end of summer based on WHO info, on the other hand, the electricity demand will be increased roughly due to governments decisions which states that every citizen must stay at home and mustn't deal with anyone outside home.

As many of the working population are preparing to work from home, the electricity demand pattern is expected to take a new shape. It is widely anticipated that the electricity demand in the coming weeks and months will largely resemble the consumption pattern on the weekends as more people stay at home. The full impacts on electricity usage are not yet known, but grid operators say demand is both shifting and falling. So, in this research some discussions and comparisons will be made to clarify the effect of **COVID-19** spread on **KUWAIT**'s electrical network.

II. ELECTRICAL DATA ANALYSIS DURING 2018-2019



KUWAIT has put new strategies to improve and develop the electrical power network all over the country.

As mentioned above, Coronavirus has great impacts on the usage of electrical power demand over

KUWAIT. So, in this section data analysis of electrical usage during 2018-2019 will be introduced according to MEW. Statistics shows normal usage of electrical consumption as shown in the following figures.

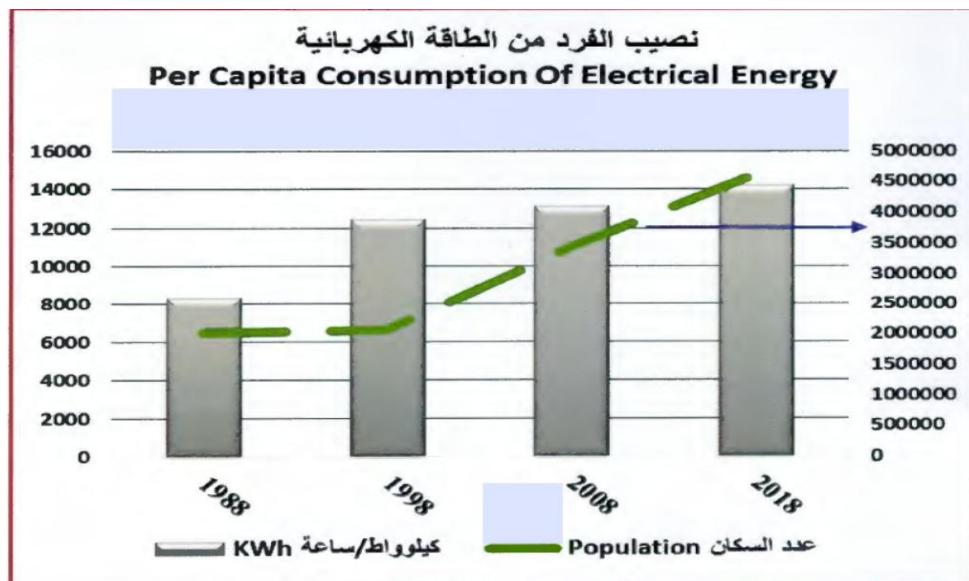


Figure 1-2; Total Electrical Consumption per person.

As illustrated in fig. 1-2, the total consumption per year for one person is nearly **14000Kwh** and it's considered to be a normal percentage over the year. The shown percentage is measured under the rated conditions (Normal temperature, operation and convenient population

growth).Also, it's observable that the electricity generation in **KUWAIT** rises roughly because of new electrical installments of different types of power stations such as; steam and renewable stations as mentioned in the next figure.

القدرة المتوفرة للطاقة في محطات القوى (بالميجاواط) كما هو في 2018/12/31
 Power Stations' Available Capacity (MW) as on 31.12.2018

المحطات Stations	القدرة المتوفرة للطاقة في محطات القوى (من الوقود)				القدرة المتوفرة من الطاقة البديلة		مجموع القدرة المتوفرة Total Availability Capacity	
	توربينات الغاز		توربينات البخار		توربينات الدورة المشتركة			
	عدد وقدرة كل وحدة Capacity of Each Unit	المجموع Total	عدد وقدرة كل وحدة Capacity of Each Unit	المجموع Total	عدد وقدرة كل وحدة Capacity of Each Unit	المجموع Total		
محطة تلويح Talwikh Station	6 x 42	252	-	-			- 252	
محطة الشعيبة الجنوبي iba South Station	-	-	6 x 120	720			- 720	
محطة الشعيبة الشمالي iba North Station	3 x 220	660			1 x 215.5	215.5	- 875.5	
محطة التوكرة الشرقية ha East Station	4 x 18	72	7 x 150	1050			- 1122	
محطة التوكرة الغربية ha West Station	5 x 28.2	141	8 x 300	2400			- 2541	
محطة الرزور الجنوبي our South Station	8 x 130 4 x 27.7 5 x 165 2 x 250	1040 110.8 825 500	8 x 300	2400	2 x 280 2 x 185	560 370	- 5805.8	
محطة الشعيبة الشمالية abiya Station	6 x 41.7 4 x 62.5 6 x 220 2 x 250 2 x 250	250.2 250 1320 500 500	8 x 300	2400	3 x 215.5	646.5	- 5866.7	
محطة الرزور الشمالي our North Station	5 x 220	1100			2 x 220	440	- 1540	
المجموع Total		7521		8970		2232	70 70 18793.0	

Figure 2-2; Power stations available capacity in 2018-19.

So, it's deduced from the last figures that the country has an excessive amount of power generation that can overcome obstacles in the current time.

Daily Maximum & Minimum Consumption of Elec. Energy (Network Export) During 2018(Million Wh)

Month	أعلى استهلاك Max. Consumption	التاريخ Date	أدنى استهلاك Min. Consumption	التاريخ Date	الشهر Month
January	110784	10-Jan.	103878	26-Jan.	يناير
February	117488	18-Feb.	103754	25-Feb.	فبراير
March	173600	29-Mar.	110351	2-Mar.	مارس
April	182197	22-Apr.	146253	1-Apr.	اپریل
May	249504	30-May.	174734	1-May.	مايو
June	269312	9-Jun.	229499	22-Jun.	يونيو
July	271842	9-Jul.	251190	29-Jul.	يوليو
August	269911	7-Aug.	245999	3-Aug.	أغسطس
September	264300	4-Sep.	221540	30-Sep.	سبتمبر
October	219536	1-Oct.	132000	29-Oct.	أكتوبر
November	139713	5-Nov.	108729	23-Nov.	نوفمبر
December	122932	6-Dec.	104300	28-Dec.	ديسمبر

Figure 3-2; Daily Maximum & Minimum Consumption of Elec. Energy.

By looking at the previous figure it's observed that the country's power production can handle the peak load demand in summer (9-July).

III. FUTURE ELECTRICAL DATA ANALYSIS DURING 2020

In this section, a future data analysis for 2020 will be handled. The world currently suffers from a pandemic disease called **COVID-19** A.k.A; Coronavirus. Governments took high risk precautions to make people stays at home mandatory and curfew has been applied all over countries. As a result of these precautions, it's expected that the electrical consumption will be increased sharply.

The most shocking numbers are expectedly from Italy. Two weeks ago, electricity demand was slightly higher than in 2019 (perhaps in anticipation of what was set to come). One week ago, electricity demand was 5% below last year's value. In the current week, beginning 16 March, electricity demand during peak-hours was often more than 20% below that of the same week last year.

In KUWAIT, due to the curfew application, the electrical consumption expected to be higher than in 2019 for the following reasons; all citizens stay at home, also, all the air flights have been banned temporary, as a result of that, citizens number in the country has been doubled! The following figures show the future electrical consumption under normal conditions.

Future Estimates of Peak Demand and Generation of Electrical Energy During 2019 - 2025

شبكة وزارة الكهرباء والماء الطاقة الكهربائية المتوقعة لتوليدها (مليون ك.و.س) Expected Electrical Energy Generation (M. kWh)		الحمل الأقصى Peak Load (M.W)	السنة Year
75426	14049	2019	
76769	14190	2020	
78135	14331	2021	
79526	14475	2022	
80942	14620	2023	
82382	14766	2024	
83849	14913	2025	
85341	15063	2026	

Figure 1-3; Future Estimates of peak demand and generation.

As illustrated in fig. 1-3, it's observable that total generated power increases, also, the peak load. But under current circumstances, it's expected that peak load demand will be increased roughly as mentioned above. So, urgent solutions must be introduced to avoid incoming disaster or electrical power failure.

Globally, **Covid-19** has affected the sourcing and supply chains across the power industry. Most of the Asian suppliers of renewable sector equipment are operating with a reduced load, and the developers in India, South Korea, Central Europe and others are witnessing logistical delays. However, the industry is not able to predict the long-term impacts of **Covid-19**.

IV. DISCUSSION OF THE OPTIMIZED SOLUTIONS

It's observed from the last figures that consumption per year / person is 14230KWh, as a

result of safety precautions (stay at home campaigns), it's deduced that the total consumption will be increased roughly. According to [2], KUWAIT has a population of **4.2** Million people and total generated power expected in **2020** is **76769M. KWh**. So, it's assumed that all the people stay at home at same time (**Worst Case**), and by using a simple calculation, total consumption is **59766M. KWh**. It's concluded that this percentage (**77%**) is considered to be a critical case that power stations can run at.

From our perspective as senior electrical engineers, some urgent solutions can be introduced to get rid of high consumption. Hence, we can face this problem without interrupting the power. The following graph shows the big growth in constructing new power stations in the future, it's a very effective step. These new power stations considered to be enough to overcome the incoming crisis.

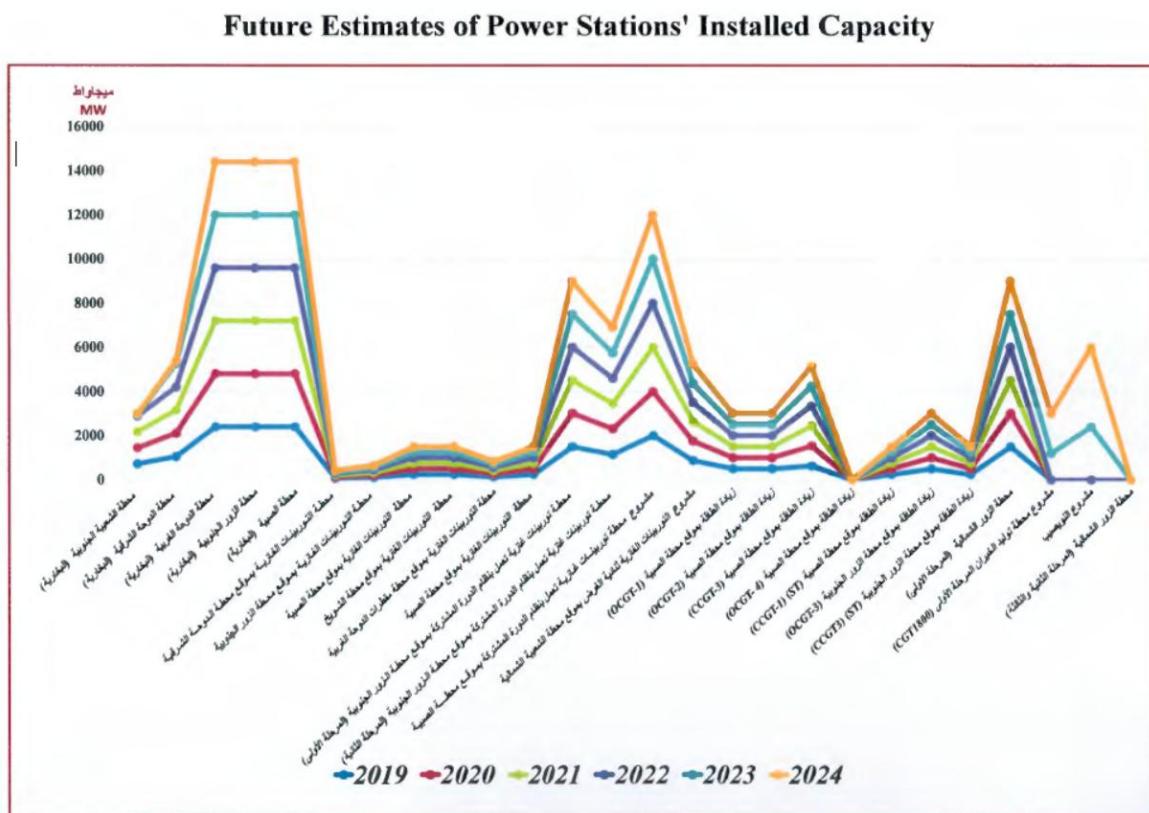


Figure 1-4; Future Estimates of Power Stations Installed Capacity.

- Country has provided **145** diesel generators can be used in emergencies cases.
 - The government also can add up more **UPS** in hospitals and sensitive places to make sure the power is always on.
 - Also, there must be a periodic maintenance on the power stations to avoid operation failure due to the expected high consumption.
 - Country can also cut the power off at schools, this will provide **600MW** nearly according the **MEW** statement.
 - Country should launch awareness campaigns to guide people to save more energy, this will be so helpful to reduce the consumption by using less electrical equipment from **10 AM** to **5 PM** (especially in **Summer**) for example and this period considered to be peak time in **KUWAIT**.
 - On the other hand, government can postpone delivering power to the new projects until **October**.
 - Governmental work and private sectors can also continue working after peak time (**5 PM**). Hence, there won't be any current interruption and everyone benefits.
- [2]. www.paci.gov.kw (Statistics Sections).
 [3]. www.twitter.com/Kuwait_DGCA

REFERENCES

- [1]. www.mew.gov.kw (Statistics Section).