THE Impact Ranking 2023

University: Al-Mustaqbal University College

Country: Iraq

Web Address: https://uomus.edu.iq/en/default.aspx

SDG 7.2: University measures towards affordable and clean energy

7.2.5 Does your university as a body undergo energy reviews to identify areas where energy wastage is highest?

The analysis approach is based on monitored changes in behavior and energy use collected for Al-Mustaqbal university college between 2020 and 2021 periods to identify areas where energy wastage is the highest and to estimate the overall impacts of stay home order on the electricity demand in MUC. First, the monitored building is described including their main features and the variations of their energy use between 2020 and the end of September of 2021. Finally, energy consumption is utilized to estimate the impact of both the actual lockdown period as well as the cost benefits of some mitigation measures to reduce the energy consumption in the MUC building.

1- Energy Consumption Calculation

The MUC is located in Babylon Province well known historical ancient as Babylon, a100-km from the capital Baghdad. Al-Mustaqbal university College comprises the following building: Engineering building, medical building, administration building, sports building, engineering lab building, medical lab building' restaurant. The Percentage of energy consumption in the MUC Buildings for the period of 2020 and 2021 is shown in Fig.1 The focus of this paper is on the annual energy usage of an office building and its HVAC system, and on-peak powers (demands). It can be seen from Fig.1(a) that the medical building has high energy consumption by about 50% of the total energy consumption followed by the engineering building, by about 19%, and the other building (sport and admin, lab building) by about 31 %.

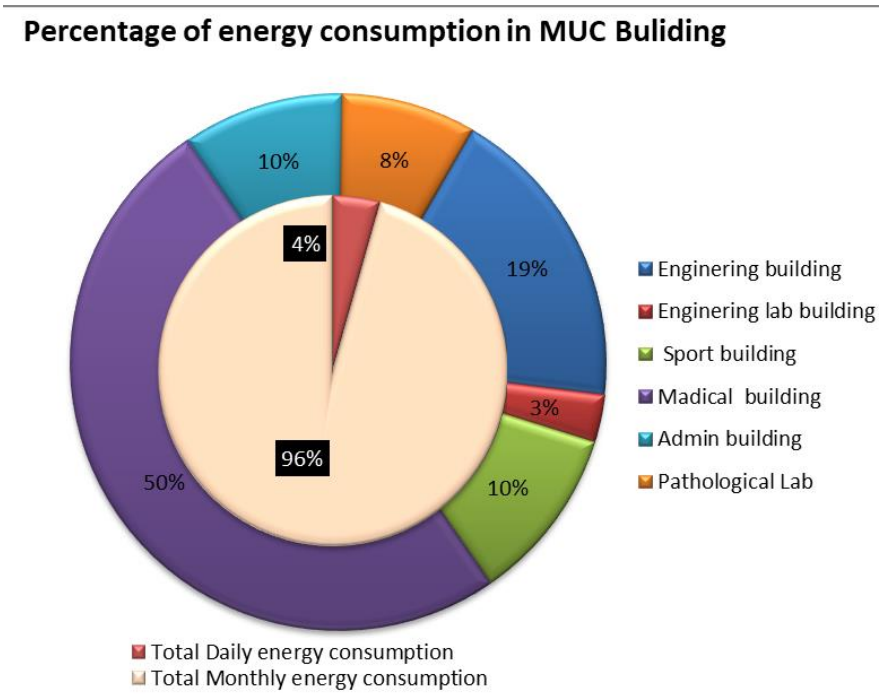

Fig.1a show the annual energy usage in the main MUC Building in 2021

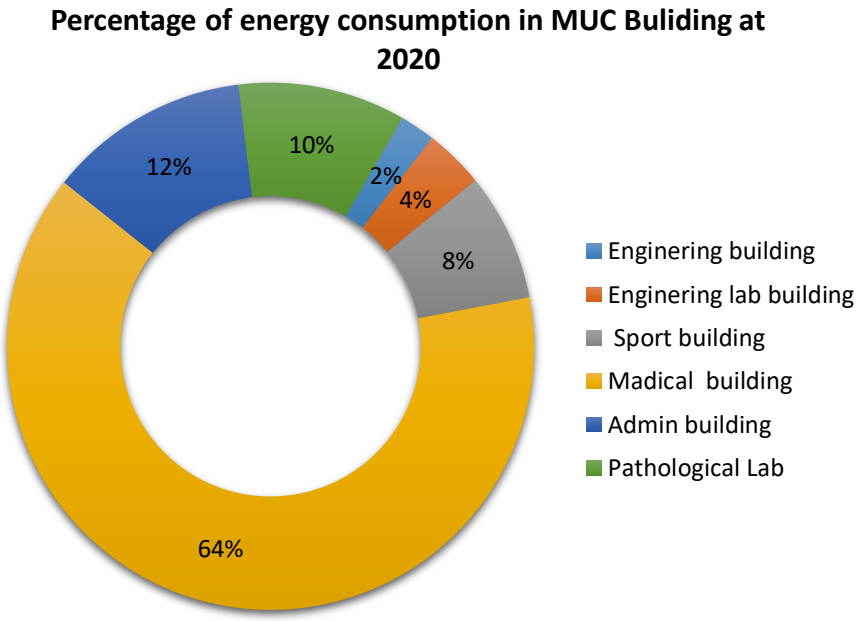

Fig.1b show the daily and annual energy usage of MUC main campus building in 2020.

2- Electricity USAGE PER YEAR (IN KILOWATT-HOUR)

Fig. 2 shows that the total electricity usage of AL- Mustaqbal University during the periods 2018 – 2021. It can be seen that in 2018 which the academic year is normal, the total electricity consumption was 250,000 kWh. During the entire year of 2019, the energy consumption was a little bit bigger than 2018 which indicate 275,000 kWh. Since this pandemic start to spread among countries and when it reaches to Iraq on February 2020, it can be seen that there is an obvious reduction energy consumption. For example, in 2020 is 123,134 kWh, while in 2019 is 331120 kWh. On the main campus area of AL –Mustaqbal University College electricity is used for lighting, cooling, heating, and laboratory appliances. The data that be collected focus on peak-hour consumption (08:00-16:00) because this is when most consumption activity would normally take place. It can be seen as illustrated via Fig. 3 that between Jan until (20 March 2020) the electricity consumption has decreased by about 12 %, while between (20 March) until (1 Sep) the electricity consumption reduced by 78 %, due to that the most of staff and student stay home. After 1 September, the college has invited the staff to work by 25 %, so the electricity usage has increased slightly. It can be seen Fig.4 which displays the evolution of total monthly electricity consumption for the entire period under study, shows a decrease in electricity consumption in 2021.

However, it can be seen that in 2021 there is a slight increasing in the energy consumption to reach about 200,000 kWh. In order to elaborate in the energy consumption during 2021 for all months, it can be seen that at Jan, the electrical consumption was 22,000 kWh while it decreases into 13,000 kWh which it reduces by 69%. It is worthy to mention that the peak load of electricity was on April which recorded 31,000 kWh. The rest of months had diverse distribution of electrical usage based on the final examinations and holidays.

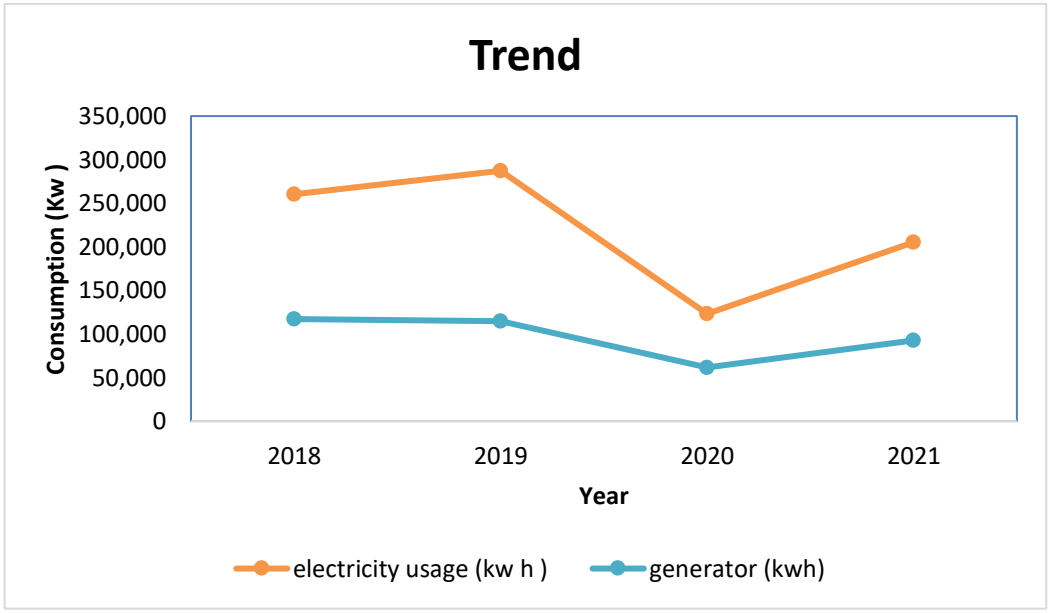

Figure 2 the trend evolution of electricity demand from (2018 to 2021)

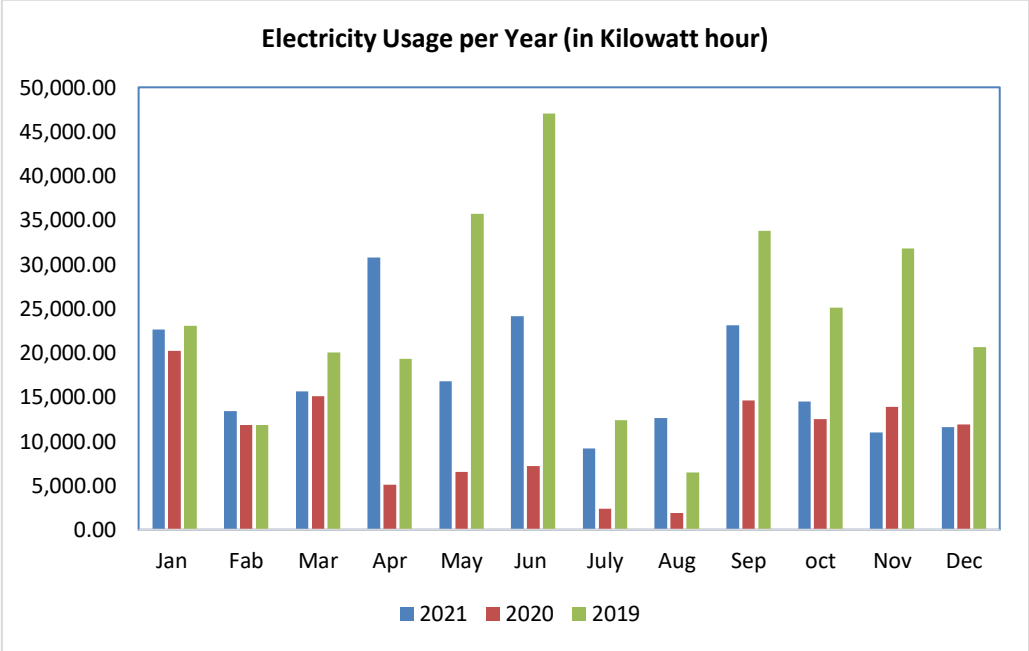

Figure 3 Comparison differences in electricity consumption between 2020 and 2019

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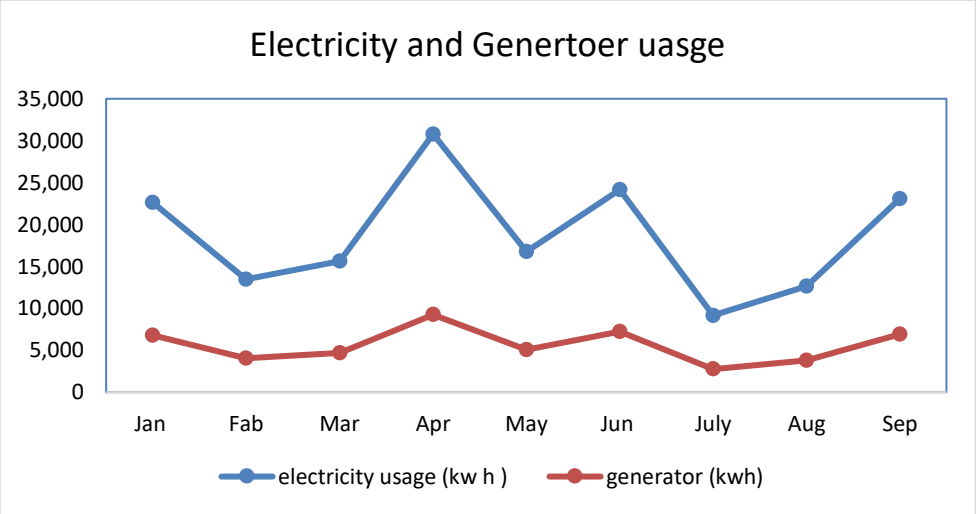

Figure 4 The total electricity and generator usage in all location of MUC in 2021.

It also has seen that from Fig. 5 that the daily peak of energy consumption starting from 10 AM to 4.30 PM, during this time a large magnitude of solar energy available which makes it a highly appealing source of electricity

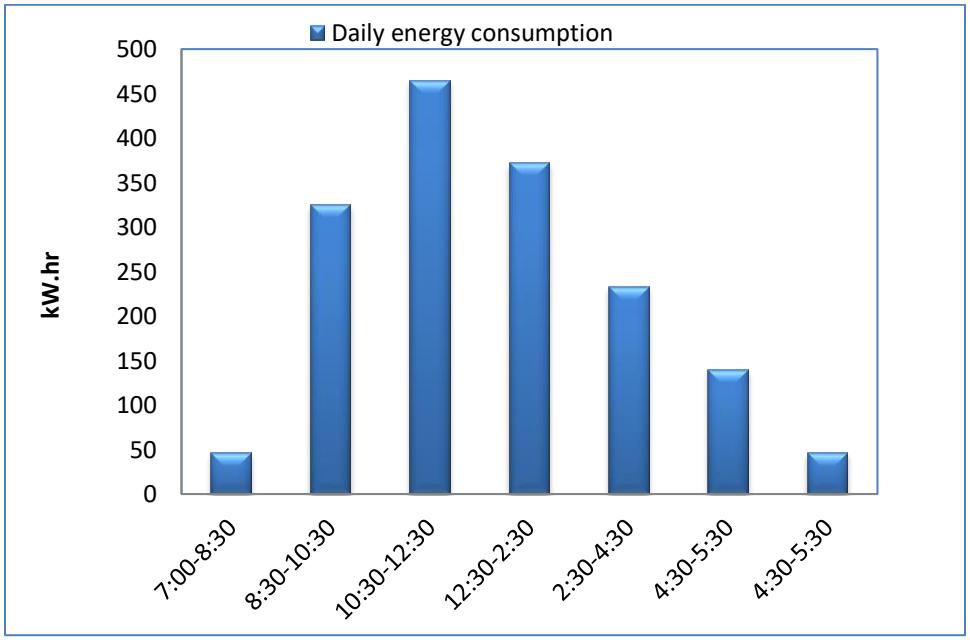

Fig. 5 the daily energy consumption of MUC .

Figure 6. shows the daily and monthly energy consumption for 2019, as it is illustrated that the electricity consumption increases during the study period specially in May and June, due to the increase in the use of air conditioners in the summer. While in July and August the semester ends, which causes decreasing the use of the appliances. September represents the month of the semesters

beginning, and the weather in Iraq is mostly hot, which means the use air conditioning is needed, so that the figure shows an increase in energy consumption. In October, November, December and January the results show that the energy consumption slightly decreases, due to that the ambient temperature decrease and the air conditioning system decrease. In February, March, and April the results show a decrement in the energy consumption, due to the weather is become moderate.

Figure 7. shows the daily and monthly energy power consumption in MUC medical building, the results show an increment in energy consumption during the period from January to March and from September to December, due to this is the semesters period and the students persistence in the college. While during the period from April to June the energy consumption significantly decreases, due to the appearance of COVID-19 and discontinuity of the students, which decreases the load, and energy consumption decreases.

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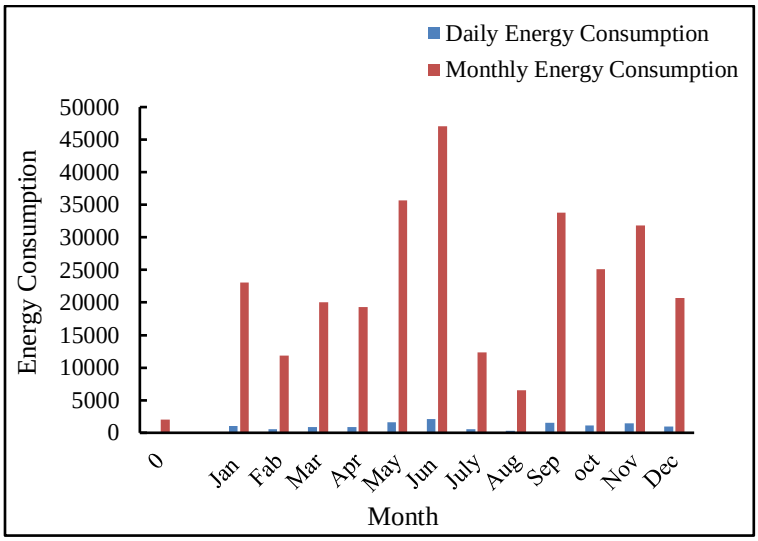

Figure 1: Daily and Monthly Power Consumption

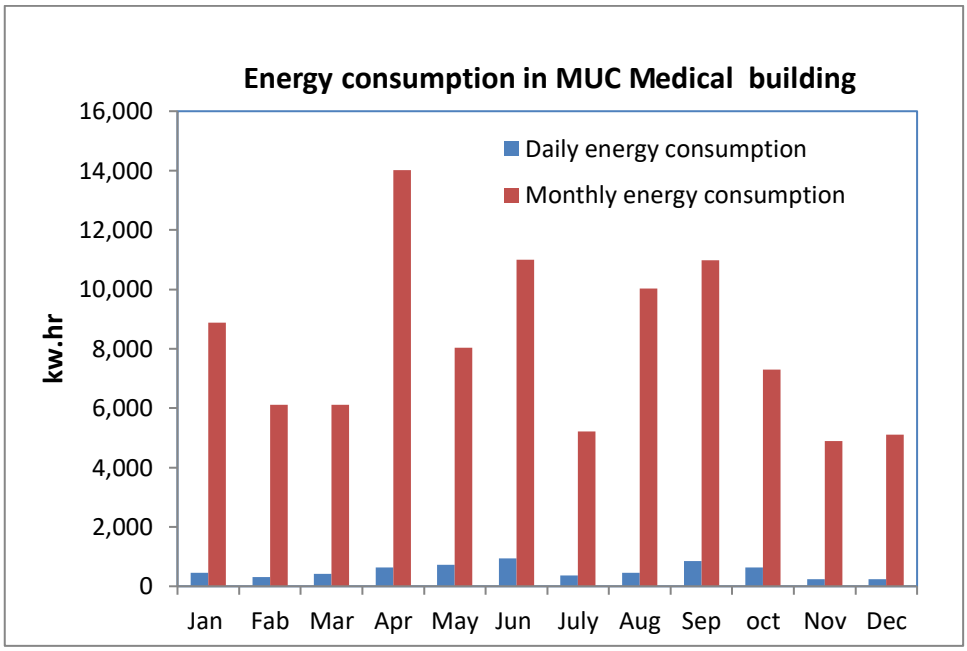

Figure 2: Daily and Monthly Energy Power Consumption in 2021 at MUC Medical building

2.1 Estimation of Change in Occupancy and Operation Patterns

In addition to energy consumption data for 2019 and the end of September of 2020, behavior patterns of occupants of the MUC building are obtained through surveys and questionnaires. Moreover, dwelling physical features are collected including, constructions, types of lighting and appliances, and air conditioning systems and their performance. Table 3 summarizes the main characteristics of the energy models for all main MUC building.

Table 3: Behavior schedules specific to 2019 calibration of the energy models for all MUC audited building.

Building model		Eng. building		Medical building		Administration building		Sport building		Security building	
Typical Schedules	Hours	WD (Sat-Wed)	WEH (Thu-Fri)	WD (Sat-Wed)	WEH (Thu-Fri)	WD (Sat-Wed)	WEH (Thu-Fri)	WD (Sat-Wed)	WEH (Thu-Fri)	WD (Sat-Wed)	WEH (Thu-Fri)
Occupancy	1-8	0%	0%	0%	0%	0%	0%	0%	0%	25%	25%
	8-14	100%	0%	100%	0%	100%	0%	100%	0%	100%	50%
	14-18	50%	0%	25%	0%	0%	0%	40%	0%	75%	25%
	18-24	0%	0%	0%	0%	0%	0%	0%	0%	25%	25%
Lighting	1-8	3%		5%		1%		0%		30%	
	8-14	75 %	0%	80%	3%	100%	1%	80%	0%	100%	60%
	14-18	100%	5%	50%	3%	1%	1%	50%	0%	100%	40%

	18-24	3%		5%		1%		1%		50%	
Appliances	1-8	0%	0%	0%	0%	0%	0%	0%	0%	40%	
	8-14	80%	0%	80%	0%	100%	0%	70%	0%	100%	50%
	14-18	40%		30%		0%	0%	40%	0%	75%	50%
	18-24	0%		0%		0%		0%		50%	30%

Table 4: Behavior schedules specific to 2020 calibration of the energy models

Building model		Eng. building		Medical building		Administration building		Sport building		Security building	
Typical Schedules	Hours	WD (Sat-Wed)	WEH (Thu-Fri)	WD (Sat-Wed)	WEH (Thu-Fri)	WD (Sat-Wed)	WEH (Thu-Fri)	WD (Sat-Wed)	WEH (Thu-Fri)	WD (Sat-Wed)	WEH (Thu-Fri)
Occupancy	1-8	0%	0%	0%	0%	0%	0%	0%	0%	25%	25%
	8-14	20%	0%	30%	0%	50%	0%	10%	0%	50%	30%
	14-18	50%	0%	25%	0%	0%	0%	40%	0%	50%	25%
	18-24	0%	0%	0%	0%	0%	0%	0%	0%	25%	25%
Lighting	1-8	3%		5%		1%		0%		30%	
	8-14	25 %	0%	30%	3%	100%	1%	20%	0%	100%	60%
	14-18	5%	5%	5%	3%	1%	1%	5%	0%	100%	40%
	18-24	3%		5%		1%		1%		50%	
Appliances	1-8	0%	0%	0%	0%	0%	0%	0%	0%	40%	
	8-14	20%	0%	20%	0%	100%	0%	20%	0%	75%	50%
	14-18	0%		0%		0%	0%	0%	0%	75%	50%
	18-24	0%		0%		0%		0%		50%	30%

2.2 Energy Efficient Appliances Usage

Al-Mustaqbal university college intends to realize further energy savings by paying close attention to energy management. All parts of the organization can assess their own energy consumption and realize their own energy-saving potential by means of, for example, insulation, LED lighting, and the deployment of sustainable technology. Figure 8 shows that the high energy-efficient appliance used in Al- Mustaqbal university college is the LED lamp compared to other appliance devices It can be seen that the LED lamp saving in energy by about 93 %.

Figure 8: The high energy-efficient appliance used in Al-Mustaqbal university college