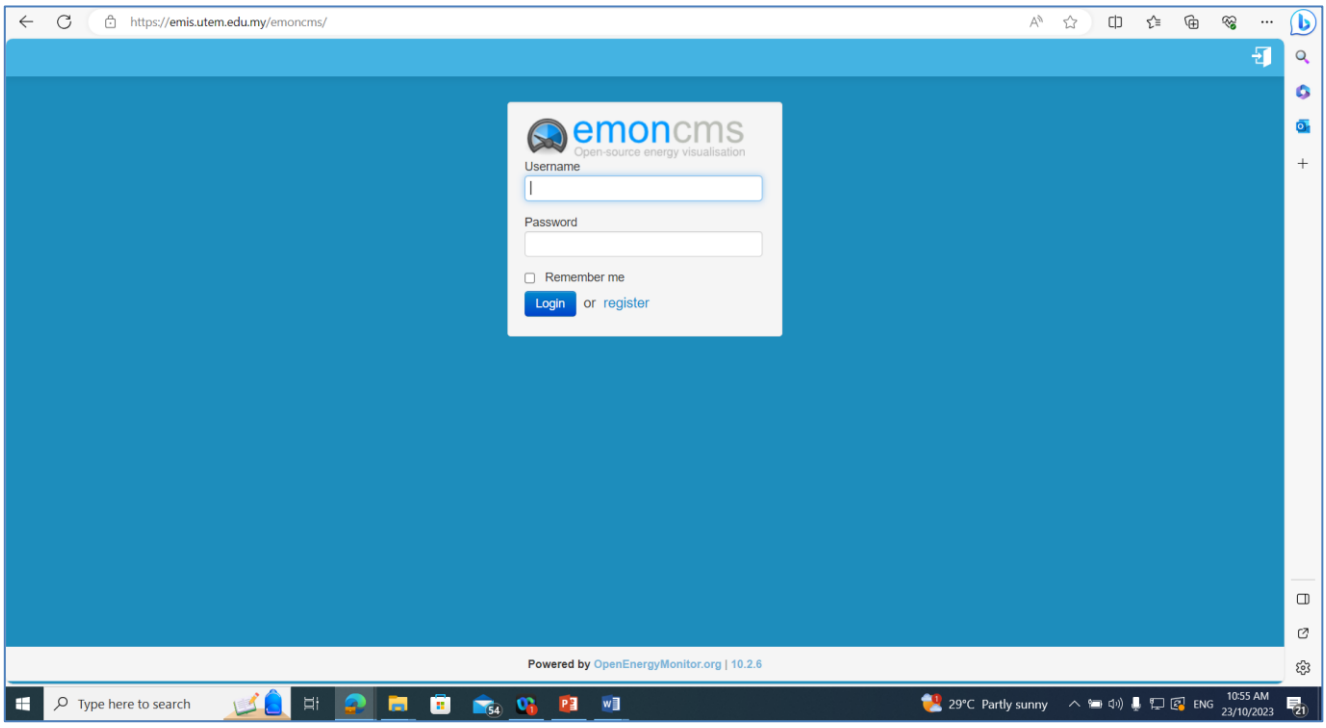
Template for Evidence(s)
UI GreenMetric Questionnaire

University : Universiti Teknikal Malaysia Melaka
Country : Malaysia
Web Address : http://www.utem.edu.my/

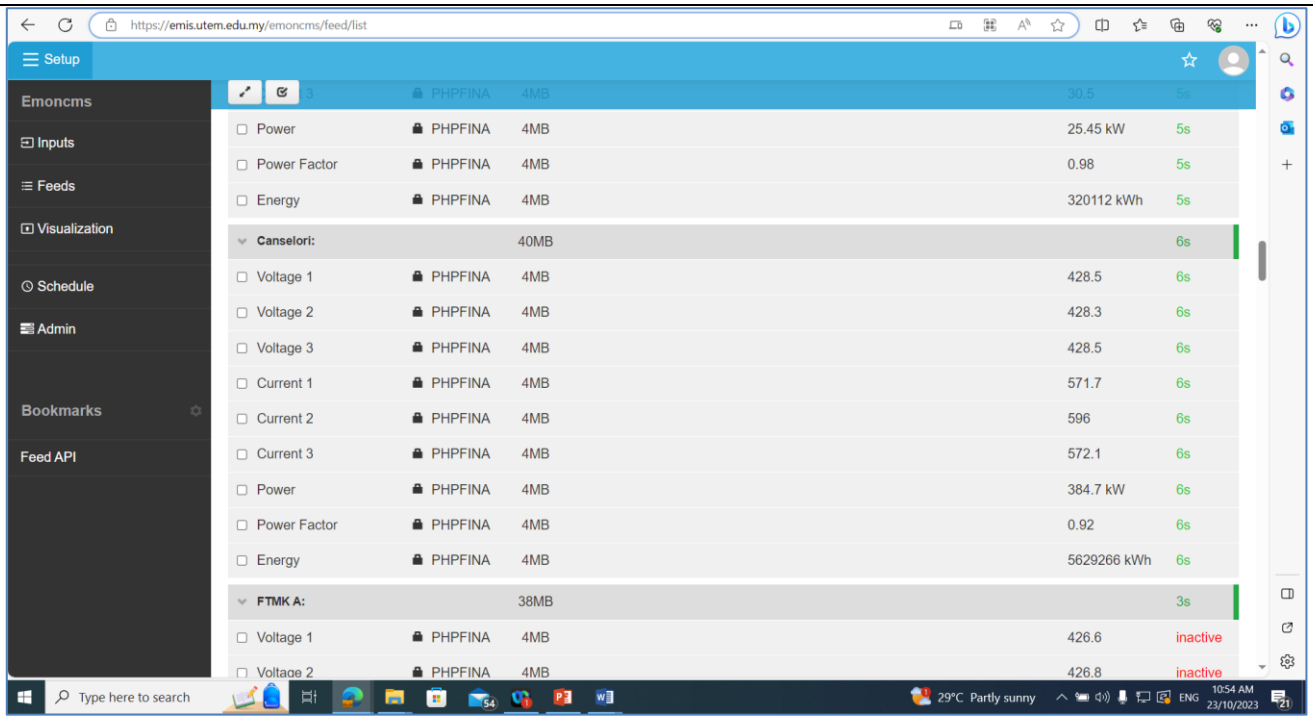
[2] Energy and Climate Change (EC)

[2.13] Number of innovative programs in energy and climate change

Program 1: IoT Energy Monitoring System . This energy monitoring system was developed in-house, started in 2019 and still continued where new building is also planned to be equipped with thus building in the future. The purpose of this system is to support Sustainable Energy Management System implemented in Universiti Teknikal Malaysia Melaka in the aspect of easy and efficient of electrical energy monitoring. This system can be assessed online through energy management information system (EMIS) at **https://emis.utem.edu.my/.** However for safety concerns and etc, only autorised person can assessed this system.



Main interface of EMIS before log in



2nd layer interface after log in

Program 2: Energy Monitoring Dashboard. This energy monitoring dashboard was developed in-house and can be assessed by all staff with the aim to rise awareness on energy conservation and energy efficiency program. Data for this Dashboard is taken from IoT Energy Monitoring System installed in each building. This Dashboard show consumption analysis (**Figure 1**), Energy Cost Analysis (**Figure 2**) and Building Comparison Analysis (**Figure 3**). In consumption analysis, monthly (SEER) and yearly (BEI) building energy index, montly load factor, monthly and yearly CO2 emission due to consumption of electricity as well as load factor and mothly maximum demand are shown.

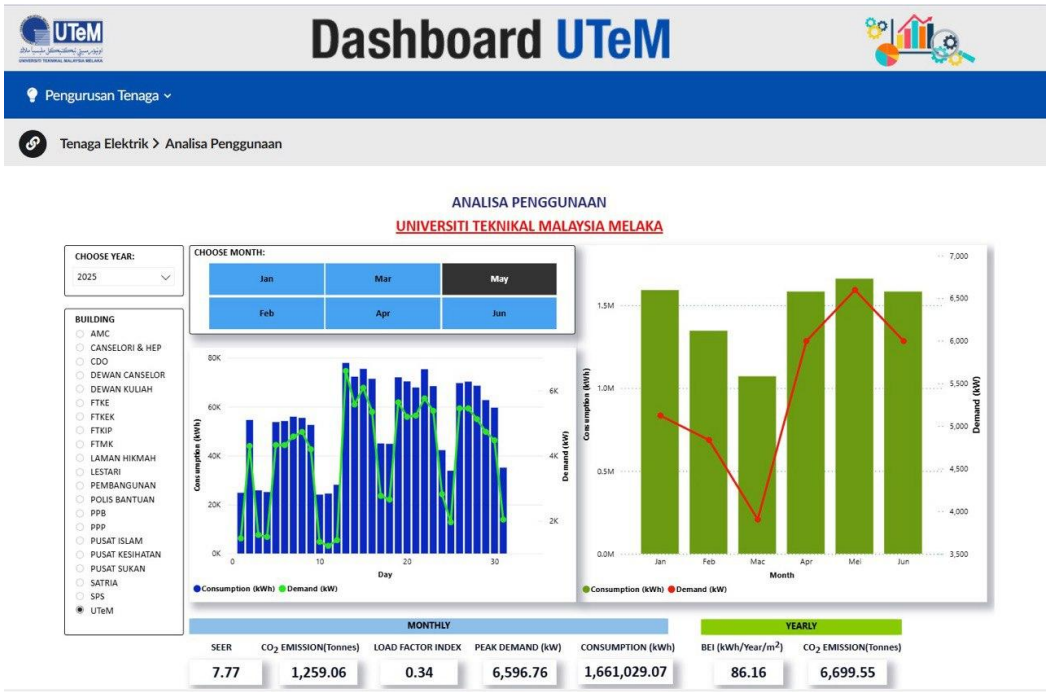


Figure 1: Consumption Analysis

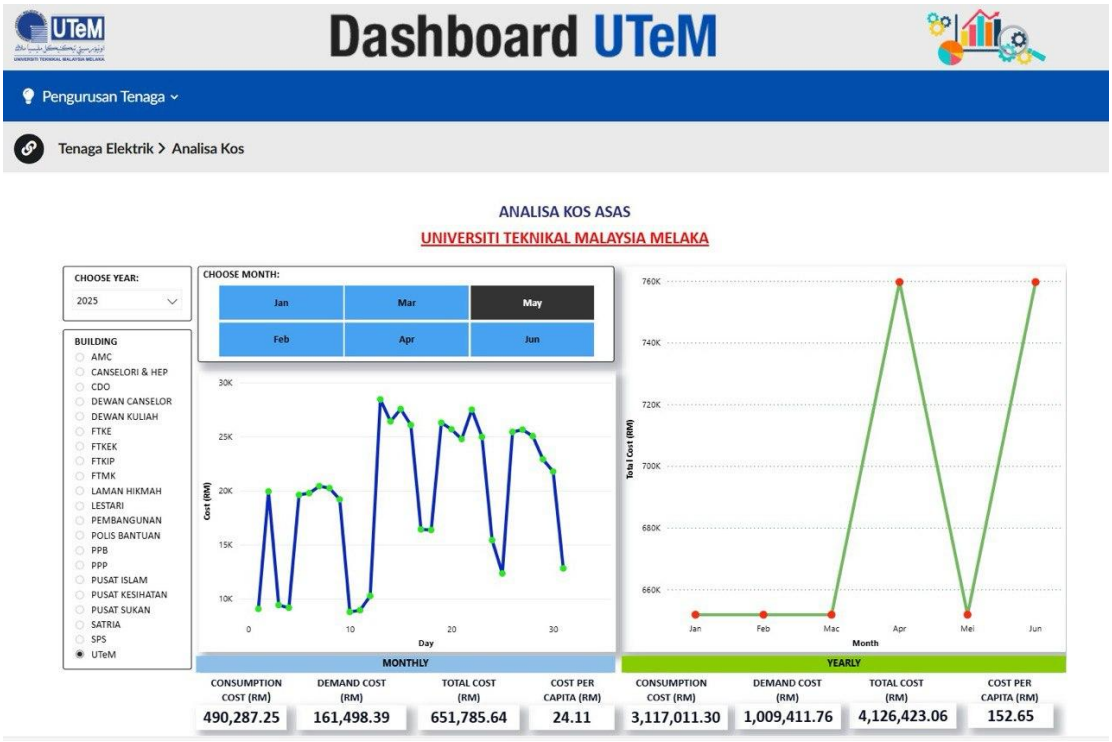


Figure 2: Energy Cost Analysis

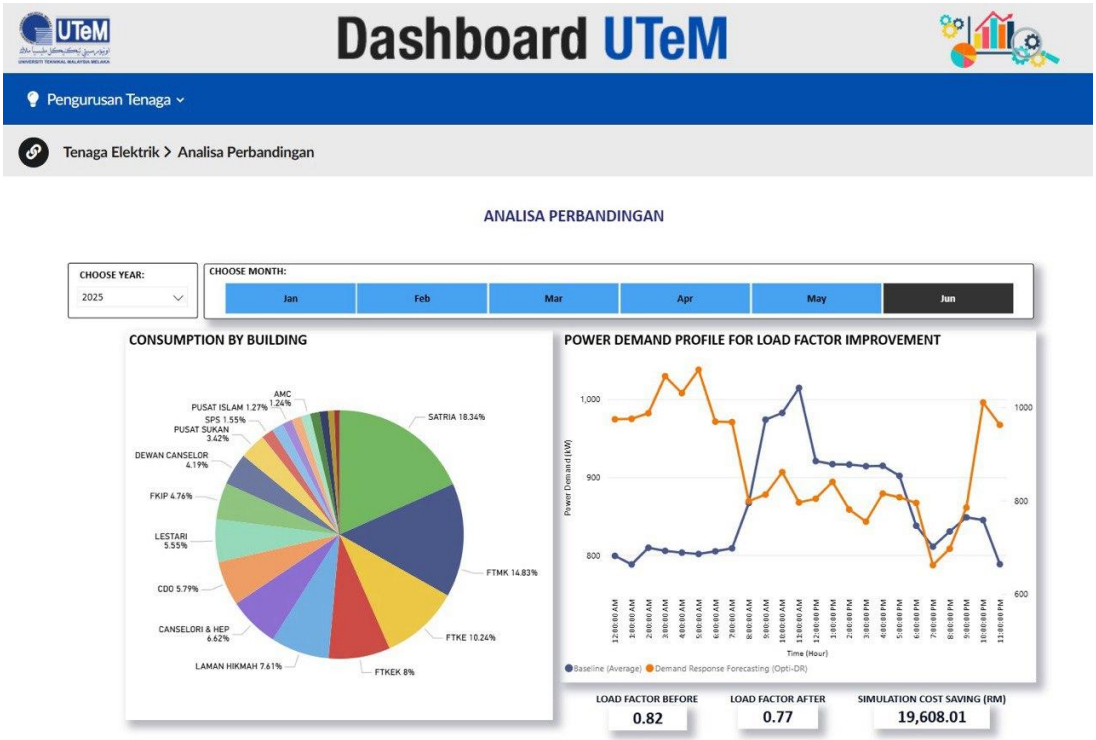


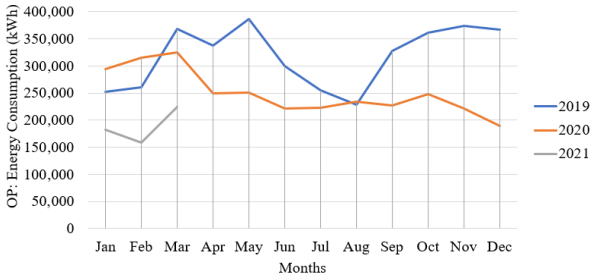
Figure 3: Building Comparison Analysis

Program 3: Optimum baseload energy consumption during pandemic condition. The baseload percentage previously above than 20% just for the safety purpose. The management agreed to rescheduled the lighting operation while maintening the standard of lux level (**continuous program from 2022**).

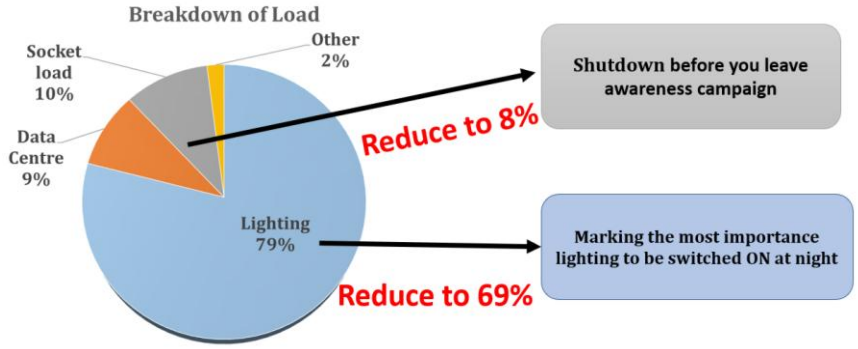
Average Data

Year	Energy (kWh)	Peak Energy (kWh)	Off Peak Energy OPTR (kWh)	Maximum Demand (kW)	Power Factor	Load Factor	Based Load Percentage (%)
2019	1,467,985	1,149,726	318,259	5,259	0.99	0.38	21.59
2020	1,136,743	886,991	249,752	4,474	0.98	0.36	22.32
2021	904,035	715,267	188,768	3,748	0.98	0.33	21.17

Off Peak Consumption



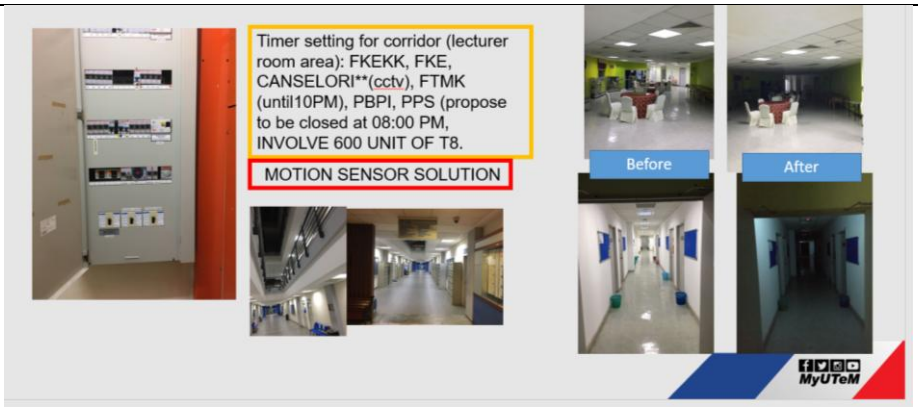
Reduction target



Performance phase 1 lighting scheduling

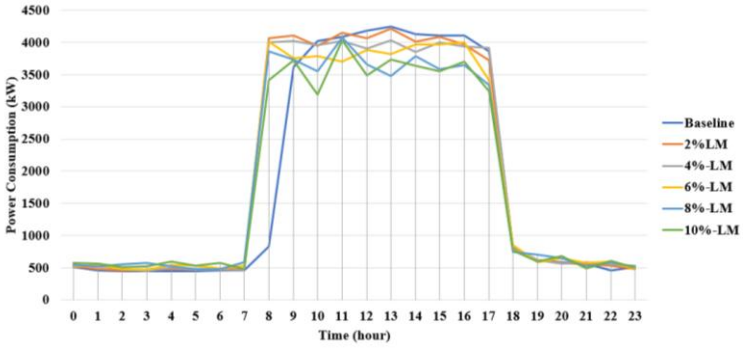
	Monthly Energy (kWh)	Yearly Cost (RM)	Cost Saving (RM)	%
Baseline (before scheduling)	21,983	96,284.14		
Action Taken After Scheduling	6,299	27,588.48	68,695.66	71

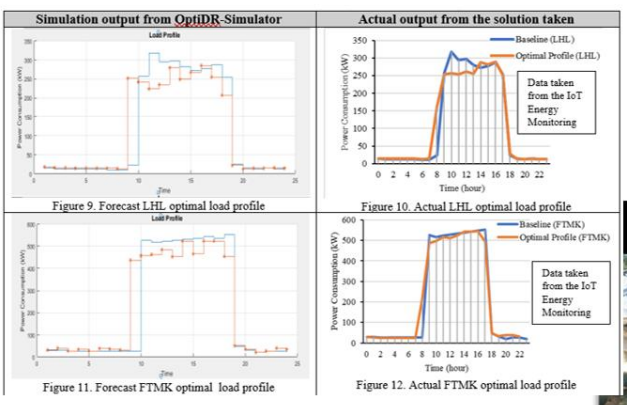
Reduction 15,683kWh~ 10% saving for the night lighting consumption

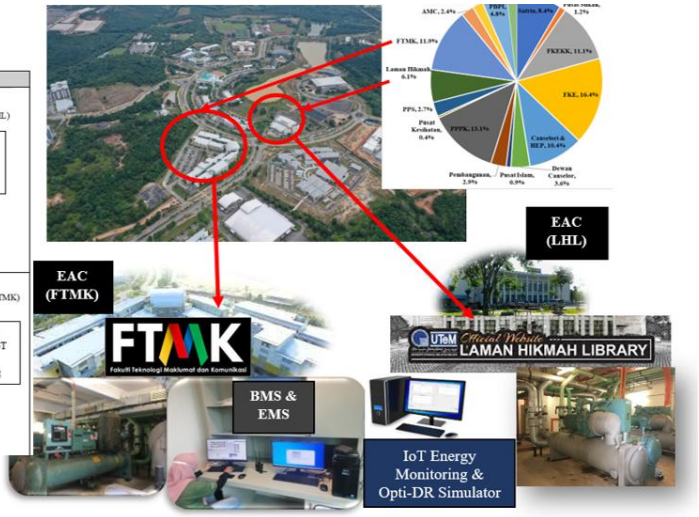


Program 4: Optimum chiller scheduling during pandemic. The maximum demand charge still high during less staff and students due to centralize chiller operation. The optimum operation scheduling of chiller has been done by using optimization algorithm such as Particle Swarm Optimization under simulation program. Once, optimum loadd profile was concluded, the real implemention will be conducted. The operation of the chillers also follow the OPTR tariff scheme, where the value of load factor should be improved to enjoy price reduction by energy provider (**continuous program from 2022)**

Simulation: optimum profile to reflect OPTR





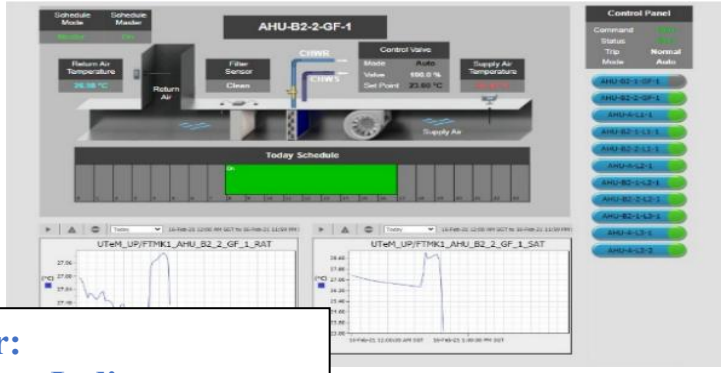


Summary of results

	Baseline	With Optimal Load Profile
MD (kW)	4,243.00	4,031.00
Load Factor Index	0.32	0.36
Monthly Energy Consumption Cost (MYR)	357,853.45	380,024.28
MD Cost (MYR)	128,562.90	122,139.30
OPTR discount (MYR)	-	40,661.61
Total Monthly Electricity Cost (MYR)	486,416.35	461,501.97
Total Yearly Electricity Cost (MYR)	5,836,996.18	5,538,023.66
Total Cost Saving/Year (MYR)		**298,972.51**

Program 5: Dust filter monitoring system. AHU dust monitoring has been installed to monitor level of dust so that the clean air circulation would be supplied to the end user (**continuous program from 2022)**.





Filter sensor:
Clean or Dirty Indicator

Remarks:

In conclusion, in 2024, Universiti Teknikal Malaysia Melaka is implementing **five (5) innovative programs** in energy and climate change, as explained in this section.