University : Al-Mustaqbal University
Country : Iraq
Web Address : https://uomus.edu.iq/default.aspx

Description:
The total electricity usage of AL- Mustaqbal University between 2020 and 2025 is as following:

- In 2020, the total electricity usage of AL-Mustaqbal University is about 123,134 kWh.
- In 2021, the total electricity usage of AL-Mustaqbal University is about 205,350.91 kWh.
- In 2022, the total electricity usage of AL-Mustaqbal University is about 277,916 kWh.
- In 2023, the total electricity usage of AL-Mustaqbal University is about 347,395 kWh.
- In 2024, the total electricity usage of AL-Mustaqbal University is about 426,011 kWh.
- **In 2025, the total electricity usage of Al-Mustaqbal University is about 468,612 kWh**

Renewable Energy (Solar) = 160,337 [kWh/ year]

Renewable Energy (Wind)= 12964 KWh/year

The ratio of renewable energy production divided by total energy usage per year = 0.369 (37%)

The annual energy output of the PV power plant which consist of 420 modules located AL-Mustaqbal University site having avarge daily global radiation of 6.1 KWh/m² and avarge ambinet temperatuer is 45 ^{o}C .

The average daily global radiation in Iraq G= 6.1 (KWh/m²) = $\frac{6.1\ KWh/m^2}{12\ h}$ = 0.508 KW/m²

I_{sc} (G) = 10.39 × 0.508 = 5.28 [A]

Tc = Tα + $(\frac{NocT-20}{0.8})$×G

Tc = 45+$(\frac{44-20}{0.8})$ × 0.508=60.24 ^{o}C

V_{oc} (Tc) = V_{oc} – 0.0023 × No. of cells × (Tc-25)

V_{oc} (Tc) = 49.86 – 0.0023× 36 × (60.24-25) = 46.942128 [V]

FF = $\frac{Pmax}{Voc \times Isc}$ = $\frac{405}{49.86 \times 10.39}$ = 0.8303796594

Pmax (G,Tc) = Isc (G) × Voc (Tc) × FF

Pmax (G,Tc) = 5.28× 46.942128 × 0.8303796594

Pmax (G,Tc) = 205.813282 [W]

C_f = $\frac{P\ operating\ cond}{Pstc}$ = $\frac{205.813282}{405}$ = 0.5081809432

AE = No. of modules× P max × C_f × h in year

AE =420 × 205.813282 ×0.5081809432× 3650

AE = 160,337 [kWh/ year]

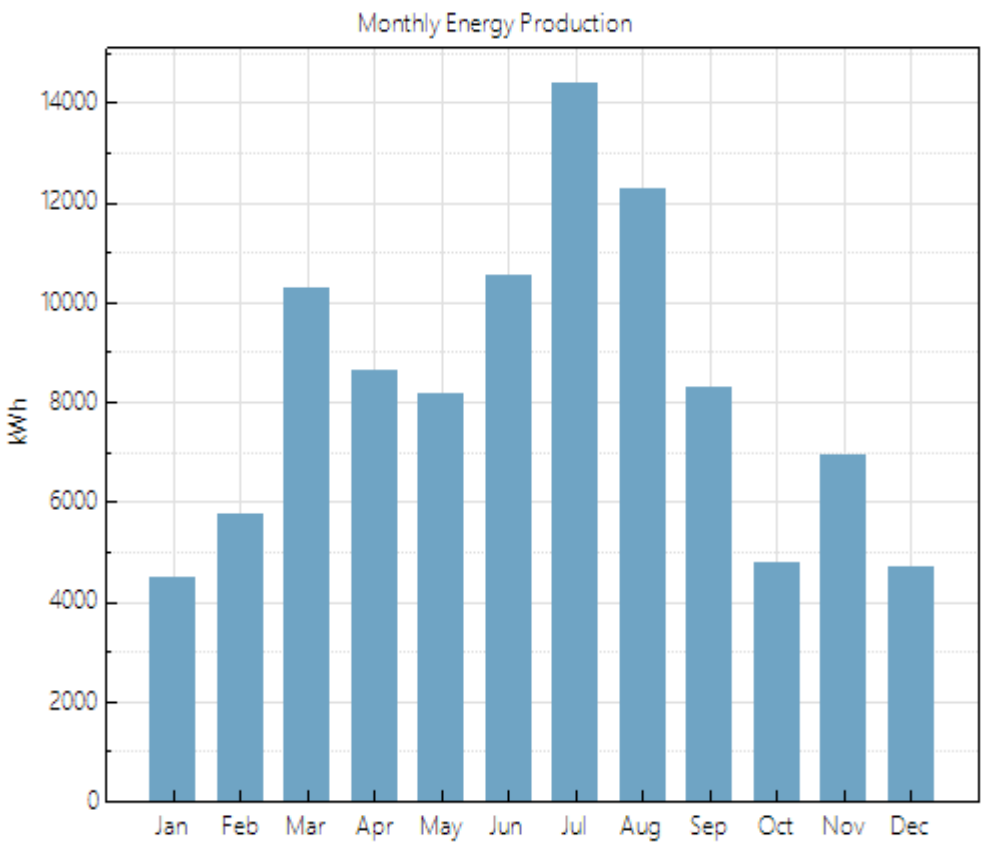


Fig.1 Monthly energy production from the PV system only

The wind system with capacity factor 37% consist of FOUR wind turbines installated in AL-Mustaqbal University . The technical data of the turbine are:

Rated power	1000 W
Rated wind speed	13 m/s
Cut in wind speed	25 m/s

Diameter	1 m
Hub height	12 m

Take: $\alpha = 0.1$ and $\rho = 1.225\ kg/m3$

$$Cf = \frac{P_{\text{actual}}}{Prated}$$

$$0.37 = \frac{P_{\text{actual}}}{1000}$$

P_{actual}(one turbine)= 0.37 * 1000 = 370 Watt

Power generation = P actual * number of wind turbines
= 370 *4 = 1480 Watt

AE = P actual * h $_{\text{in year}}$ = 1480 * 24 * 365 = 12964 Kw h/year

The total renewable energy production is 160,337 + 12964 = 173301 [kWh/ year]

The ratio of renewable energy production divided by total energy usage per year = 0.369 (37 %)