

Final Project 2

Assignment 3

To

Faculty of Management
Midocean University

Project title

**Applying Cloud Computing and Solar PV to Improve
Energy Efficiency and Reduce Costs in University IT
Infrastructure**

Student name

Duaa Nabeel Atieh

Graduation Project – 2

Faculty of Management - Midocean University

Supervisor

Dr. Mona Moustafa Elashry

Faculty member- Faculty of management- Midocean University

Chapter 4: Data Analysis & finding discussion

3 Data Analysis

The measured power consumption values were averaged on annual basis to find the total annual power consumed per all the devices which was found in the computer center. Table 1 represents the estimated power consumed by the devices.

Table 1. Power measured consumed

Application	Quantity	Power/W	hour/day
riello UPS"multisentry	2	25	24
Dell EMS R740	42	31.25	24
SAN storage MD3600f	2	150	24
Nas storage synology	2	45.73	24
switch Hp 2930	11	46.6	24
Sophos xg550	2	85	24
LAP-TOP Dell inspiron	10	65	8
PC	2	170	8
Printer Hp-pro200	4	700	2
Lamp	196	15	8
Air condition	10	1200	8
T.V	2	125	8
Cooler	3	120	8

According to the governmental tariff the total cost of the estimated power consumed is 5490kWh/month (850.75 JD) per month. This cost was calculated using the national grid tariff as shown in table 2.

Table 2. Electrical power tariff in Jordan

	Tariff Fils/kWh
Commercial Sector (Fils/kWh)	
First Block : from 1-2000 kWh/Month	120
Second Block : more than 2000 kWh/Month	175

In order to cut down this cost it is suggest to utilize solar PV as a hybrid system with that provided by the national grid by using net metering system. In addition, almost all conventional servers will be replaced by cloud servers.

4 Results

The value of annual power consumed was found to be 65,880 (kWh). According to the governmental tariff the total cost of the estimated power consumed is 850.75 (JD) per month. This cost was based on a unit cost of 0.175 (JD/kWh).

In order to cut down this cost, it is suggested to utilize a solar PV national grid (net metering) hybrid system, which will operate either with the existing devices or with the conventional servers being replaced by cloud one. This will be in accordance to the following two scenarios:

4.1 First Scenario: A Hybrid PV Solar - National Grid System with the Existing servers

This system will be used to power the existing servers at the center. Under such condition table1 below summarizes the solar PV system requirements. More details of the PVSYST software simulation is found the appendix A.

Table 3: First suggested hybrid system requirements

Total Energy consumption KWh/year	65,880
The Required PV inverters KWac	2
The Required PV module Capacity KWp	47.4
Number of 370Wp Modules Required	128
Total needed Area (m ²)	248 m ²
PV System estimated cost (JD/KWp)	600
PV total system cost (JD)	28440

Expected annual increase in electrical tariff	12.45%
Electrical Tariff (JD/KWh)	0.175
Daily average solar radiation (hour)	4.2
Solar system efficiency	80%

Having taken the above values into account a complete economic study on this hybrid system was conducted. It was found that the payback period is 2.78 year.

4.2 Second: A Hybrid PV Solar - National Grid System with the Existing Servers Being Replaced by Cloud Servers

In this case the total number of conventional servers will be replaced by cloud ones and hence the total number of servers reduced to zero. Table 4 summarizes the solar PV system requirements. More details of the PVSYST software simulation is found the appendix B.

Table 4. Second suggested hybrid system requirements

Total Energy consumption KWh/year	49,659.6
The Required PV inverters KWac	2
The Required PV module Capacity KWp	36
Number of 370Wp Modules Required	33.3
Total needed Area (m ²)	175
PV System estimated cost (JD/KWp)	600
PV total system cost (JD)	19,980
Expected annual increase in electrical tariff	12.45%
Electrical Tariff (JD/KWh)	0.175
Daily average solar radiation (hour)	4.2
Solar system efficiency	80%

As indicated in the above table, the total energy consumption is reduced now by 25 % kW/year), the cost of PV system was reduced by almost 30% and the required area is cut down by almost 29%. Consequently, this scenario will be most recommended in this work. An economic study was

also conducted on this suggested hybrid system and it was found that the payback period was 1.95 year.