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Dii

Renewables: A Key Driver for Clean Energy Transition
Solar PV Rooftop Workshop & Training

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Analysis of Measurement of Different types of PV Systems in Oman

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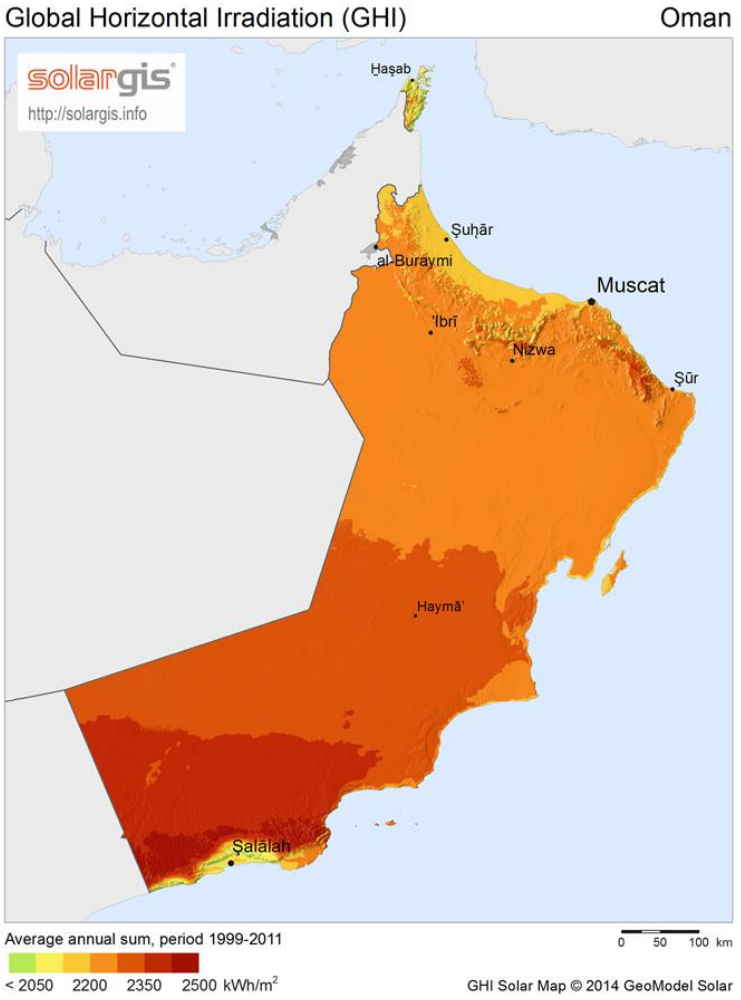
- Introduction
- Objectives
- Experimental setup
- Testing of PV modules (Indoor and outdoor)
- Field results and Analysis for two grid connected solar PV systems at SQU
- Conclusion

INTRODUCTION

- According to the growth of population and increasing in the industrial field, more electric energy is required to cover the large consumption.
- Fossil fuels resources causes environmental problems. Moreover, it has economical effect.
- Renewable energy resources can be a candidate to provide clean and green energy. One of these sources is the solar energy.

Opportunity to Use PV Systems

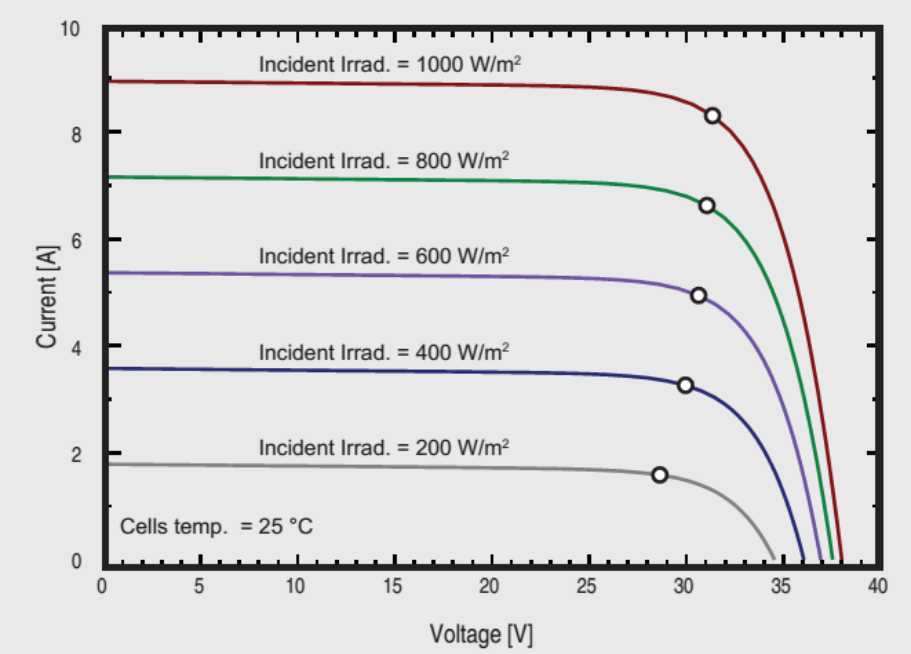
- The daily solar radiation ranging from 5,500-6,000 Wh/m2 a day in July to 2,500-3,000 Wh/m2 a day in January. This high level of solar energy density makes Oman is among the highest in the world.



OBJECTIVES

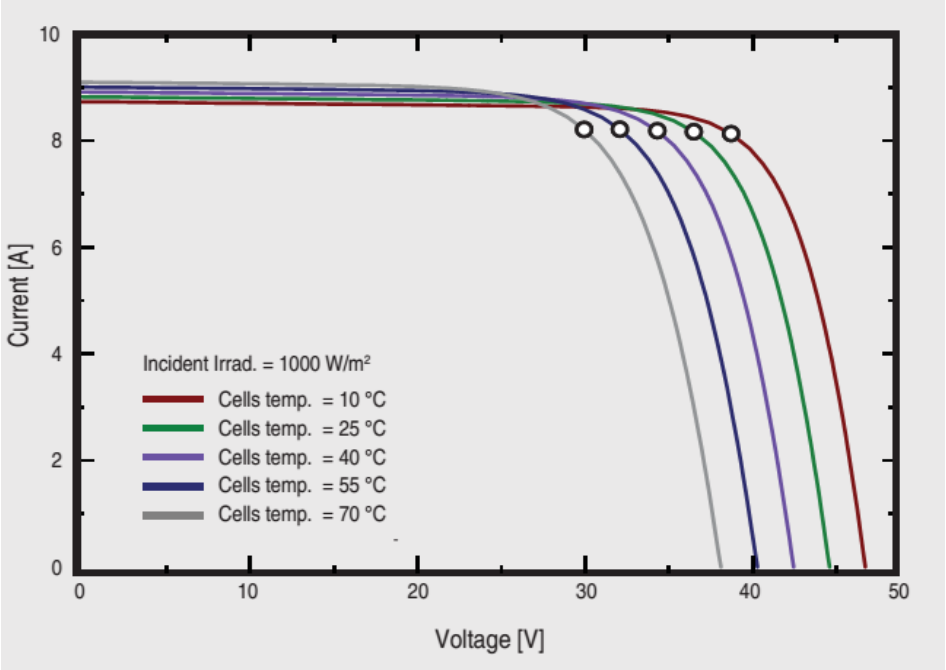
- Study factors that can impact n the PV Systems such as temperature, Irradiance and the dust.
- Analyse real measurement from two PV systems.
- Focus on practical lab testing and experimental setup
- Implement data analysis for the future studies

THE IMPACT OF THE SOLAR IRRADIATION IN PV MODULE



"SM-255PC8"

THE IMPACT OF THE CELL TEMPERATURE IN PV MODULE



"SM-255PC8"

EXPERIMENTAL SETUP

Type 1

The system consists of six PV modules (SM-245PC8 desert)

Item	Specifications
Type	PV Desert Type
Nominal Peak Power	245W(±3%)
Rated Voltage	30V
Rated Current	8.18A
Open Circuit Voltage	37.5V
Short Circuit Current	8.59
Temp Coefficient	-0.458% ^{0}C
Company/Country of Origin	S-ENERGY/Korea

EXPERIMENTAL SETUP

Type 2

This system consists of 80 PV modules (FL250P) with a total power of 20 kWp. They are installed in SQU-Ecohouse. Table 2 presents the specification of the solar panel used in this system.

Item	Specifications
Type	Normal Poly
Nominal Peak Power	250Wp(±3%)
Rated Voltage	30V
Rated Current	8.25 A
Open Circuit Voltage	37.6V
Short Circuit Current	8.98
Temp Coefficient	-0.458% ^{0}C
Company/Country of Origin	China

EXPERIMENTAL SETUP

Type 3

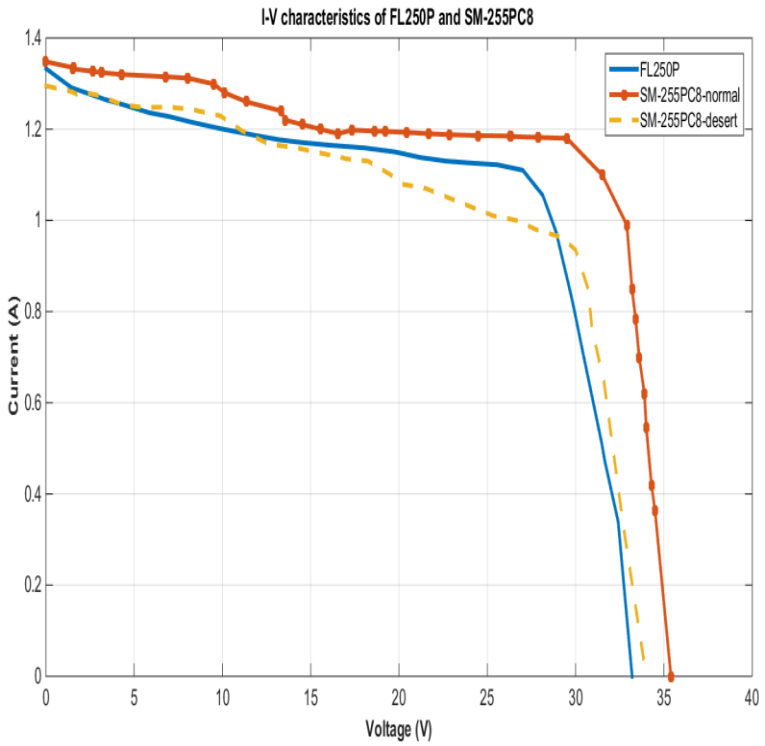
These types of modules (SM-255PC8) will be installed in SQU-Eco house. Table. 3 shows the specifications of these modules.

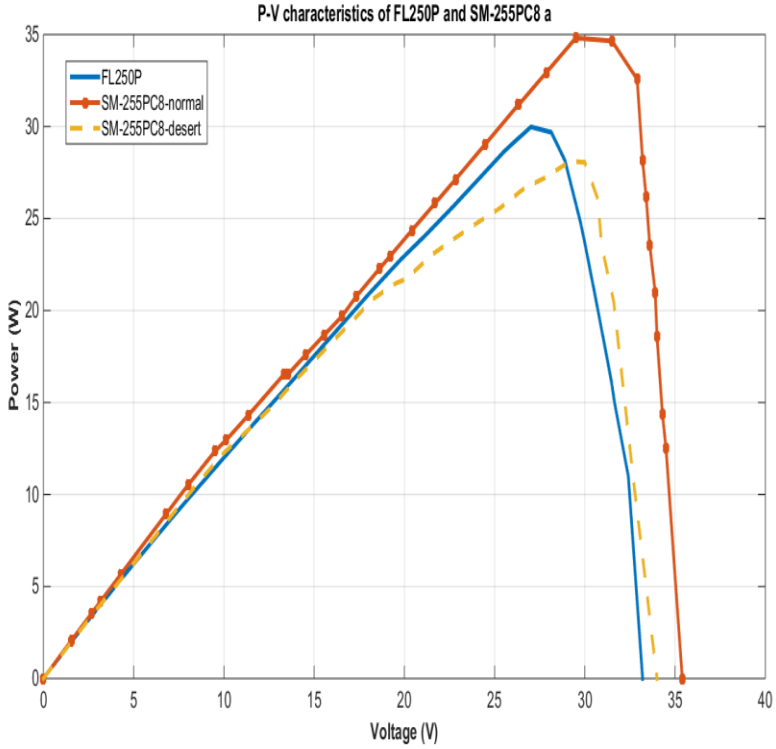
Item	Specifications
Type	Normal Poly
Nominal Peak Power	255Wp (±3%)
Rated Voltage	30.9V
Rated Current	8.27 A
Open Circuit Voltage	38 V
Short Circuit Current	8.84
Temp Coefficient	-0.429% ^{0}C
Company/Country of Origin	S-ENERGY/Korea

TESTING OF PV MODULES

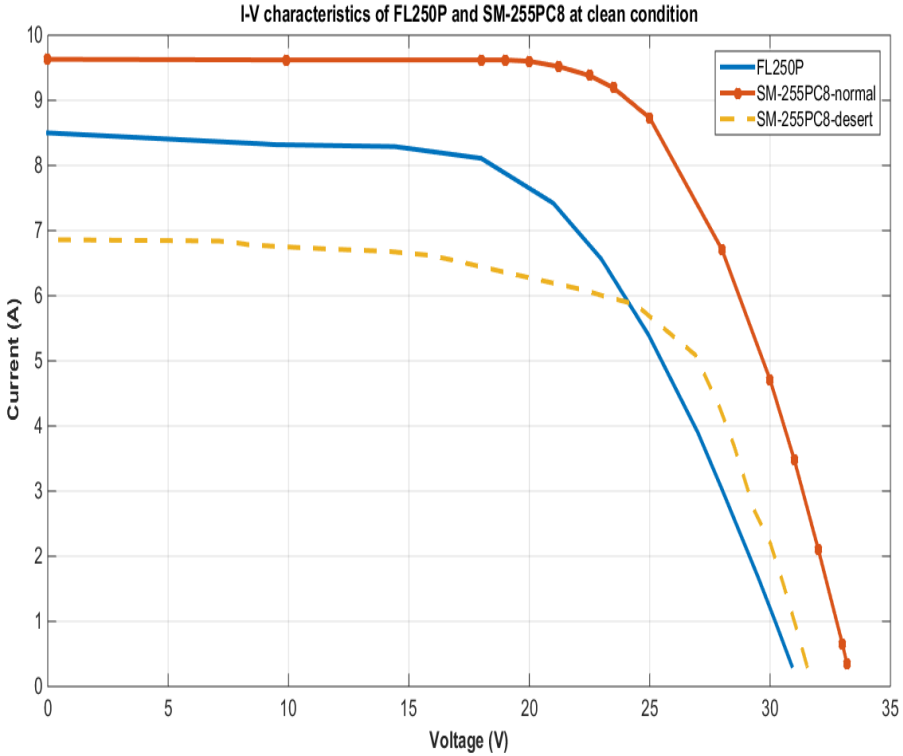
- The Testing of the PV accomplished in two ways:
  - A. Clean condition (Indoor and Outdoor Testing)
  - B. Dusty condition (Outdoor Testing)

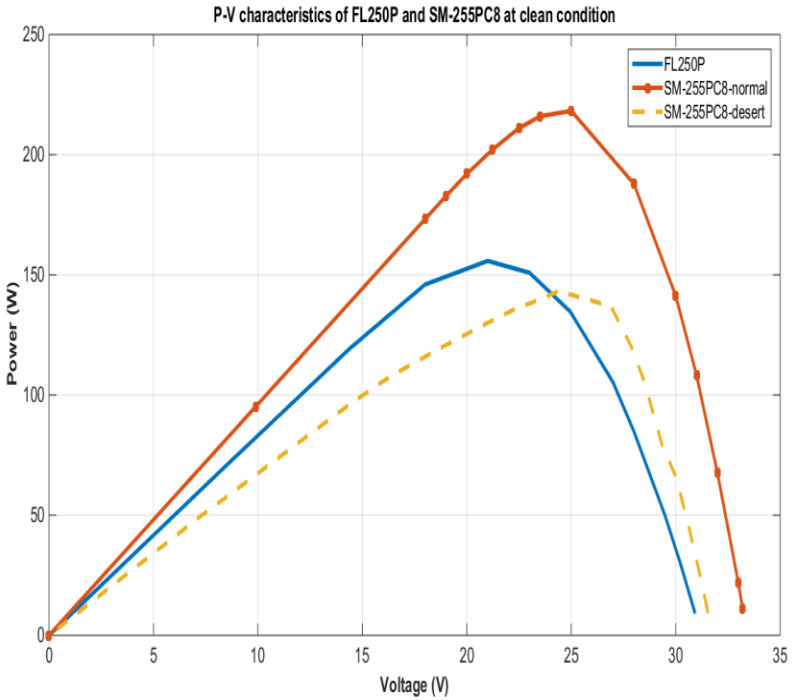
CLEAN CONDITION (INDOOR TEST)



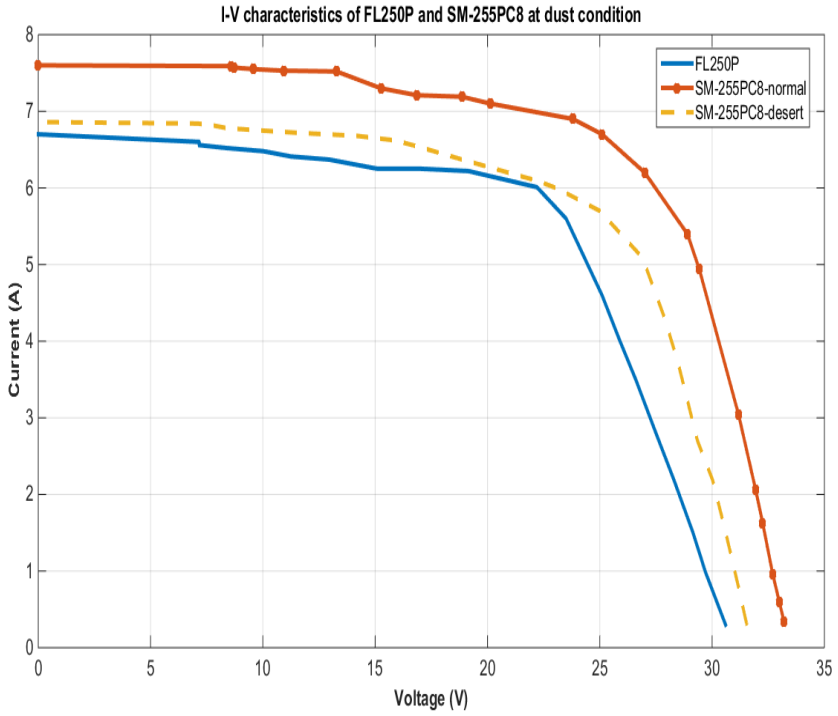


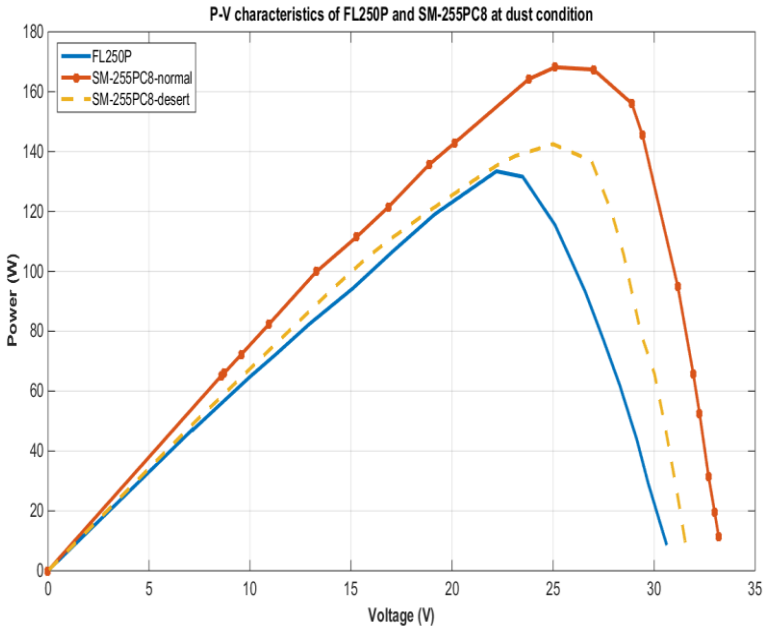
CLEAN CONDITION (OUTDOOR TEST)



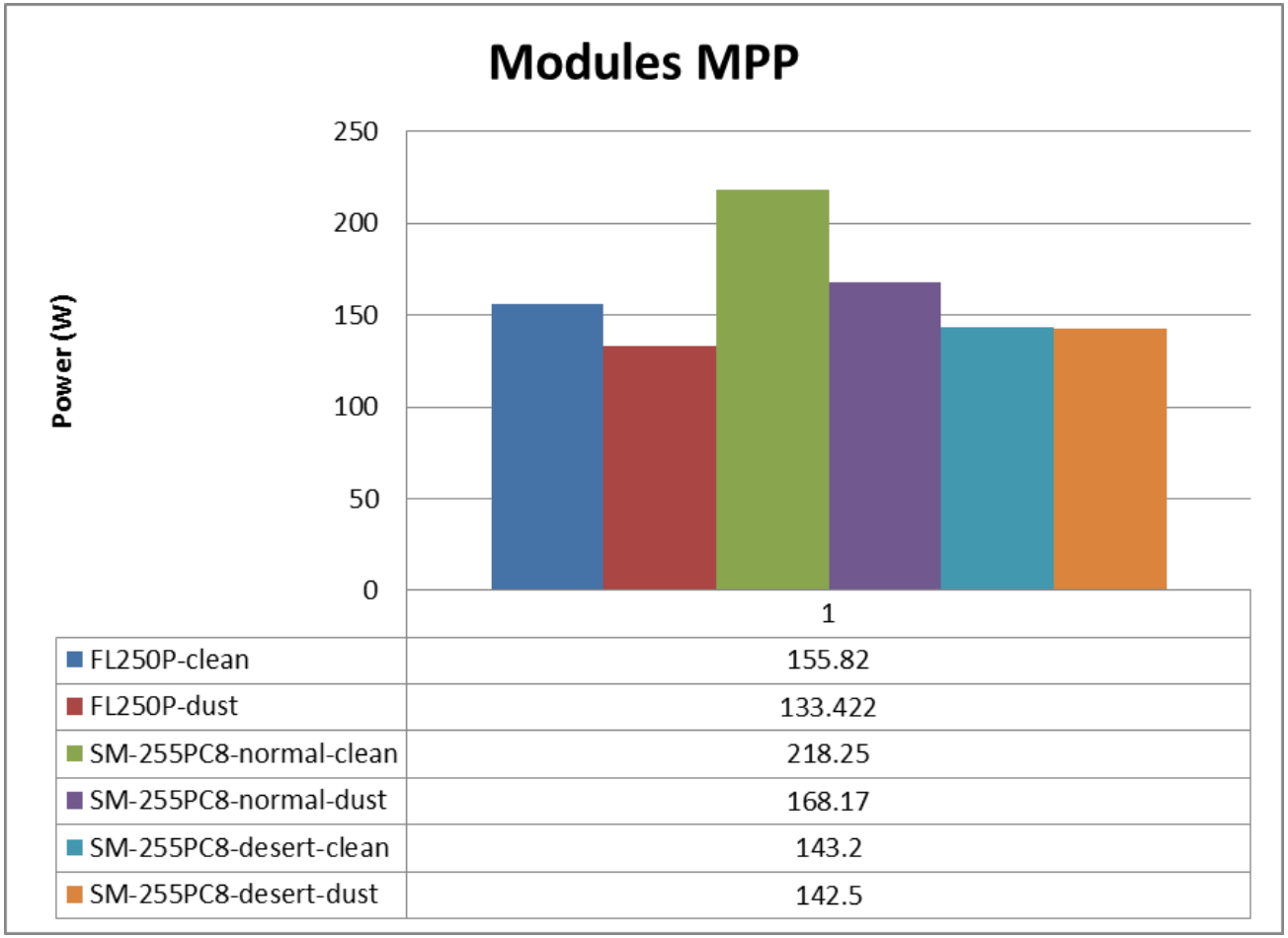


DUSTY CONDITION (OUTDOOR TESTING)





MODULE'S MPP RESULTS IN BOTH CONDITIONS CLEAN AND DUST



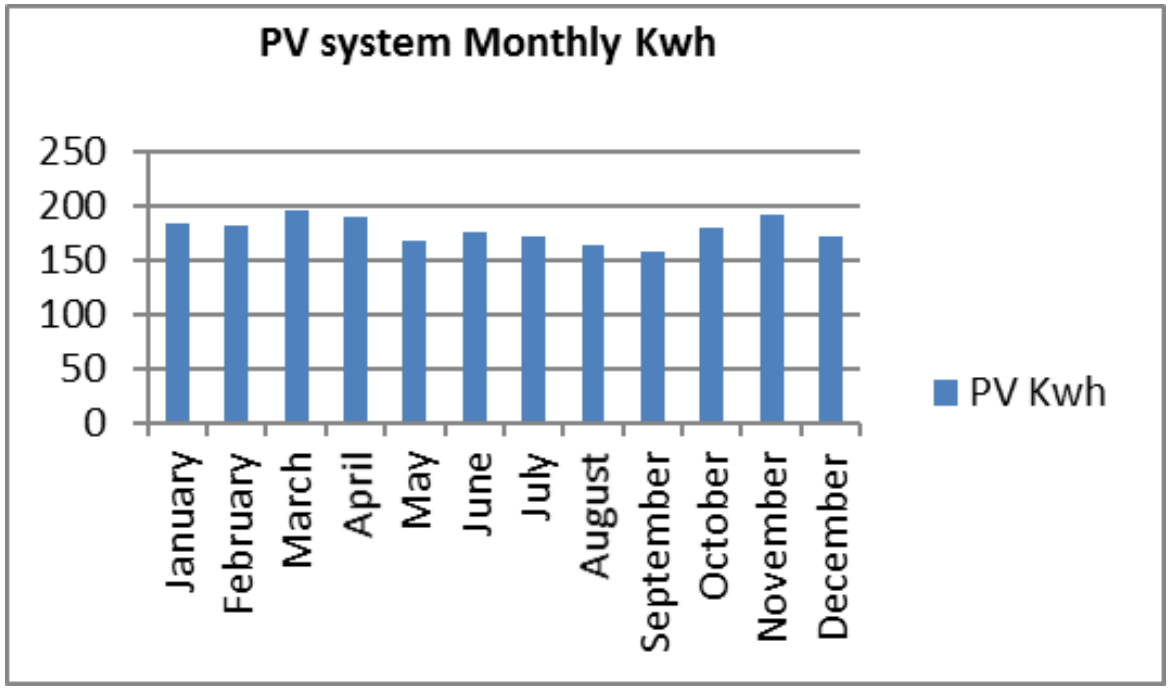
FIELD RESULTS

- This part presents the production of each type in 2015.

  Type 1 and Type 2.

- SM-255PC8 normal is recently installed in SQU-Eco house, so it will not be presented in this part.

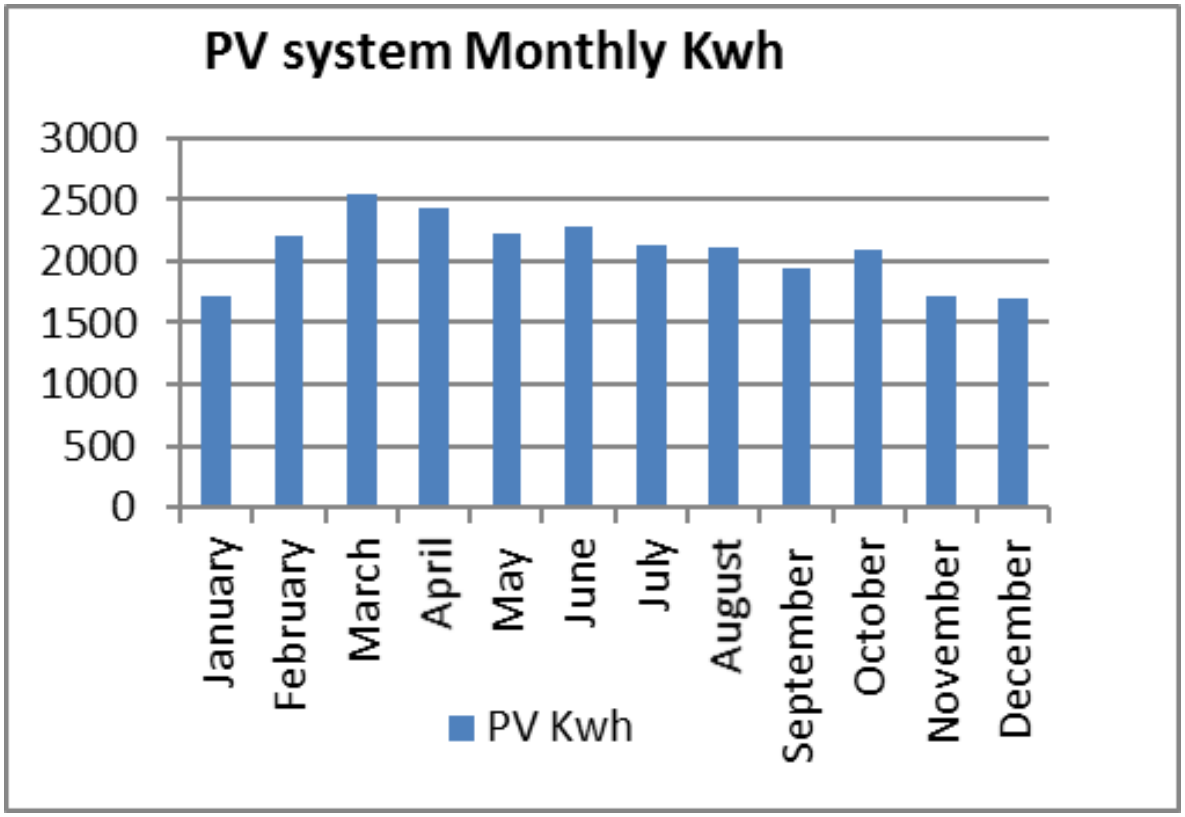
TYPE 1: 1.47 KW SYSTEM (SM-255PC8 DESERT MODULES)



Average Monthly PV production kWh for 1.47 kW System

The system produced total energy 2139.34 kWh in 2015.

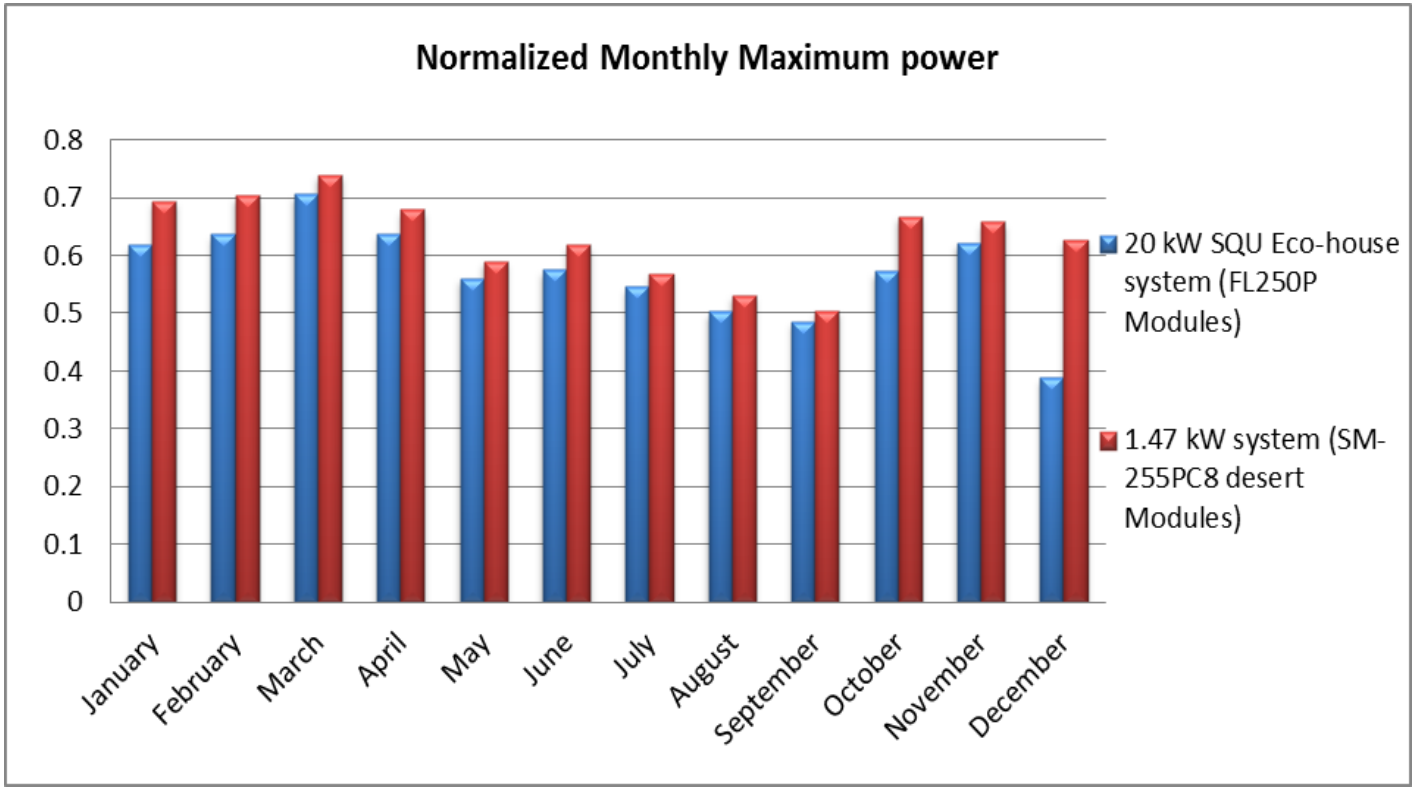
TYPE2: 20 KW SQU ECO-HOUSE SYSTEM (FL250P MODULES)



Average Monthly PV production kWh for Eco-House PV System

The system produced total energy 25.11MWh in 2015

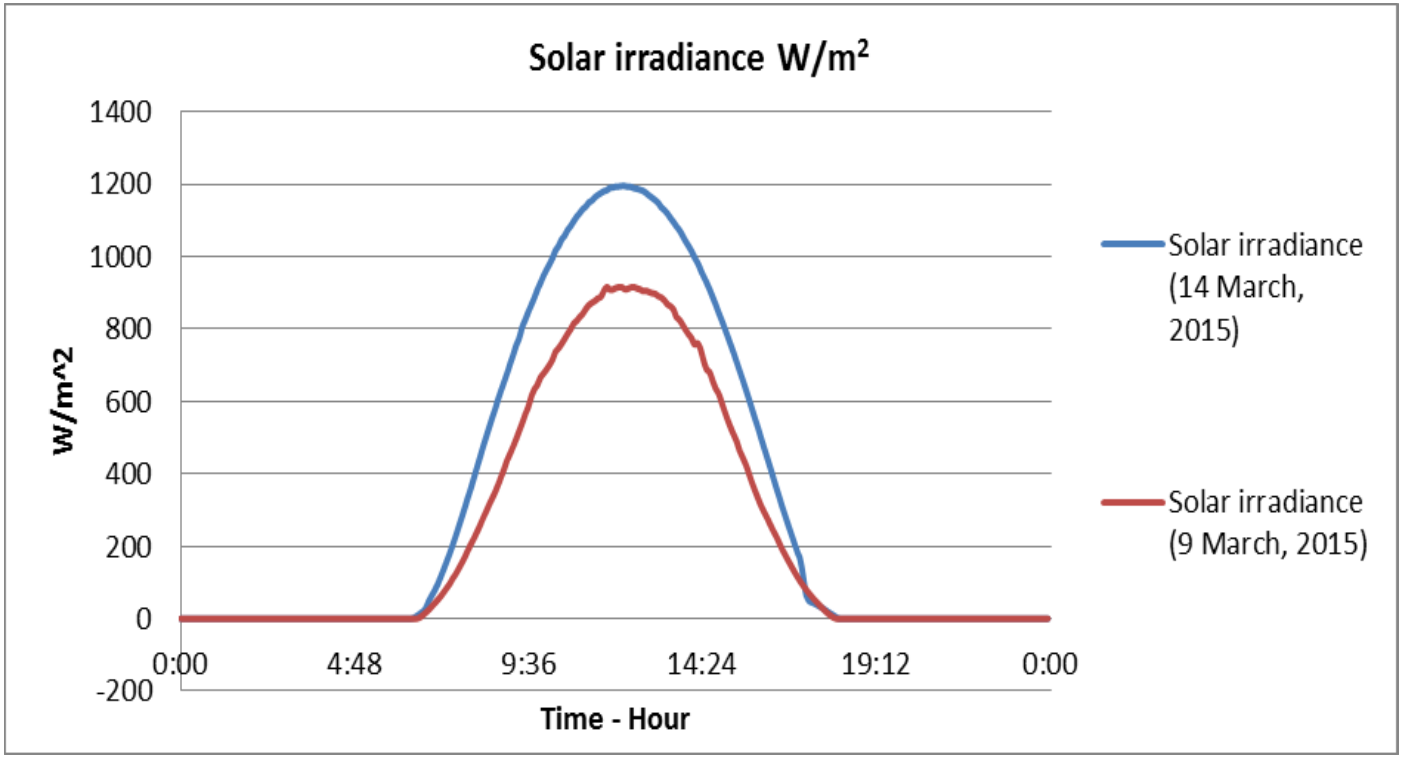
MAXIMUM MONTHLY POWER GENERATION AND THE IMPACT OF TEMPERATURE AND RAIN



IMPACTS OF RAIN ON SOLAR IRRADIANCE

The maximum monthly Energy was in March and the highest power generation was in 14 March. To explain this result, the irradiance increased in 14th March compared to 9th March

This increase was due to some rain participation between these two dates



CONCLUSION

- Three types of modules SM-245PC8 desert, FL250P, and SM-255PC8 normal were presented and tested.
- The P-V characteristics were obtained for the three types in indoor and outdoor conditions and in clean and dusty cases.
- The results shows, SM-255PC8 has better performance in both clean and dusty conditions.
- However, SM-245PC8 desert has less impact on dust conditions.
- In addition, the paper introduced field results using SM-245PC8 desert in 1.47kW system and FL250P in 20kW system.
- The highest power generation was in March and the lowest was August.

Thank you