IOT IMPLICATIONS IN SOLAR ENERGY (Innovation, management and operation)

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INTRODUCTION

Solar energy is fastest growing renewable source of energy (40% increase p.a. worldwide). The sunrays hits the solar panel surface and the photons present in sunlight creates a photoelectric effect and hence generate electricity. The tilt angle for the solar panel is dependent on the latitude of the place. Solar energy is trough out the year and solar power plants need to be monitored for optimum power output, which can be, efficiently and effectively done with the use of IOT.

CASE A: Small Scale (household solar panels)

This smart unit collects the weather data from the cloud and calculates the maximum power delivered to the load, with the battery full charged at the end of the day. This ensures that power backup is maintained even at power cut. All the details of the solar power and Load can be monitored and controlled with Web page or Android application.

OPERATIONS: ESP8266 module sends and receives data using Internet protocol => the inbuilt WIFI micro-controller connects to the Internet easily => PWM controller is used as the Charging circuit to charge the Battery => Relay Logic is used to control the Circuit form the controller => Data is monitored through HTML web page or web applications.

Fig 1.2 skeletal representation of Arduino functioning

Fig 1.1 app connectivity

CASE B: Large Scale (industrial solar plants)

IOT helps efficient power output from the power plants while monitoring for faulty solar panels, connections, and dust accumulated on panels lowering output and issues affecting solar panel performance. This automated IOT based solar power monitoring system that allows for automated solar power monitoring from anywhere over the internet.

OPERATION: Interface ESP8266 and solar panel with Arduino board => Open the Arduino IDE Software, write the program, upload to Arduino => Open thin speak account, and check the status updates.

GENERAL OPERATION

- **Connect solar panels** to utility grid
- Ensure that all elements (cellular modules, gateways, web platforms) are **integrated properly**.
- Need of software to **notify in real time**, whether the solar station is delivering sufficient energy levels.
- **Need to check** if the load balance on the grid is maintained.
- With changes in weather and environmental factors, the solar energy source should be **equipped to maintain efficiency**

BENEFITS

- **Economically feasible.**
- **Managerial Ease:** greater complexity leads to logistical nightmares for technicians and other grid manager.
- **Problem can be identified in real time:** Without IOT it would be difficult to determine if the problem was network related or hardware related.
- **Integrated IOT system** helps meets personal and industry demands and improve overall efficiency.
- **Makes it easier to manage** panels and energy outputs of complex energy grids.

CONCLUSION

Utilizing IOT in solar energy can lead to improvements with respect to metering. Smarter meters would not only increase overall efficiency, but also reduce costs for both energy providers and consumers. Securing panels and grids by installing IoT devices with a token signed by a private key, which connect to the Google Cloud IoT Core. The device can then be validated using a corresponding public key. Microchip offers Crypto Authentication chips capable of generating their own public/private key pair to encrypt device messages

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