



## IMPACT OF SOLAR ROOF TOP POWER PLANT AT GOVERNMENT POLYTECHNIC JUNAGADH

### Engineering

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### ABSTRACT

Day by day non renewable resources are diminishing, thus bringing us more and more towards the scarcity of energy. Mankind is already in search of alternative sources since many decades because oil and coal are depleting at very rapid rate. The best alternative that comes in our minds is solar energy. Various state and central governments are also promoting various techniques to harness or tap solar energy. One such method is installation of solar roof top plants. This can directly connect common man, changing his house from consumer to producer ! This paper presents various steps by different governments and in particular, the live case of Government Polytechnic, Junagadh as a case study to show the impact.

### KEYWORDS:

Solar tower, photo voltaic cell, solar power, roof top power plants

### Introduction

Since evolution to revolution leading to Industrialization, energy remained the basic need of mankind. Energy is needed in all activities to perform a task. Initially, man used its own muscles to get it done, later due to the increased demand, mans muscles were not capable, so he started using animals for that. But as the demand continued to rise, it was not possible to cop up. Coal and oil based energy sources paved a way in industrialization era. Saga continued for nearly two hundred years. But due to population rise and energy hungry products, as well as man's increased dependency on industrial products, be it day to day item or luxury item, energy demand went in almost exponential way. On the other hand, petroleum products continued to be costlier due to its diminishing quantity...! This lead man to rethink on the dependency on petroleum products. Research went in many directions, which may be sustainable for a longer period, non polluting and whose per unit price is affordable ! This lead to concentrate on various sources, one such best source was solar energy, the ultimate power for entire earth. Solar energy has huge potential of energy. Its available throughout India, that's too for almost an year. There are many ways to tap solar energy. It may be harnessed by photo voltaic cell, solar high mast tower, solar reflector, direct solar heating of water in ocean, direct heating in devices such as solar cooker an solar heater and much more... However, photo voltaic cell has been proved as the most convenient source. The price of solar energy per unit is also declining rapidly.

Being non polluting and non diminishing source, its sustainability for the future increases a lot. The price per unit is also declining day by day. As shown in below figure, year by year the price of solar PV cells is decreasing, also the solar PV cells 'global production is increasing. This has brought price per watt of solar in parity to price per watt of that produced by hydro carbon.

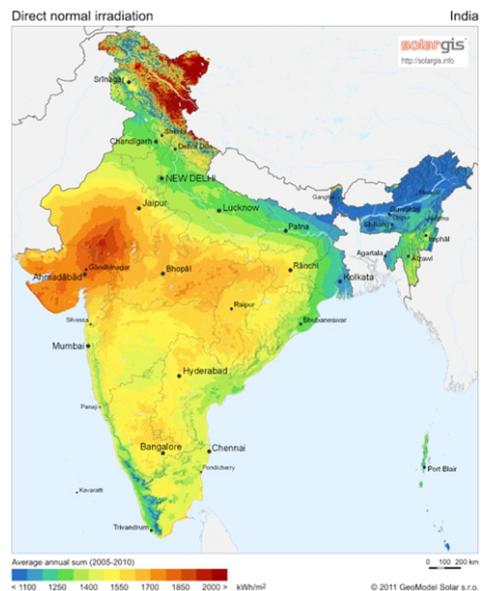


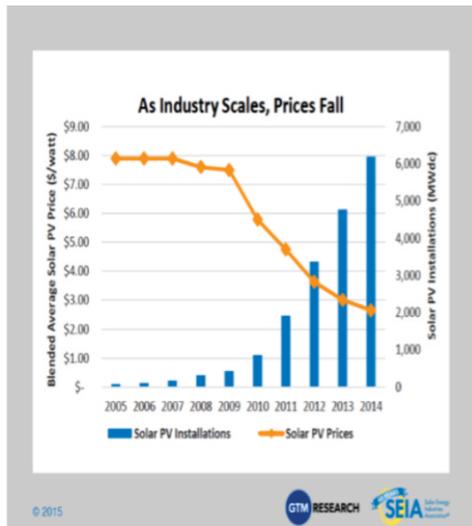
Image courtesy: <http://www.seia.org/research-resources/us-solar-market-insight> and It is very much clear from above figure that Gujarat is blessed with immense solar radiation, up to as far as 5.76 kWh/m<sup>2</sup>/day.

### Solar policy of Government

India and in particular Gujarat and Rajasthan are blessed with immense solar radiation. On the other side most energy is generated by coal, which is not found nearby these states. So solar radiation may become very much helpful to these energy starving states. Due to many fold advantages and seeing future in solar energy, central as well as various state governments are promoting solar energy production. Various incentives are being given by authorities to promote solar energy production. According to power ministry of India, as on February 2017, Total installed capacity of Indian power sector is 3,15,426 MW. Sector wise distribution is below:

- Thermal (includes coal, gas and coil): 189,047 MW (59.9%)
- Large Hydro: 44,413MW (14.1%)
- Small Hydro: 4,333MW (1.4%)
- Wind Power: 28,700MW (9.1%)
- Biomass: 7,971MW (2.5%)
- Solar Power: 9,012MW (2.9%)
- Gas: 25,329MW (8.0%)
- Nuclear: 5,780MW (1.8%)

It is very much clear that nearly 60 % energy is generated by non renewable energy sources like coal and gas which are diminishing day by day. Best way is to rely on non diminishing methods like solar and wind. Due to research in solar thin film PV cells, the price per watt is



drastically reducing day by day. Central and state governments are giving various incentives to promote solar and other renewable energy sources. Special ministries are formed to take care of it. For example, central government of India has put target of five times capacity of renewable energy by 2022. Government is also pushing hard for the penetration of solar power plants either via mega and ultra scale MW solar power parks or by roof top solar power plants.

Key features of solar power policy of Gujarat are:

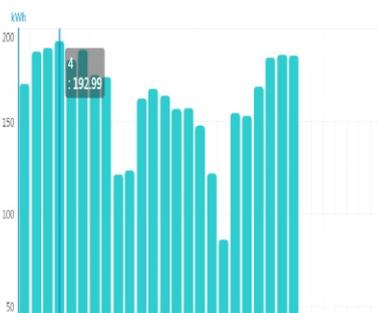
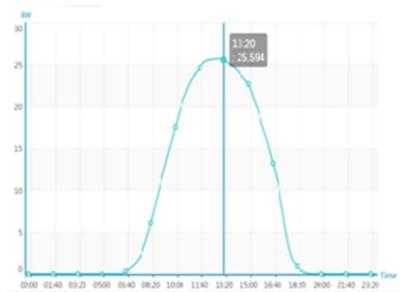
1. For residential as well as govt building's roof top solar power plants are installed at highly subsidized rates.
2. Net metering concept has been introduced
3. Up to 50 % of sanctioned load
4. No transaction charges
5. No wheeling charges and losses
6. Exemption from electricity duty
7. Cumulative unit credit encourages consumer because excess units generated at day time may benefit at night time.
8. The immediate impact is rise in installation of roof top solar power through out almost all cities and villages of Gujarat.
9. The price of per kilo watt of PV based roof top power plants has reduced to all time low as near as Rs 40000 after government subsidies.

Advantages of PV based generation:

Every renewable energy generation is far better than pollution creating non renewable sources, Yet main features available in this method includes, distributed power generation which reduces transmission and distribution losses, because mostly point of generation itself is the point of consumption. Modern techniques have removed batteries requirement to function thus increasing the life of unit up to 25 years. It uses inverters which work online with grid. Deficit power is draw from grid or excess power is supplied to grid.

Case Study of Govt Polytechnic Junagadh

Sanctioned load of Government polytechnic Junagadh is 72kW. Thus according to solar power policy of state, 35 kW has been installed on terrace of "A" building of institute, at nearly 35 feet height from ground. Wind direction is in such a way that sloppy ground comes in a way thus further increasing its height for the dust particles. Every fortnightly, all panels are cleaned. Total 117 panels have been fixed. Output of every panel is 300 watts. It has been seen that average power out per installed 1kW of PV panel, we are getting 5 units per day. Thus we are generating on an average 180 kWh per day. Thus more than 5000 kWh generation per month and more than 65000 kWh generation annually. This has directly resulted in reduction of electricity bill of institute. Initial requirement was nearly 11000 units, which has drastically reduced to 4500 to 5000 units per month. Power generated during non working days is directly feed to grid. Electricity bill of institute before installing PV plants was nearly Rs one lack, but now it has reduced to nearly Rs thirty thousand. However, this may further reduce in summer days.



It can be seen from the figure that maximum power generation per day was on 4<sup>th</sup> March at nearly 193 units and maximum power generation took place at 13.20 hours of 25.5kW. Power generation sharply increases in morning and sharply decreases at evening hours. Maximum power generation slot is from 11 am to 0400 pm. However it may vary according to seasons. All panels are regularly cleaned every fortnightly. Cleaning drastically improves efficiency.

#### Conclusion:

Per kilo watt price of solar power plants have touched all time low level as low as near Rs 40,000 after taking advantages of government subsidies. This has motivated people to install solar roof top power plants at every home. A surge has been seen across state and country for roof top solar power plants. Govt polytechnic has been awarded 35 kW such solar roof top power plant by government. This plant is running very successfully since its installation. Performance varies with variation in solar irradiation during different seasons and during day hours. Per day maximum generation observed is nearly 190 units, a major part of requirement of this institution.

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