Integration of Renewable Sources of Energy

Vikas Sharma[1], Gurinder singh[2], Maninder pal singh[3], Harvinderpal singh[4]

Abstract— The concept of grid connected system is that grid-connected system allows us to power our home or small business with renewable energy during those periods (daily as well as seasonally) when the sun is shining, the water is running, or the wind is blowing. Any excess electricity we produce is fed back into the grid. When renewable resources are unavailable, electricity from the grid supplies our needs, eliminating the expense of electricity storage devices like batteries. In addition, power providers (i.e., electric utilities) in most states allow net metering, an arrangement where the excess electricity generated by grid-connected renewable energy systems "turns back" your electricity meter as it is fed back into the grid. If we use more electricity than our system feeds into the grid during a given month, we pay our power provider only for the difference between what we used and what we produced.

***Keywords*—solar energy, wind energy, grid tie inverter, inverter**

I. INTRODUCTION

Energy is a crucial input in the process of economic, social and industrial development. Energy plays an important role in our daily life. The degree of development and civiulisation of a country is measured by the utilization of energy by human beings for their need. Energy is available in different forms. Day by day the energy consumption is increasing at an alarming rate. The world's fossil fuels supply i.e coal petroleum and natural gas will be depleted in next some years.this is called an ENERGY CRISIS. Energy can be extracted from various resources like bio energy human energy mechanical energy kinetic energy and animal energy. According to "law of conservation of energy "energy can neither be created nor destroyed, but it can be transformed from one form of energy to another form. Thus it's the need of the hour to go for some alternative sources of energy. As of now we are utilizing the energy from solar wind biomass oceans etc. While renewable energy systems are capable of powering houses and small businesses without any connection to the electricity grid, many people prefer the advantages that grid-connection offers.

1. Vikas Sharma, M.E Research scholar,

Chandigarh University

2. Gurinder singh, M.E Research scholar,

Chandigarh University

3. Maninder pal singh, M.E Research scholar,

Chandigarh University

4. **Harvinderpalsingh,**

Chandigarh University

The concept of grid connected system is that grid-connected system allows us to power our home or small business with renewable energy during those periods (daily as well as seasonally) when the sun is shining, the water is running, or the wind is blowing. Any excess electricity we produce is fed back into the grid. When renewable resources are unavailable, electricity from the grid supplies our needs, eliminating the expense of electricity storage devices like batteries. In addition, power providers (i.e., electric utilities) in most states allow net metering, an arrangement where the excess electricity generated by grid-connected renewable energy systems "turns back" your electricity meter as it is fed back into the grid. If we use more electricity than our system feeds into the grid during a given month, we pay our powerprovider only for the difference between what we used and what we produced.

II. ALTERNATE SOURCES OF ENERGY :

1. Solar energy i.e photovoltaics
2. Wind energy
3. Bio energy
4. Biomass
5. Geothermal energy and so many

The electric energy produced from these sources is fed to the inverter and is converted to the AC so that we can use it in our houses, small commercial set ups , etc. The energy is used during the working hours or during the time of the day when we are present in our homes and the energy produced when we are not using this energy is sent to the grid from where we are getting the supply of energy when our solar or wind installations are not working (like in rainy seasons). The benefit of using this kind of system is that it can cut our electricity bills as we are feeding back the part of the energy. It is done by synchronizing our power to the grid connected. This concept is called as NET METERING.

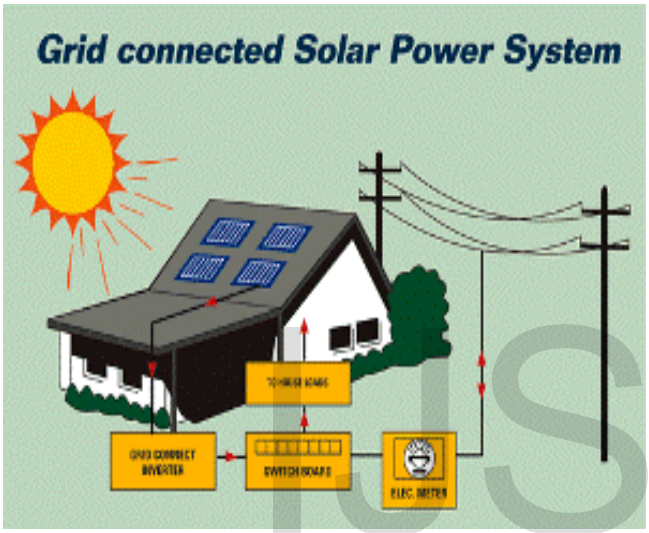
A.Grid connected solar pv system:

Grid-connected photovoltaic power systems are power systems energised by photovoltaic panels which are connected to the utility grid. Grid-connected photovoltaic power systems consist of Photovoltaic panels, MPPT, solar inverters, power conditioning units and grid connection equipment. Unlike Stand-alone photovoltaic power systemsthese systems seldom have batteries. When conditions are right, the grid-connected PV system supplies the excess power, beyond consumption by the connected load, to the utility grid.

The sun shines on the solar panels generating DC electricity The DC electricity is fed into a solar inverter that converts it to 240V 50Hz AC electricity. The 240V AC electricity is used to

power appliances in your home. Surplus electricity is fed back into the main grid.

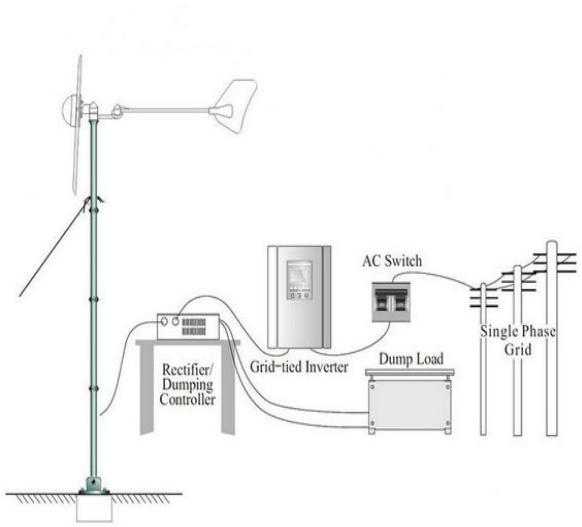
If a grid connect system is producing more power than is being consumed, the surplus is fed into the mains power grid. Some electricity companies will meter the electricity fed into the grid by your system and provide a credit on your bill.When the solar cells are not producing power, for example at night, your power is supplied by the mains power grid as usual. The energy retailer charges the usual rate for the power used.As all of the components in a grid connect system have no moving parts, you can expect a long and hassle free life from your solar power system! Generous government renewable energy rebates mean you can also save thousands on a grid connect system for a limited time.



B.Grid connected wind system :

An increasing share of electricity generation comes from wind farms. The ongoing growth in the wind turbine installations requires the transmission system operators to tighten their grid connection rules in order to obtain a better control of the production, to avoid variability and ensure the network quality.

Grid monitoring ensures that parameters such as voltage, current and frequency are measured between the converter and the transformer station. The values are continuously transmitted to the Grid Control Module, thereby enabling the adjustment of the turbine in case of changes in grid voltage or frequency. If set-point values for the system or grid protection are exceeded, the wind turbine is shut down and reports are sent to supervisors. The turbine will start up again, as soon as voltage and frequency return to acceptable levels. If emergency shutdown with grid disconnection is necessary, the incident will be reported through the monitoring system, and the turbines will automatically reconnect, and resume production, as soon aspossible.



Today, wind turbines have status as -small- power stations, and as such there is a need for better control of the production from wind turbines in coexistence with other power sources.

Almost all wind turbines producing electricity consist of rotor blades that rotate around a horizontal hub. The hub is connected to a gearbox and generator, which are located inside a protective covering (called a nacelle).

Most wind turbines have three blades that face into the wind. The wind turns the blades round spinning the shaft which is connected to a generator. This is where the electricity is made. A generator is a machine that produces electrical energy from movement..

Generally, we will need both AC and DC power for our home. DC power is produced by the wind turbine and can be stored in batteries. Then it can be converted to AC by using an inverter which also makes it suitable to export to the electricity grid. Check with the wind generator manufacturers for more specific information on configurations to suit our situation.

C. Grid tie inverter and net metering :

A grid-tie inverter is a power inverter that converts direct current (DC) electricity into alternating current (AC) with an ability to synchronize to interface with a utility line. Its applications are converting DC sources such as solar panels or small wind turbines into AC for tying with the grid.

Residences and businesses that have a grid-tied electrical system are permitted in many countries to sell their energy to the utility grid. Electricity delivered to the grid can be compensated in several ways. "Net metering" is where the entity that owns the renewable energy power source receives compensation from the utility for its net outflow of power. So for example, if during a given month a power system feeds 500

kilowatt-hours into the grid and uses 100 kilowatt-hours from the grid, it would receive compensation for 400 kilowatt-hours.

Inverters take DC power and invert it to AC power so it can be fed into the electric utility company grid. The grid tie inverter must synchronize its frequency with that of the grid (e.g. 50 or 60 Hz) using a local oscillator and limit the voltage to no higher than the grid voltage. A high-quality modern GTI has a fixed unity power factor, which means its output voltage and current are perfectly lined up, and its phase angle is within 1 degree of the AC power grid. The inverter has an on-board computer which will sense the current AC grid waveform, and output a voltage to correspond with the grid. However, supplying reactive power to the grid might be necessary to keep the voltage in the local grid inside allowed limitations. Otherwise, in a grid segment with considerable power from renewable sources voltage levels might rise too much at times of high production, i.e. around noon.

Grid-tie inverters are also designed to quickly disconnect from the grid if the utility grid goes down. This is an NEC requirement that ensures that in the event of a blackout, the grid tie inverter will shut down to prevent the energy it transfers from harming any line workers who are sent to fix the power grid.

Net metering is an electricity policy for consumers who own renewable energy facilities (such as wind power and solar power) which allows them to use electricity whenever needed while contributing their production to the grid. "Net", in this context, is used in the sense of meaning "what remains after deductions" — in this case, the deduction of any energy outflows from metered energy inflows. Under net metering, a system owner receives retail credit for all the electricity they generate unless they produce more electricity than they consume during any given billing period.

Net metering is a policy designed to foster private investment in renewable energy. In the United States, as part of the Energy Policy Act of 2005, all public electric utilities are required to make available upon request net metering to their customers. The Cross Border Energy Coalition estimated that in California alone net metering is responsible for 43,000 jobs, $10 billion in private investment and $2.5 billion in savings for schools and public agencies.

III. GUIDELINES FOR SELECTION OF SOLAR PV PROJECTS:

The objective of the Jawaharlal Nehru National Solar Mission (JNNSM) under the brand 'Solar India' is to establish India as a global leader in solar energy, by creating the policy conditions for its diffusion across the country as quickly as possible. The Mission has set a target of 20,000 MW and stipulates implementation and achievement of the target in 3 phases (first phase upto 2012-13, second phase from 2013 to 2017 and the third phase from 2017 to 2022) for various components, including grid connected solar power. The guidelines provided by this mission is as follows :

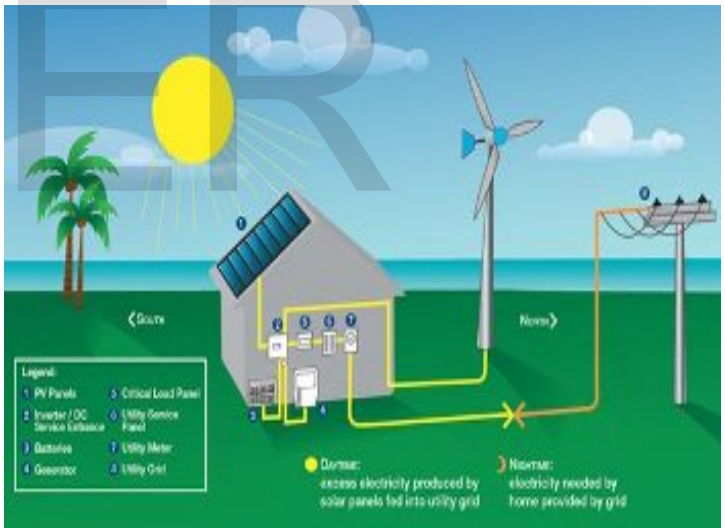
A. Capacity of Each Project :Given the requirement to connect the project to the TRANSCO substations at 33kV and above, the Project capacity shall be 5MW±5% in case of Solar PV Projects and no further variation in the capacity of the Project shall be permitted.

B. Request for Selection for Short-listing of ProjectsNVVN shall invite project developers to participate in the Request for Selection (RfS) for development of Solar Photovoltaic Projects under this scheme. The Project Developer shall submit the RfS within 30 days of the invitation by NVVN.

C. Processing Fees :The Project Developer shall submit non-refundable processing fee of Rs. 1 Lakh along with the RfS, for the Project.

D. Number of Applications by a Company **:**In order to have wider participation from Solar Power Developers, only one application per Company including its Parent, Affiliate or Ultimate Parent-or any Group Company shall be permitted for development of one project of 5 MW ±5%size using a Solar PV Project.

IV. CONCLUSION :



The benefit of using this kind of system is that it can cut our electricity bills as we are feeding back the part of the energy. It is done by synchronizing our power to the grid connected.

REFERENCES

[1]. "Grid-connected photovoltaic system". Soe

[2]. townsville.org

[3]. en.wikipedia.org/wiki/Gridconnected_photovoltaic_power_system

[4]. http://en.wikipedia.org/wiki/Grid-tie_inverter

[5]. www1.eere.energy.gov/solar/pdfs/31687.pdf

[6]. energy.gov/energysaver/.../grid-connected-renewable-energy-systems

[7]. ec.europa.eu/energy/technology/.../2001_fp5_brochure

_energy_env.pdf

[8]. Connecting to the Grid: published monthly, focusing on he latest news on interconnection and net metering in the U.S.

[9]. http://en.wikipedia.org/wiki/Net_metering