# GRID CONNECTED RENEWABLE ENERGY SOURCES

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## ABSTRACT

*There are various ways in which the power generation can be minimized & also the cost of generation, transmission and distribution can be reduced. Cost plays an vital role in the power system generation and distribution. For example:- Using Smart Grid reduces generation Cost & also Utilities the renewable energy generated by Solar and Wind. The main motive of Grid Connected Renewable Sources reduce the cost, utilizes the power in significant ways and protects the environment (it is eco friendly) and proper use of renewable sources. (solar, wind etc) supplies the power to the Grid and through which the power is being transferred or distributed to the utility area or remote area where the electricity is needed and though which we indirectly gives the energy to the sources and our we earn the money by the help of the Net Metering.*

**Keyword : -** *Smart Grids , Reduce Cost, eco friendly, renewable Sources.*

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### 1. Introduction:-

It is the project based on SMART GRID system which will operate on Renewable Energy (solar & wind ) as there sources and work on Net Metering system and hence will be beneficial for economy as eco friendly uses solar and wind as there sources.

We intended as electrical engineers to minimize the cost of generation & utilizes all the power generated in significant ways, Also it aims to introduces a concept of Smart Metering GCRES is a new concept of generating electricity from renewable sources, and giving that energy for using other industries by use the concept of Smart Grid.

**Renewable Energy Sources**

Our research paper describe the GCRES concept, uses and what are the advantages and how it is useful for minimizing the cost of electricity. We have worked on same project at our college presenting a synopsis showing its uses, advantages and usefulness. The mission is implemented in most efficient manner such that as generation by renewable sources, smart grid concept, full utilization of electricity, net metering concept.The Smart Grid is: Adaptive, with less reliance on operators, particularly in responding rapidly to changing conditions, Predictive, in terms of applying operational data to equipment maintenance practices and even identifying potential outages before they occur, Integrated, in terms of real-time communications and control functions, Interactive between customers and markets, Optimized to maximize reliability, availability, efficiency and economic performance Secure from attack and naturally occurring disruptions

Today’s power systems are designed to support large generation plants that serve faraway consumers via a transmission and distribution system that is essentially one-way. But the grid of the future will necessarily be a two-way system where power generated by a multitude of small, distributed sources—in addition to large plants—flows across a grid based on a network rather than a hierarchical structure.

The basic idea of Smart grids is about information and control as much as power management. Much of the information is sent over the power lines using broadband over power Lines (BPL), which superimpose information on top of the Electrical power. This information can reroute electricity around problem spots until the problem is fixed, and adjust power levels to match demands. Both power suppliers and power consumers can be accommodated by smart grids. Wind and solar power can add to the grid, and consumers can be charged higher rates during peak consumption hours and lower rates when consumption is low. Smart grids can even adjust for reduced output from solar cells on cloudy days and from wind turbines on still days, in addition to the increased demands from air conditioners on hot days. Smart grids can also quickly respond to natural failures "Disaster Avoidance" or terrorist attacks by rerouting around problems or closing down the network entirely. They also manage rolling brown outs to save electricity when demand exceeds production.

## 2.WORKING:-

Smart grid and net metering. The grid connected PV power System is an electricity generated solar power system that is connected to utility grid.

1. When sunlight hits PV panels electricity (or solar energy) is produced. The electricity then run from solar panels through an inverter.
2. The inverter turns the power from DC to AC which you can use for Electronic applications in your home
3. If the appliances in your home are turned on while solar power is being produced, the power runs through the switch board and the solar power is sent to your appliances.
4. Any appliances that are AC powered can use the solar power, including lights, dishwashers and electric hot water cylinders.
5. If electrical appliances are switched off, or if excess solar power is being produced, the power gets sent to the grid which is measured by the meter box. Your electricity retailer applies credits in exchange for the energy you produce. During the night, when your solar power system is not producing energy, you will draw power from the grid, which you can pay for with credits earned from exporting solar power during the day.

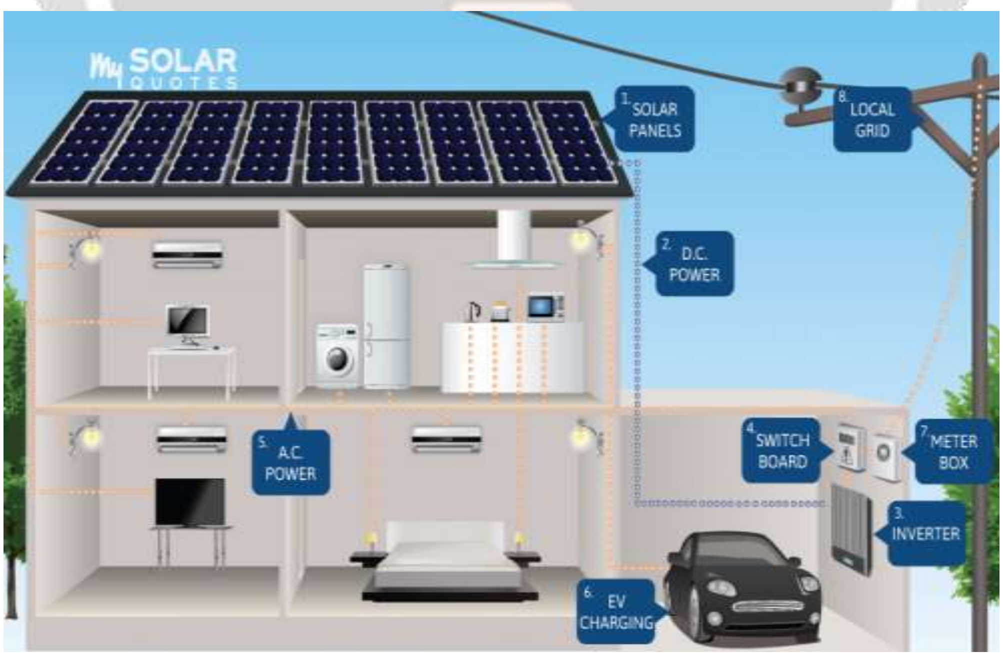


**Fig**:- Layout of GCRES

## 3. ComponentDetails:-

**Solar panel**

A solar cell is an electrical device that converts the energy of light directly into electricity by the photovoltaic effect, which is a physical and chemical phenomenon. It is a form of photoelectric cell, defined as a device whose electrical characteristics, such as current, voltage, or resistance, vary when exposed to light. Individual solar cell devices can be combined to form modules.

A single solar module can produce only a limited amount of power; most installations contain multiple modules. A photovoltaic system typically includes an array of photovoltaic modules, an inverter, a battery pack for storage, interconnection wiring, and optionally a solar tracking mechanism.

Photovoltaic modules use light energy (photons) from the Sun to generate electricity through the photovoltaic effect. The majority of modules use wafer-based crystalline silicon cells or thin-film cells. The structural (load carrying) member of a module can either be the top layer or the back layer. Cells must also be protected from mechanical damage and moisture. Most modules are rigid, but semi-flexible ones based on thin-film cells are also available. The cells must be connected electrically in series, one to another. Externally, most of photovoltaic modules use MC4 connector's type to facilitate easy weatherproof connections to the rest of the system.

**Fig :-** Solar panel

**2. Inverter circuit:-**

Using Transistors. A **12V** DC to 220 V AC converter can also be designed using simple transistors .It can be used to power lamps up to 35W but can be made to drive more powerful loads by adding more MOSFETS .It is a critical balance of system (BOS)–component in a photovoltaic system, allowing the use of ordinary AC-powered equipment. Solar power inverters have special functions adapted for use with photovoltaic arrays, including maximum power point tracking and anti-islanding protection. Solar grid-tie inverters are 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 produces from harming any line workers who are sent to fix the power grid. Grid-tie inverters that are available on the market today use a number of different technologies. The inverters may use the newer high-frequency transformers, conventional low-frequency transformers, or no transformer. Instead of converting direct current directly to 120 or 240 volts AC, high-frequency transformers employ a computerized multi-step process that involves converting the power to high-frequency AC and then back to DC and then to the final AC output voltage

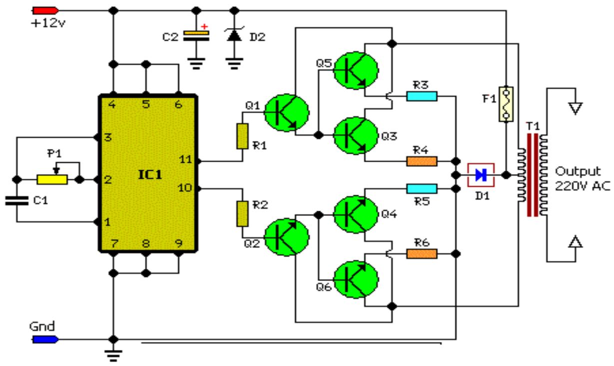


**Fig:- Inverter circuit**

**3.Transformer:-**

A **transformer** that increases voltage from primary to secondary (more secondary winding turns than primary winding turns) is called a **step-up transformer** .Wrap two, equal-length bars of steel with a thin layer of electrically-insulating tape. Wrap several hundred turns of magnet wire around these two bars. You may **make** these windings with an equal or unequal number of turns, depending on whether or not you want the **transformer** to be able to "**step**" voltage **up** or down.

A smart transformer (ST) provides the exact amount of power that is needed, and responds instantly to fluctuations within the power grid, acting as a voltage regulator to ensure that the optimized voltage is undisturbed.

STs are programmed to, as a default, provide an voltage optimized power supply that directly addresses their facility's energy needs. ST can help large commercial facilities use power more efficiently to save money, power and go greener.

A solid state transformer (SST) with managerial role in the electric distribution grid is generally called Smart Transformer (ST). Smart transformers work independently to constantly regulate voltage and maintain contact with the smart grid in order to allow remote administration (if needed) and to provide information and feedback about the power supply and the transformer. Moreover this type of transformers are used in Point of Common Coupling (PCC) in a micro grid for voltage control – and it acts as a protecting device for electrical equipment's during power fluctuations

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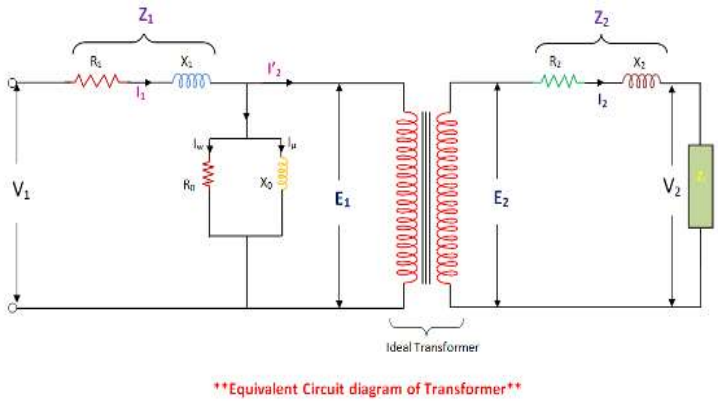


Fig:- circuit Diagram of Transformer

4.**Smart Energy Meter**:-

An electricity **meter** or **energy meter** is a device that measures the amount of electric energy consumed by a residence, or electrically power device. Recognizes and details Electric consumptions. Power outage notifications and power quality monitoring.

Smart meter is essentially an electrical device that specifically recognizes and details electrical consumption in intervals of an hour and communicates that information on a daily basis back to utility for monitoring and billing purposes. It provides a two-way communication between consumers and utilities. It is designed to replace traditional meters.

Compared to traditional meters, smart meters have the added functionality of utilizing real-time sensors, power outage notification and power quality monitoring. Time of day charges are documented in the data and relayed to electrical company to allow them to know how much electricity was consumed any time during the day and can charge consumers accordingly.

Home Energy Management System is usually used alongside smart meters as they provide the interface between consumer and energy provider. As mentioned before, smart meters operate digitally and allow for automatic and complex transfers of data between utilities and consumers.

EMS also allows consumers to monitor real-time information and pricing signals from utilities and can create settings to minimize power usage when prices are highest, that is, during maximum demand. Some settings allow specific devices such as "smart" appliances to shut down without human intervention when a large demand threatens to cause an outage.


**Fig.:- Smart Energy Meter**

## 4.CONCLUSION:-

The Project present a GCRES using concept of Smart Grid & net metering. GCRER is a concept designed to provide electricity in more efficient way by better allocating electricity according to consumer's wants. It integrated multiple energy sources and avoid over generation as well. In foreign countries, namely the UK and USA, started to implement as they see it as a solution of energy and environment pressure in their own country.

Smart Grids are most comprehensive technology during recent years and it has been grown rapidly because of its benefits. It has many features and the transition to a fully implemented smart grid brings a host of benefits in an often symbiotic relationship GRID OPERATORS will enjoy a quantum improvement in monitoring and control capabilities that will in turn enable them to deliver a higher level of system reliability even in the face of ever-growing demand. UTILITIES will experience lower distribution losses, deferred capital expenditures and reduced maintenance costs. CONSUMERS will gain greater control over their energy costs, including generating their own power, while realizing the benefits of a more reliable grid.

THE ENVIRONMENT will benefit from reductions in peak demand, the proliferation of renewable power sources, and a corresponding reduction in emissions of $CO_2$ as well as pollutants such as mercury. "Smart grid" enabled distribution could reduce electrical energy consumption by 5-10%, carbon dioxide emissions by 13-25%, and the cost of power-related disturbances to business by 87%. (Source: The Electric Power Research Institute). Smart grid enabled energy management systems have proven in pilots to be able to reduce electricity usage by 10–15%, and up to 43% of critical peak loads. (Source: The Brattle Group, SMUD and PNNL.)

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