# Review on Hybrid Power System

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***Abstract*— The best alternative is a regional hybrid energy demand program. Incorporation of multiple alternative energy sources in existing transmission systems is an integrated energy system, including wind, solar and hydropower. This article discusses a hybrid control network's reliability. This paper discusses reliability problems and various controls that affect the output power of a hybrid power system. Stability or power efficiency is key issues of the hybrid system. Many sorts of factual devices or other approaches are used to `1 these issues. Hybrid control systems are increasing in popularity today. The majority of research is focused on different controllers or control mechanisms used for full hybrid device generation of reasonable power efficiency.**

***Keywords*— *Inverters, hybrid topologies, CHB, THD, phase shift pulse width modulation, PWM, sinusoidal pulse width modulation, Solar System, Renewable Energy, Solar power, Boost converter, Solar panel, MPPT.***

## I. INTRODUCTION

The hybrid energy solution blends traditional and green energy sources such as wind, solar, hydro, etc. These technologies can deliver clean, eco-friendly electricity. The network hybrid solution is more secure to supply constant electricity to the grid as demand is directly connected to the grid if there is any power loss or malfunction of sources of renewable energy. Since the wind, as well as the sun, is consistent every day, this triggers a hybrid system's stability issue.

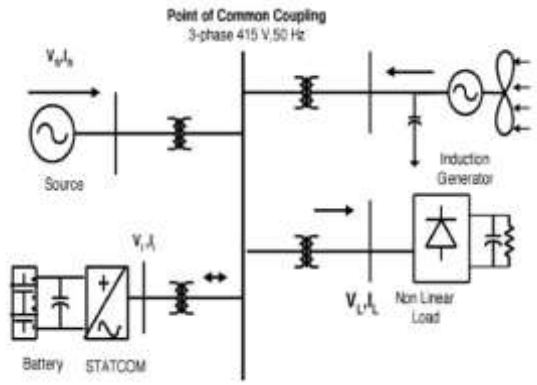


Fig.1.Grid-connected FACT system for power quality improvement

As the wind, as well as the sun, is not consistent every day, this triggers the hybrid system's stability issue. Specific types of Data tools are used to increase the reliability of the network. For preserving the reliability of the system, UPFC, IPC, Fuzzy logic, SVC, STATCOM, etc. And a full generation of power and continuous output is accomplished with optimum power point monitoring technology, which absorbs the combined wind or sunlight for optimal hybrid system efficiency.

## II. CONTROLLER FOR SOLAR AND WIND HYBRID POWER SYSTEM

Power efficiency or voltage stability are key challenges for wind and solar hybrid systems. The production for each source depends on itself since all sources are renewable. The wind speed is not constant as well as sunshine varies all day long. The solar system does not work in the rainy season. It stops voltage from being stable but impacts power efficiency. To maintain stability and improve power quality, these different controllers are used. The UPFC D-STATCOM, IPFC, SVC, SSSC, and Fuzzy Logic Controllers were used for energy conservation and power continuity. The tensile stability of the power system has been reduced by the swell, slope, and harmonics produced in the system. Unless the fee is given, the FACTS devices are linked to the inverter output terminal. These Information tools help to reduce current waveform harmonics, which increase power efficiency. STATCOM is static synchronous compenser used to reduce dynamic power compensation, boost device constancy and transient stability. This is used to compensate for reactive or aggressive strength.

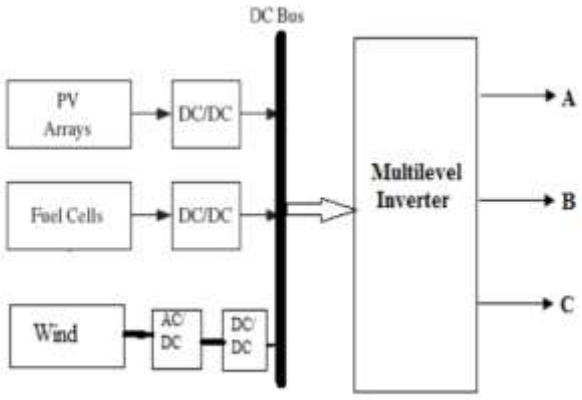


Fig.2.Block Diagram of Hybrid System with Multilevel Inverter

## III. IMPROVEMENT OF POWER QUALITY IN HYBRID SYSTEM WITH MULTILEVEL INVERTER

Multi-level inverter power efficiency depends on the number of stages. The multi-level inverter has the primary advantage of generating peak voltages with low harmonics. The harmonics induce the development of present that leads to a favorable rise of current. These inversions are used for high power applications. Inputs are first connected to the dc-dc converter in hybrid systems or multilevel inverters. Specific converter topologies such as two-stage voltage converters are being used; 3-stage clamped voltage source converter diode, 4-story convector, or H-bridge mounted voltage converter series. Voltage converter. diode clamped inverter is the most

widely utilized converter, whereby a diode is used to push dc bus voltage into three-phase output voltage so that seven inverters may be used. As the number of rates increases, low order harmonic amplitude decreases. Since high-frequency harmonics are simple to detect, a low pass detect is usually added to the inverter. By can lower order harmonics, the efficiency of multilevel inverters can be increased. The DC bus voltage at a consistent value can also be regulated via the PI controller.

Renewable electricity, like wind, was given a huge boost soon after the first major oil crisis in the second half of the 1970s. Financial problems at the time were the most significant considerations and the interest in these systems declined as oil prices plummeted. The need for this is inspired by construction expenditure in renewable energy. the strong influence of the use of fossil energy systems. Around half of the energy hits the surface of the earth and the other half is transmitted by the atmosphere to the outer space. the Sun, that gives over 150,000 terawatts of electricity to Earth. Only a tiny portion of the solar energy generated on Earth will meet the world's anticipated need for electricity. Although most green energy sources are wind, we are talking about the actual use of solar radiation through the application of solar electricity. One of our biggest scientific and technological prospects is the creation of efficient ways of capturing, transforming, processing and using solar energy at an affordable cost. Solar energy networks have two major drawbacks:

1. The energy costs resulting are not yet sustainable and
2. When required, solar power is not always available.

Substantial attempts to explore strategies that can help solve these disadvantages; one such technique is power. While the primary source of energy (fuel) in many power generation processes can be controlled as it is the main control element solar Power System cannot be controlled as solar power is the main source of energy (Camacho et al. (1997)) as it changes seasonally regularly and is a control condition. Solar plants have all the technologies necessary to deal with changing environments for innovative management approaches (nonlinearities and uncertainty). Since fixed PID controllers are incapable of dealing with any of the above issues, they must be discarded with small gains, result in sluggish answers or when tuned near, they may generate strong oscillations as process dynamics differ due to shifts in environmental or operational conditions. Using more effective control techniques to boost reactions will maximize the number of solar hours plants, thereby reducing costs produced per kW-h. This paper discusses the current hybrid power system as well as the issues with management and how control systems should increase their performance.

## IV. Solar Energy

The photovoltaic cell can provide solar-powered power or the CSP can specifically be produced using the photovoltaic cell and the power generation turbine. Specific control is based on the photovoltaic effect, which is that light-photons smash electrons into higher levels of energy. PV generation systems are used for everyday use, including enclosed buildings, boats, water pumps, electric vehicles, emergency route phones, and remote sensing, which are not limited to electric vehicles.

The solar concentrative thermal system uses sun-tracking devices and optical equipment (usually mirrors) to focus a wide area of sunlight in a smaller receiving zone. A conventional power plant instead utilizes distributed solar energy as a heat source. Many integrated developments have been developed A) the most critical target conditions are parabolic boiling, b) solar panels, c) rectangular fresnels, and d) solar towers. The oriented solar electricity is based on low temperatures and hence high thermodynamic performance.

**A. Irradiation –** Data from various sources have been analyzed and source based on the definition of accuracy in such a study established.

**B. Performance ratio –** The efficiency ratio is found to be dependent on irradiation, optimum tilt angle, air temperature, the geometry parameters, module size, inverter efficiency, etc. The tests were obtained using RETscreen tools based on the above parameters. Some information on the newly deployed Indian network linked power stations was related to the results.

**C. Degradation –** Over 25 years, every producer guarantees its efficiency, with 90% production for the first 12 years, and up to 80% after 25 years of service. Related analyses of the extenuation of modules during long-term field service by world-renowned organizations. Such results are evaluated to obtain the final findings.

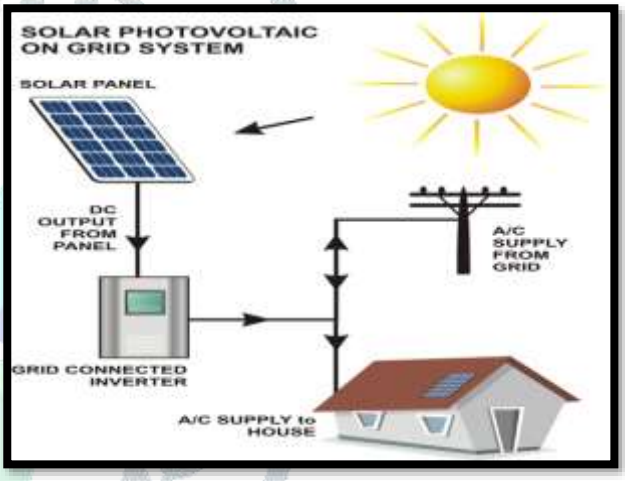


Fig.3. Solar power System

**D. Life expectancy –** Trends in panel, inverter, system support and cabling accelerated tests were investigated.

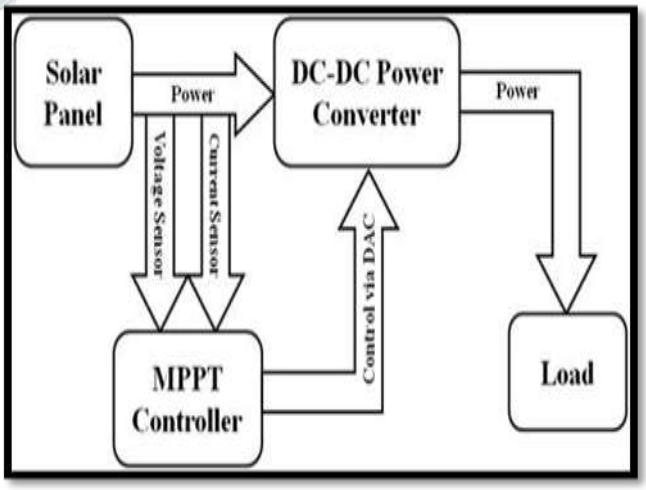


Fig.4.Block of control circuitry

### 1. Technology for Solar power plants

Solar energy can be classified loosely into two groups:

a) Solar PV technologies.
b) Solar thermal power plants.

## 2. Solar Photovoltaic (SPV) technologies

Semiconductor machines are photovoltaic transformers that transform most of the solar radiation incident into electricity directly. most increasing PV cells are made of silicone with single glass, yet cell substrates, design or development processes vary significantly. Amorphous cells including cadmium telluride, copper indigenous Silicon, CIGS, DSSC sensitized solar cells, as well as other emerging developments like silicon nanoparticle manufacturing, carbon nano tubing, or quantum dots, are possible. or CIGS, CD-Te Crystalline Silicone, and Silicium Amorphous Cells are possible.

Table.1.Solar Module efficiency

| S.No | Module | Efficiency |
|---|---|---|
| 1 | Thin film | 12-14% |
| 2 | Polycrystalline | 15-16% |
| 3 | Monocrystalline | 16-18% |

## 3. Performance of solar power plants

The productivity of solar power plants is also measured in the Facility Usage (CUF), which is the ratio of the plant's actual production to its estimated yearly production. The approximate solar power plant output is measured using standard software and is based on design parameters. But, considering that the final product from a plant has many factors, CUF varies over a number. This may be due to inadequate panel quality, derived modules at a higher temperature, other architecture parameters such as ohmic failure, Variables in the climate such as increased cloud cover or dung. Therefore, various factors that contribute to variation in plant production are important to note. Also, the performance of plants depends on many factors, like facility position, solar insolation level, in general, climatic temperature conditions, cable technological loss, module mismatching, land loss, MPPT losses, transformer losses or inverter loss System failure or module deterioration by aging can also lead to losses.
Many of them are defined by the manufacturer like power production dependency on temperature recognized as a coefficient of temperature. Main success metrics are known as the following:

a) site radiation
b) PV system losses
c) temperature and atmosphere conditions
d) Plant architecture parameters
e) Inverter performance
f) Module aging degradation

### a) Solar Radiation Basics and Definition

Solar radiation for several physical, biological & chemical treatments on the surface of the planet is the main catalyst. Full and accurate solar radiation data are important for science and engineering fields as architecture in a specific area., Industry, forestry, the environment, hydrology, irrigation, water, limnology, oceanography, and environmental sciences. Furthermore, the solar ray data are an integral component of solar power applications like photovoltaic power generation systems, solar heating collectors, building solar-powered air conditioning and passive solar power systems [3]. Several analytical formulas for measuring solar radiation have been established using different parameters. Many plays have taken advantage of sunlight season, daylight hours, relative humidity and temperature, and rainy days, sunlight periods and a feature that varies based on latitude and height. The primary condition for the construction of any renewable power plant is the correct solar radiation data. device must be known for accurate construction measurements. Instantly or mixed results may be measured (irradiance), usually over one hour or one day for a long period (irradiation). Data for a pulse, scattered or absolute radiation, or horizontal or sloping field. Also important is awareness of types of measurement instruments for these measures.

### b) Losses in PV Solar systems

All systems losses measured lead to a lower grid voltage than for power produced by photovoltaic modules system losses. Such failure is caused by many factors, like cable drops, inverters, the soil on modules and atmospheric conditions, differing amounts of insolation, etc. We must take into account all potential losses when planning a PV network.

### c) Reflection losses

At normal test conditions, PV module power ratings, which include perpendicular incident light, are calculated. Larger incidence angles are generated under field conditions, leading to higher reflex losses than the nominal power value. Measurements display an average reflection loss as contrasted to STC of approximately 1% in equator facing modules with a latitude angle of tilt.

### d) Soiling

The deposition of dirt and dust will contribute to the soiling of solar panels. The dust is normally washed off by moisture from the panel sheet, but soil such as bird dropping can linger even after heavy rains. The lower edge is the most essential element of a module. Silting occurs at the edge of the frame, particularly with very low inclinations. The water accumulation between the frame and the glass also accumulates in the shallow puddle and consequent debris for evaporation. The dirt decreases the strength from a battery while the cells are shaded. Losses are normally 1%, so when the modules are washed the control is returned.

### e) Mismatch effects

The connectivity of solar modules in sequence and concurrently induces wrongdoing damages. The modules that do not have the same property or have different conditions. Mismatch errors in PV modules and arrays are a significant concern as, in worse circumstances, the efficiency of the entire PV system is calculated by the lowest-performance solar cell. The choice of modules is thus very significant in the overall production of the plant.

### f) Maximum Power Point Tracking (MPPT)

Changes in solar panel output in the direction of the sun, raise sunset but differ in temperature. The curve of the PV module (power vs. voltage) only has one total power. This assumes that

a high voltage nor current is identical to the same voltage. As the output of the module is low, the module should be run at a high power level, to provide full power to the load under varying temperatures and insolations conditions. It increases the usage of the solar PV module by optimizing capacity. Utilizes an MPPT to remove full power from the solar PV module then transmit this energy to load. A dc / dc conversion system aims to convert maximum energy into a charge from the solar PV panel. High power point control means that the output of the panel is still at the highest PowerPoint. The use of MPPT raises solar power plant production substantially. maximum power point for a mono-crystalline solar cell is achieved at the intersection of the current or voltage curve for a certain irradiation frequency.
Cable, converter, inverter and switch networks experience damages that are normally easy to assess.

### g) Inverter efficiency

A solar photovoltaic inversion is an electric converter intended to transform DC energy for household equipment or to be fed into the grid from photovoltaic to alternative current (AC). These generators may be independent inverters on isolated systems or inverters for connection of power plant to the grid. Inverter's output depends on how often DC voltages are converted into AC. There are efficiencies of 96 to 98.5% for currently available grid-connected inverters, so a right inverter is critical for the design process. Lower inverters are also less effective than 95 percent. If used at the low end of their full strength, the inverters are therefore much less effective. In 30 to 90 percent power range, the majority of inverters are most powerful.

## V. Wind Energy Conversion System

WECS consists of a rotor that consumes kinetic force in the air, and a power train to increase the rotary speed of the shaft. The WECS mechanism consists of a piston. This article uses a variable wind turbine with the option to adjust the speed from' ATE' to' V' of wind turbine continuously. According to the used motor, ECS with dual feed inductance generators is the most important listed variable speed wind turbines. The ability to control pitches through efficient power transmission through active or reactive power control has been made very appealing, as wind power is increasingly influenced by the electricity network. The stator (stationary) of generators is directly connected to grid & rotor power is managed via converters in these types of generators. There are three main components of that model: wind turbine rotor, drive train as well as the generator. By generating torque, the wind turbine rotor transforms the wind's cinematic energy into mechanical energy. As energy in wind is like kinetic energy.

## VI. Conclusion

Sustainable solar power generation is one of today's big technological problems. The Control is one of the methods that allow this goal to be accomplished. This paper shows the major control issues of solar systems operation.

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