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250KW Solar Power with MPPT Hybrid Power Generation Station

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Abstract: Energy comes in different forms. Light is a form of energy. So is heat. So is electricity. Often, one form of energy can be turned into another. This fact is very important because it explains how we get electricity, which we use in so many ways. Electricity is used to light streets and buildings, to run computers and TVs, and to run many other machines and appliances at home, at school, and at work. One way to get electricity is to This method for making electricity is popular. But it has some problems. Our planet has only a limited supply of oil and coal .In this method details about Endless Energy, Solar Cells Galore, Energy from Sun shine , Understanding Electricity. Solar Thermal power plant use the Sun as a heat source. In order to generate a high enough temperature for a power plant, solar energy must be concentrated. In a solar thermal power plant this in normally achieved with mirrors. Estimation for global solar thermal potential indicates that it could more than provide for total global electricity needs. There are three primary solar thermal technologies based on three ways no of concentrating solar energy: solar parabolic through plants, solar tower power plants, and solar dish power plants. The mirrors used in these plants are normally constructed from glass, a although, other techniques are being explored. Power plant of these types use solar heat to heat a thermodynamics fluid such as water in order to drive a thermodynamic engine; for water this will be a stream turbine. Solar thermal power plants can have heat storage systems that allow them to generate electricity beyond daylight hours.
Keywords: Solar-power, Thermal-power, Hybrid Energy solar power Grid PV solar Power Grid.

I. INTRODUCTION

Solar hybrid system design has many parameters that need to be evaluated. First of all, it should be determined that the system to be installed will be on-grid or off-grid structure. After selecting the solar hybrid building type, the system is sizing. One of the critical parameters in solar energy system sizing is the determination of the amount of load. In addition, during the installation stage, the location where the solar energy system will be installed, mounting angles, local solar irradiation data are the parameters to be considered. These energy resources are renewable, meaning they're naturally replenished. There are two types of sources of energy in the world: renewable energy sources and non-renewable energy sources. Renewable energy sources are generated directly from nature for example, from the sun, rain, wind, tides, and it is possible to generate it over and over whenever it is needed. Renewable energy sources are abundant and are definitely the cleanest energy sources in Earth. Many types of Renewable energy sources are solar energy, biomass energy, wind energy, tidal energy, hydro energy, and geothermal energy. For instance, it is possible to use the energy from the sun and that is converted into electricity. Geothermal, wind, tides, and biomass energy from plants can also be used in different forms like Wind is harnessed from Earth's natural weather patterns. Hydropower comes from flowing rivers and from reservoirs. Solar energy comes from the Sun's light and radiation. Geothermal energy comes from the heat produced by the Earth underneath the ground. The advantages of Renewable energy is that wind, sun, ocean, and geothermal energy is in abundance and completely free of charge. The renewable energy sources have very low or zero carbon emissions, so they are environmental friendly. The another advantage is, it is not necessary to rely on any country to supply renewable energy sources, unlike its non-renewable counterparts. Non-renewable sources are not environmental friendly and can have serious affect on our health. Most energy that is used in the world today is generated from non-renewable energy sources. These energy sources can be re-generated over a short period of time. Natural gas and oil are derived from ancient plant or animal remains or fossils. These remains are what we have been left with after millions of years of fluctuation in pressure and temperature. Non-renewable energy sources include oil, coal, natural gas, and nuclear energy. The advantage of non-renewable energy sources are it is ready, cheap, and easy to use. The non-renewable energy convert one non-renewable energy type to another. The major disadvantage of non-renewable energy sources is that they are finite and will expire sometime in the future. This will make the prices of these non-renewable energy sources increase dramatically. They also cause severe environmental changes and are in a large way responsible for climate change and global warming. Non-renewable energy sources can have a serious impact on human health, as they are certainly not environmental friendly.

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II. SOLAR SYSTEM DESIGN

Solar hybrid system design has many parameters that need to be evaluated. First of all, it should be determined that the system to be installed will be on-grid or off-grid structure. After selecting the solar hybrid building type, the system is sizing. One of the critical parameters in solar energy system sizing is the determination of the amount of load. In addition, during the installation stage, the location where the solar energy system will be installed, mounting angles, local solar irradiation data are the parameters to be considered. Solar PV panels should be designed in a size that can meet all loads during the day. Thus the solar PV system can meet the demand regardless of both the grid and the energy storage unit. The battery capacity directly determines the availability of the system in off-grid solar PV systems. The more battery groups, the longer it supports the energy demand. The large battery group size will increase the total cost of the system. In addition, solar PV panel capacity and battery group should be selected in proportion to each other. If it is desired to charge the battery group in addition to the daily use of power, the solar PV panel capacity should be high. If the energy produced by the solar PV panels only meets the demand power, the battery group will never be charged. In such a case an extra battery group will have been purchased . When determining the capacity of the battery group, design should be made according to the load power. The battery group should not be deeply discharged in high power demands. In such a case the cycle life of the battery group decreases and creates costs. For off-grid solar PV systems

A. Solar Panel Design

After determining the demand power in the solar energy system, the PV panel is selected. Today, there are solar PV panels with different technology structures. The most used and preferred PV panel technologies are monocrystalline, split-cell module, polycrystalline, and passivity emitter and rear contact (PERC) module PV panels [37]. In solar energy systems the power range of a solar PV panel module varies between 250 and 400 W at standard temperature conditions of 25 °C per module. Maximum power values stated in catalog values are given under 1100 W/m^2 solar radiation values. Different solar PV panel manufacturers give different W/m^2 and efficiency factors. Array can be obtained by connecting solar PV panels in series or in parallel, depending on the demand power. The comparison of power production capacities of monocrystalline, split-cell module, polycrystalline, and PERC module PV panels with the same power values is given in Fig. 13.3. These values are calculated under the same conditions by taking from solar PV panels with the same capacity.

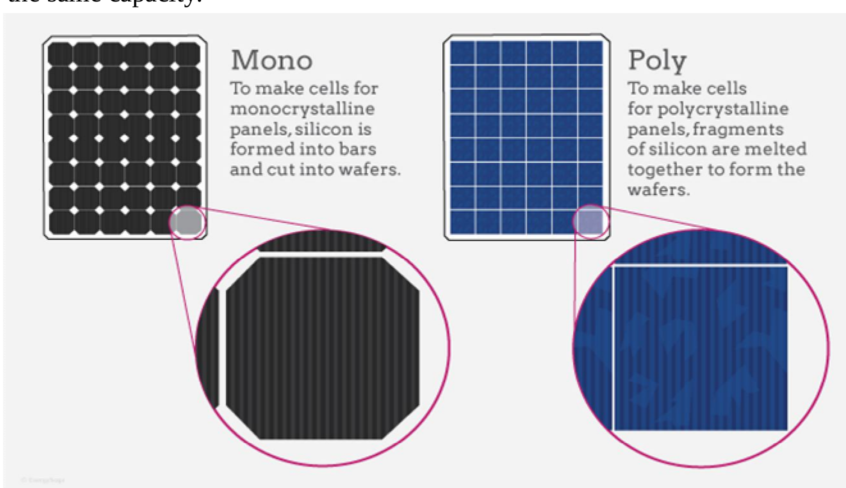


Figure1

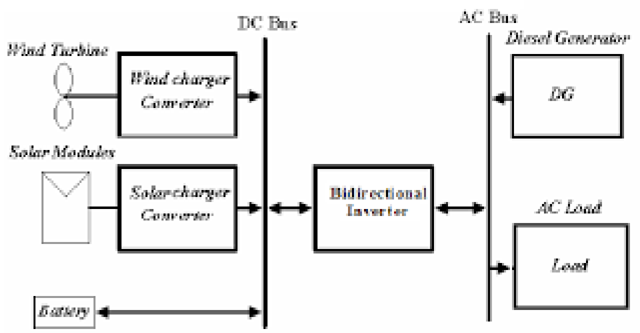
The total efficiency of the system should be considered during the dimensioning and design in solar PV panel systems. Factors affecting total efficiency are cables, terminal connections, power converter efficiency, battery group efficiency, and dust in solar PV panels. The total loss rate in a solar PV panel system is approximately 10 %–20 %. Correct sizing of the solar system will reduce the total cost and increase the total life and performance of the system

One of the sizing items in off-grid solar PV systems is the battery group. The number of batteries that can be used in series or in parallel will be determined as a result of the design. One of the factors determining the number of batteries is power capacity. The power capacity will determine the size of the battery group in Ah. In addition, the total efficiency of the batteries should be taken into account when calculating the losses. Temperature factor affects solar PV panels, power converter circuits, and battery group. During seasonal use, attention should be paid to the temperature effect.

In the case of excessive electrical energy in solar PV panel systems, it can be given to the grid. In this case, bidirectional meters are used to measure the power transferred to the grid. The difference between the consumed and transferred power to the grid is calculated with these bidirectional meters. The electricity sales are carried out at the rate of the tariff thanks to the bidirectional meters. In addition, it is necessary to have leakage current fuse and over current/voltage protection equipment together with bidirectional meters. All these equipment affect the total cost of the system

III.THERMAL SOLAR HYBRID GRID.

Thermal Power Plant is converter of fossil fuel energy to electricity in which during a cycle, steam is used to spin a turbine driving electrical generator to produce electricity. The first thermal power plant was built by Sigmund Schuckert in Ettal 1878. In the power plant a steam engine drove 24 dynamo generators. Fig2 : power plant cycle The condenser is a heat transfer device or unit used to condense a substance from its gaseous to liquid state , typically by cooling in it . In doing so, the latent heat is given up by the substance and will transfer to the condenser coolant. Use of cooling water or surrounding air as the coolant is common in many condensers.The main use of a condenser is to receive exhausted steam from a steam engine or turbine to condense the steam .The benefit being that the energy which would be exhausted to the atmosphere is utilised. A steam condenser generally condenses the steam to a pressure significantly below atmospheric . the Efficiency of Thermal Power Plant Using Thermoelectric Material, about the use of thermoelectric material or specifically the use of Thermoelectric Generator to produce electricity from the wasted heat in the condenser. It shows an increase of about 3.3% of the power plant (from 33% to 36.33%). VikramHaldkar et al experimentally showed in his paper-condenser maintains a very low back pressure on the exhaust side of the turbine. Secondly, the exhaust steam condensate is free from impurities. Condenser pressure dependence on cooling water temperature is obtained for the given water flow rate. It is experimentally shown that with cooling water increasing, pressure in the condenser will also increase



A. MPPT Solar Tracking

An MPPT, or maximum power point tracker is an electronic DC to DC converter that optimizes the match between the solar array (PV panels), and the battery bank or utility grid. To put it simply, they convert a higher voltage DC output from solar panels (and a few wind generators) down to the lower voltage needed to charge batteries. Solar cells are neat things. Unfortunately, they are not very smart. Neither are batteries - in fact, batteries are downright stupid. Most PV panels are built to put out a nominal 12 volts. The catch is "nominal". In actual fact, almost all "12-volt" solar panels are designed to put out from 16 to 18 volts. The problem is that a nominal 12-volt battery is pretty close to an actual 12 volts - 10.5 to 12.7 volts, depending on state of charge. Under charge, most batteries want from around 13.2 to 14.4 volts to fully charge - quite a bit different than what most panels are designed to put out.

Panel tracking - this is where the panels are on a mount that follows the sun, These optimize output by following the sun across the sky for maximum sunlight. These typically give you about a 15% increase in winter and up to a 35% increase in summer. This is just the opposite of the seasonal variation for MPPT controllers. Since panel temperatures are much lower in winter, they put out more power. And winter is usually when you need the most power from your solar panels due to shorter days. Maximum Power Point Tracking is electronic tracking - usually digital. The charge controller looks at the output of the panels and compares it to the battery voltage. It then figures out what is the best power that the panel can put out to charge the battery. It takes this and converts it to best voltage to get maximum AMPS into the battery. (Remember, it is Amps into the battery that counts). Most modern MPPT's are around 93-97% efficient in the conversion. Grid tie systems are becoming more popular as the price of solar drops and electric rates go up. There are several brands of grid-tie only (that is, no battery) inverters available. All of these have built in MPPT. Efficiency is around 94% to 97% for the MPPT conversion on those.

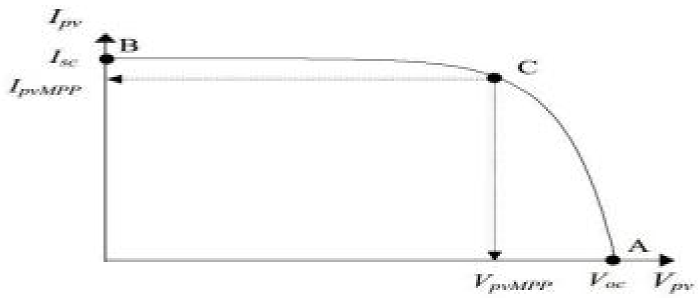


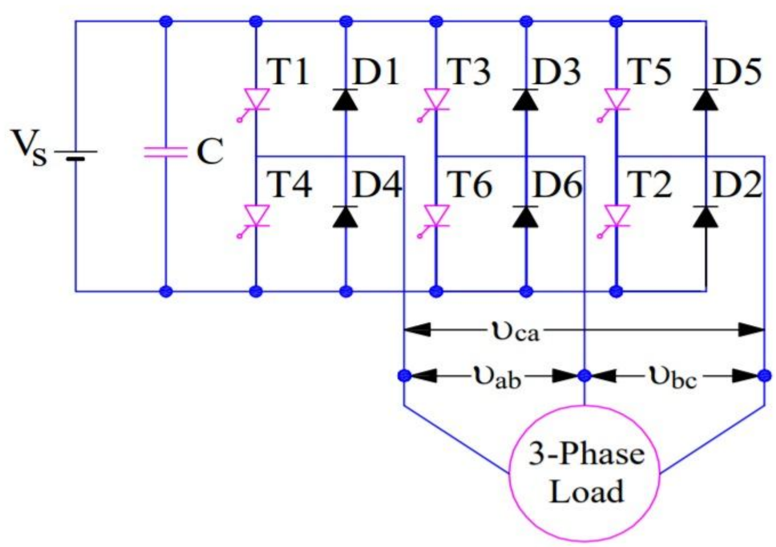
Figure 7: PV Cell operating point

The fuel is transported from mines via trains to the fuel storage facility in a power plant. The fuel transported to the plant is generally bigger in particle size and before it is fed to the boiler furnace it is broken down into smaller pieces using crushers. The fuel is then fed to the boiler generating a large amount of combustion heat. On the other hand treated water free from impurities and air is fed to the boiler drum where the combustion heat from the fuel is transferred to water to convert it into high pressure and temperature steam**.**

Given the wide range of technologies under development for both concentrating solar thermal and combustion technologies in isolation, the number of potential combinations of hybrids between them is even greater. It includes those that harness a relatively small fraction of solar energy into commercially available combustion plant without carbon-capture, such as the low temperature solar heating of the feedwater to a steam, hybrids with a gas turbine , hybrids that integrate solar thermal into a CO_2 capture process , including hybrids with chemical looping combustion . However, the majority of hybrid technologies reported to date have combined components developed for stand-alone CST or combustion technologies. It is only relatively recently that fully integrated components are also beginning to emerge that are purpose-designed to harness both energy sources, such as the Hybrid Solar

B. Three Phase inverter Working Principal

There are two possible patterns of gating the thyristors. In one pattern, each thyristor conducts for 180° and in other, each thyristor conducts for 120°. But in both these patters the gating signals are applied and removed at 60° interval of the output voltage waveform. Therefore, both these models require a six step bridge inverter. Now, we will discuss 180° model of this three phase inverter. 120° mode inverter will be explained below.



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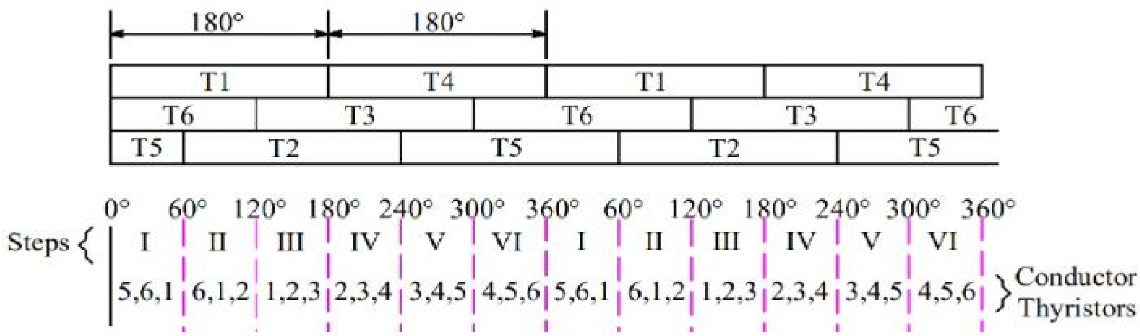
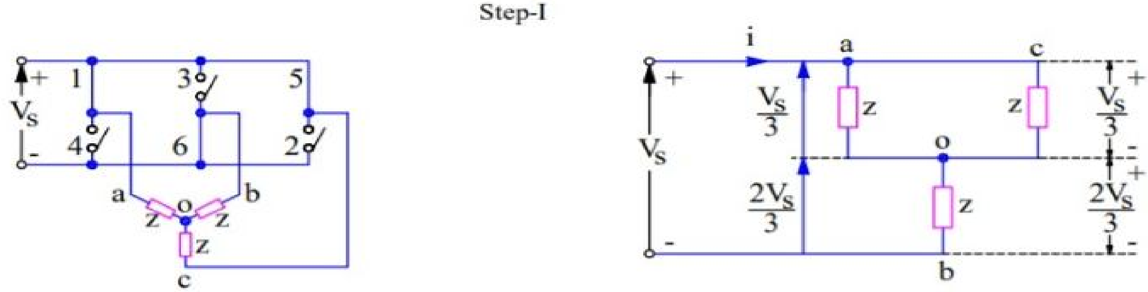
C. 180° Conduction Mode of Three Phase Inverter

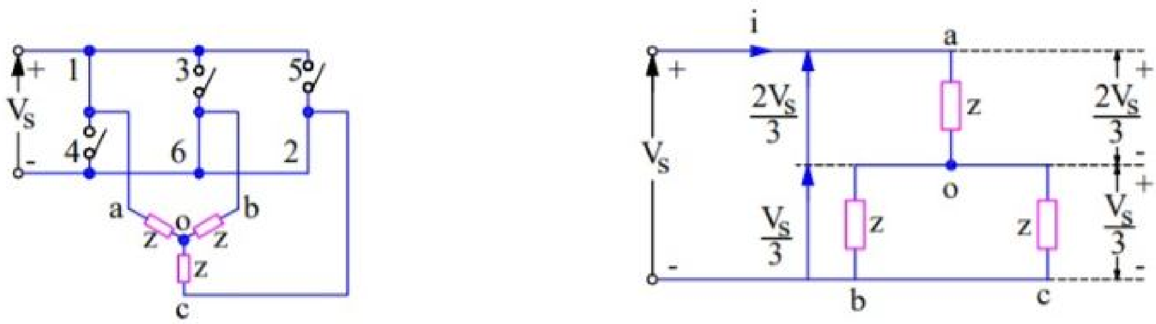
In 180° conduction mode of three phase inverter, each thyristor conducts for 180°. Thyristor pair in each arm i.e. (T1, T4), (T3, T6) and (T5, T2) are turned on with a time interval of 180°. It means that T1 remains on for 180° and T4 conducts for the next 180° of a cycle. Thyristors in the upper group i.e. (T1, T3 & T5) conducts at an interval of 120°. It implies that if T1 is fired at wt = 0° then T3 will be fired at 120° and T5 at 240°. Same is also true for lower group thyristors i.e. (T4, T6 & T2).



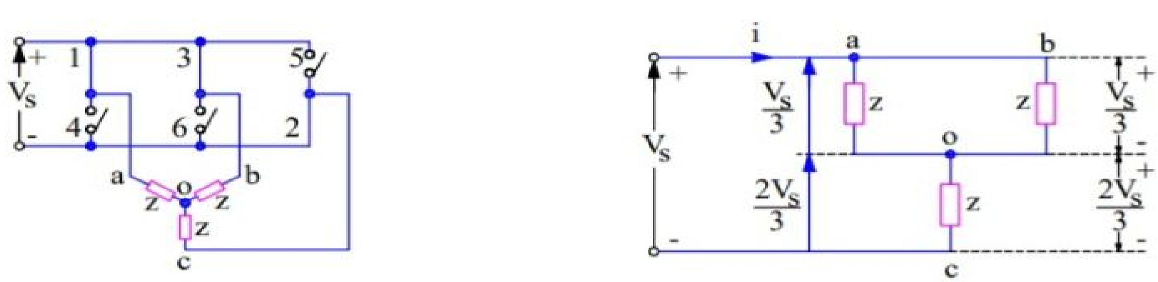
Step-I



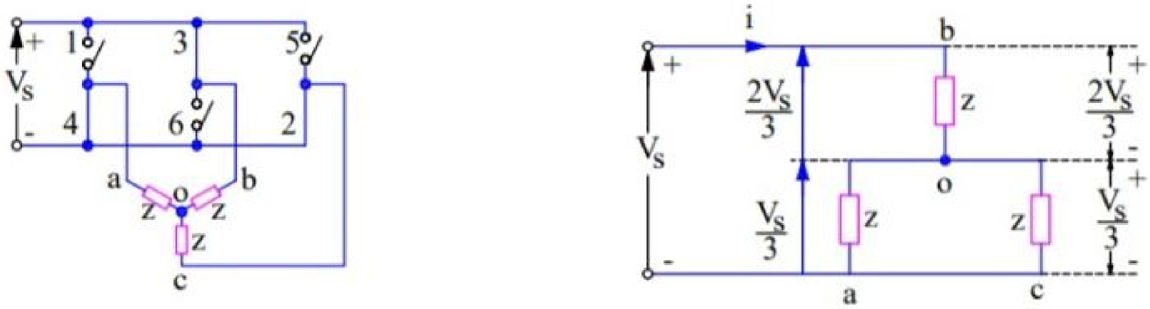
Step-II

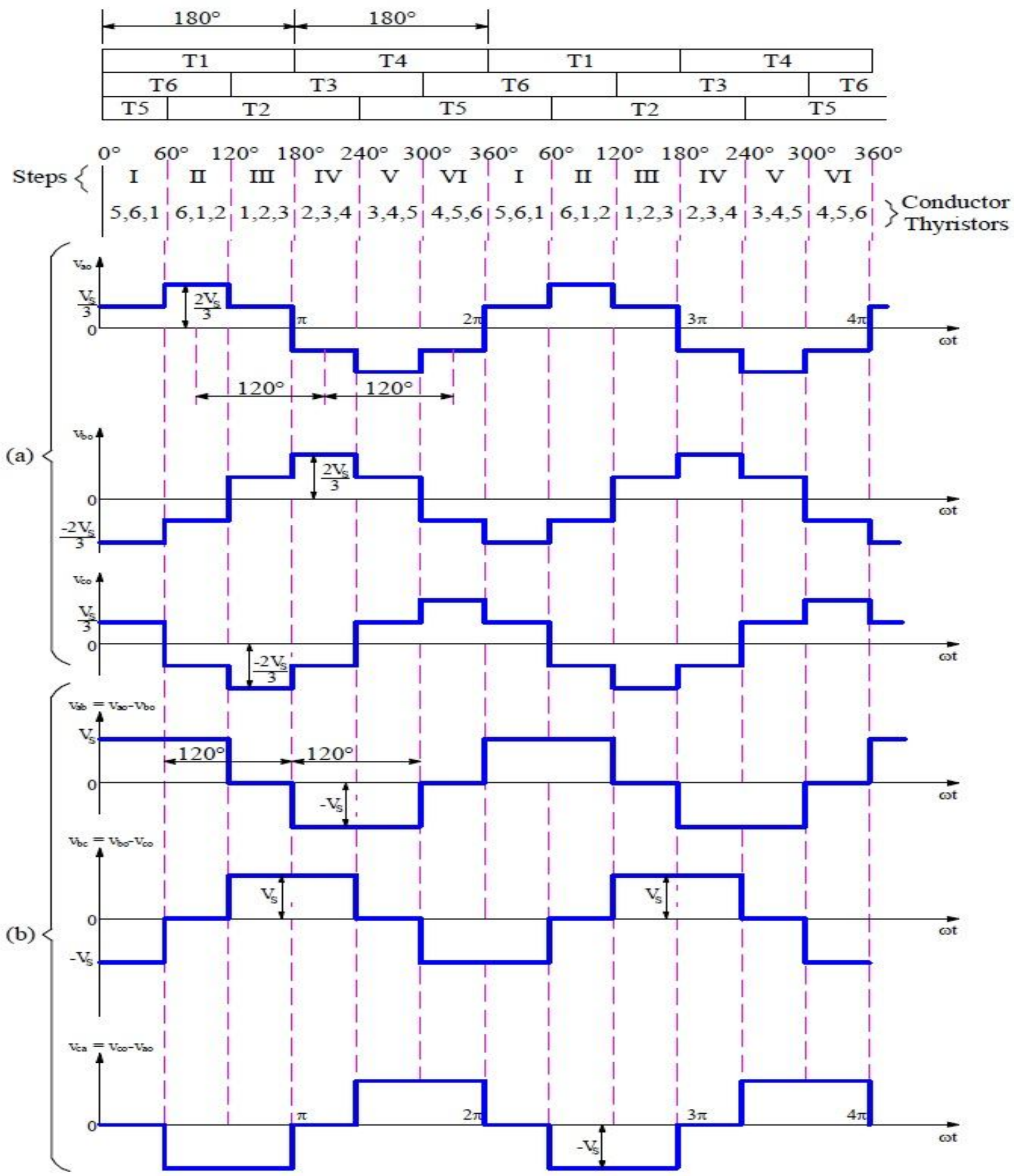


Step-III



Step-IV


Vs
a
b
c
o
z
i
2Vs/3
Vs/3


180°
T1
T4
T6
T3
T5
T2
Steps
I
II
III
IV
V
VI
Conductor Thyristors
5,6,1
6,1,2
1,2,3
2,3,4
3,4,5
4,5,6
(a)
(b)
120°
ωt

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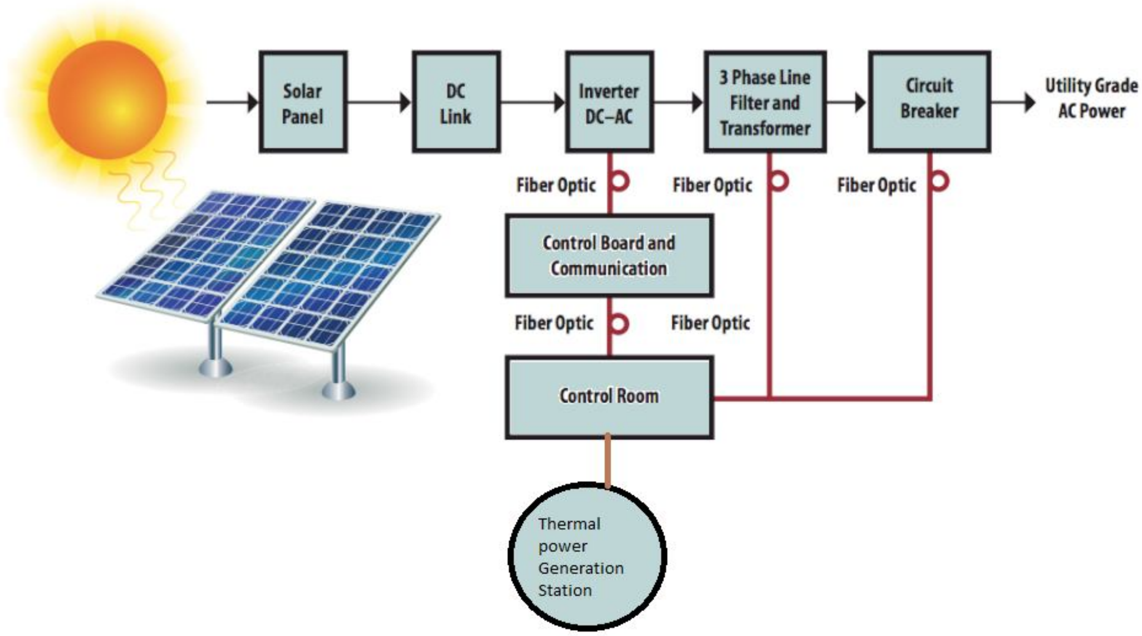

D. Power Grid

Final Solar power is DC is converted into AC power Using above Rectifier. Then we connect Bus bar to Distribution System. This model which is having two components one is solar power and an other one is Thermal power
Total power is 100MW. One is comes from solar and next one is comes from Thermal power.

IV. CONCLUSIONS

Hybrids are expected to play an increasingly important role in future power generation, both for centralised power plant and for combined heat and power. This is because combustion can play as an important complement to thermal energy storage in being able to accommodate both seasonal (i.e. long term) and weather-based (i.e. short term) variability in the solar resource. Hybridising combustion with CST upstream from the turbine offers the potential to avoid (or reduce) the need to turn-down the turbine, with the associated loss in efficiency. In the short-term, hybrids offer potential to reduce the amount of fossil fuel needed to provide firm supply, while in the longer term they offer potential to lower the cost of carbon-neutral cycles over their stand-alone counterparts. Finally, while the potential benefits of hybridising concentrating solar thermal energy with combustion are significant, further research and technology development is required to harness their full potential. Critical among these research needs

V. ACKNOWLEDGMENT

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