GOOD DESIGN AND MANUFACTURE TO GET A GOOD RELIABILITY OF RENEWABLE ENERGY POWER PLANT

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Abstract

Easier access to the global marketplace today makes local product competition with products from the global market increasing, pushing designers better to make machines as efficient as possible while still paying attention to their reliability. In obtaining good reliability, from the design stage of the machine and its manufacture must have root cause analysis that can help to guide design and manufacturing processes. However, for renewable energy fields, it is very difficult to build from the beginning as raw materials come from overseas acquired in the global market. In the domestic raw material is processed creatively to gain added value of the product and make it a superior product that is installed and marketed locally. Photovoltaic monitoring will independently keep the grid stable and conceptual able to monitor the health of every photovoltaic photo for its reliability can also be maintained. Good design with good manufacturing will also increase the reliability of solar power plants, with the appropriate field-based design and appropriate installation procedures in the root analysis of the problem increase significant reliability.

Keywords: *design, manufacture, reliability, renewable energy.*

1 Introduction

Today access to global marketplace is so easy, so we must creative to make local product can compete with global product. Especially for renewable energy product, until now we can't build our own design for main component of renewable equipment such as photovoltaic, wind turbine, generator, and etc. Main component of renewable energy device is ready from the global marketplace in raw material, so we can improve and re design to increase the selling value and gain value added of the final product and to improve the reliability of product. There are eight types of renewable energy sources in Indonesia that are eligible to be developed to meet the energy needs in Indonesia. Indonesia is a country with abundant renewable energy potential. Unfortunately this renewable energy source has not been fully utilized yet.

Renewable energy is a source of energy that is recovering naturally, and the process can be sustained. Renewable energy is generated from energy sources that naturally will not be exhausted even if properly operated. Renewable energy is often referred to as sustainable energy. The concept of renewable energy has been known in the world in the 1970s. Its emergence as an antithesis towards the development and use of energy made from fossils (coal, petroleum, and natural gas) and nuclear. In addition to restoring, renewable energy is believed to be clean (environmentally friendly), safe and affordable by the community. The use of renewable energy is more environmentally friendly as it reduces environmental pollution and environmental damage compared to non-renewable energy.

There are many types of renewable energy sources in Indonesia. If successful and used correctly, it is believed to replace fossil energy. Below is a list of 8 sources of renewable energy available in Indonesia. 1. Biofuel: Biofuels or biofuels are sources of renewable energy (solid, liquid and gas) generated from organic matter. Biofuel sources are plants with high sugar content (such as sorghum and sugarcane) and plants with high vegetable oil content (such as spacing, algae, and oil palm). 2. Biomass: Biomass is a type of renewable energy that refers to biological material originating from living or dead organisms recently. Biomass sources include wood fuel, waste and alcohol. The biomass power plants in Indonesia such as PLTBM Pulubala in Gorontalo use corn cobs. 3. Geothermal: Geothermal energy or geothermal is a renewable energy source in the form of heat generated and stored energy on earth. Geothermal energy is believed to be quite economical, abundant, sustainable, and environmentally friendly. However, its use is still being constrained by exploitation technologies that can only reach tectonic plates.

Geothermal Power Generation (PLTP) owned by Indonesia include: PLTP Sibayak in North Sumatera, PLTP Salak (West Java), Dieng PLTP (Central Java), and PLTP Lahendong (North Sulawesi). 4. Water: Hydro power is one of the most common alternative fossil fuels. This energy source is obtained by utilizing the potential of the kinetic energy and energy possessed by water. Currently, about 20% of the world's electricity consumption is filled with hydroelectric power plants. In Indonesia there are dozens of water forces, such as: Singkarak (West Sumatra), Gajah Mungkur (Central Java), Karangkates (East Java), Riam Kanan PLTA (South Kalimantan) and Larona (South Sulawesi). 5. Wind: Wind is the source of renewable energy generated by the power of wind. The windmill is used to capture wind power and converts into kinetic energy or electricity. The use of wind power into electric power in Indonesia has been done as at PLTBayu Samas in Bantul, Yogyakarta. 6. Sun: Solar energy or solar energy is renewable energy derived from radiation from light and heat emitted by the sun. Solar Power plants in Indonesia include: Airplanes (Bali), Raijua plai, plt nule, and plt West Solor (NTT). 7. Sea wave: Waves are renewable energy that comes from rising sea water pressures and falls. Indonesia as a maritime country located between two seas has a high potential to use energy sources from ocean waves. Unfortunately this alternative energy source is still in development in Indonesia. 8. Tidal power: Tidal power is renewable energy that comes from tidal water processes. There are two types of tidal energy sources, the first being the difference between low and low sea levels at the highest and lowest levels. The second is tidal currents, especially in the small strait. Like power surges, Indonesia has a high potential in using tidal power. Unfortunately, this energy source has not been used yet.

Renewable energy sources are not used optimally in Indonesia. As much as 90% of Indonesian energy still uses fossil fuels (coal, petroleum, and natural gas) and the rest, less than 10%. Photovoltaic is one of the many renewable energy we can use today, there are so many ways to improve the efficiency of photovoltaics, from mechanical layers or in electrical parts with a stimulus converter that will maintain electrical stability.

Photovoltaic technology (PV), which transforms direct sunlight into direct electric currents, provides technically viable solutions and community self-reliance on current challenges in the modern era caused by dependence on fossil fuel-based power plants (Pearce, 2009). The use of renewable energy such as solar energy continues to be developed to promote the independence of the community in the implementation of electricity independently. This is due to an increase in demand for electricity that is not proportional to the growth of electric power, as well as unbalanced loads during the day and night which result in frequent outages at night.

One key to improving PV energy conversion efficiency is to operate converters only when necessary and only with as much power as necessary (Shenoy, Kim, Johnson, & Krein, 2013).

Photovoltaic is considered a clean, renewable, sustainable energy conversion technology that can help meet the energy demands of the world's growing population, whilst reducing the adverse anthropogenic impacts of fossil fuel use on earth (Branker, Pathak, & Pearce, 2011).

The solar energy generator has the maximum nominal power installed, so that the design of the assembly must be determined by the angle or other process to get the power mounted optimally. power in solar cells commonly called Watt Peak (WP). This value will be achieved if the hot sun and the solar panel acceptance angle are correct.

The increase in PV installed capacity has also sparked a continuous evolution of the PV power conversion stage. Gradually, PV power converters have become extremely efficient, compact and reliable permitting to obtain the maximum power from the sun in domestic, commercial and industrial applications (Kouro, Leon, Vinnikov, & Franquelo, n.d.).

One key issue for a high efficiency and reliability transformer less PV inverter is that in order to achieve high efficiency over a wide load range it is necessary to utilize MOSFETs for all switching devices. Another key issue is that the inverter should not have any shoot-through issues for higher reliability. In or- der to address these two key issues, a new inverter topology is proposed for single-phase transformer less PV grid-connected systems in this paper. The proposed transformer less PV inverter features: 1) high reliability because there are no shoot-through issues, 2) low output ac current distortion as a result of no dead-time requirements at every PWM switching commutation instant as well as at grid zero-crossing instants, 3) minimized CM leakage current because there are two additional ac-side switches that decouple the PV array from the grid during the freewheeling phases, and 4) all the active switches of the pro- posed converter can reliably employ super junction MOSFETs since it never has the chance to induce MOSFET body diode reverse recovery. As a result of the low conduction and switching losses of the super junction MOSFETs, the proposed converter can be designed to operate at higher switching frequencies while maintaining high system efficiency. Higher switching frequencies reduce the ac-current ripple and the size of passive components (Gu et al., 2013).

Many types of renewable energy, but its use cannot be anywhere. In order for renewable energy selection in accordance with the existing environment and the suitability of the load must be carefully calculated to obtain the best reliability and efficiency.

Every power plant with all energy source losses their efficiency due to its continuous operation, age, bad maintenance condition and many other reasons. Everything equipment grows older with time. After years of operation, a plant will no longer be operating at best practice levels(Anjali & Kalivarathan, 2015).

Renewable energy such as solar radiation is ideal to meet the projected demand, it requires new initiatives to harvest incident photons with greater efficiency (Kamat, 2007).

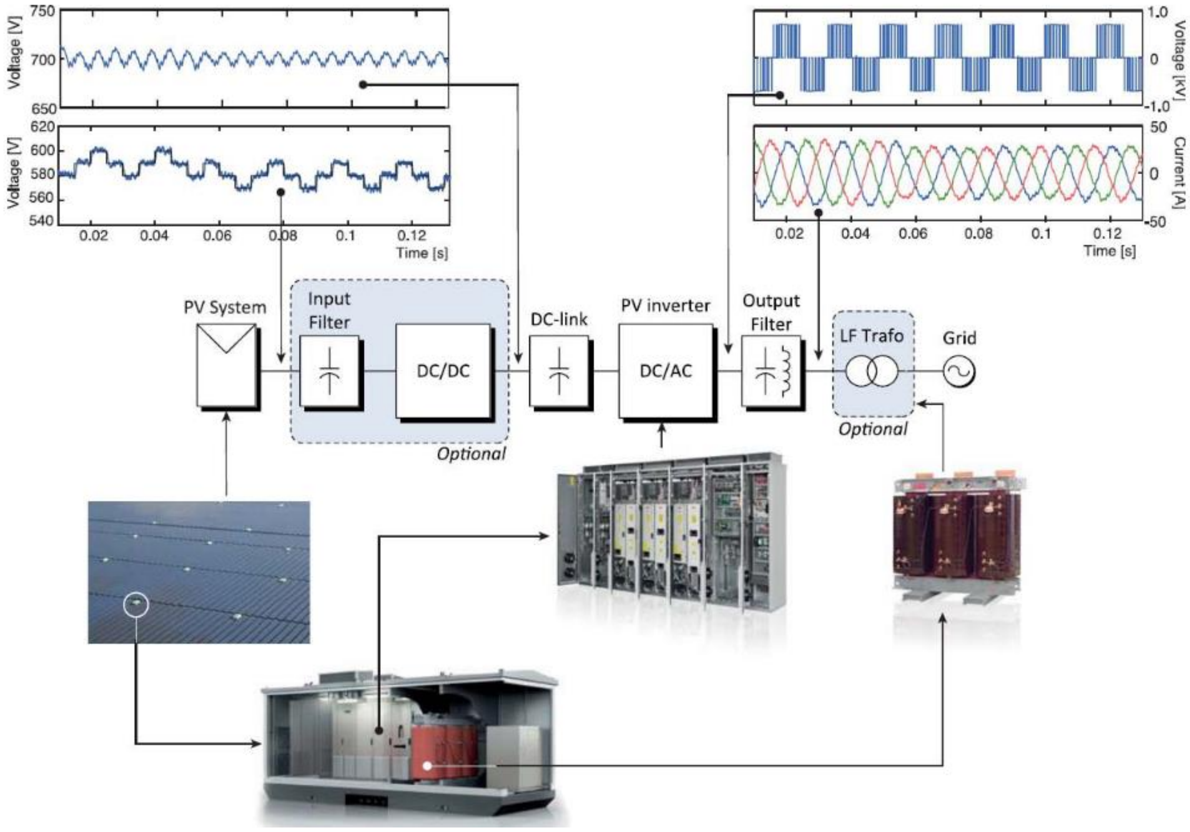
2 Method

From the introduction we can learn, that renewable energy will indeed be needed by society. With renewable energy, people will be more independent and able to meet energy requirements, and when the government has established sales and purchase transactions, perhaps the public will earn revenues from renewable energy.

In building solar power plants, it should be noted that the installation area must be free of shadows and plants so that it can properly absorb solar energy. The panel cleaning system should also be considered when the dusty conditions are so that the surface of the solar cell will be covered with dust which results in reduced solar energy absorption. System output from solar cells should also be considered whether to embrace a direct current (DC) system and an alternating current system (AC). For now the current system of change has also been developed to accommodate direct current generator to intermittent current. But in practice this system requires the power for him to work called during idle or when absorbed by the power converter when it is not loaded.

In Figure 1, a typical configuration of a grid-connected PV system is represented. In a conventional PV system, the PV cells (arranged in a single module, a string of series- connected modules, or an array of parallel-connected strings) generate a dc current, which greatly depends on the solar irradiation and the voltage at the terminals of the PV system. This dc power is transformed and interfaced to the grid via a PV inverter. Additional elements include a grid connection filter, a grid monitor or interaction unit (for synchronization, measurements, anti-island detection, etc.) and a low-frequency transformer (which is optional depending on local regulations, the converter topology and the modulation used to control it). Optionally, there is an intermediate dc-dc power stage between the PV modules and the grid-tied inverter. This optional stage decouples the PV system operating point from the PV inverter grid control. Additionally, it can boost the PV system dc output voltage if required, or provide galvanic isolation and perform the maximum power point tracking (MPPT) control (Pearce, 2009).

In Figure 1 shows how the solar energy system is connected to the existing power grid. Start from solar cell connected to filters and dc to dc converters to stabilize the voltage. Then in the bait returns to the DC link or can be called the power bank to keep electrical power temporarily so that the shock current from the load system can be underestimated. The inverter will switch the direct current back and forth to meet the required network and the transformer is used to increase the system voltage to match the voltage across the network.



Nomenclature
PV = Photovoltaic
WP=Watt Peak

Figure 1 Generic structure of a grid-connected PV system (large-scale central inverter shown as example).

3 Result and Discussion

For our future, renewable energy will be very useful for everyday life and help us to be self-sufficient in managing energy. The best focus on gaining reliability is to design and use renewable energy generators according to environmental conditions.

Photovoltaic monitoring will independently keep the grid stable and conceptual able to monitor the health of every photovoltaic photo for its reliability can also be maintained. Good design with good manufacturing will also increase the reliability of solar power plants, with the appropriate field-based design and appropriate installation procedures in the root analysis of the problem increase significant reliability.

4 Conclusion

In the future, renewable energy will greatly help human life and will reduce the incidence of environmental pollution due to the burning of fossil energy. In building a renewable energy center, we should pay attention to all aspects of the equipment and the environment to obtain optimum reliability.

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