

Solar Energy For Sustainable Rural Electrification In Indonesia

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Abstract

Global Warming is a problem faced by every nation in the world. This issue must be solved in order to continuity of life of future generations can be kept safe and secure. As part of the world community, Indonesia is actively overcome this problem by issuing policies that are pro-renewable energy usagethat in fact environmentally friendly. One of them is to put renewable energy sources as a first priority to supply electrical energy needs. Since the presence at the equator, the sun's abundant energy to be important option in fulfilling the electricity needs of the population, especially people living in eastern Indonesia and other areas on each island that is located very far from the grid.

Introduction

Global climate change that is now beginning to be felt can not be avoided. The disaster is due to the still large and continuous use of fossil fuels such as coal, petroleum, and naturalgas.

As we all know, the result of global warming has brought many negative effects. Sea levels global average has risen by an average rate of 1.8 mm per year in the period between the years 1961-2003 include. The increase in total sea levels were recorded in the 20th century is estimated to 0.17 m. The IPCC report also states that human activity contributes to global warming since the mid-20th century. Global warming will continue to increase with higher acceleration in the 21st century if no efforts are overcome.

Global warming resulting in climate change and increased frequency and intensity of extreme weather events. The IPCC states that global warming could lead to significant changes in physical and biological systems such as the increase in the intensity of tropical storms, changes in precipitation patterns, ocean salinity, wind patterns change, affect the reproduction of animals and plants, species distribution and population size, frequency of pest attack and disease, and to influence the various ecosystems of the region, with high latitudes (including ecosystems in the Arctic and Antarctic), location, height, and coastal ecosystems.

If there is no systematic and integrated effort to increase resilience to climate change and improving local and global environmental conditions from now on, the impact caused by climate change in the future will be greater and will further impact on the difficulty of achieving sustainable development system. Handling future climate change in the context of climate change need to be managed effectively, and at the same time anticipating the impacts of global

climate change in a comprehensive long-term. Also requires cross-sectoral approach at the national, regional and lokal. In facing climate change, increasing system resilience in communities to reduce the risk of dangerous climate change through mitigation and adaptation.

Adaptation is the act of adjusting the natural and social systems to cope with the negative impacts of climate change. However, these efforts will be difficult giving mandate effectively if the rate exceeds the ability to adapt to climate change. Therefore, the adaptation should be offset by mitigation, ie reducing or increasing resource sinks (sinks) of greenhouse gases, so that the development process is not hampered and sustainable development goals can be achieved.

One of the efforts that must be done is to diversify energy sources that reduce the use of fossil fuels such as coal, petroleum, and natural gas and to increase the use of renewable energy such as solar energy, wind, microhidro, geothermal, biofuels, etc. Thus, future generations are not burdened by the threat of more severe climate change.

As part of the world community, Indonesia actively overcome the problem of global warming by prioritizing the use of renewable energy to fullfiling the electrical energy needs. In order to increase the level of electrification ratio, especially in eastern Indonesia as well as other areas through out Indonesia that is far from grid, some renewable energy sources will be utilized to supply the electrical such as sunlight, wind, hydro, geothermal, biomass.

Condition of National Electricity

Indonesia is a country in South east Asia, which is crossed by the equator and located between the continents of Asia and Australia and between the Pacific and Indian Oceans. Indonesia is the world's largest archipelago consisting of 13,487 islands. Indonesia is the fourth most populous country in the world with a population of 244 million people (2012).

To fulfilling the electrical energy needs of the population, the government has built many power plants. Based on data from PLN, in late December 2011, the total installed capacity and number of generating units PLN (Holding and Subsidiaries Company) reached 29268.16 MW and 5269 units, with 22513.61 MW (76.9%) were in Java. Total installed capacity increased 8.82% compared to the end of December 2010. Percentage of installed capacity by plant type as follows: 12053 MW power plant (41.2%), PLTGU 7834 MW (26.8%), diesel 2569 MW (8.8%), 3511 MW hydro power (12%), 2839 MW power plant (9.7%), and PLTP 435 MW (1.5%).

Because it consists of thousands of islands is difficult to achieve 100% electrification rate. In 2010 the electrification rate was 66.51% while in 2011 was 67.98%. Efforts to increase the electrification rate is, as already mentioned in the introduction, renewable energy sources will be utilized to the fullest.

National Energy Policy

Indonesia has reserves of fuel oil, coal, and natural gas in a considerable amount. These non-renewable energy sources are still major sources in fulfilling the needs of national electricity. Specifically on the provision of electricity from PLN's installed capacity, amounting to 72.85% of the energy generated from fossil fuels comprising: 28.58% comes from gas-fired plants,

25.28% of the oil, and 18.99% were from coal. While electricity generated by hydro power at 11.96%, and the heat generated by the earth by 1.51%. However, the use of these resources, because of issue of global warming, the government has established a series of policies in such away that on the one side the national energy supply remains safe while on the other hand continue to support efforts over come global warming. The following are some government regulations related to renewable energy :

Government's Policy on Renewable Energy

Electricity Law No. 20/2002 states that Renewable Energy is the first priority for providing electricity in the country.

Ministerial Decree: No. 0002/2004:

Green Energy Policy:

- Implementing the maximum utilization of renewable energy.
- Efficient utilization of energy.
- Public awareness in energy efficiency.

Government has established seven basic policy direction, where five of them closely related to renewable energy sources. Here are five principal policy that emphasizes renewable energy:

1. Policy Direction of Renewable Energy.
2. Policy Direction of Biofuel Renewable Energy.
3. Policy Direction of Geothermal Renewable Energy.
4. Policy Direction of Solar Renewable Energy.
5. Policy Direction of PLT Sea Power Renewable Energy.

Direction of energy policy is determined by the availability of the potential for renewable energy sources.

Why Solar ?

From the many types of renewable energy sources, solar energy receive great attention. Indonesia is geographically located in the equatorial regions so it receive abundant solar energy. The Intensity of Solar Radiation in Indonesia is quite high, averaging about 4,5 kWh/m² per day in all parts of Indonesia. This means that every 1 kW Photovoltaic (PV) can produce 4.5 kWh of electrical energy per day.

The Abundance of Solar Energy in Indonesia is a potential that should be used to generate electrical energy optimally.

Solar Photovoltaic System

Photovoltaic systems (PV system) use solar panels to convert sunlight into electricity. A system is made up of one or more solar photovoltaic (PV) panels, a DC/AC power converter (also known as an inverter), a racking system that holds the solar panels, electrical interconnections, and mounting for other components. Optionally it may include a maximum power point tracker (MPPT), battery system and charger, solar tracker, energy management software, solar concentrators or other equipment. A small PV system may provide energy to a single consumer, or to an isolated device like a lamp or a weather instrument. Large grid-connected PV systems

can provide the energy needed by many customers. The electricity generated can be either stored, used directly (island/standalone plant), or fed into a large electricity grid powered by central generation plants (grid-connected/grid-tied plant), or combined with one or many domestic electricity generators to feed into a small grid (hybrid plant). Systems are generally designed in order to ensure the highest energy yield for a given investment.

Benefit PV Power Plant

Here are several advantages to using solar photovoltaic systems :

- Generates free and green energy from the sun.
- Has no moving parts to break down thus requiring minimal maintenance.
- Non-polluting energy reduces emissions: Has no direct impact on the environment.
- Photovoltaic (PV) cells are modular, we can start with a small system and expand as needs increase.
- Systems have a long life & durability (Cells last 25-30 years).
- Grid-Tie systems allow you to sell excess electricity back to the utility (based on government policies).
- Can be installed and operated anywhere including areas of difficult access and remote locations.
- Helps get us off dependence on foreign oil.
- PV cells make no noise and give off no exhaust.
- Allow the use of electricity in remote areas where it would be expensive or impossible to run power lines.
- Have electrical power during blackouts.

Applications of Solar Energy

- Solar Street Light
- Solar Sign & CCTV
- Solar Traffic Application
- Solar Home / Residential Rooftop System
- Solar Industrial Rooftop
- Solar Power Plant / Solar Farm
- Solar Carport
- Solar Tree Power
- Solar Water Pump
- Solar Light House
- Vaccine Refrigerator
- Solar BTS

Conclusion

Diversification of energy sources usage is part of the solution to the problem of global warming and the energy crisis. Besides reducing dependence on fossil fuels will also reduce carbondioxide emissions.

Supplies of non-renewable energy sources such as petroleum, coal, and natural gas will decrease. While in Nature has provided renewable energy sources in abundant quantities, such as: sunlight, wind, geothermal, water, biofuels, etc. The availability of these free and green energy resources must be optimally utilized for the welfare of mankind.

Optimal utilization of renewable energy sources is by implementation to a wide range of applications, such as: Solar Farm, Solar Street Light, Solar Home / Residential Rooftop, Solar Water Pump, etc.

Indonesia has more attention to renewable energy, besides participating tackling global warming issues, also renewable energy is solution for electrification in rural area.

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