

**DESIGN AND IMPLEMENTATION OF PHOTOVOLTAIC –  
DIESEL HYBRID POWER SYSTEM IMPLEMENTATION IN  
NEMBERALA VILAGE, ROTE ISLAND, NUSA  
TENGGARA TIMUR-INDONESIA**

**Presented by**

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## **ABSTRACT**

*Crisis Energy which is happened in Indonesia has given great lessons in order to figure out the solutions to implement alternative energy to replace the fossil energy. Fossil energy, especially oil fuel is the major source energy and national major income for Indonesia. Renewable energy potency is that energy that can not export to other countries, but it will useful and give beneficial values if renewable energy is converted into electricity which is able to replace conventional energy. National Political Energy Target in 2020 is expected to reach 5 % which is meant that Indonesian national energy source will be supplied from renewable energy sector. In order to gain the national energy target, it needs political commitment and willingness that supported by government regulations which is capable to back up the successful of the implementations renewable energy in Indonesia. At this so far, there are several implementation of renewable energy program that is developed intensively including photovoltaic energy development in rural area in Indonesia. Photovoltaic-Diesel Hybrid Power system is one of its application that implemented in Nembrala village, Rote Island, East Nusa Tenggara Province. Photovoltaic-Diesel Hybrid Power is the pilot project owned by PT.PLN (National Electric Company) that implemented by Brawijaya University-Malang. Energy production from diesel power in Nembrala Village is fluctuated between 270-290 kWh/day while diesel fuel consumption is 90 liters per day. With the Implementation of Photovoltaic-Diesel Hybrid system, the fuel consumption is able to be reduced became 60 liters per day. It means that it can save oil fuel energy until 30 liters per day.*

**Keyword : Implementation, Hybrid system, Photovoltaic, Diesel.**

## **I.BACKGROUND**

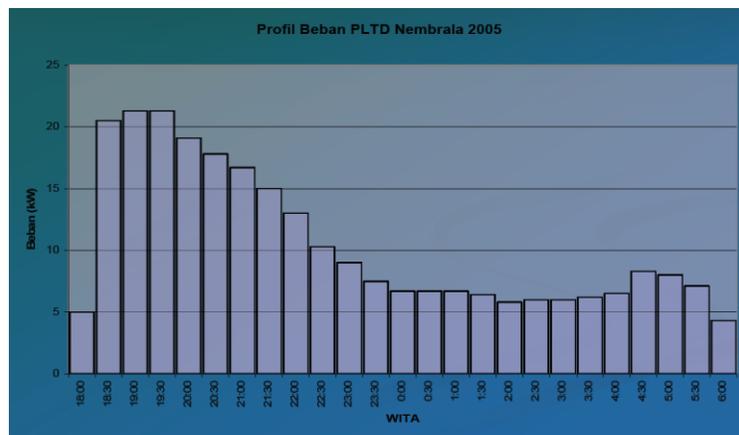
Crisis Energy which is happened in Indonesia has given great lessons in order to figure out the solutions to implement alternative energy to replace the fossil energy. Fossil energy, especially oil fuel is the major source energy and national major income for Indonesia. Renewable energy potency is that energy that can not export to other countries, but it will useful and give beneficial values if renewable energy is converted into electricity which is able to replace conventional energy. National Political Energy Target in 2020 is expected to reach 5 % which is meant that Indonesian national energy source will be supplied from renewable energy sector. In order to gain the national energy target, it needs political commitment and willingness that supported by government regulations which is capable to back up the successful of the implementations

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## 2. DESIGN OF HYBRID SYSTEM IN NEMBERALA

Diesel engine Generator generally is operated in the peak Diesel engine Generator generally is operated in the peak load (about 22 kW); load (about 22 kW); On the Base load, electric energy will be supplied from On the Base load, electric energy will be supplied from Battery Banks (55kWh); Battery Banks (55kWh);In the certain condition where battery banks is maximally In the certain condition where battery banks is maximally loaded, Peak load is expected to be supplied from the loaded, Peak load is expected to be supplied from the battery banks through inverter system; battery banks through inverter system; In the condition Diesel generator is supplied electricity to In the condition Diesel generator is supplied electricity to consumers Load, the excess power from diesel generator is consumers Load, the excess power from diesel generator is used to charge the battery banks; used to charge the battery banks; Battery Charging at midday could be fully charged by Battery Charging at midday could be fully charged by photovoltaic generator. Load Profile Generator in nemberala in Bild 2

Bild 2 . Load Profile Generator in Nemberala –Rote Island



### III. IMPLEMENTATION PV –HYBRID SYSTEM IN NEMBERALA

Based on the operation described above Based on the operation described above can be concluded as it below :

1. Peak Load in Nemberala was reached 38 kW or increased to be 173% from the previous planning calculation (peak load based on planning is 22 kW)
2. Average base load between 12-14 kW or increased 100% from the previous planning calculation ( base load design is 6 kW)
3. Nevertheless, Photovoltaic Diesel Hybrid system has given energy saving benefit by saved solar fuel until 33%

BY Table 3 is explained about Capital for development Hybrid system in Nemberala

Table 3 Capital Cost for Hybrid system in Nemberala

<i>Item</i>	<i>Capacity</i>	<i>Capital (Rp)</i>	<i>Lifetime</i>
<i>Diesel Generator</i>	<i>50 kW/60 kVA</i>	<i>238.000.000</i>	<i>20.000 hours</i>
<i>Photovoltaic</i>	<i>21 kWp</i>	<i>760.000.000</i>	<i>25 years</i>
<i>Converter</i>	<i>30 kVA</i>	<i>225.000.000</i>	<i>10 years</i>
<i>Battery</i>	<i>1000Ah / 220VDC</i>	<i>425.000.000</i>	<i>10 years</i>
<i>Building &amp; installation</i>		<i>250.000.000</i>	<i>30 years</i>

### IV. RECOMMENDATION

Photovoltaic-Diesel Hybrid Power system is one of its application that implemented in Nemberala village, Rote Island, East Nusa Tenggara Province. Photovoltaic-Diesel Hybrid Power is the pilot project owned by PT.PLN (National Electric Company) that implemented by Brawijaya University-Malang. Energy production from diesel power in Nemberala Village is fluctuated between 270-290 kWh/day while diesel fuel consumption is 90 liters per day. With the Implementation of Photovoltaic-Diesel Hybrid system, the fuel consumption is able to be reduced became 60 liters per day. It means that it can save oil fuel energy until 30 liters per day.

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