

# The experiences on the implementation of PV-Diesel Hybrid System

**Adjat Sudradjat**

**Energy Technology Center**

**The Agency for the Assessment and Application of Technology (BPPT),**

**PUSPIPTEK 620-622 building Tangerang 15314, Banten**

**Indonesia**



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## Introduction of each projects

The Agency for the Assessment and Application of Technology (BPPT), has been assessing on the hybrid system since 1997, by setting up one unit of hybrid PV-system in Subang village West Jawa, 4 unit system in south Sulawesi and east Kalimantan in 1997, 14 unit system in South-east Sulawesi and Central Sulawesi in 1999, and one unit system in Ponelo east Sulawesi in 2003. These activities are part of pilot project as a demonstration plant on PV-Diesel hybrid system as a rural electrification

### ❑ Subang Hybrid System.

The budget was coming from the DGGED

The villages got electricity as a reward for strong support of the political party, the installation was not plan and design properly due to the limited time and budget.

### ❑ Transindo Hybrid System.

The budget of this program come from the French Protocol as soft loan to Indonesia through the ministry of Transmigration. It was good planed and designed; however , the design of the system was not proper enough due to the different between demand of electricity of the people and the package of system which been specify from original country.

## Fourteen Hybrid system in Sulawesi

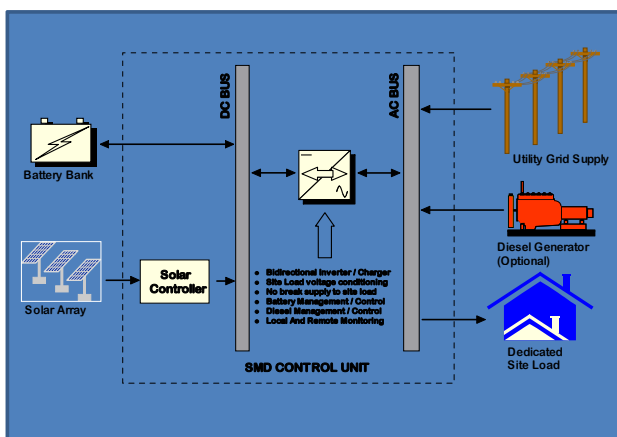
Through the Australian Aid, BPPT installed the 14 PV-Diesel Hybrid system in South east Sulawesi (8 systems) and Central Sulawesi (6 systems), This installation was properly planned and completed with digital energy limiter, but system design was come in a package , all of components has been specified.

### Hybrid system in Ponelo

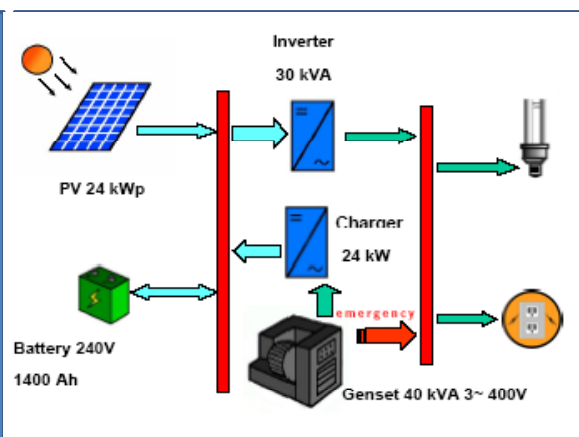
Learning from the above experiences, BPPT and the local government of Gorontalo installed the PV-diesel hybrid system in small island called "Ponelo". This program was executed in two fiscal years. This program is started by surveying for the electricity need of the user, and follows by socializing the program and established the local management , and finally installed the system. System was installed in the end of 2004.

## The specification of the systems installed.

|                              | Subang                | Transindo        | 14 units in Sulawesi    | Ponelo                         |
|------------------------------|-----------------------|------------------|-------------------------|--------------------------------|
| System                       | Parallel              | Series           | Parallel                | Parallel                       |
| PV generator                 | 7 kWp                 | 24 kWp           | 8 kWp                   | 24 kWp                         |
| Diesel                       | 40 kVA                | 40 kVA           | 25 kVA                  | 125 kVA                        |
| Inverter                     | 20 kVA bi-directional | 30 kVA           | 25 kVA bi-directional   | 90 kVA bi-directional          |
| Battery                      | 150 kWh flooded       | 1440 Ah, flooded | 86,4 kWh gel            | 450 kWh flooded                |
| Consumers                    | 350 houses,           | 300 -400 houses, | 200 -300 houses         | 400 houses                     |
| Each Load Installed capacity | 100 & 200 VA          | 100 & 200 VA     | 100 & 200 VA            | 450 VA                         |
| Energy limiter               | N A                   | Available        | Available               | Available                      |
| Pre-payment system           | N A                   | Digital          | Digital (domestic made) | Analog-Digital (domestic made) |
| Year of installation         | March 1997            | December 1998    | December 1999           | December 2004.                 |

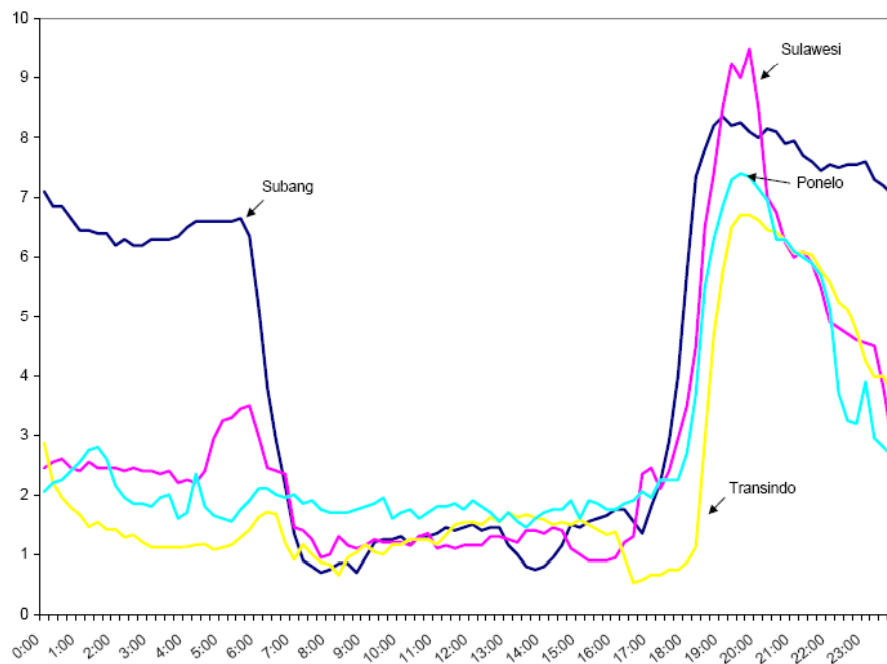


Parallel system



Series system

## LOAD PROFILE



## THE PRICE OF ELECTRICITY

In order to run fulfill the operation and maintenance cost, the users has to pay on the basis of their use of electricity. And each site are as follows:

|                   | Subang                                       | Transindo                        | 14 hybrid in Sulawesi         | Ponelo              |
|-------------------|----------------------------------------------|----------------------------------|-------------------------------|---------------------|
| Connection Fee    | Rp 20,000,- for 100 W & Rp 30,000,-for 200 W | Rp 25,000,-                      | Rp 250.000,-                  | Rp 2,500,000,-      |
| Electricity Price | Monthly fixed basis Rp 7500,-                | Rp 2.250,- to Rp 2.500,- per kWh | Rp 1.250,- to Rp 1.500,- /kWh | Rp 3.500,- per kWh. |

## LOCAL MANAGEMENT

|                        | Subang                                   | Transindo                                          | 14 hybrid in Sulawesi                                  | Ponelo                                                         |
|------------------------|------------------------------------------|----------------------------------------------------|--------------------------------------------------------|----------------------------------------------------------------|
| <b>Establishment</b>   | Through the local Government             | Through the Ministry of Transmigration             | Contract between BPPT and Village cooperative          | Established from local people with supervision from local Gov, |
| <b>Manager</b>         | 1 person                                 | 1 person                                           | 1 person                                               | 1 person                                                       |
| <b>Operator</b>        | 2 person                                 | 2 person                                           | 2 person                                               | 3 person                                                       |
| <b>Book keeper</b>     | 1 person                                 | 1 person                                           | 1 person                                               | 1 person                                                       |
| <b>Technical visit</b> | During first year was three times a year | During 2 years after installation was twice a year | During the 2 years after installation was twice a year | Twice a year                                                   |

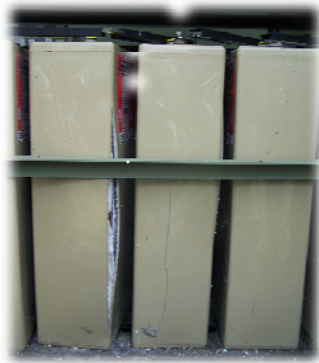
## LESSONS LEARNED

|                              | Subang                                                                                                                                          | Transindo                                                                                                                                                                             | 14 hybrid in Sulawesi                                                                                                                                                              | Ponelo                                                                               |
|------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------|
| <b>Technical Aspects</b>     | <ul style="list-style-type: none"> <li>•Need energy limiter on each houses</li> <li>•The electricity demand was higher than expected</li> </ul> | <ul style="list-style-type: none"> <li>•The absence of after sales service for the "Suncash"</li> <li>•System was over designed, need improvement for "real" hybrid system</li> </ul> | <ul style="list-style-type: none"> <li>•The quality of digital domestic pre-payment equipment need to be improved</li> <li>•The gel battery is not suited to the system</li> </ul> | Quality of pre-payment equipment has been improved by using analog-digital equipment |
| <b>Non-technical aspects</b> | Failure of local management to run the system                                                                                                   | Failure of local management to run the system                                                                                                                                         | Failure of local management to run the system                                                                                                                                      | Need to introduce the productive activities                                          |
| <b>Year of installation</b>  | March 1997                                                                                                                                      | December 1998                                                                                                                                                                         | Dec 2000                                                                                                                                                                           | December 2004.                                                                       |
| <b>Status</b>                | Not working anymore                                                                                                                             | Two of four systems are still working                                                                                                                                                 | two of fourteen system are still working                                                                                                                                           | Working                                                                              |

## CONCLUSION

- ❑ Develop better Partnerships among the stakeholders.
- ❑ The accurate electricity demand for rural houses need to be obtained in order to have a better design
- ❑ The battery used for the hybrid systems should be a flooded battery
- ❑ Energy and Power limiter on each house must be installed,
- ❑ The national standard (SNI) on hybrid system need to be developed.
- ❑ Technical visit by the expert need to be carried out at least once a year.
- ❑ The local management has to be elected and come from the villagers
- ❑ The Involvement of Local Government urgently needed.





**THANK YOU  
FOR YOU ATTENTION**

