

# IMPLEMENTATION OF SUPER INTELLIGENT MICROGRID SYSTEM AT SEMAU ISLAND - INDONESIA

## TRANSFORMING INDONESIAN ARCHIPELAGO INTO SUSTAINABLE ISLANDS

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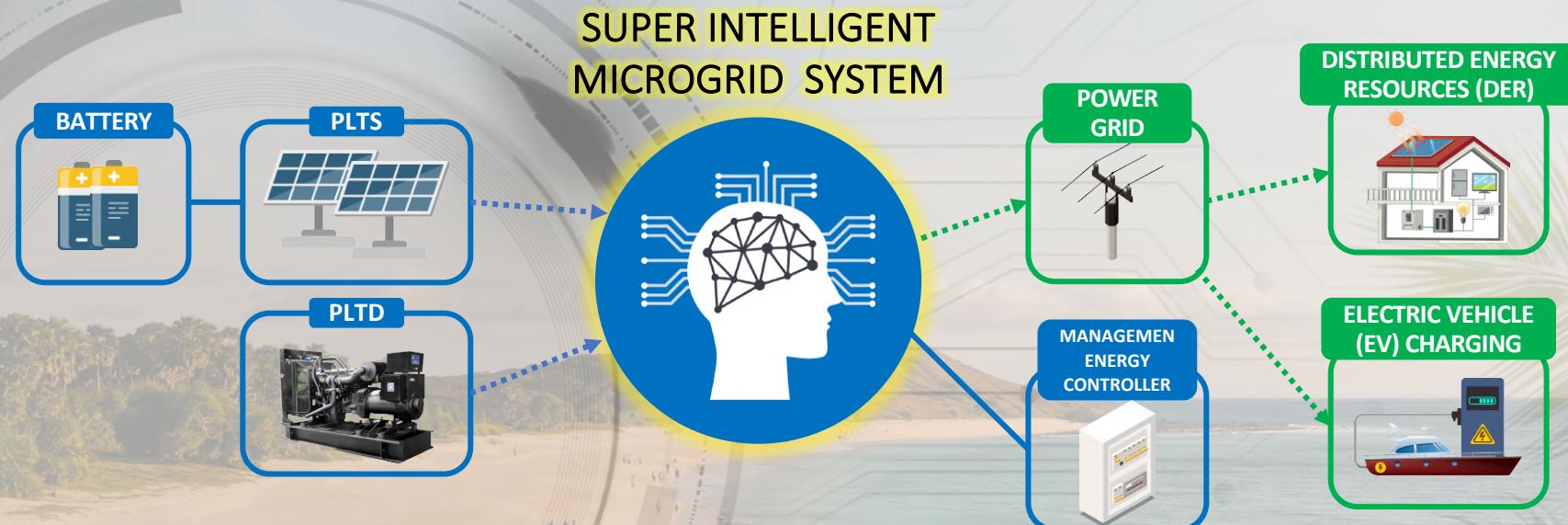
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# ENERGY TRANSITION LANDSCAPE OF INDONESIAN ARCHIPELAGO



The implementation of Semau Smart Grid System in Eastern Nusa Tenggara is a solid blueprint of energy transition initiative  
The initiative will create more energy transition agent, promote green environment and nurture social empowerment



ENERGY TRANSITION AGENT



GREEN ENVIRONMENT



SOCIAL EMPOWERMENT

# ENERGY TRANSITION TO NET ZERO EMISSIONS



## New Renewable Energy Mix



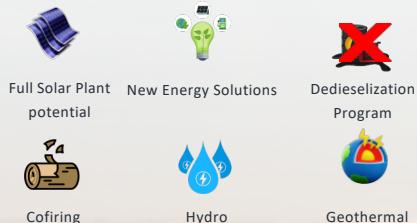
## ESG Practices Adoption

as a commitment towards achieving a carbon-neutral nation status by 2050

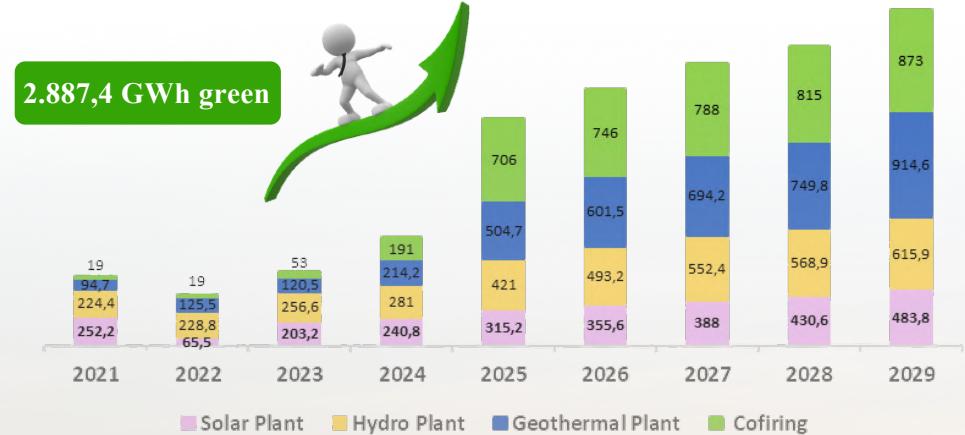
- Decarbonization of the NRE KIT addition program
- Energy Transition "Cofiring" to Nertal Carbon

## UIW NTT RNE Roadmap to 2030

Towards a Carbon Low Carbon Energy System

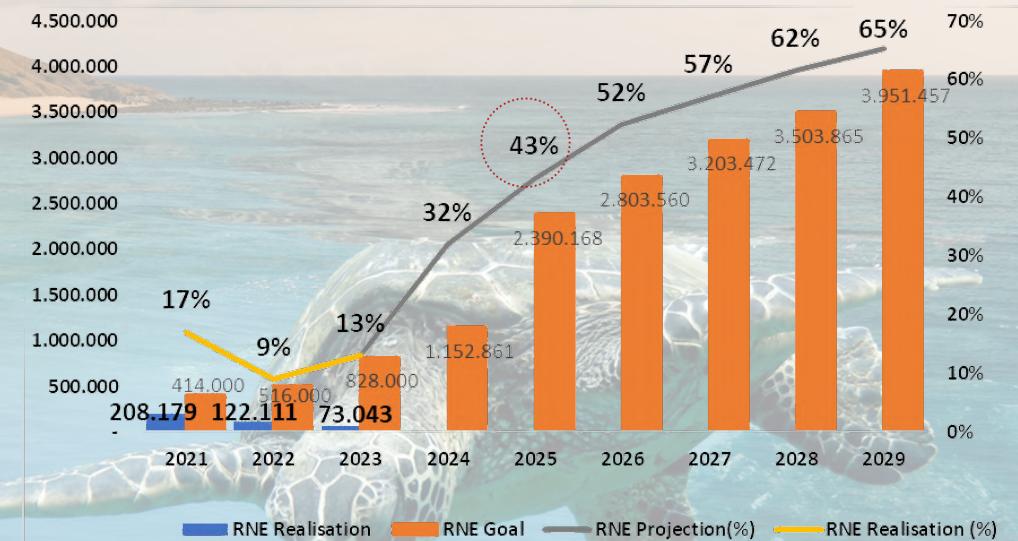
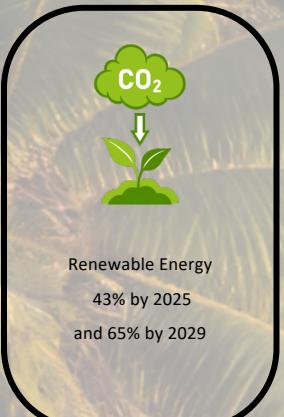


## REALIZATION OF NRE IN THEIR RESPECTIVE MIX

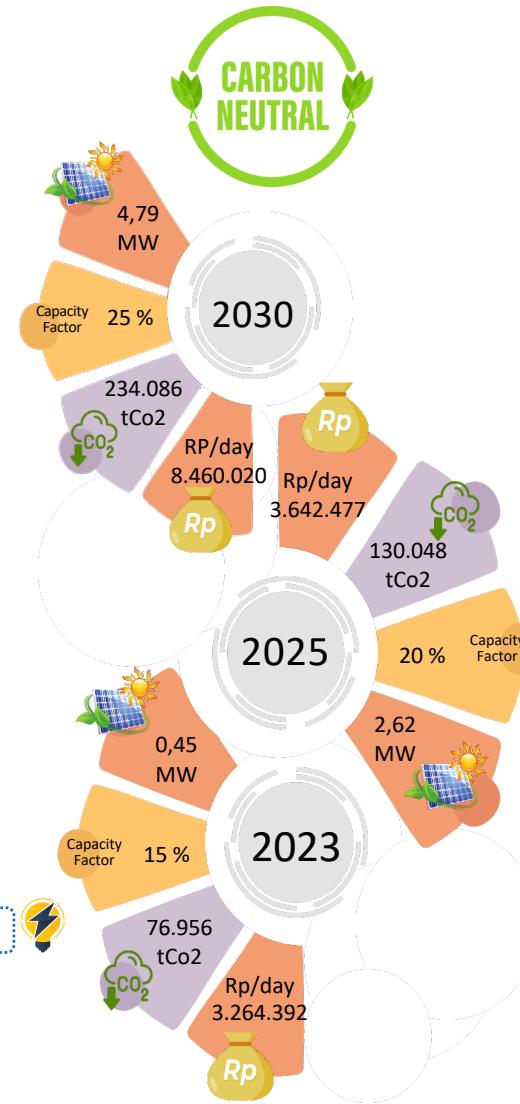
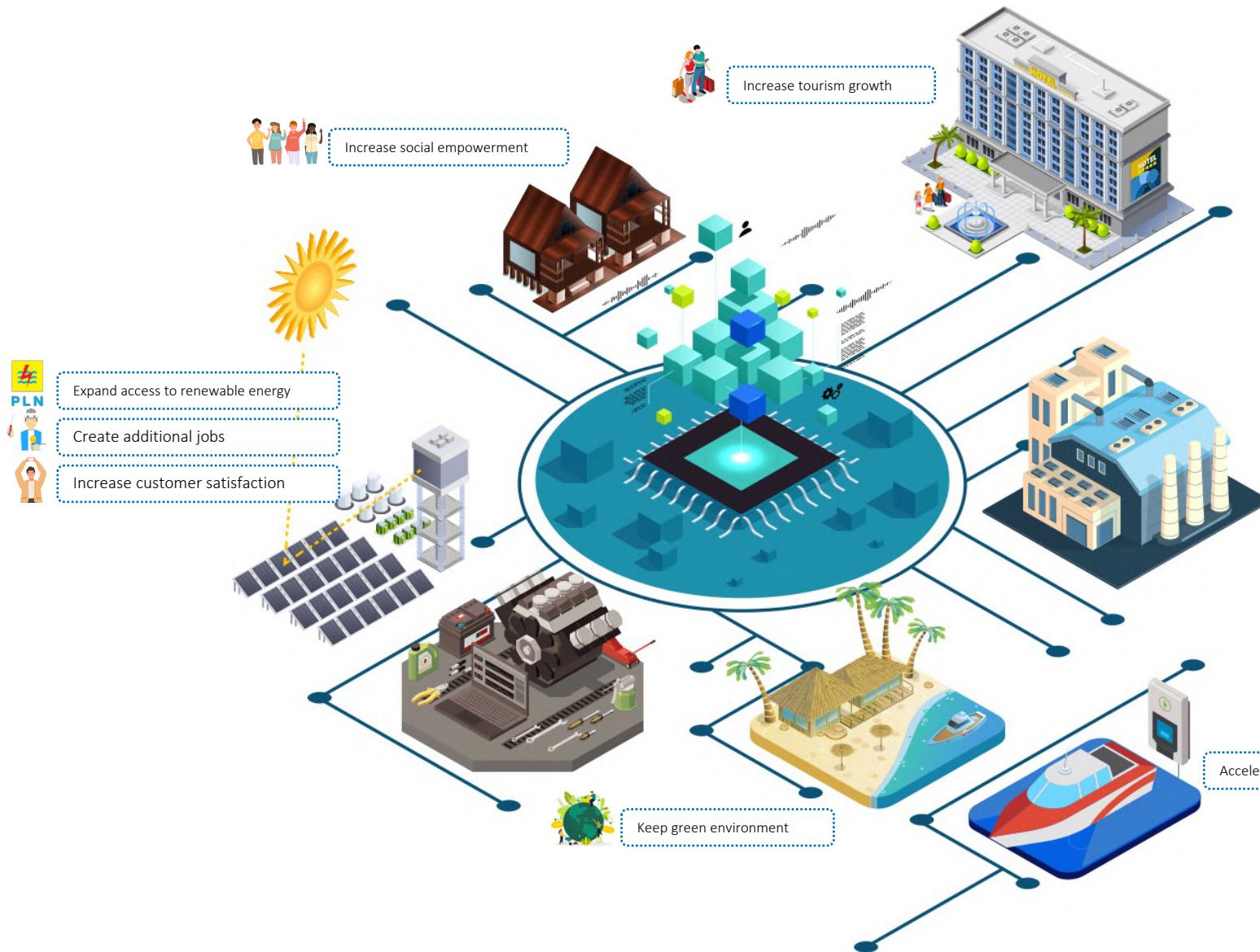


## PROJECTED REDUCTION IN EMISSION INTENSITY

### TARGETS TOWARDS LOW-CARBON ENERGY



# VALUE CREATION IMPLEMENTATION OF SUPER INTELLIGENT MICRO GRID SYSTEM AT SEMAU ISLAND - INDONESIA

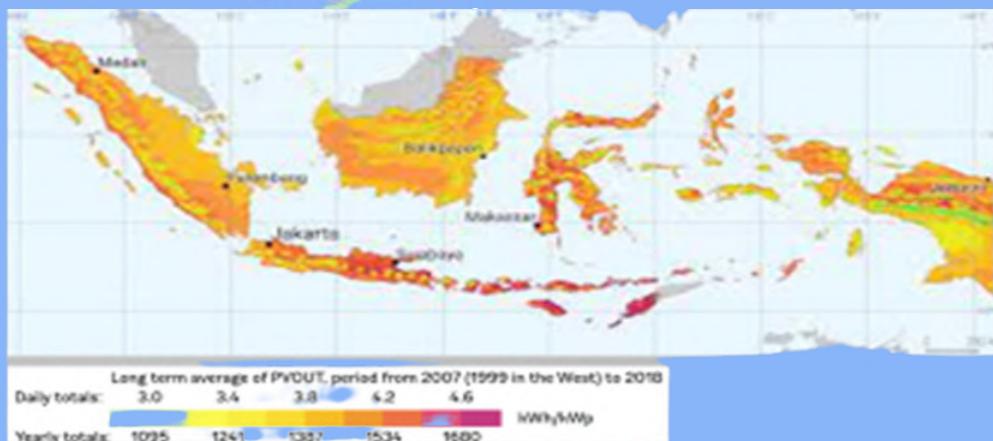




Click here to watch the Semau Intelligent Microgrid System Video:

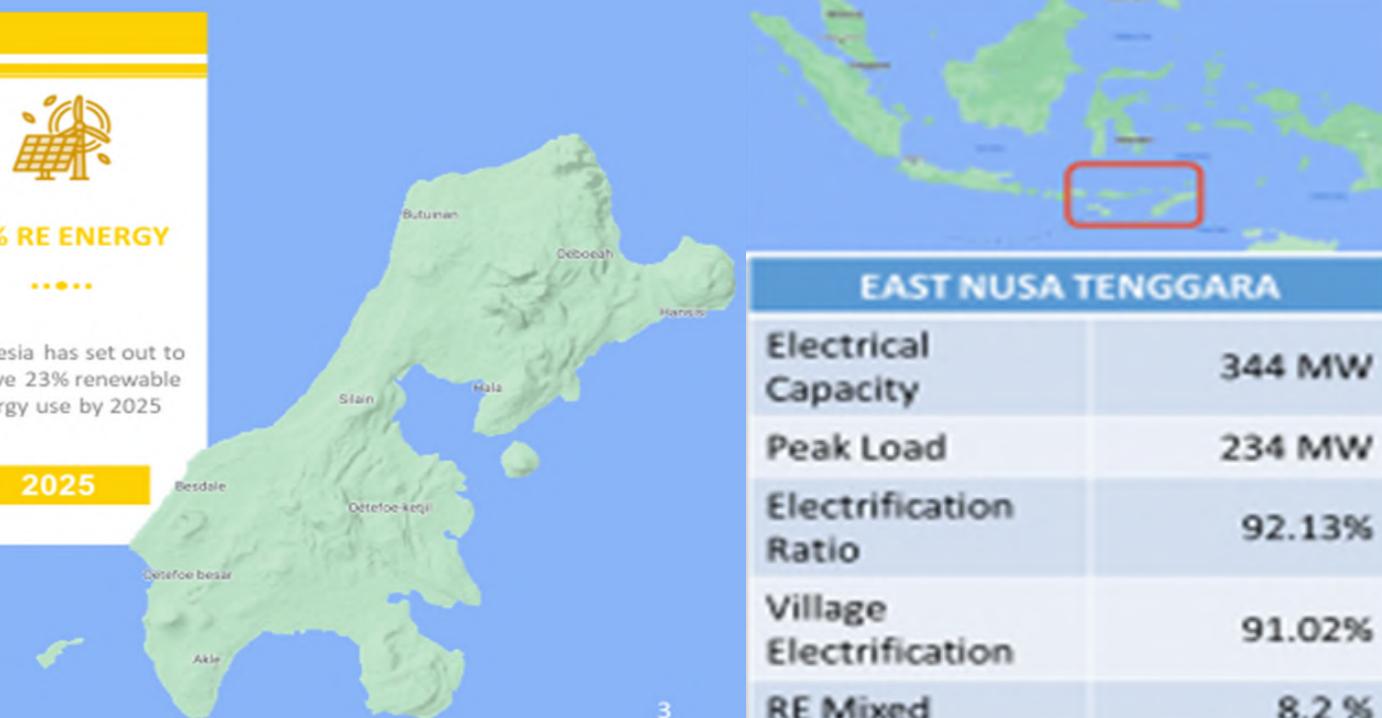
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# Strategic Goal for Renewable Energy development



Map OF Solar Energy Potential in Indonesia

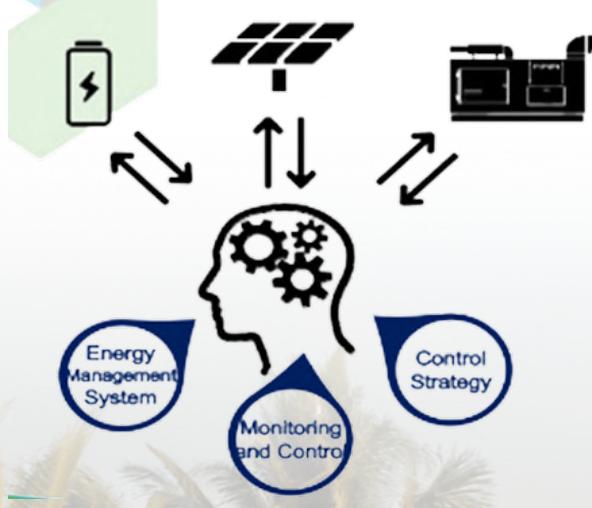
NTT is the future of Indonesia and even the world for solar electric energy because according to research by expert, the best intensity of sunlight in Indonesia is on the island of Sumba and Timor. This can also be seen from The maps and data for Indonesia have been released in parallel with Global Solar Atlas, which is published by the World Bank Group, funded by ESMAP, and prepared by solargis.



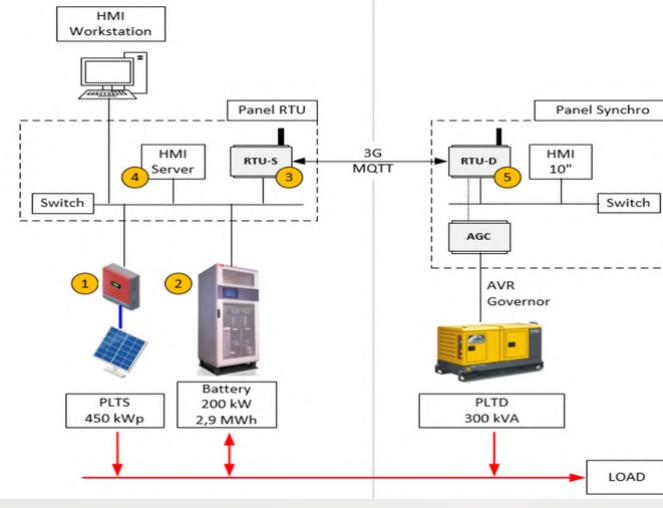
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# AUTOMATION & CONTROL SYSTEM OF SEMAU MICROGRID SYSTEM



Interactive Microgrid Integration comes with component of the 'brain' that ensures the system operate according to design. It is actualized by the Microgrid Controller which functions to process system data and then give operation orders to every component in the Interactive Microgrid. The Microgrid Controllers can be ready-to-use Controllers, or Custom Controllers using PLC / DCS



In the control system diagram, it can be seen where in principle, the PLC system in PLTS (RTU-E) is the brain of the operation of the system. The PLC system will instruct the genset (RTU-G) to ON and OFF via the communication system according to the battery condition



Hybrid control system using PLC is needed to realize the system. The control system designed must be able to operate easily and reliably. This system is designed as simple as possible so that operators can understand and operate easily

## SYSTEM

PLC system in Solar Power Plant (RTU-S) is the brain of system operation. PLC system will command Diesel Power Plant (RTU-D) to switch ON dan OFF via communication system in accordance with batteries level.

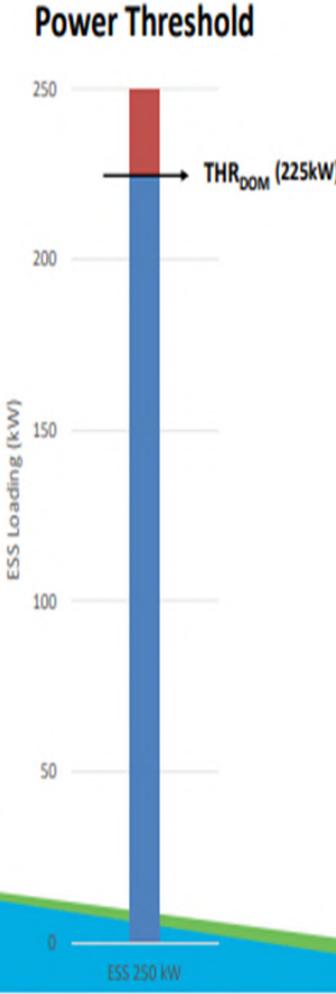
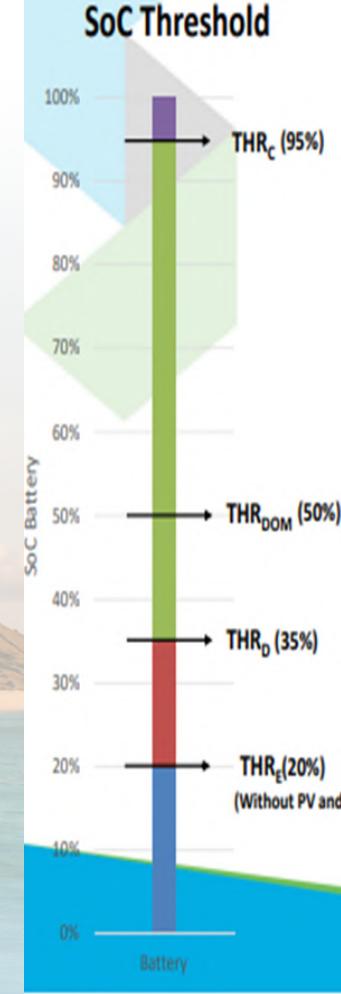
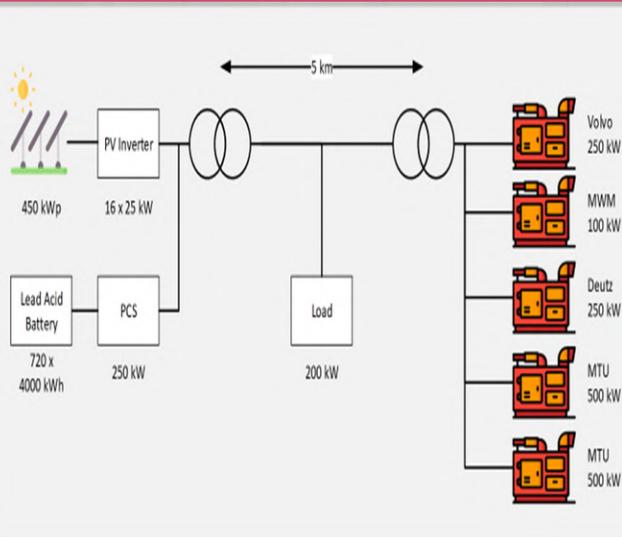
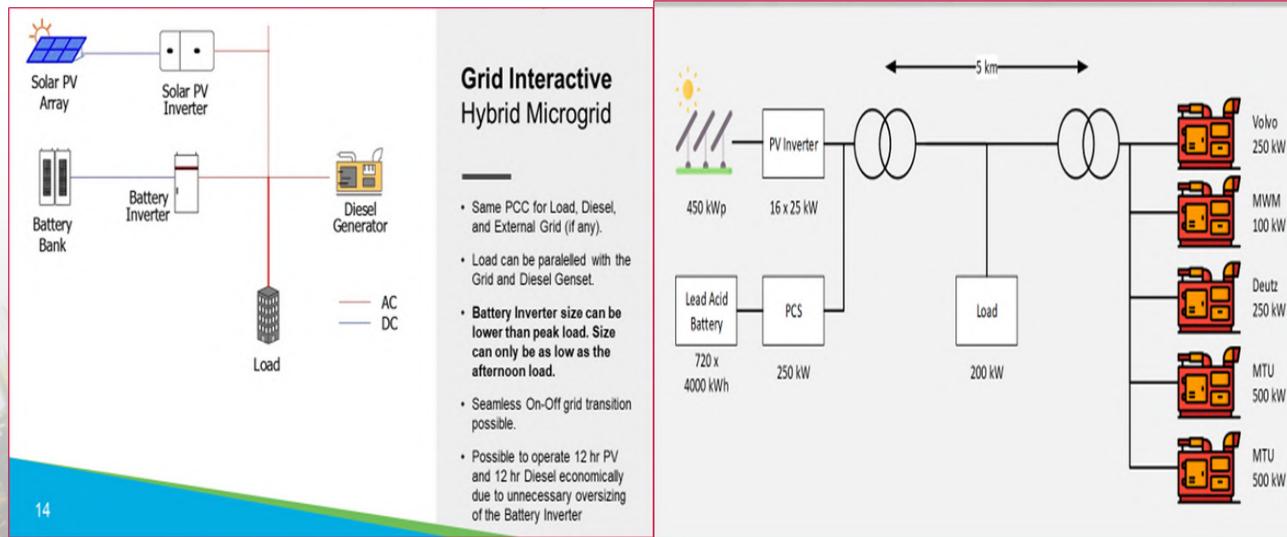
## TOOLS

- PV inverter 25 kW x 8 unit
- Bidirectional inverter 100 kW x 2 unit
- Hybrid Control System (Scada & RTU)

## ADVANTAGES

- Solar Power Plant can be maximized until 450 kWp
- Batteries can accommodate all energies.
- Batteries and Solar Power Plant can take over electricity supply for more and less 9 hours long.
- batteries can be the baseload, follower, peaker, voltage source, current source etc.

# SCHEME TRANSITION ENERGY INTELLIGENT SMART MICROGRID



SoC Threshold	
<b>Switch to DOM</b>	
1. Battery energy $\geq$ THR <sub>DOM</sub>	
2. Minimum X of Y battery is operating	
3. Minimum X of Y PCS modules is operating	
<b>Exit DOM</b>	
1. SoC battery $\leq$ THR <sub>DOM</sub>	
2. SoC battery $\leq$ 35%, battery is shutting down	
<b>RTU limit PV</b>	
1. If SoC battery $\geq$ THR <sub>C</sub> , RTU will limit PV production to prevent battery overcharged	
Power Threshold	
<b>Switch to DOM</b>	
1. Load $<$ 225 kW	
<b>Exit DOM</b>	
1. Load $\geq$ 225 kW	
2. PV critical fault and shutdown	

It can be managed without ABB technician. (Auth)

# KEY TAKEAWAYS



- 1 PLN East Nusa Tenggara has put all the hard work and breakthrough over the last few years to speed up the electrification program to achieve 100% ratio in 2022 through the high utilization of Solar Energy
- 2 In accordance with PLN corporate values : Green, Lean, Innovative, and Customer Focus, PLN East Nusa Tenggara has embarked to a smart microgrid focusing on mitigation techniques to tackle the duck curve phenomenon
- 3 Super intelligent Microgrid systems adopt advanced automation and ICT system to ensure the energy supply transition runs smoothly throughout the 24-hour period, which is aimed to boost the capacity factor of solar energy
- 4 The super intelligent microgrid system project in Semau Subsystem has succeeded in reducing the overall production cost and speeding up green power plant development to achieve 23% Renewable Energy portion in 2025. PLN East Nusa Tenggara will seek other locations for smart microgrid dissemination