SOFWAN HOUSE – DC NANOGRID
DISTRIBUTED ENERGY RESOURCE BUSINESS MODEL

Sofwan Farisyi

- Mechanical Engineer and Master of Marketing from University of Indonesia
- Asean Leadership Program at Cambridge (UK) and CKGSB (Shanghai, China)
- My current position now serves as CEO of PT Radiant Utama Interinsco Tbk (public listed company in Energy business)
- My other position in the Radiant Group are:
  - President Director of PT Supraco Lines (marine offshore company)
  - Commissioner of PT Supraco Indonesia (energy support company)
  - Commissioner of PT Sorik Merapi Geothermal Power (Geothermal Power Plant)
- Advisory Board Member at FTUI Mech. Eng. Dept.

TOWARDS INDONESIA 2045: CHALLENGES AHEAD

> *Indonesia is moving from 'growth that is driven by resources and depending on capital and manpower' to 'growth that is based on high productivity and innovation'.*

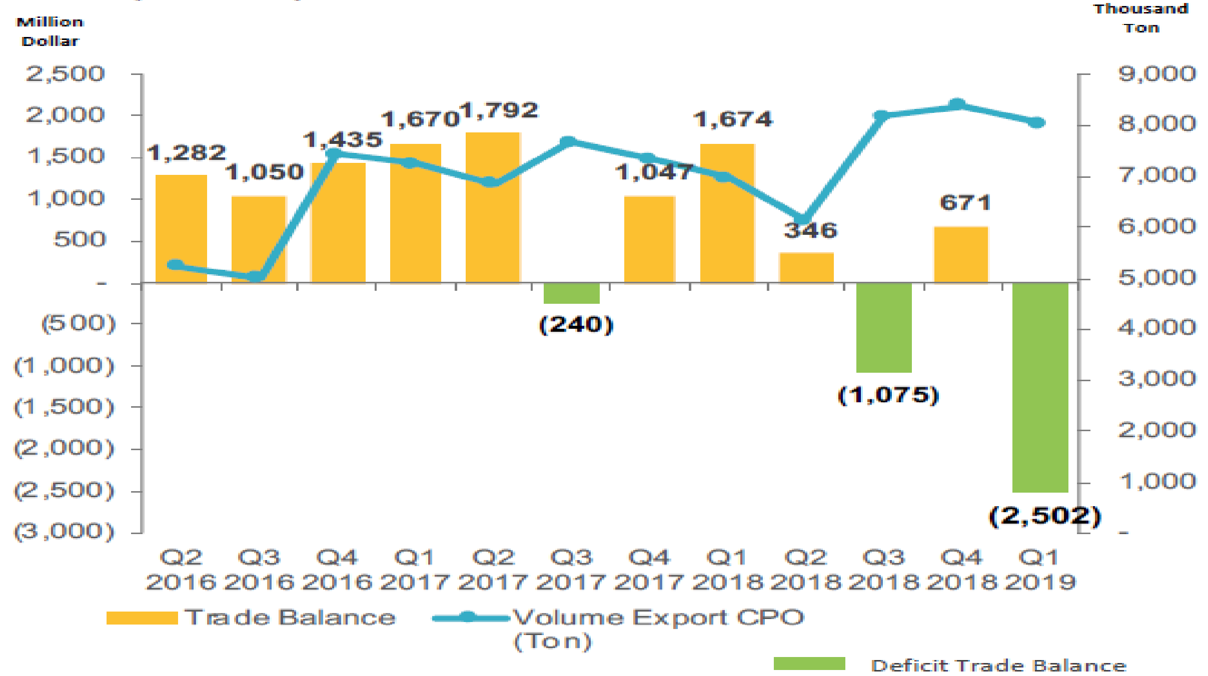
Key elements:

1. Equitable growth throughout Indonesia.
2. Infrastructure and connectivity supporting growth.
3. Innovation and technology in encouraging the resources utilization.
4. High quality human resources reliable to compete globally.
5. **WATER, FOOD AND ENERGY RESILIENCE.**

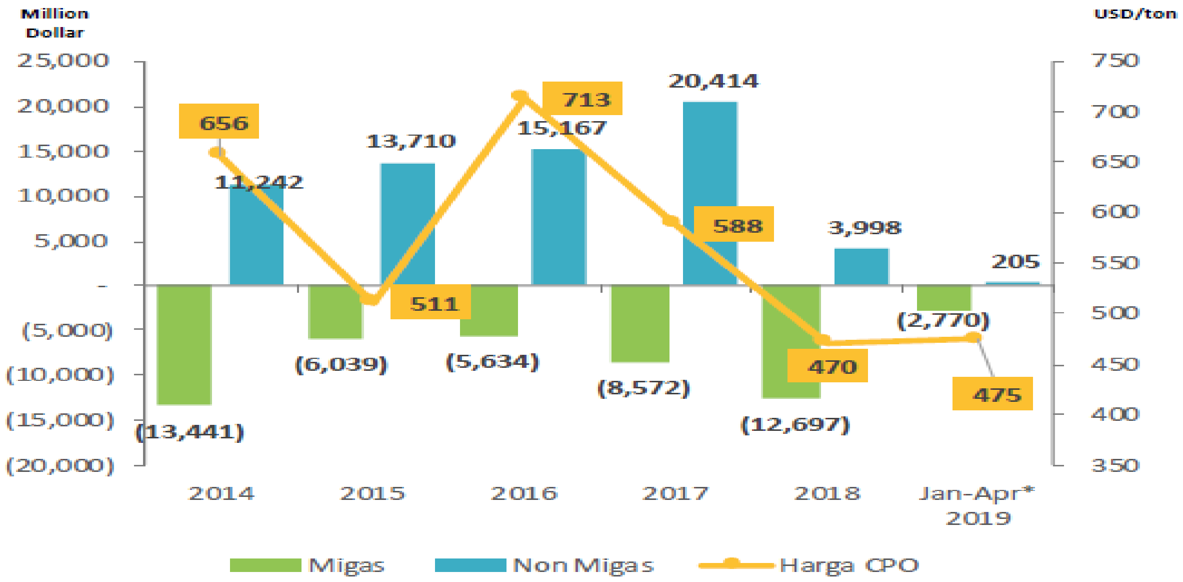
THE BIGGEST TRADE BALANCE DEFICIT WITHIN THE LAST 5 YEARS

Indonesia had the biggest trade balance deficit within the last five years in the Q1 2019 reaching for USD2.502 million. The main factor causing the deficit was the amount of imported oil and gas reaching for USD2.770 in the Q1 as well as the low of CPO price for 475 USD/Ton in April 2019.

Trade Balance and CPO Export Progress per Quarter
Period: Q3 2016 – Q1 2019

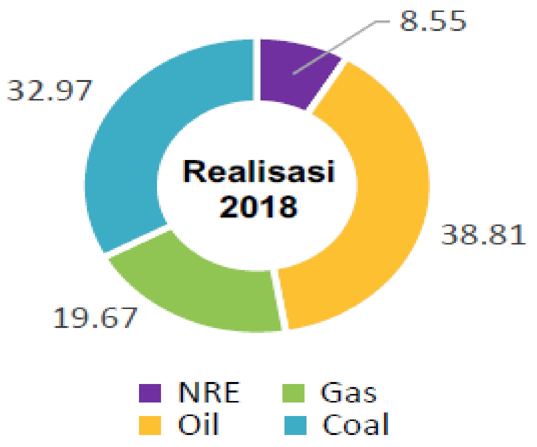


Oil and Gas, Non Oil and Gas Trade Balance and CPO Price Movement
Period: Q3 2016 – Q1 2019

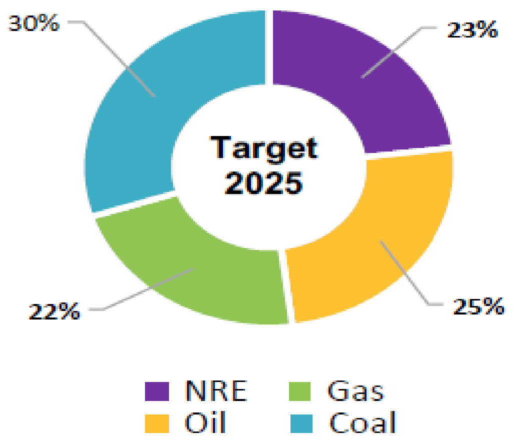


Even though the volume of exported CPO increased in Q1 due to the low CPO price, the number of exported CPO could not reduce the trade balance deficit in Q1 2019

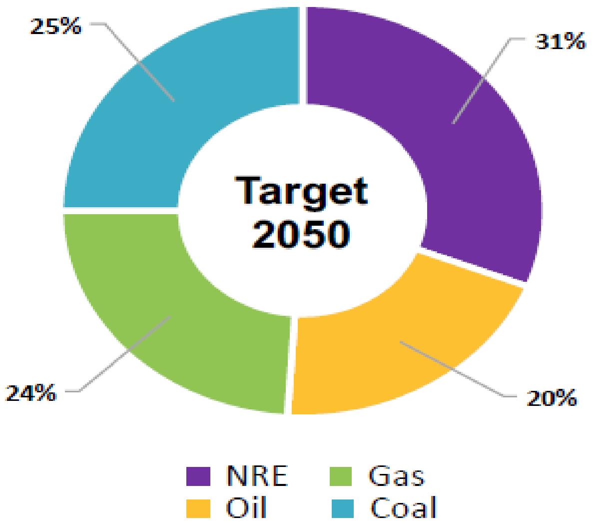
TARGET OF NATIONAL ENERGY GENERAL PLAN



1. Power Plant : 62,6 GW
2. Energy Consumption : 0,8 TOE/cap
3. Electricity Consumption : 1.064 Kwh/cap



1. Power Plant : 115 GW
2. Energy Consumption : 1,,4 TOE/cap
3. Electricity Consumption : 2500 Kwh/cap

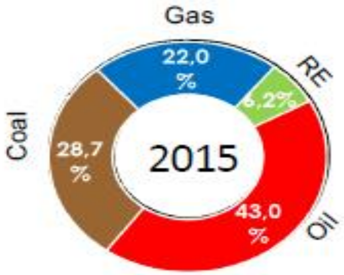


1. Power Plant : 430 GW
2. Energy Consumption : 3,2 TOE/cap
3. Electricity Consumption : 7000 Kwh/cap

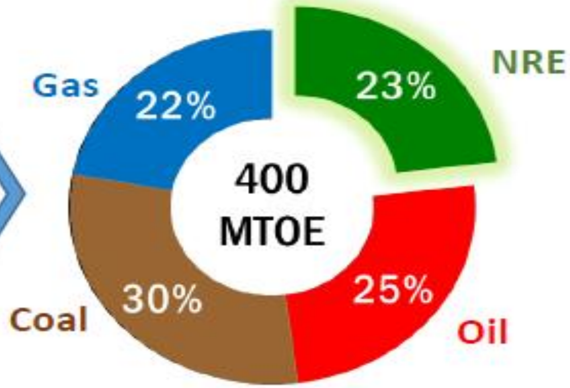
Source: National Energy Council and Data and Information Center

GOV REG 79 OF 2014 NATIONAL ENERGY POLICY

Maximize renewable energy utilization;
Reduce fuel-oil consumption and refined oil import



PRIMARY ENERGY SUPPLY 2025



Policy

- Maximize Renewable Energy utilization
- Minimize Oil utilization
- Optimize gas and new energy utilization
- Utilization of coal as the main national energy supply
- Utilization of Nuclear Power Plant as the last option

Target of RE:

23 % NRE → 92.2 MTOE → 69.2 MTOE / 23.0 MTOE

69.2 MTOE:

Electricity	45.2 GW

Indirect Utilization
1. Geothermal PP, 7,2 GW
2. Hydro PP, 17,9 GW
3. Small Hydro PP, 3 GW
4. Bioenergy PP, 5,5 GW
5. Solar PP, 6,5 GW
6. Wind PP, 1,8 GW
7. Others, 3,1 GW

23.0 MTOE:

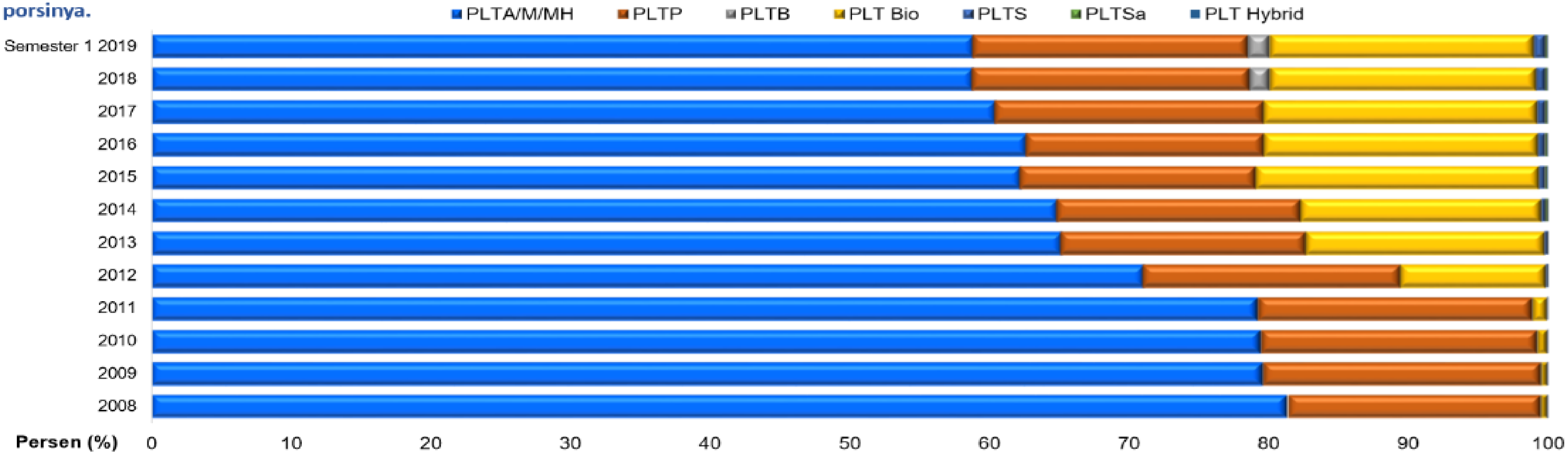
Biofuels	13.8 Million KL
Biomass	8.4 Million tons
Biogas	489.8 Million M3
CBM	46.0 MMSCFD

Direct Utilization

BASED ON:
- Government Regulation No. 79/2014 on National Energy Policy
- Presidential Regulation No. 22/2017 on General Plans Of National Energy

RENEWABLE POWER PLANT DEVELOPMET

Secara total kapasitas, porsi PLTA, PLTP, dan PLT Biomas masih mendominasi kapasitas pembangkit EBT. Namun mulai 2018, PLTB dan PLTS mulai menunjukan porsinya.



	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	Semester 1 2019
PLTA/M/MH	81.34	79.54	79.39	79.18	70.91	65.05	64.79	62.12	62.56	60.33	58.71	58.78
PLTP	18.17	19.98	19.85	19.71	18.47	17.56	17.46	16.93	17.06	19.28	19.92	19.74
PLTB	0.01	0.01	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	1.47	1.56
PLT Bio	0.43	0.42	0.68	1.04	10.45	17.13	17.28	20.32	19.67	19.63	19.09	18.92
PLTS	0.05	0.05	0.05	0.06	0.15	0.23	0.28	0.39	0.48	0.54	0.62	0.80
PLTSa	-	-	-	-	-	-	0.17	0.18	0.17	0.17	0.16	0.16
PLT Hybrid	-	-	-	-	0.00	0.00	0.00	0.04	0.04	0.04	0.04	0.04

ROOFTOP SOLAR PV

(MEMR REGULATION No 49/2018 jo. MEMR REGULATION NO 13/2019 jo. MEMR REGULATION NO 16/2019

OBJECTIVES/ADVANTAGES

<u>PLN Consumer</u>

- Reducing monthly electricity bills.
- Improving the role of the community regarding the use and management of renewable energy

<u>Government and PLN</u>

- Increasing the percentage of NRE in the national energy mix.
- Accelerating the solar energy utilization.
- Encouraging the local solar energy industry.
- Increasing the NRE investment.
- Energy security and energy independency.
- Reducing green house gas emission.
- Increasing the rate of employment.

ROOFTOP SOLAR PV SYSTEM

INCOMPONENT: solar PV module, inverter, consumer electricity connection, safety system, dan export-import kWh meter.

CONSUMER: All PLN Consumer including industrial sector.

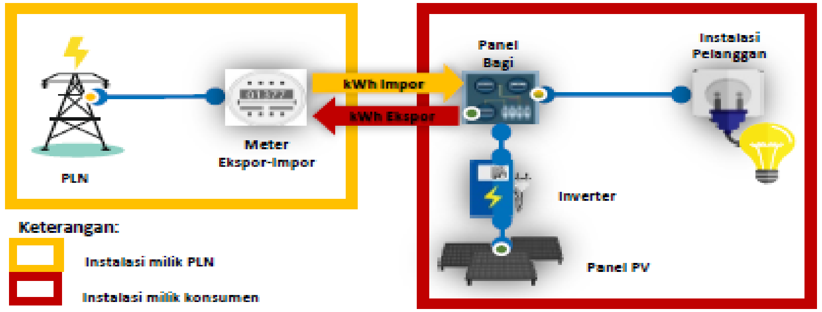
MAX. CAPACITY: 100% installed capacity of consumer electricity (Watt).

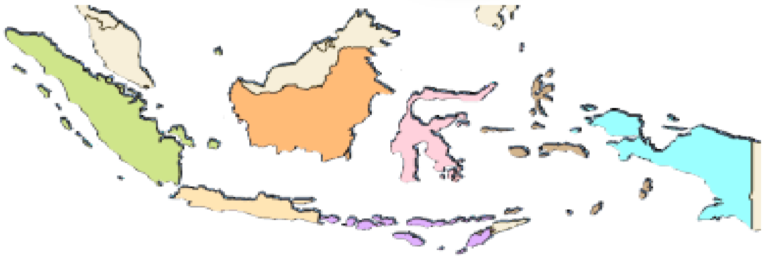
LOCATION: rooftop, wall, or other parts of building of PLN consumer.

EXPORT AND IMPORT CALCULATION

Electricity Bill (kWh) = Total imported kWh – 65% of expoterd kWh

- Total kWh Ekspor : Jumlah kWh yang diekspor pelanggan ke PLN yang tercatat pada meter kWh ekspor.
- Nilai kWh Impor : Nilai kWh yang diimpor pelanggan dari PLN.





Total customer: 1.435 customers (3,63 MWp)

*September 2019

SOFWAN HOUSE STORY

TREC UI

Renewable Energy in Tropical Area Research Center

Located in Universitas Indonesia

Established since 2014

Research Cluster

- Nanogrid and Dual Power
- Fluid and Thermal Energy Conversion
- Waste to Energy
- Energy Storage

GOAL

Develop a house model with Integrated Clean Energy Technology

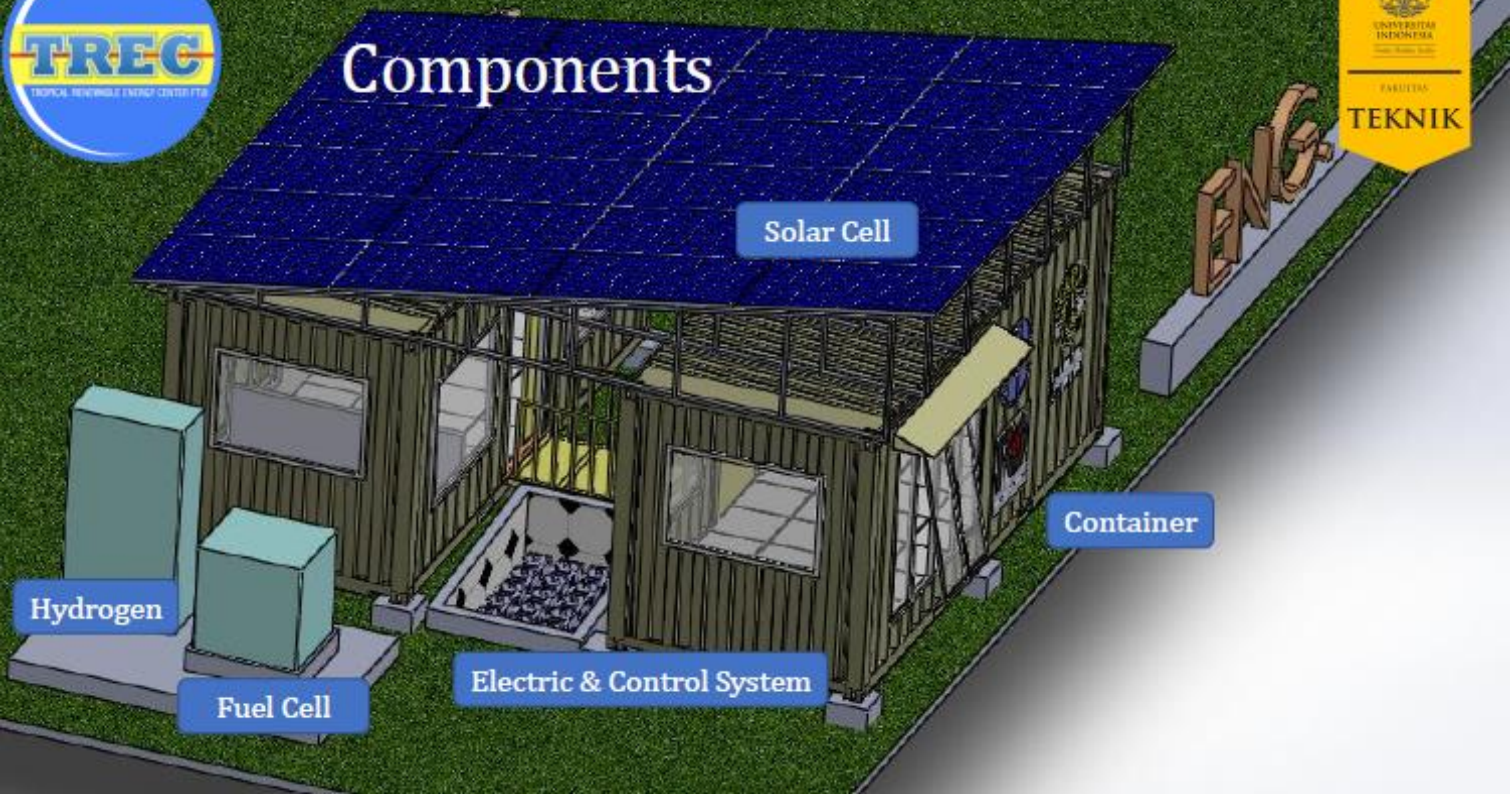
↓

Produce a Clean and Reliable Energy

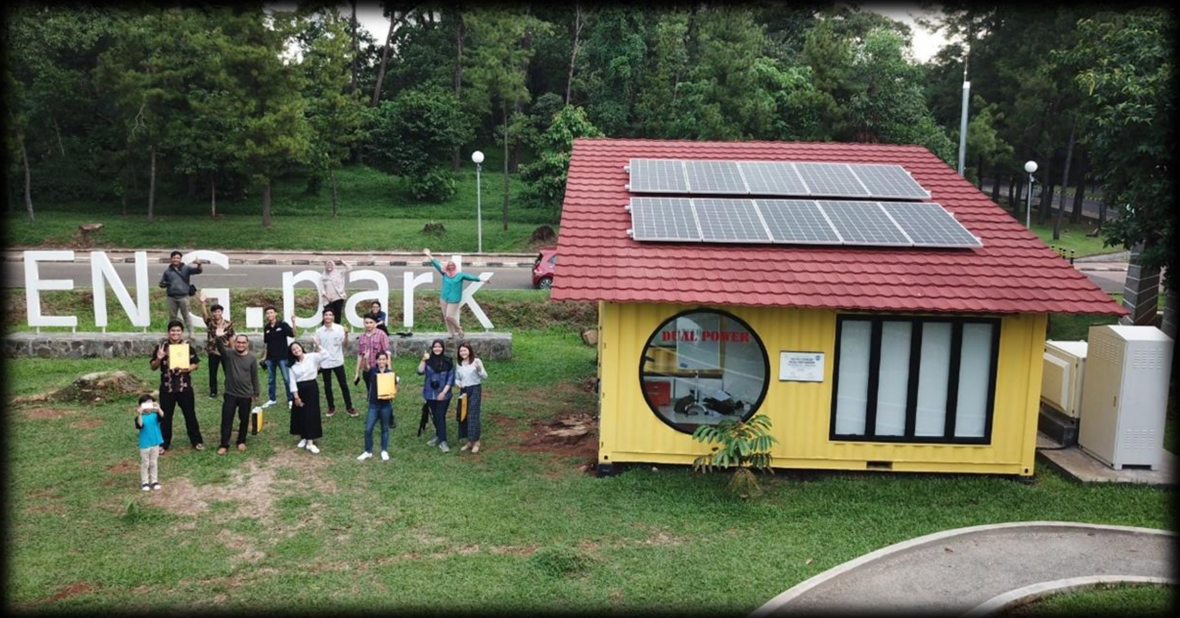
↓

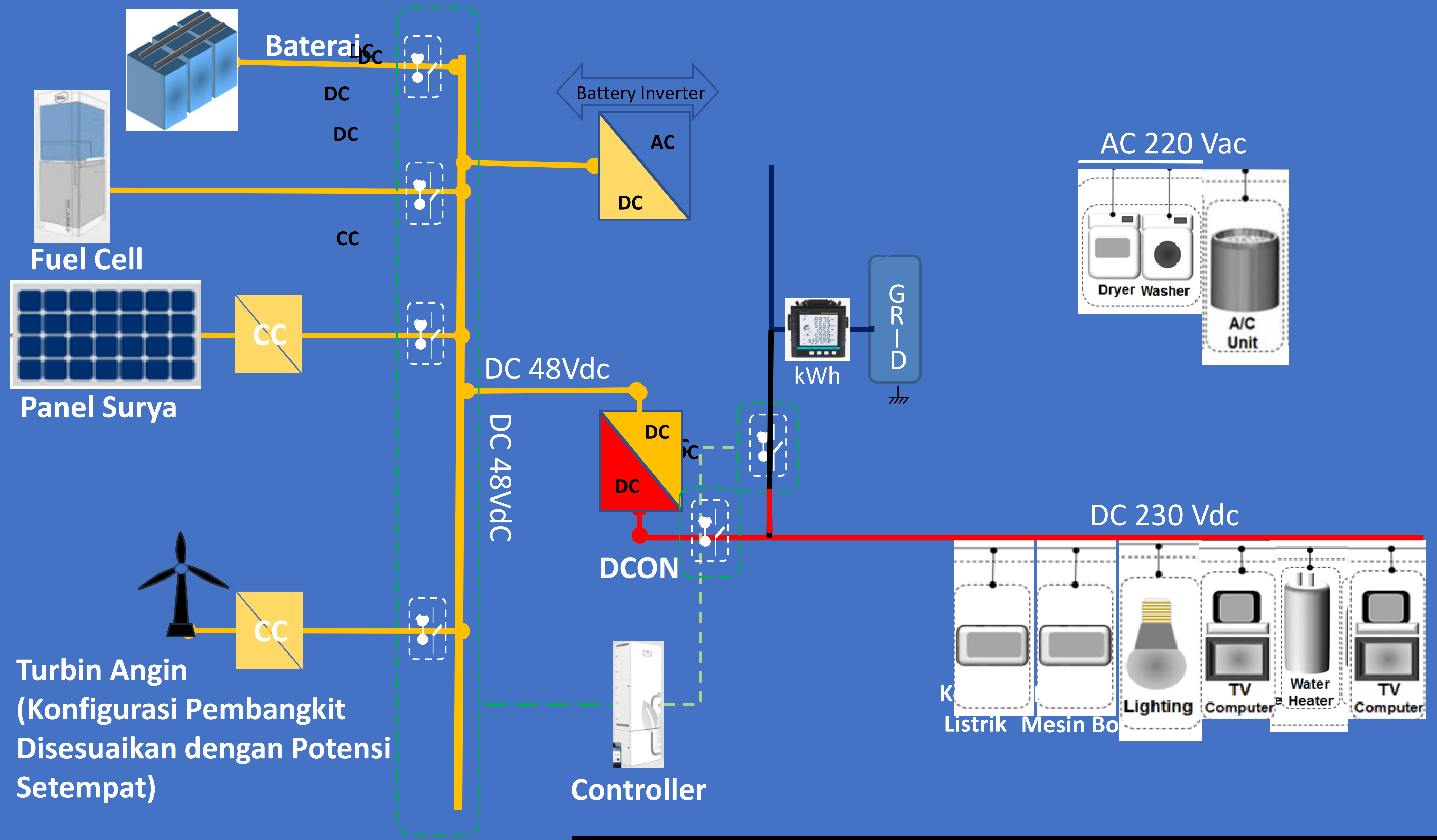
Create a Research and Education Lab

Components


Solar Cell
Container
Hydrogen
Fuel Cell
Electric & Control System

Faculty Engineering,
University Of Indonesia
Thursday 25th October
2018

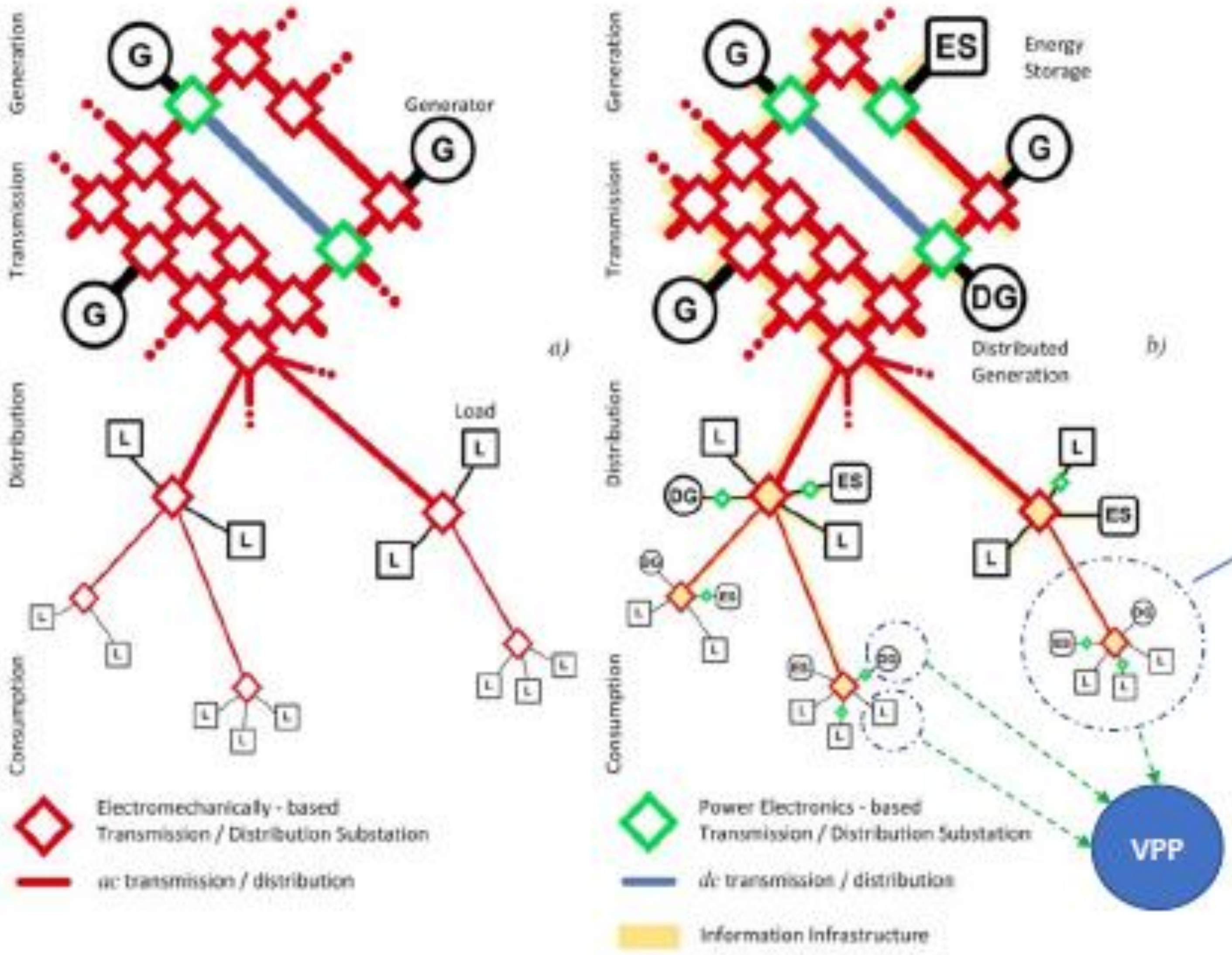




SOFWAN HOUSE – DC NANOGRID

The last two decades saw a steady growth of distributed generation (DG), with higher penetration of renewable energy sources, and the policies on electricity distribution have been supporting needs for a "Smart Grid"

SMARTGRID-MICROGRID-VPP



a) Traditional Electricity Grids *b) Smart Grid*

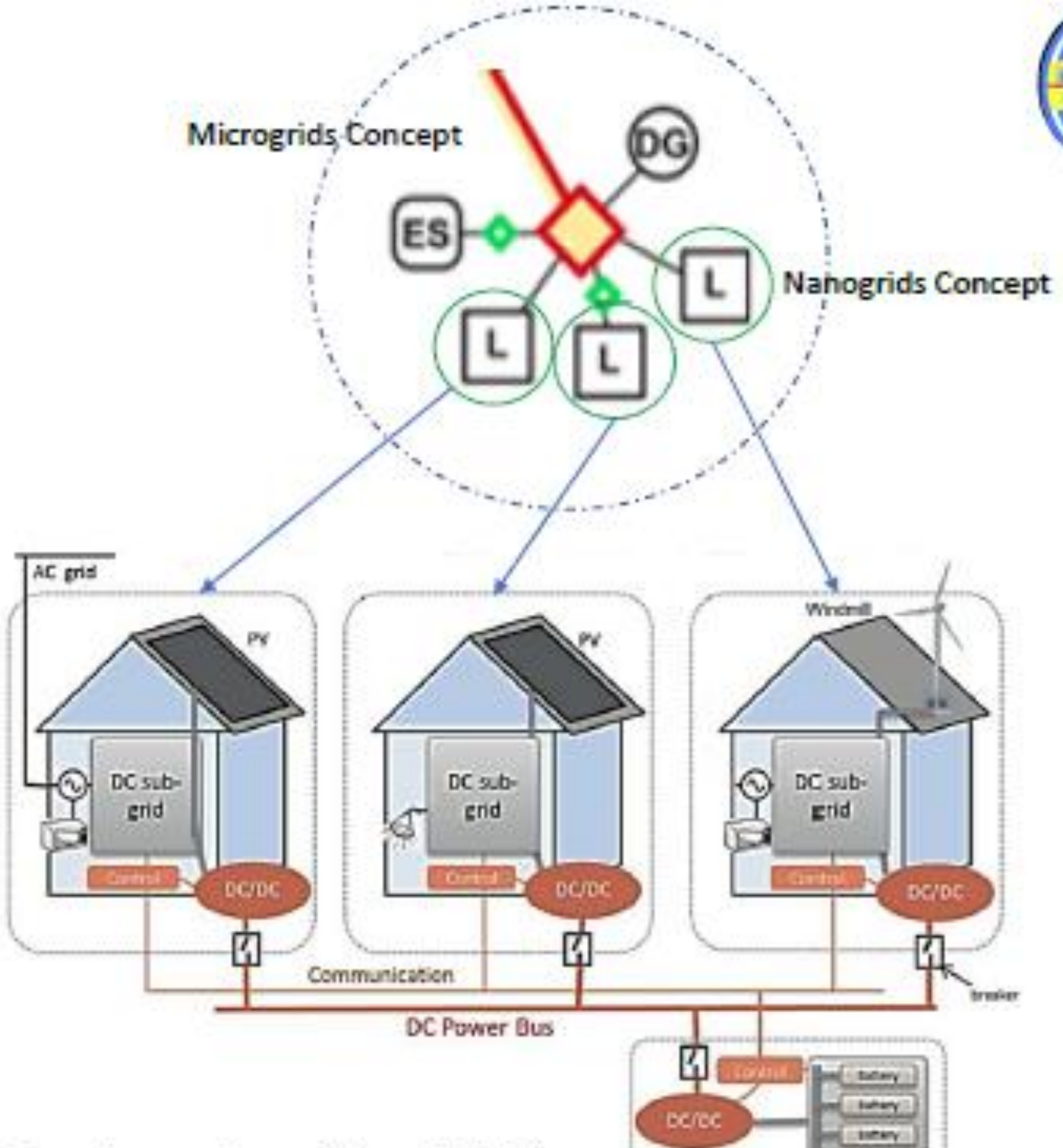
Microgrids can be defined as structures that combine DG units, energy storage systems (ES), and loads

Virtual Power plant (VPP) : Aggregation control of a number distributed generation units, grid connected and installed near the loads.

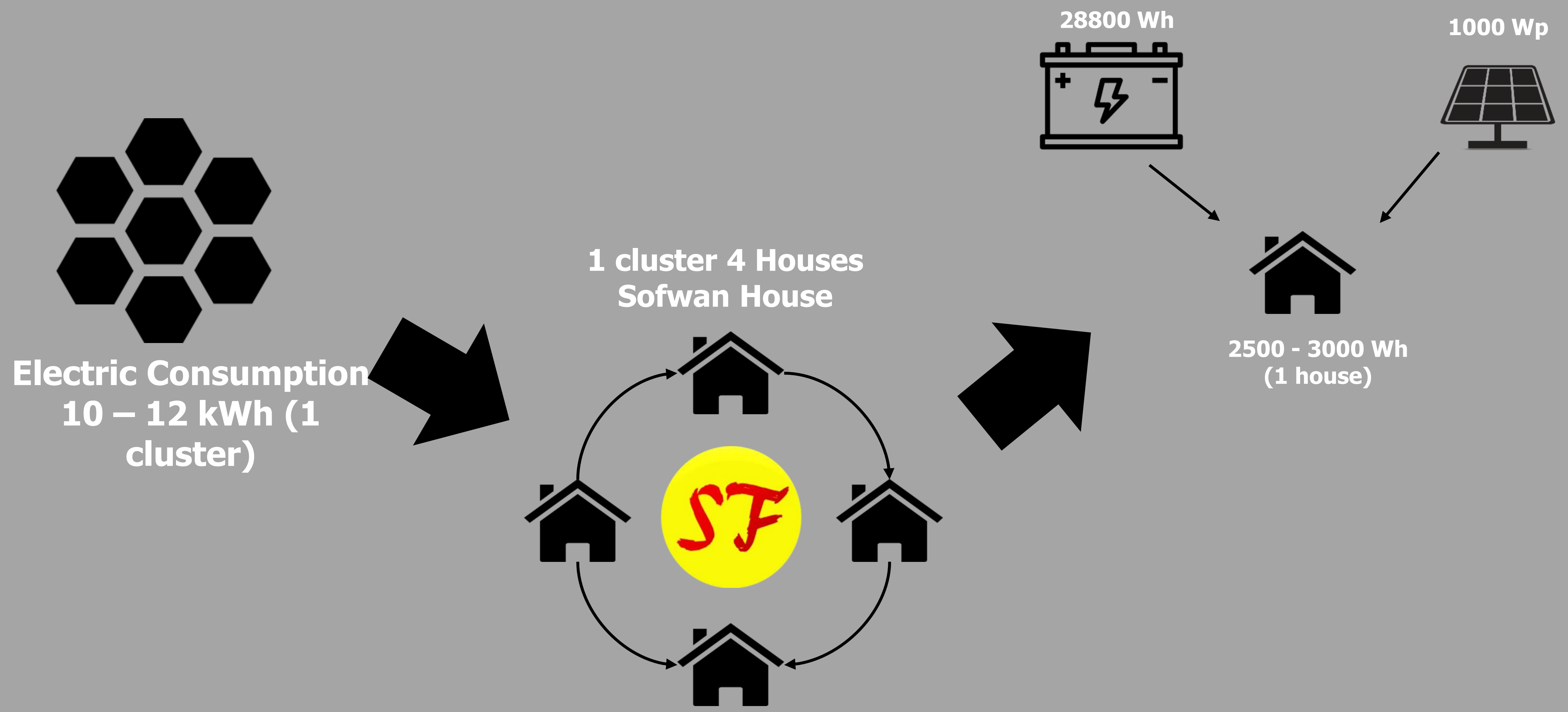
NANOGRIDS

Nanogrids = microgrids yang lebih kecil, secara teknologi juga lebih sederhana. Fungsinya untuk memenuhi kebutuhan beban1 gedung atau 1 rumah, sistem ini pun sering dilihat sebagai **buttom-up approach,** namun dapat juga diterapkan untuk daerah off-grid.

A nanogrid has a similar structure to a microgrid, but it is spread out in a much smaller geographic area (e.g., a single building) and usually entails a much smaller capacity. Nanogrids are designed to satisfy very specific objectives within a microgrid.

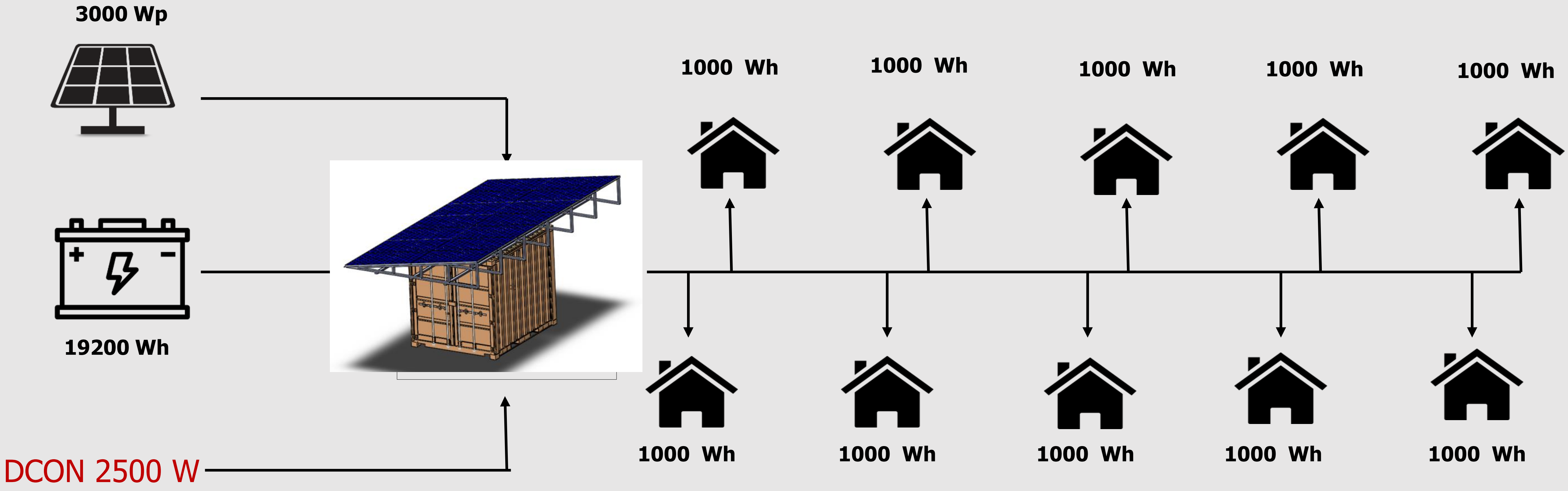


General system layout (Nanogrids) [1]



Rural Development – DC Nanogrid

POWER CONTAINER FOR SMALL COMMUNAL



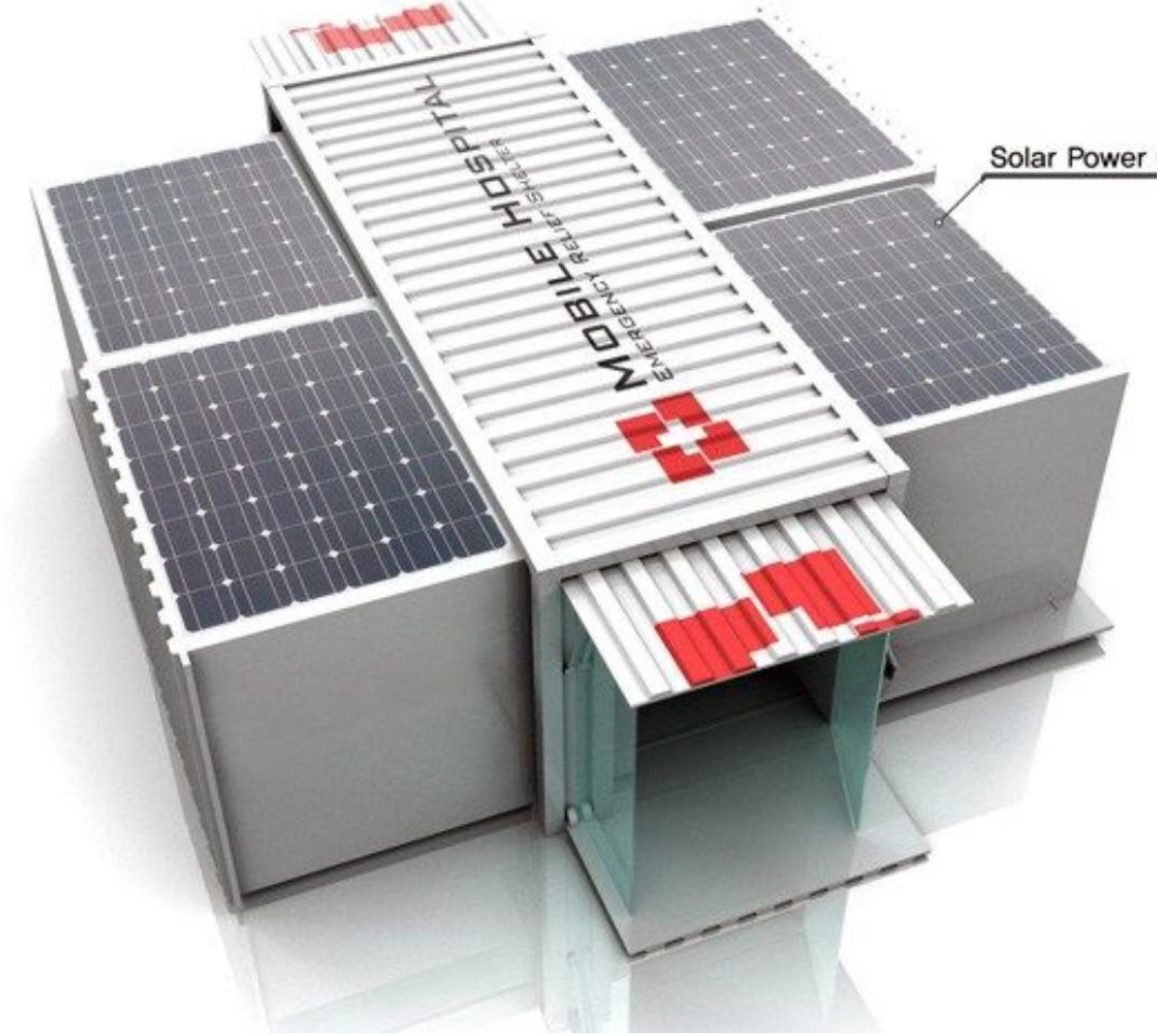
DC NANOGRID IMPLEMENTATION

DC Nanogrid at Urban House

DC Nanogrid at Urban House

Surgical Container Palu (DepKes)

Future Project, Mobile Hospital (DepKes)



SUMMARY

- Solar PV suitable for rural area
- Voltage 230 Vdc as alternative voltage for rural house
- In future DCON 2.5-4 kW can replace inverter function
- Container house concept can use distributed energy resources
- Renewable energy for bright future


Dual Cells Technology Integration Project
TREC Research Lab – Sofwan House
TREC
SF
SOFWAN

THANK YOU