



Case Study of Microgrid Stabilization Using K-EMS

Promoting Technology on Renewable Energy by
Kyudenko in Indonesia



CEFIA
15th January 2025
Kyudenko Corporation

Established	December 1, 1944
Capital	12,550 Million Yen
Sales	460.0 Billion JPY (FY 2022)
HO	Fukuoka city
Number of employees	10,425 persons (non-consolidated) (March 31, 2022)

Kyudenko is a leading company of :

- * Electrical Construction
- * Air conditioning, water supply and drainage work
- * Power distribution line construction
- * Renewable Energy plant : Construction
(Solar PV, Wind Power, Biomass, others) and O & M

Over 3,500MW experience of Photovoltaic Power Plant construction in Japan



Business Operation

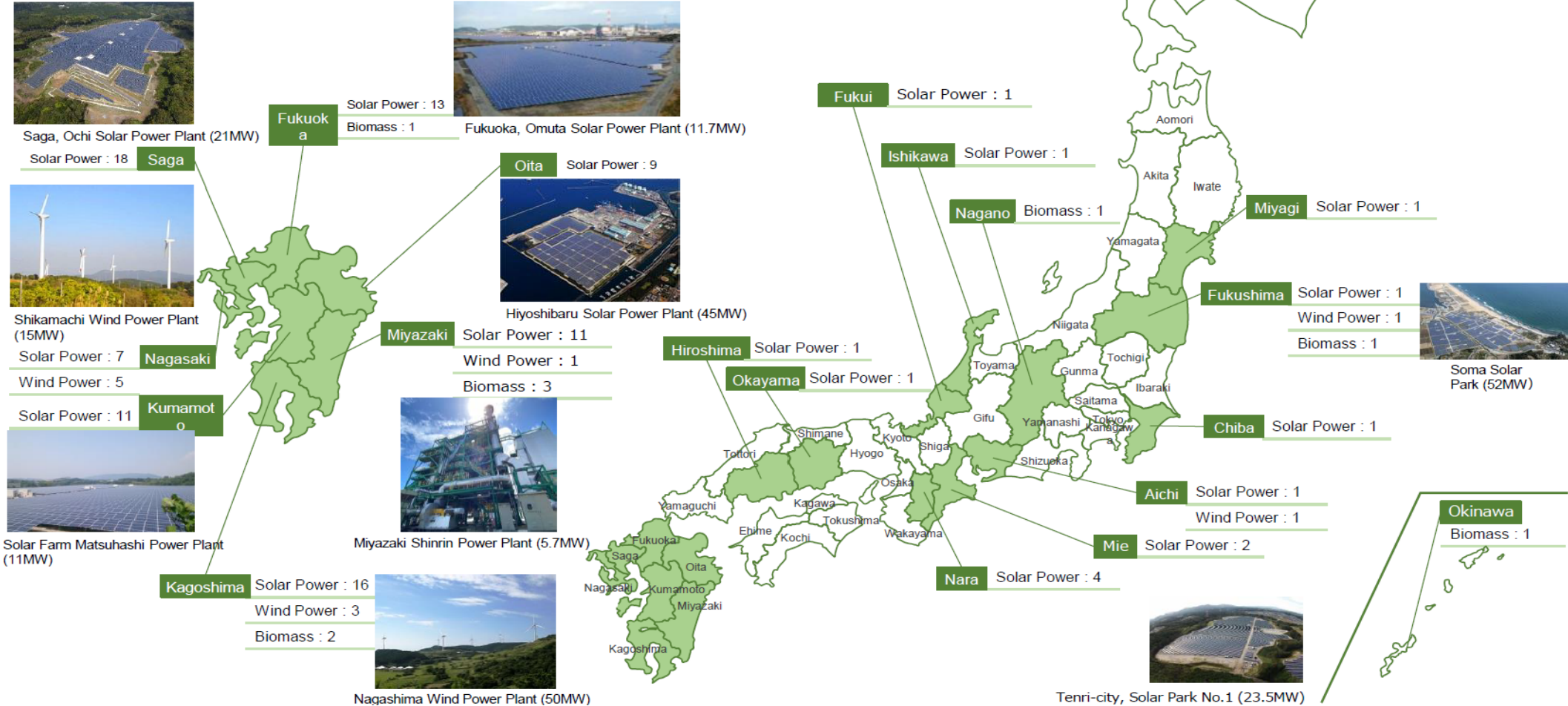
	Number of Power Plant	Capacity (Overall Business)	Capacity (Equity Equivalent)
Solar Power	99	1,315 MW	368 MW
Wind Power	11	204 MW	101 MW
Biomass	9	324 MW	34 MW
Total	119	1,842 MW	504 MW

* Including projects under construction and planning

Track Record of Construction

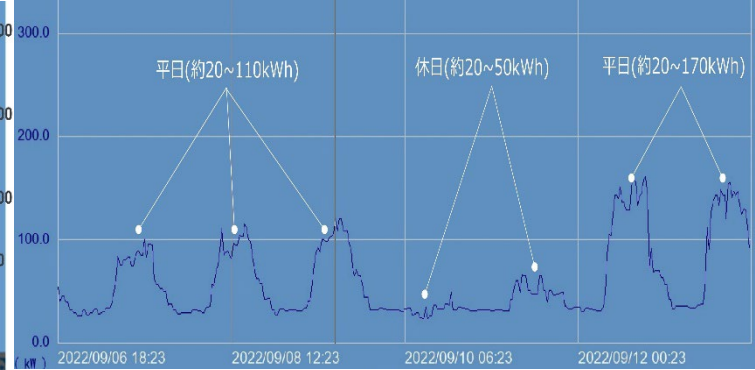
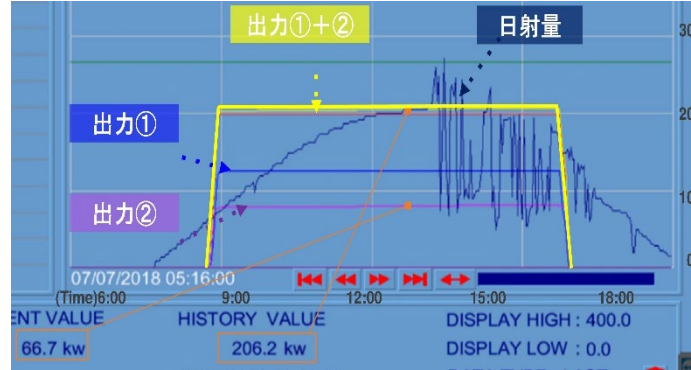
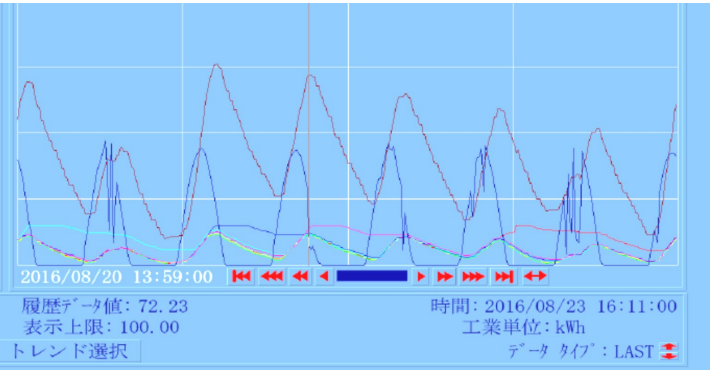
	Number of Power Plant	Capacity
Solar Power	1,252	2,681 MW
Wind Power	10	184 MW
Biomass	2	55 MW
Total	1,264	2,920 MW

* Only Main Contractor



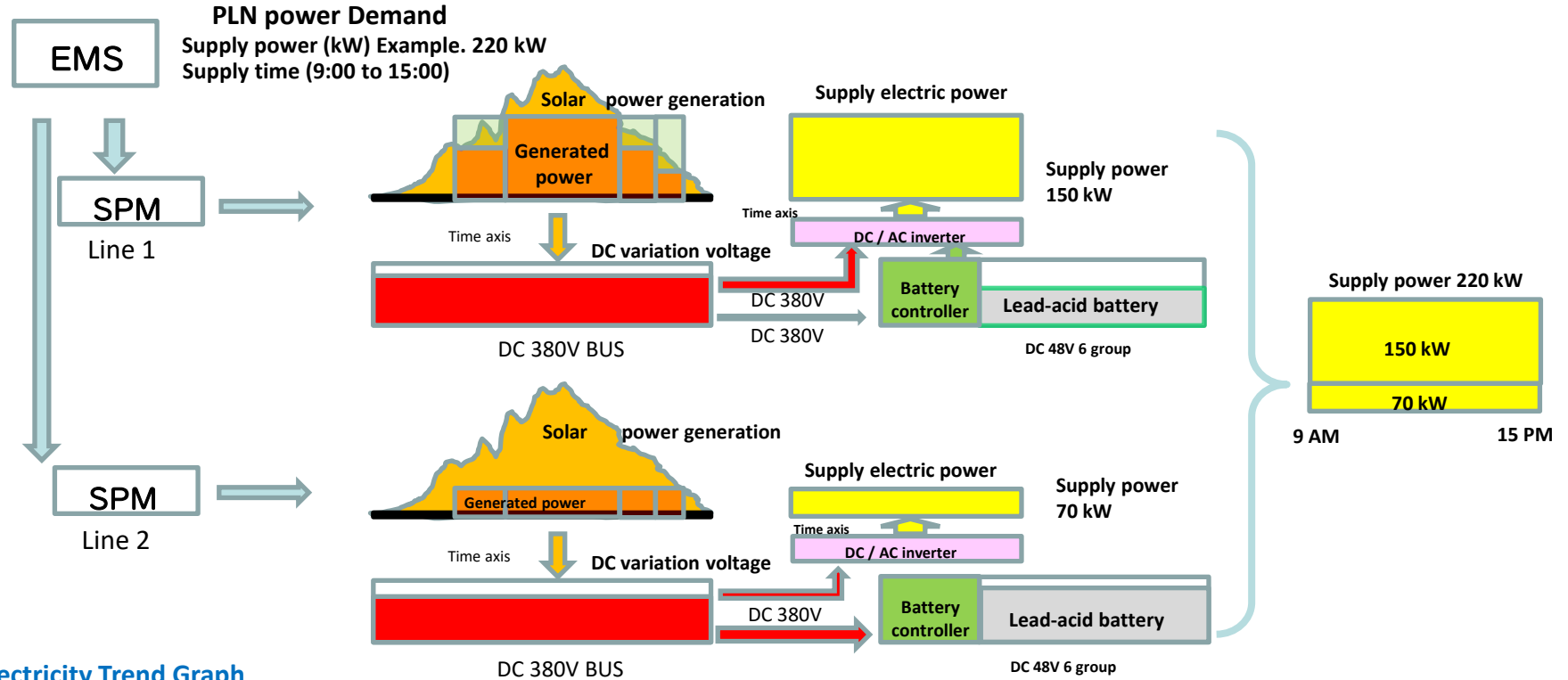
Track Record in RE and Micro Grid

Small OFF -Grid Demonstration	Stabilization of RE ON -Micro Grid	100% OFF -Grid with RE For City-hall building
Nagasaki, Japan	Sumba, NTT, Indonesia	Ogi city, Saga Japan
PV: 30kW, Wind: 10 kW	PV: 400 kW	PV: 552 kW
Battery 120 kWh	Battery 1,152 kWh	Battery 3,456 kWh
COD: Jul 2015 Battery SOH: 93% (Dec 2022)	COD: Dec 2017 Battery SOH= 100% (Dec 2022)	COD: Mar 2022 100% covered by RE

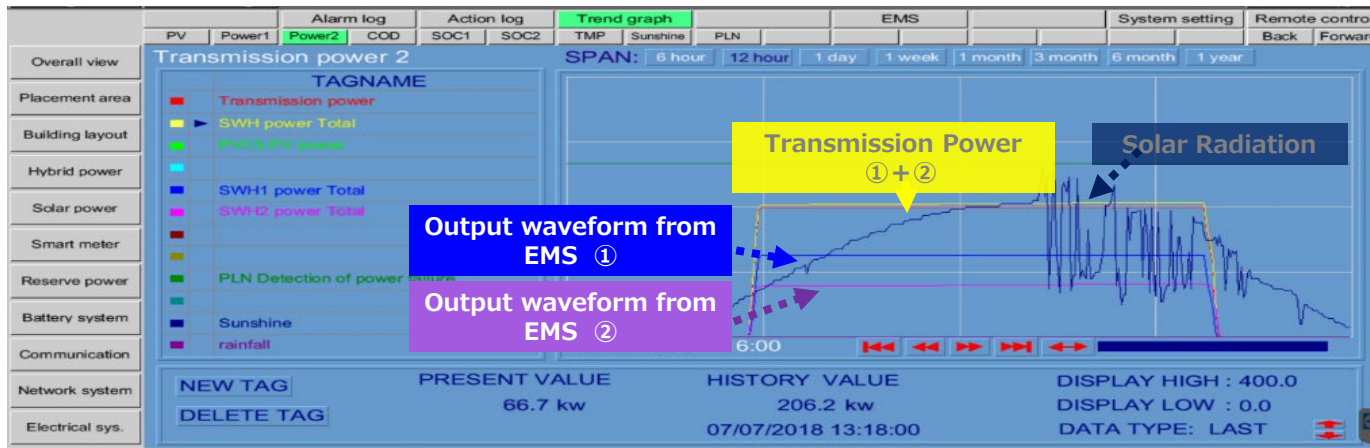


Peak-cut of Diesel generators

ON-grid Demo in Sumba Island



Transmit Electricity Trend Graph



- ✓ **STABLE SUPPLY**
- ✓ **Long-life Battery**
- ✓ **Adjustable based on demand**
- ✓ **Control Remotely**

INDONESIA'S GOALS AND TARGETS



23% NRE IN NATIONAL PRIMARY ENERGY MIX

- NRE installed capacity target: 18.5 GW based on RUPTL PT PLN (2021-2030). Rooftop PV capacity: 3.6 GW.
- 52 CFPPs will commercially utilized biomass cofiring with demand estimation of 10.2 tons biomass.
- Biodiesel mandatory will reach B40 (current implementation: B35).
- ≈ 100% electrification ratio.



Achieving Enhanced NDC Target

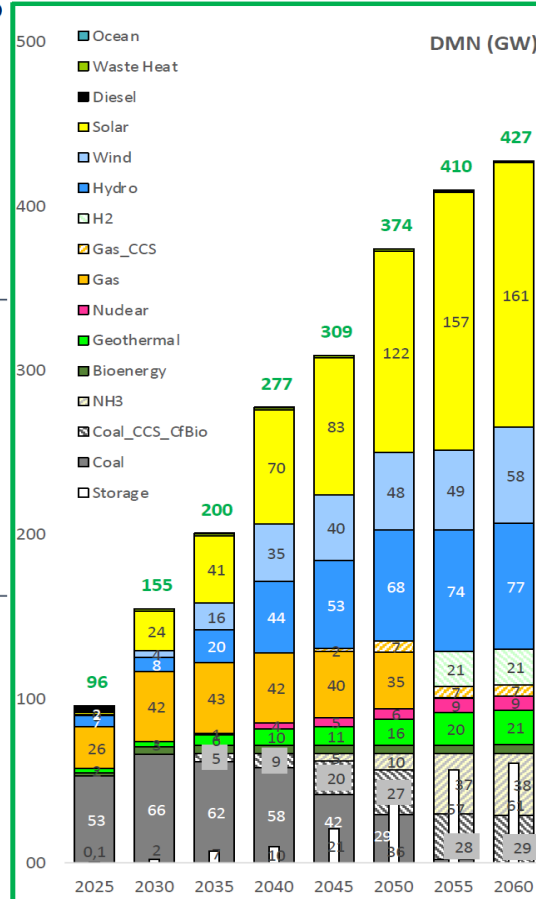
- Through Enhanced NDC, Indonesia raised its carbon emission reduction target and the energy sector target is increased from 314 million tonnes of CO₂e to 358 million tonnes of CO₂e
- By 2023, the energy sector reduced GHG emissions by 127.7 million tonnes of CO₂e.
- Realization strategies: RE power generation, biofuel utilization, energy efficiency, fuel switching, and so on.



Net Zero Emission

- Emission reduction: 93% from BaU, by optimizing supply side by using NRE and demand side by applying energy efficiency.
- **NRE will provide whole electricity.** More diverse new energy source will also be utilized, including nuclear for power plant and hydrogen for transportation.
- Application of innovation and modern technologies is also promoted, such as carbon capture and smart grid

● ● ● Directorate General of New, Renewable Energy, and Energy Conservation @2023



North Kalimantan Project Presentation by MEMR, Japan Pavilion, COP 28, Dubai, 4th December 2023



MoU Ceremony Kyudenko-Indonesia Power, 2nd AZEC, Jakarta, 21st August 2024

- To accelerate the achievement of the NZE goal, the Indonesian government plans to significantly expand NRE power plants in 2025, establishing smart grids and inter-island grids connecting Sumatra, Java, and Kalimantan. To support this initiative, Kyudenko is committed to implementing smart grid projects across various remote islands and engaging in B2B collaborations utilizing NRE.
- Hybrid NRE power plants will be utilized effectively based on local resources to accelerate the replacement of fossil fuel use in remote areas.

Overall Planning



PLN De-dieselization Phase-1

PLN Dediesel Phase-2 Tender Announcement plan in 2025

North Maluku IPP Proj.
 Total : 10 MWp Solar PV + BESS
 Waiting for Tender Announcement

100% RE in North Kalimantan
 Total : 12 MW Biomass, 17 MW Solar PV, 80 MWh BESS

Sumba
 Total : 700 kWp Solar PV + 1,152 kWh BESS
 Under discussion with Local Gov't

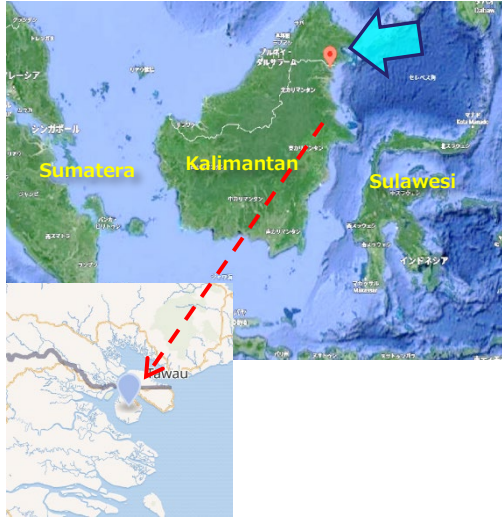
Hybrid Power Generation (Based on availability of Power resources in the area)

- : IPP/EPC with PLN (based on PLN's tender)
- : B2B planning projects

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Detail Survey for Demo Project (PLAN)



The Planning Project aims to provide solutions to the challenges of decarbonization in the Remote islands of Indonesia especially in 3T regions (Frontier, Outermost and Least Developed Regions)

Goals of Demonstration Project :

- ❖ Reduce fossil fuel consumption by replacing diesel power
- ❖ Possible to supply 100 % RE
- ❖ Adopt inexpensive biomass fuels that are not effectively utilized in the area
- ❖ Realize an integrated power supply system that combines solar power, biomass power and BESS WITHOUT fluctuating output and minimize the impact on the grid
- ❖ Reducing of GHG emission

- **Feedstock needs**
94 ton/day (3.9 ton/hr)
- **Solution System**
Solar PV + Biomass + BESS
- **Capacity**
2 MWp + 2 .2 MW + 7.2 MWh
- **Interconnection System**
Isolated 20 kV
- **Investment Amount**
IDR 250 B (Assumption)
- **Fuel Material**
Empty Fruit Bunch (EFB)
- **Feedstock Supplier**
11 Prospect Vendors

EXISTING (2022~)			DEMO (PLAN)			IPP (PLAN)		
	Capacity	Output		Capacity	Output		Capacity	Output
Gas Engine	8.0 MW	3.3 MW	Gas Engine	8.0 MW	3.3 MW	Demo Solar PV	2.0 MW	0.2 MW
Diesel (1)	12.4 MW	8.6 MW	Diesel (1)	12.4 MW	8.6 MW	Project Biomass	2.2 MW	1.8 MW
Diesel (2)	4.9 MW	3.2 MW	Diesel (2)	4.9 MW	3.2 MW	IPP Project Solar PV	20.0 MW	2.0 MW
						IPP Project Biomass	22.0 MW	18.0 MW
Total		15.1 MW	Demo Solar PV	2.0 MW	0.2 MW	Total		22.0 MW
			Project Biomass	2.2 MW	1.8 MW			
			Total		18.0 MW			

Facing Power Shortage

SMALL SCALE with K-EMS (Biomass, Solar PV & BESS)


SOLUTION PROPOSAL

Diesel PP Replacement, 100 % CLEAN ENERGY

N's Potential



Geography

Location	North Kalimantan
Coordinates	 4°3'34"N 117°40'1"E
Archipelago	Kalimantan
Area	226 km ² (87 sq mi)

- ❑ **N Regency :**
Population = 217.923
Area = 14.247,50 km²
- ❑ **N Island :**
Population = 98.472
Area = 746,27 km²

Close to the border with Malaysia

- N close to the border with Malaysia, the closest is Tawau, approx. 29 km

Abundant of palm production

- Plantation Area : (as of 2023) has approx. 33,111 hectares dedicated to oil palm plantations, accounting for about 88% of North Kalimantan's total palm oil production [Source : InfoSawit]
- Production Volume : These plantations yield around 66,785 tons of palm oil, highlighting N's pivotal role in the North Kalimantan province's palm oil industry. [Source : InfoSawit]

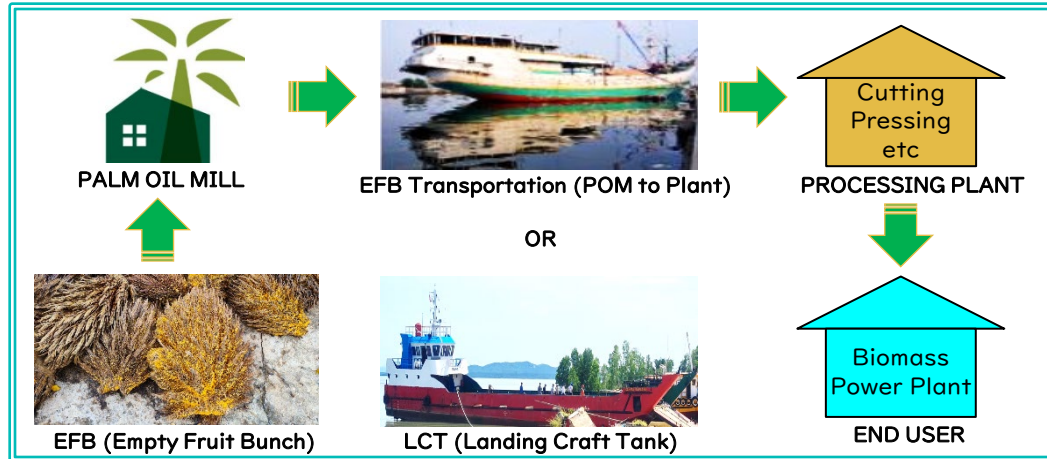
Potential for RE usage e.g. Solar, hydro

- Yearly average temperature : 30.3 °C [Source : Central Bureau of Statistics, 2024]

Biggest production of seaweed and tuna

- N Regency has length coastline 304,87 km and 26.393 hectares of coastal area
- Seaweed production averagely 3.000 tons/month
- Seaweed as raw material is exported via Makassar & Surabaya
- Regional Government Initiative : build the Marine Techno Park
- In 2014, tuna catch production reached 10,48 tons

Hybrid RE PP in N Islands



Current Condition & Challenges

- Abundant production of EFB
- Limited Local Use of EFB
- Lack of infra and processing facilities
- Residue disposal problem at CPO mills

Potential Opportunities

1. Utilization of Local Renewable Resources

- Abundant Resources
- Energy Independence
- Lower Operating Costs
- Maintenance Savings

2. Reliability & Energy Security

- Diverse Energy Sources
- Energy Storage

3. Environmental Benefits

- Reduce Carbon Footprint
- Minimize Pollution
- CLEAN ENERGY

4. Improved Livelihoods

- Energy Access
- Additional income for plantation owner & partners
- Improve Infrastructure & energy projects

5. Alignment with Global & Local Goals

- Support global climate action initiatives and local government objectives to reduce reliance on fossil fuels
- Attractive for Funding

6. Long-term Economic Development

- Job Creation in installation, O & M activities
- Capacity Building to enhance technical skills of local populations

Conclusion

- ❑ The current demand and future projections for electricity have prompted both the central and local governments of Indonesia to accelerate the construction of new power plants. At the same time, there is a strong focus on transitioning to cleaner energy sources to replace fossil fuels and coal with NRE.
 - ❑ In pursuit of the energy transition, the Indonesian government, through the State Electricity Company (PLN), plans to build over 100 GW of power capacity by 2040. This includes an additional 75 GW from NRE, 5 GW from nuclear, and the remainder from gas. [<https://web.pln.co.id/media/siaran-pers/2024/11/ceo-climate-talks-pln-siap-dukung-pemerintah-capai-75-energi-terbarukan-hingga-tahun-2040>]
However, as of 2023, the country's NRE mix has reached only 13.09%, falling short of the targeted 23% by 2025
 - ❑ Despite the numerous potentials and opportunities in developing hybrid power plants in remote areas, several challenges are being faced, including:
 - Establishing reasonable hybrid tariffs by the Government
 - Lacking of infrastructure in remote islands that lead to the high transportation cost
 - Ensuring the sustainability of material sourcing
 - Minimizing ecological impacts
- * Needs the win-win solution between Government and Stakeholders in achieving all of the targets



Thank you

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