Ministry of Industry
REPUBLIC OF INDONESIA

INDUSTRI HIJAU

G20 INDONESIA 2022

Developing A Robust Ecosystem for RE (Solar PV) Manufacturing

Director of Centre for Green Industry
Ministry of Industry

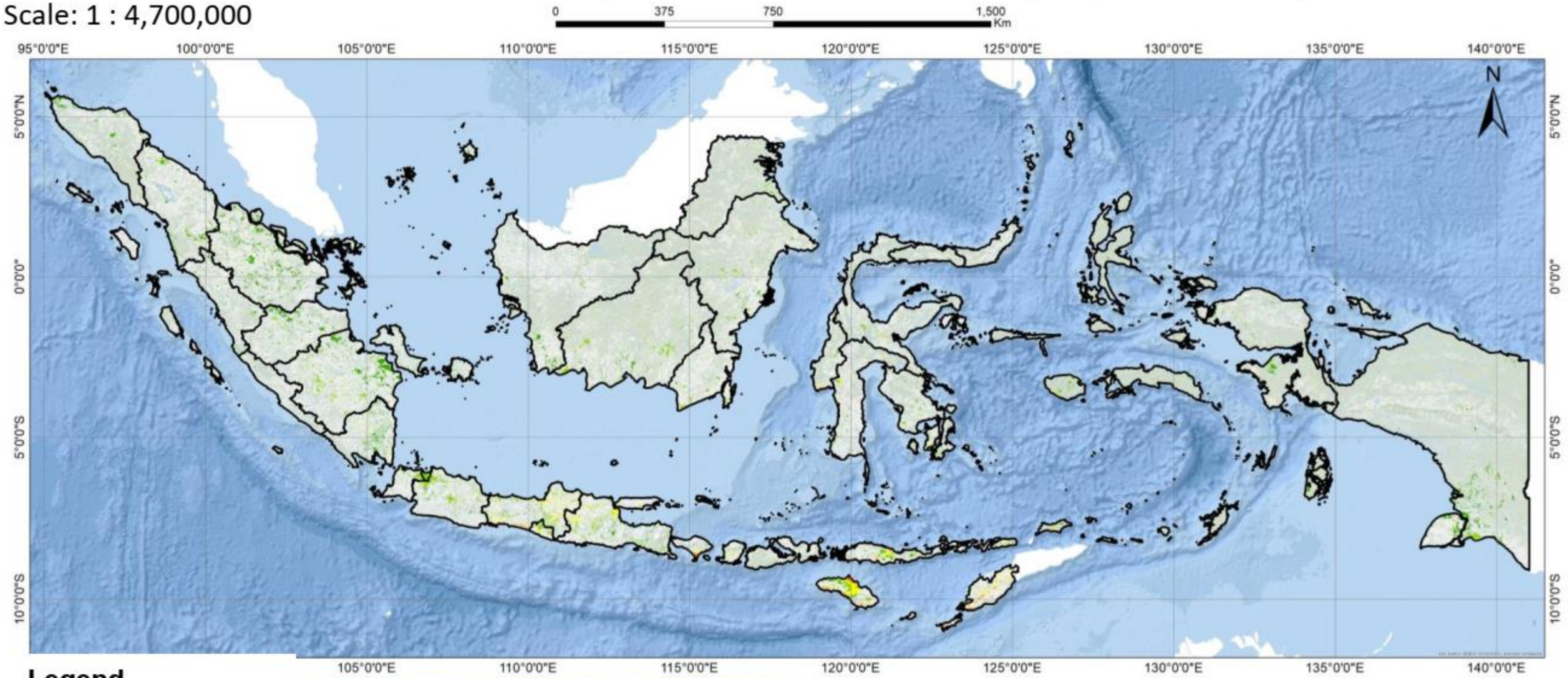
Jakarta, May 19th, 2022

The 2022 China - Indonesia Renewable Energy Investment Forum
(RE Invest Indonesia)

INDONESIA'S MAP OF SOLAR POTENTIAL

Scenario radiation more than 3.75 kWh/m²/day,, residential land, sabana, and open ground. Exclude protected Area

Scale: 1 : 4,700,000



Legend

Indonesia's Solar Radiation (kWh/m²/day)

- 3,75 - 4,20
- 4,21 - 4,60
- 4,61 - 4,80
- 4,81 - 5,00
- 5,01 - 5,27

No	Provinsi	Potensi (GWp)						Energi Terbangkitkan (TWh/tahun)					
		Kelas 1	Kelas 2	Kelas 3	Kelas 4	Kelas 5	Total	Kelas 1	Kelas 2	Kelas 3	Kelas 4	Kelas 5	Total
1	Bali	1.91	3.89	5.82	9.94	0.00	21.56	2.23	5.11	8.65	14.85	0.00	30.84
2	Banten	0.76	47.47	3.54	0.00	0.00	51.77	0.90	62.73	5.18	0.00	0.00	68.80
3	Bengkulu	10.43	3.50	0.00	0.00	0.00	13.92	12.57	4.40	0.00	0.00	0.00	16.97
4	DI Yogyakarta	0.02	6.79	19.61	3.84	0.00	30.27	0.02	8.84	28.25	5.68	0.00	42.78
5	DKI Jakarta	0.00	37.41	2.96	0.00	0.00	40.37	0.00	49.40	4.33	0.00	0.00	53.81
6	Gorontalo	0.84	4.74	0.89	0.00	0.00	6.47	1.00	6.25	1.32	0.00	0.00	8.57
7	Jambi	96.90	24.76	0.00	0.00	0.00	121.66	116.92	31.07	0.00	0.00	0.00	147.99
8	Jawa Barat	24.14	123.95	7.42	0.02	0.00	155.53	28.72	162.62	10.91	0.03	0.00	202.28
9	Jawa Tengah	10.33	104.43	57.00	14.18	0.00	185.94	12.33	151.60	84.12	20.89	0.00	268.93
10	Jawa Timur	43.48	84.99	46.60	1.27	0.00	176.35	51.56	138.06	68.98	1.86	0.00	260.47
11	Kalimantan Barat	48.94	42.67	0.00	0.00	0.00	91.61	71.06	75.23	0.00	0.00	0.00	146.28
12	Kalimantan Selatan	7.26	43.53	1.96	0.00	0.00	52.74	8.86	56.48	2.88	0.00	0.00	68.22
13	Kalimantan Tengah	22.81	125.32	1.38	0.00	0.00	149.51	27.73	162.40	2.03	0.00	0.00	192.16
14	Kalimantan Timur	24.01	71.75	4.62	0.38	0.00	100.77	29.10	92.82	6.81	0.56	0.00	129.29
15	Kalimantan Utara	3.43	15.80	14.44	1.85	0.00	35.52	4.20	20.45	21.46	2.73	0.00	48.87
16	Kepulauan Bangka Belitung	39.70	6.79	0.00	0.00	0.00	46.49	46.58	8.59	0.00	0.00	0.00	55.16
17	Kepulauan Riau	16.48	13.26	0.00	0.00	0.00	29.74	19.86	16.81	0.00	0.00	0.00	36.68
18	Lampung	82.82	38.60	0.00	0.00	0.00	121.40	100.14	49.27	0.00	0.00	0.00	149.41
19	Maluku	19.09	32.28	16.75	9.35	0.01	77.48	29.80	46.18	24.91	13.93	0.01	114.82
20	Maluku Utara	4.20	10.28	2.73	0.00	0.00	17.21	4.96	13.47	4.02	0.00	0.00	22.45
21	Nanggroe Aceh Darussalam	96.50	2.74	0.00	0.00	0.00	99.24	114.79	3.43	0.00	0.00	0.00	118.22
22	Nusa Tenggara Barat	0.76	6.02	6.13	7.46	2.03	23.40	0.89	9.02	9.42	11.10	2.73	33.16
23	Nusa Tenggara Timur	30.06	106.81	119.09	94.56	18.97	369.50	35.94	148.87	176.77	140.88	25.38	519.84
24	Papua	199.67	46.24	6.95	0.03	0.00	252.29	230.87	59.83	10.21	0.04	0.00	300.94
25	Papua Barat	38.00	23.34	4.46	0.00	0.00	65.80	44.85	30.07	6.68	0.00	0.00	81.60
26	Riau	278.76	11.64	0.00	0.00	0.00	290.41	330.15	14.64	0.00	0.00	0.00	344.78
27	Sulawesi Barat	5.08	8.25	4.19	2.25	0.00	19.78	5.99	10.80	6.22	3.32	0.00	26.33
28	Sulawesi Selatan	8.25	22.51	15.41	13.74	0.47	60.38	9.76	545.73	22.87	20.38	0.62	399.36
29	Sulawesi Tengah	7.20	22.16	7.32	2.67	0.00	39.35	5.02	8.20	4.45	2.30	0.00	19.98
30	Sulawesi Tenggara	13.52	45.74	20.21	5.54	0.00	85.01	16.16	59.74	30.09	8.16	0.00	114.15
31	Sulawesi Utara	5.09	4.49	1.89	0.53	0.00	12.01	6.04	5.83	2.81	0.78	0.00	15.46
32	Sumatera Barat	37.72	5.49	0.00	0.00	0.00	43.21	45.34	6.87	0.00	0.00	0.00	52.21
33	Sumatera Selatan	188.17	97.02	0.00	0.00	0.00	285.18	231.95	122.85	0.00	0.00	0.00	354.80
34	Sumatera Utara	89.65	32.72	0.00	0.00	0.00	122.37	107.99	40.95	0.00	0.00	0.00	148.94
	Total						3,294.36						4,794.59

Data:

1. Radiasi Surya dari hasil luaran model WRF periode 2001 - 2015 resolusi 5 km (P3TKEBTKE, 2020)
2. Data inputan model WRF bersumber dari data FNL *Reanalysis* resolusi 1 derajat periode 2001 - 2015 (NCEP, 2015)

Sumber Peta:

1. Peta Batas Administrasi (BIG, 2019)
2. Peta Tutupan Lahan (FAO, 2017)
3. Peta *Protected Area* (UNEP, 2021)

Metode:

1. *Running* model WRF oleh P3TKEBTKE resolusi 5 km (P3TKEBTKE, 2020)
2. Interpolasi *Krigging* oleh P3TKEBTKE resolusi 1 km
3. Potensi Kapasitas (MWp) = Luas Potensial (km²) dikali Rapat Kapasitas (MWp/km²)
4. Energi Terbangkitkan (MWh/tahun) = Potensi Kapasitas (MWp) dikali PVout (MWh/MWp/hari) dikali 365 (hari/tahun)
5. Visualisasi peta menggunakan software ArcGIS

KEMENTERIAN ENERGI DAN SUMBER DAYA MINERAL
BADAN PENELITIAN DAN PENGEMBANGAN ENERGI DAN SUMBER DAYA MINERAL
PUSAT PENELITIAN DAN PENGEMBANGAN TEKNOLOGI KETENAGALISTRIKAN, ENERGI BARU, TERBARUKAN, DAN KONSERVASI ENERGI

1. Total of Solar Potential is 3,294.36 GWp, and it is spread throughout Indonesia.

2. The three largest potential are:
   - East Nusa Tenggara with 369.5 GWp,
   - Riau with 290.41 GWp, and
   - South Sumatera with 285.18 GWp.

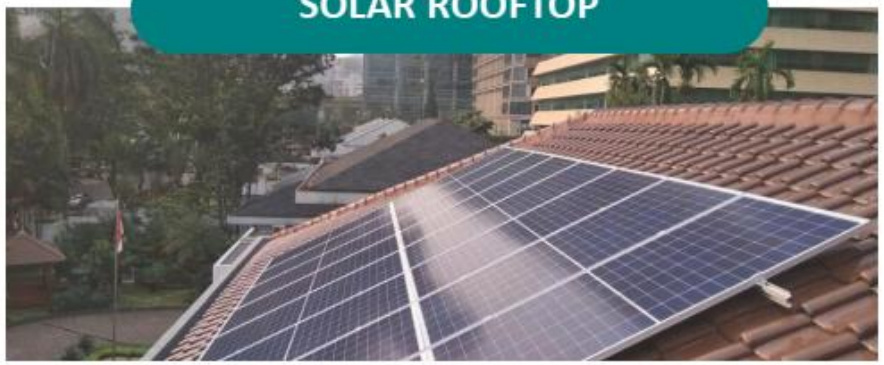
3. Estimated potential for PV Rooftop development is around 32.5 GW.

Source: MOEMR (2022)

SOLAR POWER PLANT DEVELOPMENT

Solar energy is the most abundant NRE potential, its costs continue to decline, and rapid deployment makes solar power generation a priority

SOLAR ROOFTOP



2025 Target: 3.61 GW

Reduce GHG emission 5.4 million ton CO2

- Government Building (37.35 MW)
- Social group and PLN Customer (16.65 MW)
- Business (728.68 MW)
- Industry (1,307.10 MW)
- Household (1,525 MW)

Installed Capacity by February 2022: 59.84 MWp (5,321 customers), among them:

- Coca Cola Solar Rooftop at Cikarang 7.2 MWp (the largest in ASEAN)
- Danone Aqua Solar Rooftop at Klaten 3 MWp

2022 Target: 450 MWp (Cumulative)

Increase of 800% from the realization in 2021

LARGE SCALE SOLAR PP

2030 Target: 4.68 GW

- Jamali (2,906.06 MW)
- Sumatera (192.82 MW)
- Kalimantan (303.71 MW)
- Sulawesi (175.79 MW)
- MPNT (1,101.04 MW)

GHG Emission Reduction:
6.97 Million ton CO_2e

FLOATING SOLAR PP

Potential : 26.65 GW (271 locations)

Potential at Existing Hydro PP: 11,913 MW (28 locations)

- Jawa Bali (1,783.4 MW) -13 locations
- Sumatera (7,143.1 MW) – 3 locations
- Kalimantan (26.7 MW) – 1 locations
- Sulawesi (2,920.6 MW) – 6 locations
- Maluku – Papua – Nusa Tenggara (39.4 MW) - 5 locations

GHG Emission Reduction:
39.68 Million ton CO_2e

Source: MOEMR (2022)

PV ROOFTOP DEVELOPMENT

Better arrangements and incentives for people who want to install PV Rooftop

Ministerial Regulation of PV Rooftop (Permen ESDM No. 26/2021)

1. Provisions for export of electricity to 100% (originally 65%) and extension of nullification to 6 months (originally 3 months)
2. The application-based service mechanism and services are shorter, from 15 days to 5 days
3. PV Rooftop customers and IUPTL holders can trade carbon
4. Expansion of not only PLN customers but customers in non-PLN Business Areas (originally only PLN customers)
5. The existence of a PV Rooftop System Complaint Center to receive and follow up on complaints on the implementation of PV Rooftops (originally not available)

On Progress :

1. Preparation of PV Rooftop applications for Non-PLN Business Areas, reporting and Complaints center
2. Finalize the MEMR decree regarding Assignment to PLN to build service applications, reporting and integration with SCADA
3. Finalize the MEMR decree regarding Complaint center
4. Launching of Funding Incentives for PV Rooftop in cooperation with UNDP, with grant of Rp. 23.6 Billion on 10 February 2022. Target 5 MWp for 1,296 customers, with Micro, Small, and Medium Enterprises as main priority.

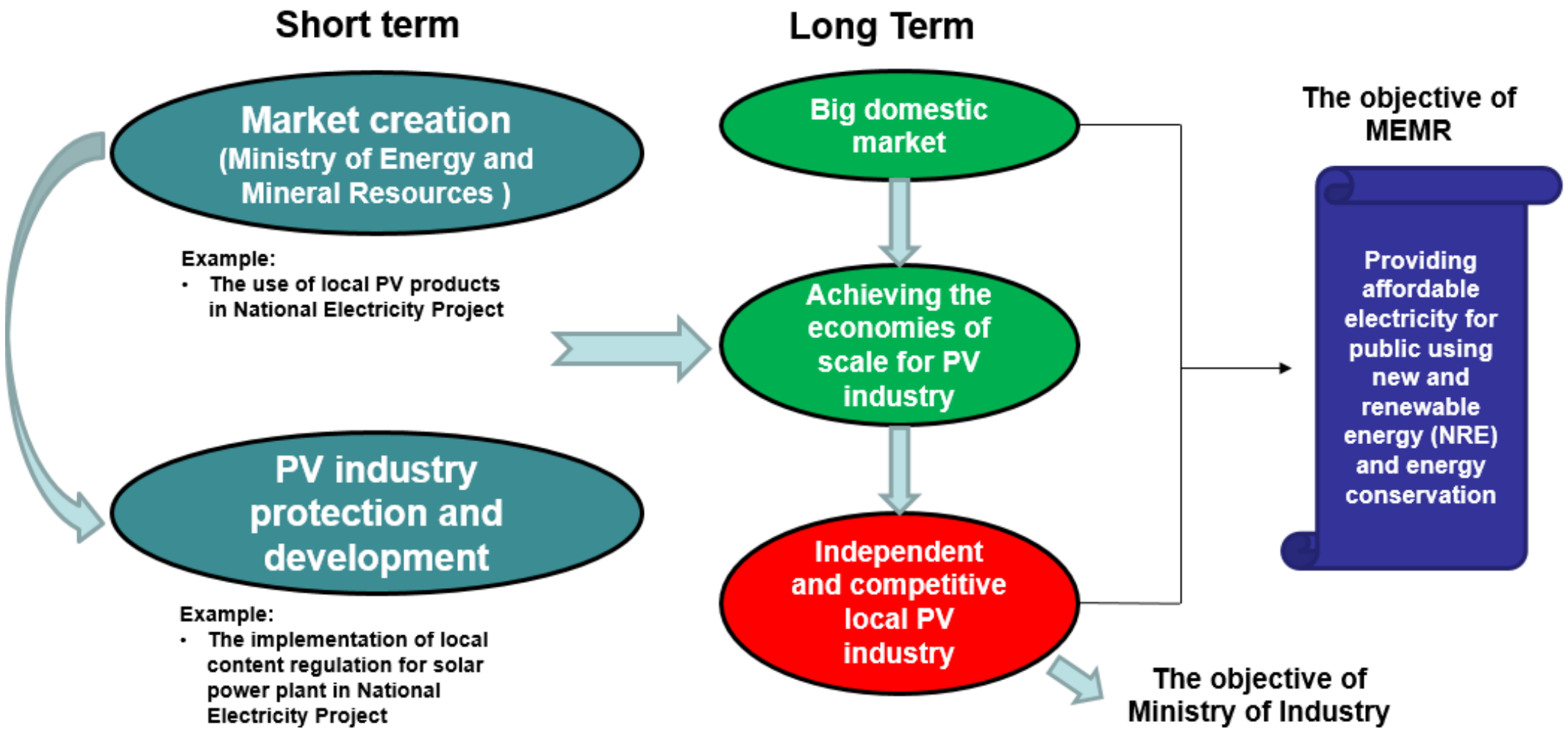
Roadmap for PV Rooftop as PSN Program

Implementation progress of 3,6 GW PV rooftop program per february 2022

Customers Sector	Number of PLN customers (Estimation)	Potential Capacity of PV Rooftop (Estimation)	Total Potential (MW)
Government	• 1% of Customers < 6600 VA • 10% of Customers > 6600 VA	• 100% Power Installed • Up to 80% Power Installed	37.5
Social	• 1% of Customers 1300VA - 200kVA • 5% of Customers above 200kVA	• 100% Power Installed • 10% of Power Installed	16.65
Household	• 2% of Customers 1300VA • 10% of Customers above 2200VA	• 100% Power Installed • Up to 90% Power Installed	1525.12
Business	• 7.5% of Customers 1300VA - 5500VA • 10% of Customers above 6600VA	• 100% Power Installed • Up to 80% Power Installed	728.68
Industry	• 10% of Customers 1300VA - 14kVA • 20% of Customers above 14kVA	• 100% Power Installed • 100% Power Installed	1307.1
	TOTAL		**3.614.9**

Source: MOEMR (2022)

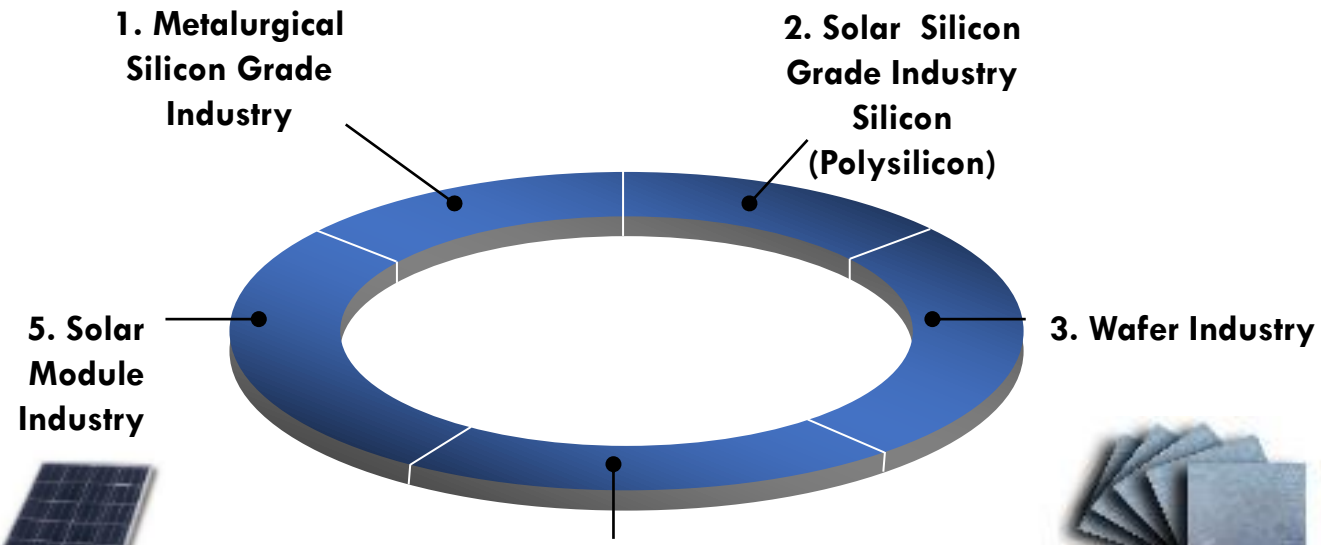
The Framework of Photovoltaic Industry Development in Indonesia



Source: Dirjen ILMATE (2022)

The Development of Domestic Photovoltaic Industry

PV Industry Chain



The LCR policy is expected to encourage investment in the manufacture of solar cells, wafers, Tempered Glass, Eva Film, PV Ribbon and Solar Silicon

No	Komponen Modul Surya	Kriteria		Bobot (%)	TKDN (%)
		Dalam Negeri	Luar Negeri		
(1)	(2)	(3)	(4)	(5)	(6)
Material (95%)					
1	Solar Cell				
	- Pengadaan pasir silika		✓	2,50%	0,00%
	- Pembuatan *silicon metallurgical grade*		✓	7,50%	0,00%
	- Pembuatan *silicon solar grade*		✓	15,00%	0,00%
	- Pembuatan ingot		✓	5,00%	0,00%
	- Pembuatan *brick*		✓	2,50%	0,00%
	- Pembuatan *wafer*		✓	2,50%	0,00%
	- Pembuatan *blue cell*	✓		7,50%	7,50%
	- *Printing cell*	✓		7,50%	7,50%
2	Tempered Glass		✓	12,00%	0,00%
3	PV Junction Box	✓		8,00%	8,00%
4	Backsheet		✓	4,00%	0,00%
5	Frame	✓		9,00%	9,00%
6	Film Eva		✓	4,00%	0,00%
7	PV Ribbon		✓	2,00%	0,00%
8	Solar Silicon		✓	2,00%	0,00%
Tenaga Kerja (5%)					
9	Tenaga Kerja Langsung	✓		5,00%	5,00%
Mesin produksi (4%)					
10	Mesin produksi	✓		4,00%	4,00%
Total bobot				100,00%	
Total TKDN					41,00%

Source: Dirjen ILMATE (2022)

Local Content Regulation (P3DN) for Solar Power Plant

1. Ministry of Industry Regulation No 04/M-IND/PER/2/2017 on Provisions and Procedures for Assessment of Local Content for Solar Power Plants
2. Ministry of Industry Regulation No 05/M-IND/PER/2/2017 on Amendment to the Regulation of the Minister of Industry Number 54/M-IND/PER/3/2012 concerning Guidelines for the Use of Domestic Products for Electricity Infrastructure Development.

Solar Power Plant (PLTS) divided by:

1. Off Grid and local Solar Power Plant (Tersebar Berdiri Sendiri)
2. Off Grid and Communal Solar Power Plant (Terpusat Berdiri Sendiri)
3. On Grid and Communal Solar Power Plant (Terpusat Terhubung)

Persyaratan TKDN Minimal pada PLTS:

1. PLTS Tersebar Berdiri Sendiri;

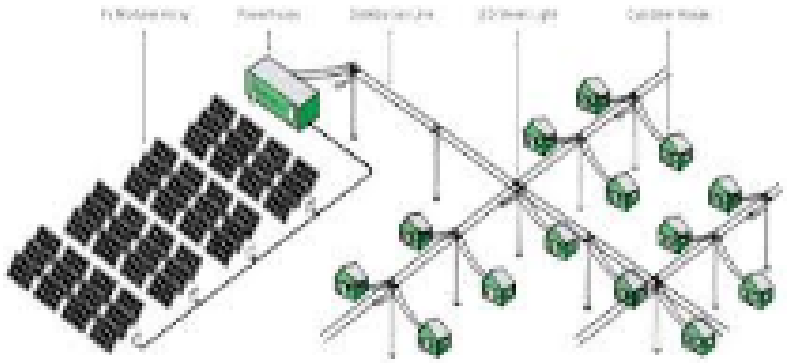
No	Keterangan	Target TKDN
1	TKDN Barang	39.87%
2	TKDN Jasa	100.00%
3	TKDN Gabungan Barang dan Jasa	45.90%

2. PLTS Terpusat Berdiri Sendiri;

No	Keterangan	Target TKDN
1	TKDN Barang	37.47%
2	TKDN Jasa	100.00%
3	TKDN Gabungan Barang dan Jasa	43.72%

3. PLTS Terpusat Terhubung.

No	Keterangan	Target TKDN
1	TKDN Barang	34.09%
2	TKDN Jasa	100.00%
3	TKDN Gabungan Barang dan Jasa	40.68%



Source: Dirjen ILMATE (2022)

Industry Profile of National Solar Module

APAMSI

Asosiasi Pabrikan Modul Surya Indonesia

Indonesian Solar Module Manufacturer Association

PT Len Industri Bandung Kapasitas: 75 MWp	PT Adyawinsa Electrical and Power Kaw. Industri Jababeka II Kapasitas: 40 MWp	PT. Surya Utama Putra Kabupaten Bandung Kapasitas: 45 MWp	PT. Swadaya Prima Utama Kabupaten Karawang Kapasitas: 40 MWp	PT. Azet Surya Lestari Bintaro, Tangerang Kapasitas: 45 MWp	PT. Deltamas Solusindo Bogor Kapasitas: 30 MWp
PT Wika Energi Intrade Jakarta Kapasitas: 50 MWp	PT Sankenindo Tangerang Kapasitas: 45 MWp	PT Sky Energi Indonesia Gunung Putri, Bogor Kapasitas: 50 MWp	PT Canadian Solar Tangerang Kapasitas: 60 MWp	PT Jembo Energindo Tangerang Kapasitas: 60 MWp	PT Indodaya Surya Lestari Jakarta Kapasitas: 30 MWp

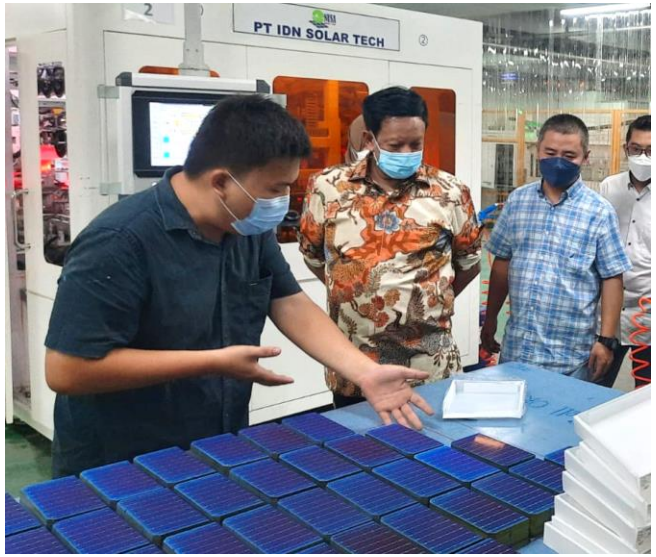
- Direktur Strategi Bisnis dan Portofolio PT Len Industri (Persero) saat ini menjabat sebagai Ketua Asosiasi Pabrikan Modul Surya Indonesia (APAMSI)
- Terdapat 12 Perusahaan yang terdaftar sebagai anggota APAMSI
- Kapasitas/Tahun yang dapat di produksi oleh Perusahaan yang terdaftar sebagai anggota APAMSI yaitu 560 MWp

Source: Dirjen ILMATE (2022)

Domestic Solar Module Industry Profile

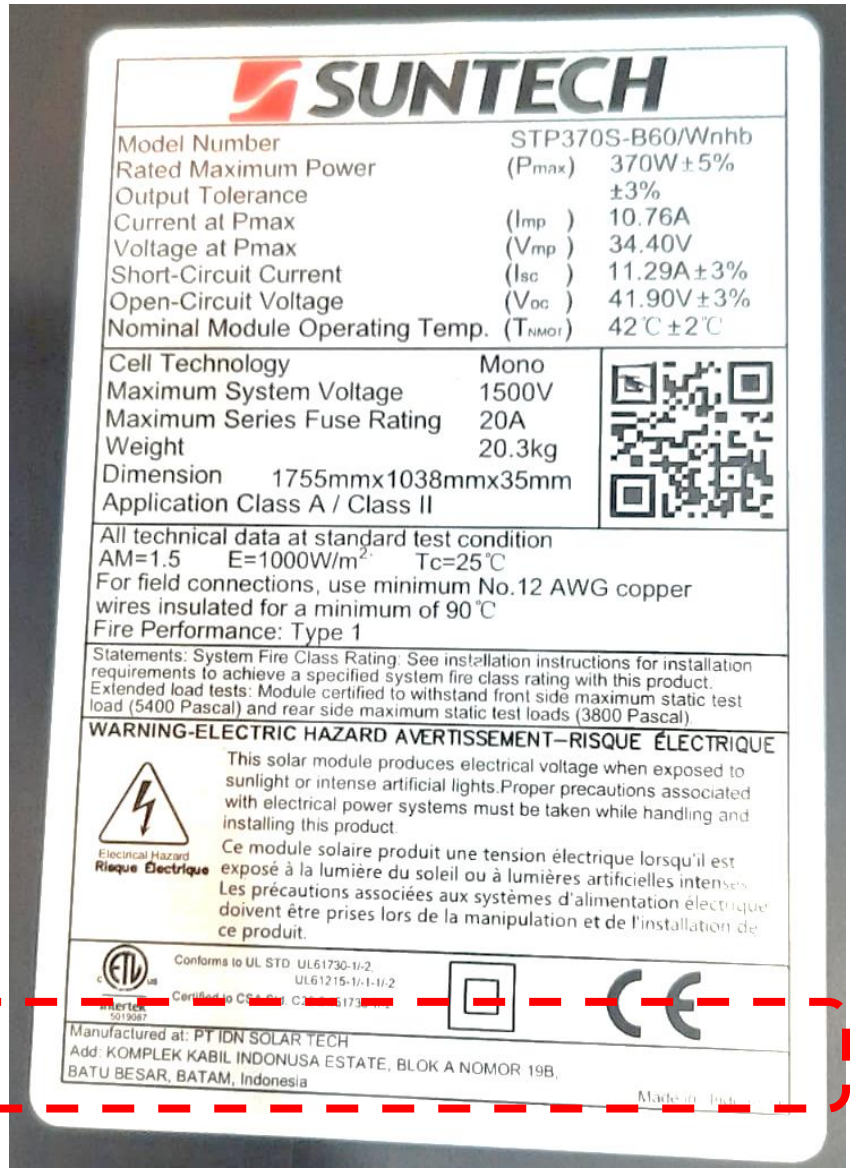
PV module Company (non-APAMSI members) :

1. PT. IDN Solar Tech, Batam
2. PT. Avecode International, Batam
3. PT. Indonesia Solar Global, Tangerang
4. PT. Zeff Energi, Jakarta
5. PT. Techlan Solar Indonesia, Tangerang
6. PT. Sundaya Indonesia



PT. IDN Solar Tech

- Make Solar Module for Suntech (Tier 1 PV Manufacture) that exported to USA
- Having production capacity 360 MW/year



Source: Dirjen ILMATE (2022)

Domestic Solar Module Industry Profile

Keunggulan dan Produk Apamsi

APAMSI
Asosiasi Pabrikan Modul Surya Indonesia

International Certificate :

- IEC 61215 : 2016 dan IEC 61730:2016 PolyCrystalline.
- IEC 61215 : 2016 dan IEC 61730:2016 Monocrystalline.
- IEC 61701 : 2011 (Salt mist Corrosion Testing)
- IEC TS 62804-1 : 2015 (PID testing)
- IEC 62716 : 2013 (Ammonia Corrosion Testing)

> 40%

JAMINAN WAKTU DELIVERY

JAMINAN KUALITAS

JAMINAN PASCA INSTALASI

FRAMED SOLAR PANEL

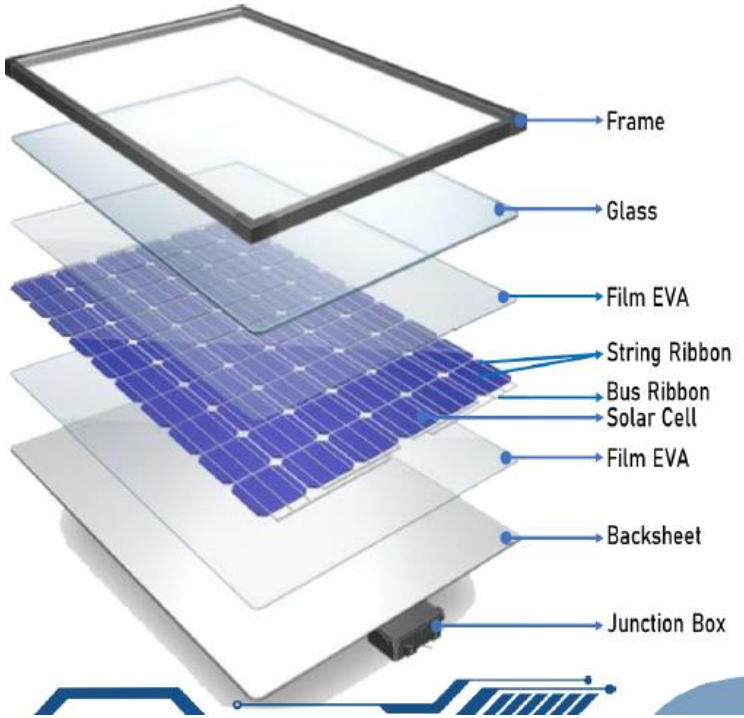
LIGHTWEIGHT FRAMELESS SOLAR PANEL

PERC HALF CELL SOLAR PANEL

SEMIFLEXIBLE SOLAR PANEL

FLEXIBLE SOLAR PANEL

Solar Modules



Sudah Pabrikasi:
Frame , Kaca, Cell (printing), Junction Box

Belum Pabrikasi:
EVA, Ribbon, Backsheet, Cell

Bidirectional Inverter 15kW-3P

Battery Solar Charger 65A-240V Boost

Bidirectional Inverter 5kW-1P

Sistem PLTS dengan DC Grid

Grid Tied Inverter 5kW-1P

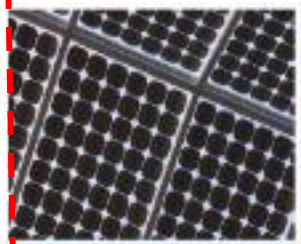
Sistem PLTS dengan DC Grid

Source: Dirjen ILMATE (2022)

Domestic Solar Module Industry Profile








Kuarsa/Silika (SiO_2) → Monosilikon/ Polysilicon → Wafer → Solar Cell → Solar Module → Solar System (module + inverter + BoS + PM) → Electricity → Customer

Industrial Development Potential

- Upstream industrial development is needed to increase competitiveness (Quality, Cost and Delivery aspect), national added value, increase TKDN value and energy independence.
- The development of the silica sand processing industry into wafers, the market estimate required is 2 GW to achieve economies of scale and the required energy price is USD 3 cents / kWh
- The Solar Cell industrial development plan is being implemented by PT. LEN Industries, PT. Sky Energy Indonesia and PT. IDN Solar Tech

Existing Industry

- APAMSI members have an annual production capacity of 560 MWp.
- The potential production capacity of non-APAMSI members reaches 500 MWp.
- Trends in the need for large capacity solar modules for PLTS, above 500 Wp / module.
- The 400 Wp-Solar module is more suitable for rooftop PV mini-grid
- The domestic solar module industry is encouraged to comply with SNI IEC 61215 of 2016 as a guarantee of the quality of domestic Solar Module products.

THANK YOU

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