

Methodology for Indonesia Provincial Simulated Hourly Electricity Demand

Power Transformation Lab, UCSD

Updated: October 2026

Overview

These datasets contain simulated hourly electricity demand for Indonesia's island power systems, broken down by province. They are derived from PLN's RUPTL load projections.

- **Source:** PLN RUPTL 2021–2030 (Rencana Usaha Penyediaan Tenaga Listrik), provincial electricity demand projections. The hourly shape comes from the 2023 system load of Peninsular Malaysia (Grid System Operator).
- **Provinces: 33, in 8 island power systems** (Sumatra, Java-Bali, Kalimantan, Sulawesi, Nusa Tenggara, Papua, Maluku, North Maluku)
- **Horizon:** 2030 and 2035
- **Temporal resolution:** hourly, full year (8,760 hours)

Province definitions

Provinces follow the boundaries used in RUPTL 2021–2030. Papua and West Papua are the provinces as they stood before the 2022 split, and the Riau Islands (Kepulauan Riau) are not included.

System	Code	Province	RUPTL 2021–2030 table
Sumatra	AC	Aceh	A1.8
	SU	North Sumatra	A2.8
	RI	Riau	A3.8
	BB	Bangka Belitung	A5.8
	SB	West Sumatra	A6.8
	JA	Jambi	A7.8
	SS	South Sumatra	A8.8
	BE	Bengkulu	A9.8
	LA	Lampung	A10.8
Java-Bali	JK	Jakarta	B1.8
	BT	Banten	B2.8
	JB	West Java	B3.8
	JT	Central Java	B4.8

System	Code	Province	RUPTL 2021–2030 table
	YO	Yogyakarta	B5.8
	JI	East Java	B6.8
	BA	Bali	B7.8
Kalimantan	KB	West Kalimantan	A11.8
	KS	South Kalimantan	A12.8
	KT	Central Kalimantan	A13.8
	KI	East Kalimantan	A14.8
	KU	North Kalimantan	A15.8
Sulawesi	SA	North Sulawesi	C1.8
	GO	Gorontalo	C3.8
	ST	Central Sulawesi	C2.8
	SN	South Sulawesi	C4.8
	SG	Southeast Sulawesi	C5.8
	SR	West Sulawesi	C6.8
Nusa Tenggara	NB	West Nusa Tenggara	C11.8
	NT	East Nusa Tenggara	C12.8
Papua	PA	Papua	C9.8
	PB	West Papua	C10.8
Maluku	MA	Maluku	C7.8
North Maluku	MU	North Maluku	C8.8

Codes are the ISO 3166-2:ID province codes.

Hourly Demand Profiles

Source: PLN RUPTL 2021–2030 provincial sales projections (annex tables "Proyeksi Kebutuhan Tenaga Listrik"), shaped with the 2023 hourly system load of Peninsular Malaysia.

Files: `id_prov_simulated_hourly_demand_2030.csv` and `id_prov_simulated_hourly_demand_2035.csv`, plus `id_prov_simulated_hourly_demand_provinces.csv` (province list and 2035 growth factors).

Format: each demand file has 8,760 rows, one per hour of the year.

Columns:

- Time columns: `Hour`, `Month`, `Day`, `Hour_Of_Day`.

- **System totals (MW):** Sumatra, Java_Bali, Kalimantan, Sulawesi, Nusa_Tenggara, Papua, Maluku, North_Maluku.
- **Provincial demand (MW):** AC through MU.

Each system total is the sum of its provinces, for example Sulawesi = SA + GO + ST + SN + SG + SR.

Method

1. **Hourly shape.** PLN does not publish hourly load data. We therefore use Peninsular Malaysia's 2023 system demand, recorded at 10-minute resolution by its Grid System Operator. Malaysia shares Indonesia's tropical climate and a similar mix of cooling-driven residential evening peaks and industrial baseload. One reading per hour is kept, giving an 8,760-hour series.
2. **Provincial scaling (2030).** Each province's hourly demand is the Malaysian series scaled by a single constant, so that its annual energy equals $1.19 \times$ the province's 2030 electricity sales in RUPTL 2021–2030:

$$\text{Demand}_p[h] = \text{Shape}[h] \times k_p, \text{ with } \sum_h \text{Demand}_p[h] \approx 1.19 \times \text{Sales}_p, 2030$$

Values are rounded to whole MW.

3. **2035 projection.** Each province's 2035 profile is its 2030 profile multiplied by a provincial growth factor, listed in the scaling table below and in

`id_prov_simulated_hourly_demand_provinces.csv`.

Because one shape is scaled linearly, every province has the same normalised profile and the same annual load factor (0.776). Annual energy is matched to the projection. Peak demand is not set separately; it follows from the load factor.

Sanity totals

Annual energy is the sum of the 8,760 hourly values. Peaks are each system's own annual maximum. Because every system has the same shape, they also coincide in time.

System	RUPTL 2030 sales (TWh)	2030 demand (TWh)	2030 peak (GW)	2035 demand (TWh)	2035 peak (GW)
Sumatra	69.7	83.1	12.21	87.6	12.88
Java-Bali	258.7	308.8	45.40	320.3	47.09
Kalimantan	23.8	28.4	4.17	30.7	4.51
Sulawesi	21.8	26.0	3.82	27.5	4.05
Nusa Tenggara	7.4	8.9	1.30	9.6	1.41
Papua	3.0	3.6	0.53	3.8	0.56
North Maluku	1.8	2.2	0.32	2.5	0.37
Maluku	1.5	1.8	0.27	2.0	0.29
Total	387.7	462.7	68.0	483.9	71.2

Scaling factors

RUPTL provides demand projections by province.

Code	Province	RUPTL 2030 sales (GWh)	2030 demand (GWh)	Ratio	2035 growth factor	2035 demand (GWh)
AC	Aceh	4,814	5,736	1.19	1.0480	6,011
SU	North Sumatra	19,106	22,765	1.19	1.0518	23,944
RI	Riau	9,962	11,870	1.19	1.0515	12,481
BB	Bangka Belitung	2,227	2,654	1.19	1.0682	2,835
SB	West Sumatra	6,757	8,051	1.19	1.0604	8,537
JA	Jambi	3,457	4,119	1.19	1.0683	4,400
SS	South Sumatra	10,617	12,650	1.19	1.0470	13,245
BE	Bengkulu	1,958	2,333	1.19	1.0660	2,487
LA	Lampung	10,818	12,890	1.19	1.0615	13,683
JK	Jakarta	46,362	55,337	1.19	1.0350	57,274
BT	Banten	30,888	36,867	1.19	1.0266	37,848
JB	West Java	72,800	86,893	1.19	1.0341	89,856
JT	Central Java	38,672	46,158	1.19	1.0460	48,282
YO	Yogyakarta	5,047	6,024	1.19	1.0550	6,355
JI	East Java	55,632	66,402	1.19	1.0370	68,858
BA	Bali	9,298	11,098	1.19	1.0610	11,775
KB	West Kalimantan	5,111	6,100	1.19	1.0610	6,473
KS	South Kalimantan	5,608	6,694	1.19	1.0620	7,109
KT	Central Kalimantan	2,716	3,242	1.19	1.0570	3,427
KI	East Kalimantan	8,712	10,399	1.19	1.0900	11,334
KU	North Kalimantan	1,627	1,942	1.19	1.1900	2,311

Code	Province	RUPTL 2030 sales (GWh)	2030 demand (GWh)	Ratio	2035 growth factor	2035 demand (GWh)
SA	North Sulawesi	3,588	4,283	1.19	1.0690	4,578
GO	Gorontalo	1,047	1,250	1.19	1.0500	1,312
ST	Central Sulawesi	2,529	3,019	1.19	1.0610	3,203
SN	South Sulawesi	11,209	13,379	1.19	1.0530	14,088
SG	Southeast Sulawesi	2,559	3,054	1.19	1.0810	3,302
SR	West Sulawesi	831	992	1.19	1.0600	1,051
NB	West Nusa Tenggara	4,745	5,664	1.19	1.0850	6,145
NT	East Nusa Tenggara	2,675	3,193	1.19	1.0870	3,470
PA	Papua	1,979	2,362	1.19	1.0550	2,492
PB	West Papua	1,028	1,227	1.19	1.0600	1,301
MA	Maluku	1,520	1,814	1.19	1.0790	1,958
MU	North Maluku	1,842	2,199	1.19	1.1380	2,502

Data Fields

Dataset: `id_prov_simulated_hourly_demand_YEAR.csv` (**×2**)

Field	Description
Hour	Hour of the year, 1–8,760
Month, Day	Calendar month and day of the profile year
Hour_Of_Day	Hour of the day, 1–24; hour 1 is 00:00–01:00
Sumatra ... North_Maluku	System demand (MW), the sum of the system's provinces
AC ... MU	Provincial demand (MW)

Dataset: `id_prov_simulated_hourly_demand_provinces.csv`

Field	Description
Code	ISO 3166-2:ID province code (column name in the demand files)
Province	Province name
System	Island power system
RUPTL_2021_2030_Table	RUPTL annex table with the province's demand projection
Growth_Factor_2035	Multiplier from the 2030 to the 2035 profile