

Methodology for Vietnam Datasets

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Datasets Overview

#	Category	File	Records	Description
1	Demand	<code>vn_regional_yearly_power_consumption.csv</code>	35	Zonal annual electricity demand (2030–2050)
2	Transmission	<code>vn_500kv_substations.csv</code>	52	500 kV substations (existing, operational by 2025)
3	Transmission	<code>vn_500kv_power_network.csv</code>	47	500 kV transmission lines (existing, operational by 2025)
4	Parameters	<code>vn_coal_import_price.csv</code>	74	Newcastle FOB coal price benchmark

1. Vietnam Regional Annual Electricity Consumption

Source

Vietnam's Eighth Power Development Plan (PDP8, Decision No. 500/QD-TTg, May 2023; revised Decision 768/QD-TTg, April 2025), with demand projections derived from regional load profiles.

Methodology

- Hourly demand profiles for 6 zones constructed from PDP8 load growth projections

- The model uses **36 representative days** (3 per month: 1 weekday, 1 weekend, 1 peak) × 24 hours = 864 model hours
- Each representative day carries a **sample weight** reflecting how many real hours it represents (sum = 8,760 hours/year)
- Projections cover 5-year intervals: 2030, 2035, 2040, 2045, 2050

Demand Summary

Year	Total (TWh)
2030	550.9
2035	726.9
2040	864.0
2045	975.8
2050	1,092.5

Zone Definitions

Zone	Code	Region	Provinces
1	BB	North (Bắc Bộ)	Ha Noi, Hai Phong, Quang Ninh, Hai Duong, Thai Binh, Nam Dinh, Ninh Binh, Hung Yen, Bac Ninh, Ha Nam, Bac Giang, Thai Nguyen, Lang Son, Cao Bang, Bac Kan, Tuyen Quang, Ha Giang, Phu Tho, Vinh Phuc, Lao Cai, Yen Bai, Son La, Lai Chau, Dien Bien, Hoa Binh (25 provinces)
2	BTB	North Central (Bắc Trung Bộ)	Thanh Hoa, Nghe An, Ha Tinh, Quang Binh
3	TTB	Central (Trung Trung Bộ)	Quang Tri, Thua Thien Hue, Da Nang,

Zone	Code	Region	Provinces
			Quang Nam, Quang Ngai
4	TN	Central Highlands (Tây Nguyên)	Kon Tum, Gia Lai, Dak Lak, Dak Nong
5	NTB	South Central (Nam Trung Bộ)	Binh Dinh, Phu Yen, Khanh Hoa, Lam Dong, Ninh Thuan, Binh Thuan
6	NB	South (Nam Bộ)	TP HCM, Dong Nai, Ba Ria-Vung Tau, Binh Duong, Binh Phuoc, Tay Ninh, Long An, Tien Giang, Ben Tre, Dong Thap, An Giang, Vinh Long, Tra Vinh, Can Tho, Hau Giang, Soc Trang, Kien Giang, Bac Lieu, Ca Mau (19 provinces)

Regional Structure

PDP8 defines three planning regions with the following demand shares (2030):

PDP8 Region	Share	Demand (TWh)	Constituent Zones
North	43.7%	241.0	BB + BTB (Zones 1–2)
Central	10.4%	57.0	TTB + TN (Zones 3–4)
South	45.9%	252.9	NTB + NB (Zones 5–6)

We decompose these 3 PDP8 regions into **6 model zones** per PDP8's subregional planning structure. The northern region splits into BB (northern core) and BTB (north-central coast), the central region separates TTB (coastal) from TN (highlands), and the southern region divides into

NTB (south-central coast) and NB (southeast + Mekong Delta). Provincial demand within each PDP8 region is allocated proportionally across its constituent zones.

Data Fields

Field	Description
zone	Zone code
zone_number	Zone number
zone_en	English name of the zone
zone_vn	Vietnamese name of the zone
year	Reporting year
demand_gwh	Total electricity demand in Gigawatt-hours (GWh)

Notes

- Peak system demand (2030): 83.4 GW

2. Vietnam 500 kV Substations

Source

PDP8 transmission planning annex.

Methodology

- 52 existing 500 kV substations extracted from the validated substation profile dataset
- Substations filtered by voltage rating (500 kV) and operational status (existing by 2025)
- Each substation includes province location and zone assignment

Zone Distribution

Zone	Substations
1 (North)	13
2 (North Central)	5
3 (Central)	4

Zone	Substations
4 (Central Highlands)	8
5 (South Central)	4
6 (South)	18
Total	52

Data Fields

Field	Description
sub_id	Unique substation identifier
name	Short substation name (Vietnamese)
name_full	Full official name
province	Province location
zone_number	Model zone (1-6)
voltage	Voltage rating (all 500 kV)
status	"existing" (operational)
count	Unit count indicator

Network-Referenced Substations

The 500 kV power network (Section 4) references 10 additional substations as transmission line endpoints that are not included in the substations dataset: NĐ Nam Định (Nam Dinh), Bắc Ninh 2 (Bac Ninh), Cần Thơ (Can Tho), Củ Chi (TP HCM), Lào Cai (Lao Cai), Mỹ Phước (Binh Duong), Quỳnh Lưu (Nghe An), Sóc Trăng (Soc Trang), Thái Nguyên (Thai Nguyen), and Vĩnh Yên (Vinh Phuc).

3. Vietnam 500 kV Power Network

Source

PDP8 Draft Table 4, validated transmission line dataset.

Methodology

- 47 validated 500 kV transmission line segments (operational by 2025)
- Filtered by voltage (500 kV) and status (Existing_2025) from a larger dataset containing 355 500 kV lines and 1,308 additional 220 kV lines
- 15 interzone lines crossing zone boundaries

Interzone Connections

Zone Pair	Lines
1 ↔ 2	3
2 ↔ 3	3
3 ↔ 4	3
4 ↔ 5	2
4 ↔ 6	2
5 ↔ 6	2

Data Fields

Field	Description
<code>line_id</code>	Unique line segment identifier
<code>substation_a/b</code>	Endpoint substations
<code>province_a/b</code>	Endpoint provinces where the substations are located
<code>voltage</code>	Voltage rating (all 500 kV)
<code>count</code>	Unit count indicator

4. Vietnam Coal Import Price

Source

World Bank Commodity Price Data (Pink Sheet), via IndexMundi.

Methodology

- Newcastle FOB thermal coal benchmark (Australia), 6,000 kcal/kg specification
- Monthly prices in USD/metric ton, 2019–2025
- Newcastle FOB is the standard Asia-Pacific benchmark for seaborne thermal coal
- Vietnam imports coal primarily from Australia (~50%) and Indonesia (~35%) for power generation

Data Fields

Field	Description
<code>fuel_type</code>	Type of fuel covered by the index
<code>index_name</code>	Official name of the coal price index
<code>calorific_grade</code>	Calorific grade of the coal used in the index
<code>price_usd_per_ton</code>	Coal price in USD per metric ton
<code>year</code>	Reporting year
<code>month</code>	Reporting month

Notes

- This is a **benchmark proxy**, not Vietnam-specific import prices
- Vietnam's actual CIF import prices are typically 5–15% higher than Newcastle FOB (includes freight/insurance)
- Indonesia HBA (Harga Batubara Acuan, 6,322 kcal/kg) is an alternative regional benchmark
- The model uses a fuel cost of \$3.73/MMBTU (~\$89/ton at 6,000 kcal/kg), consistent with the IEA 2017–2019 Newcastle FOB baseline

Reference

- World Bank, "Commodity Markets Outlook" (Pink Sheet)
- IndexMundi: <https://www.indexmundi.com/commodities/?commodity=coal-australian>
- FRED: Global Price of Coal, Australia (PCOALAUUSDM)
- IEA, "Coal 2025 — Prices and Costs"