

IMPLEMENTATION OF PHOTOVOLTAIC PROJECTS IN VIETNAM

Frankfurt, July 11th, 2019

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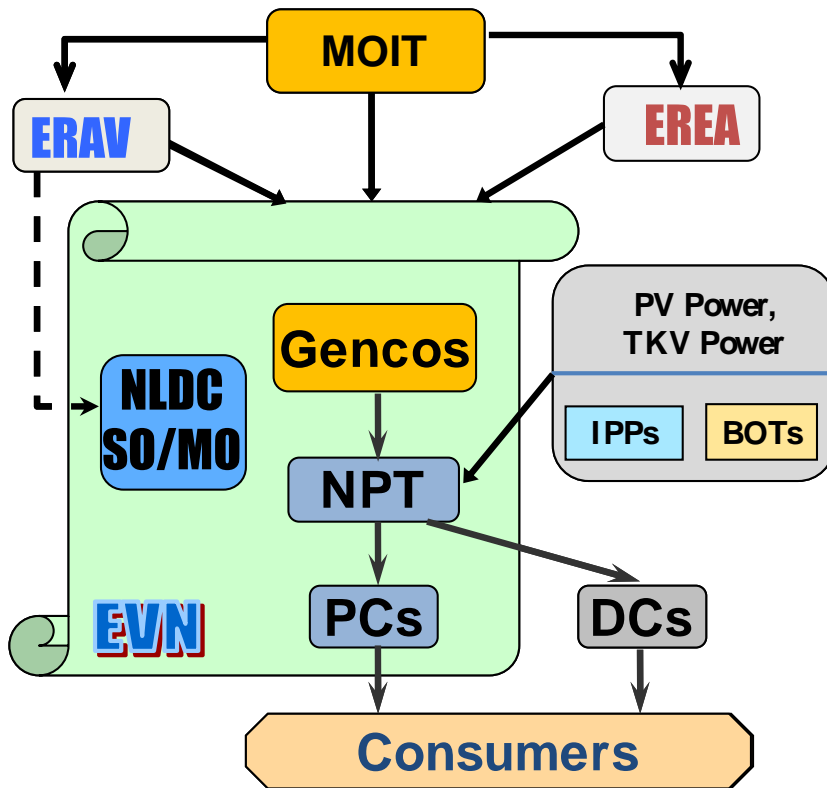
- 01.** VIETNAMESE POWER SYSTEM
- 02.** RENEWABLE ENERGY DEVELOPMENT
- 03.** CHALLENGES CAUSED BY RES
- 04.** PROSPECT OF BATTERY ENERGY STORAGE SYSTEM

01

OVERVIEW OF VIETNAMESE POWER SYSTEM



Structure of Vietnam's Electricity Sector



MOIT – Ministry of Industry and Trade

EREA – Electricity and Renewable Energy Authority

ERAV – Electricity Regulatory Authority of Vietnam

EVN - Electricity of Vietnam

NLDC– National Load Dispatch Centre

IPP– Independent Power Plant

BOT – Built-Operate-Transfer Power Plant

Gencos– EVN Owned Generation Companies

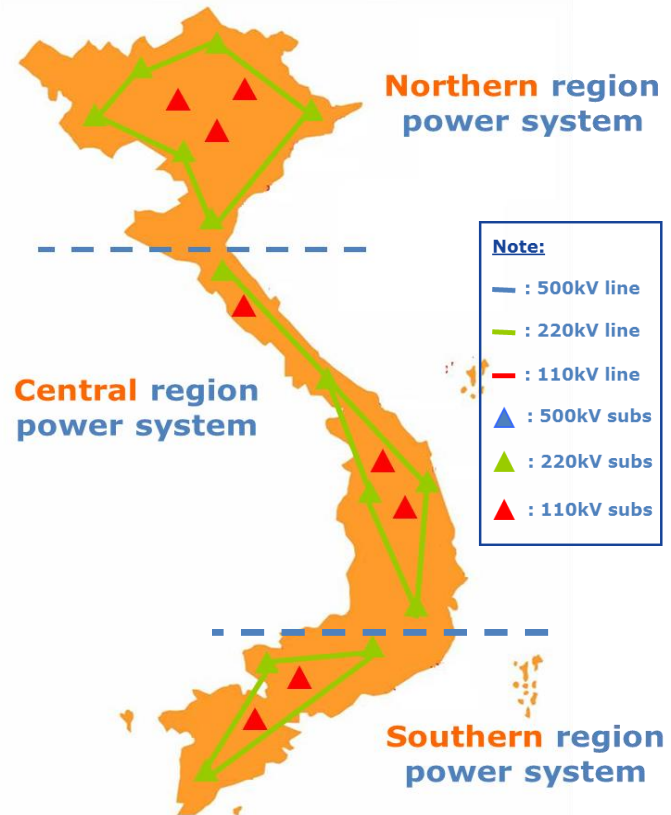
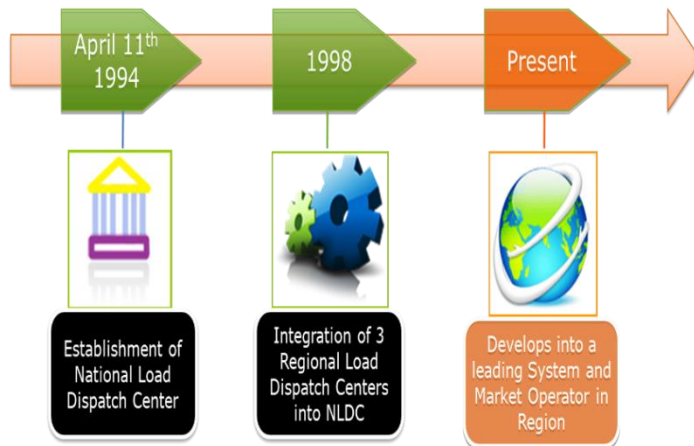
NPT – National Power Transmission Corporation

PCs– Power Corporations

DCs– Joint stock Distribution Companies

NLDC HISTORY

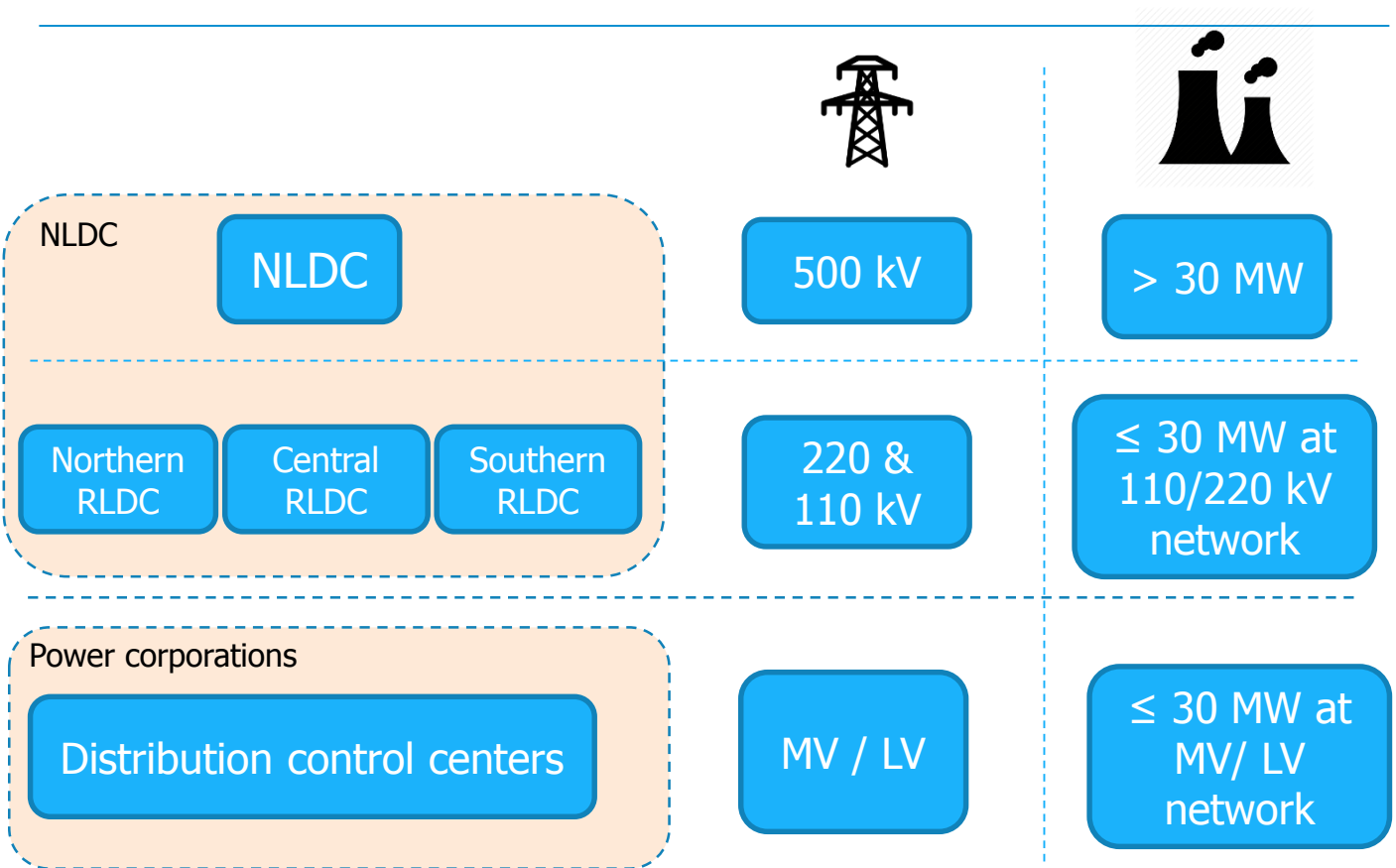
- ❑ **United control** of the national power system
- ❑ National Load Dispatch Center establishment, being a state-owned enterprise affiliated to EVN.



NLDC FUNCTION AND MANDATE



DISPATCHING HIERARCHY



POWER CAPACITY



Hydro



20170 MW (40%)

Coal



18945 MW (37.6%)

Oil & Gas



9070 MW (18.1%)

Import



1400 MW (2.8%)

Renewable
Energy



754 MW (1.5%)

Total



50339 MW

Data:02/2019

ENERGY PRODUCTION 2018



Hydro



83081 GWh (37.7%)

Coal



91654 GWh (41.6%)

Oil & Gas



41452 GWh (18.8%)

Import



3125 GWh (1.4%)

Renewable
Energy



997 GWh (0.5%)

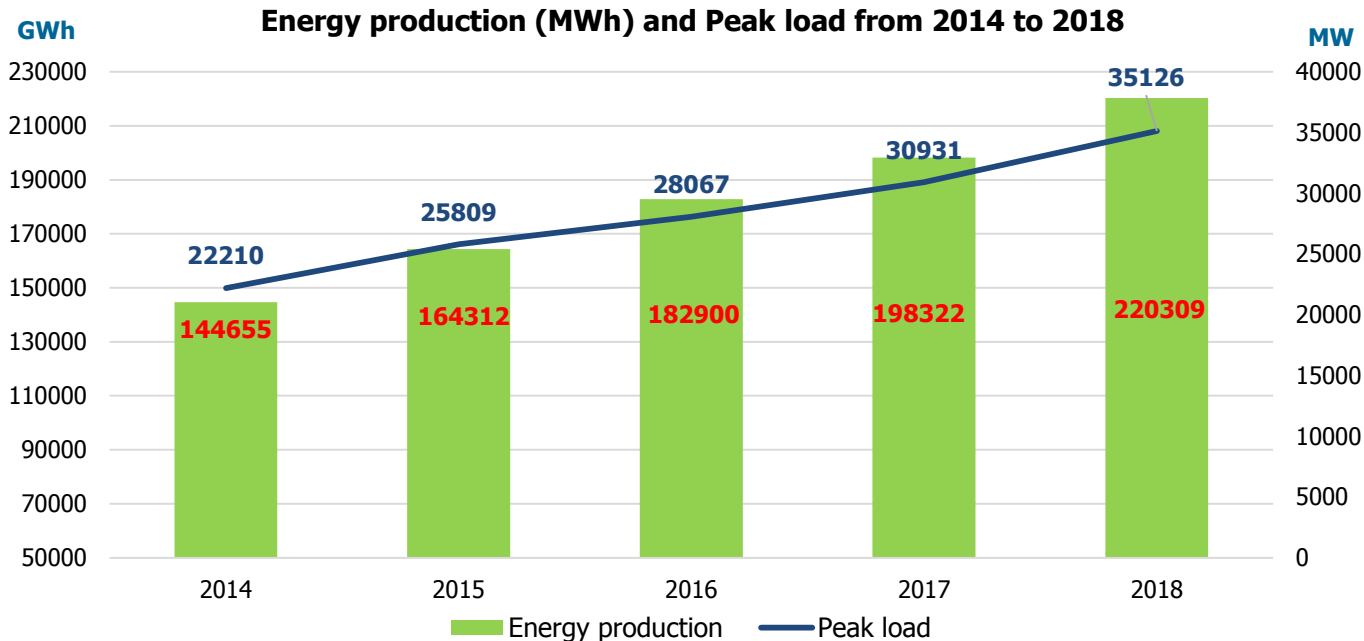
Total



220310 GWh

Data:2018

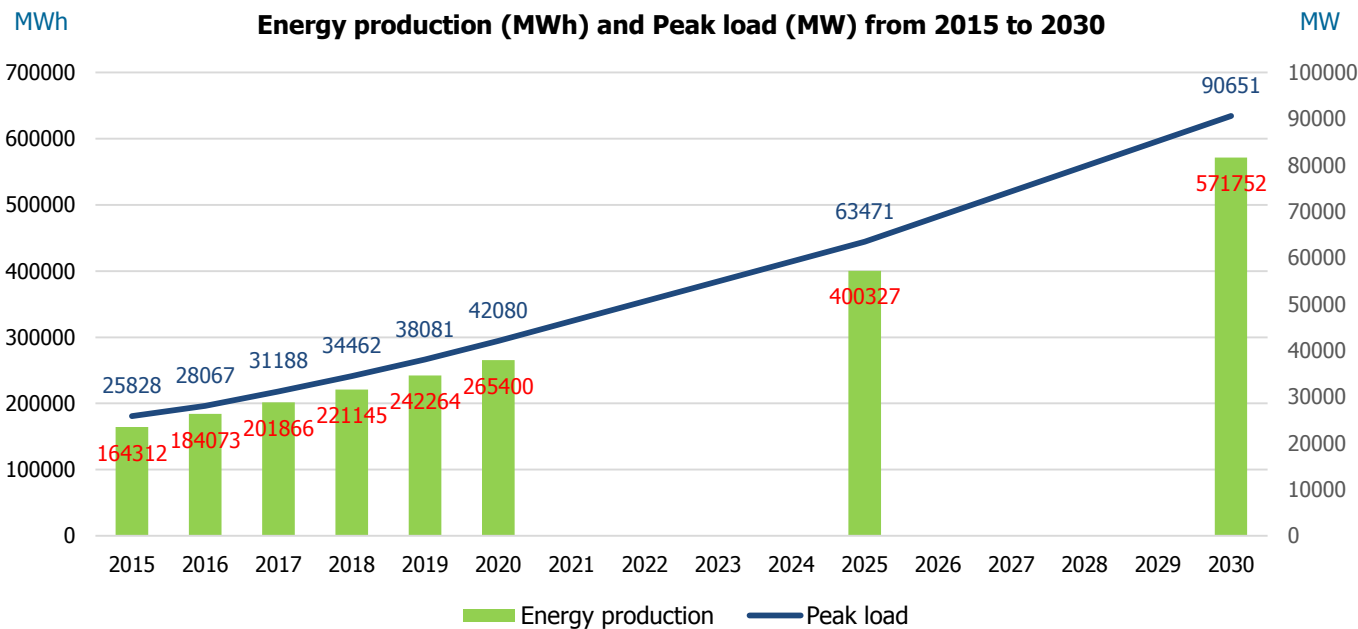
ENERGY PRODUCTION



Average growth rate (%)

	2014-2018
Peak Load	12.17
E. Production	11.10

FUTURE DEVELOPMENT

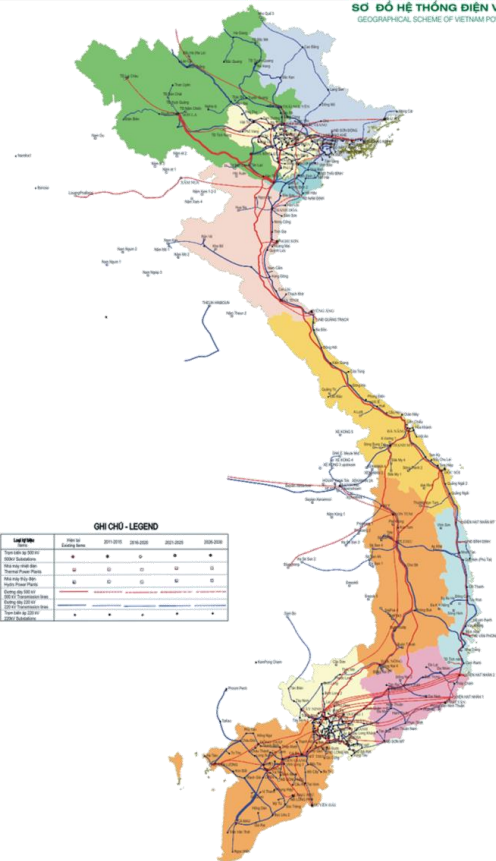


Average growth rate (%)

	2016-2020	2021-2025	2026-2030
Peak Load	10.26	8.57	7.39
E. Production	10.07	8.57	7.39

TRANSMISSION SYSTEM

BỘ ĐỒ HỆ THỐNG ĐIỆN VIỆT NAM
GEOGRAPHICAL SCHEME OF VIETNAM POWER SYSTEM



Vietnam Transmission System (2019)

- ❑ 03 interconnected regions
- ❑ 500-22500 kV: 30 substations – 33300 MVA;
- ❑ 500 kV line: ~ 8000 km of line

	Unit	Quantity
500kV substation	MVA	31000
500kV line	km	7994
220kV substation	MVA	57441
220kV line	km	17059

Transmission capacity

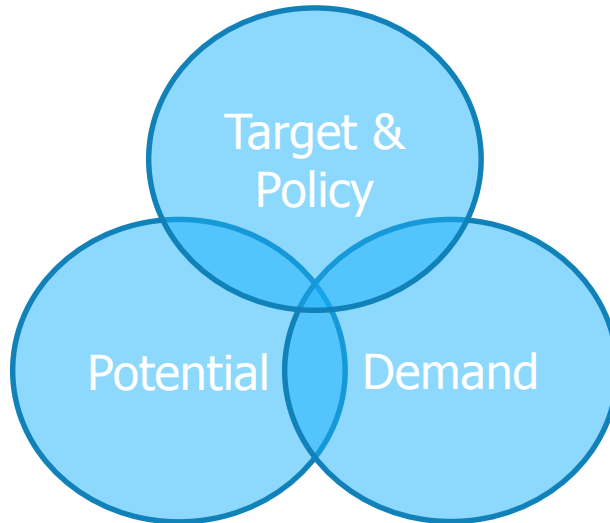
Year	North - Central	Central - South
2019	2200-2400	4000

02

RENEWABLE ENERGY DEVELOPMENT



PROSPECTS FOR RENEWABLES DEVELOPMENT



RENEWABLE ENERGY POTENTIAL

Small hydro power

Potential: > 7.000 MW
Current use: 3300 MW

Solar power

Potential: 4-5 kWh/m²
Current use: ~ 5000 MWp

Wind power

Potential: 27 GW
Current use: 300 MW

Biomass

Potential: >3000 MW
Current use: 400 MW

Biogas

Potential: 58 MW
Current use: 0.5 MW

Municipal wastes

Potential: 220 MW
Current use: 2.4 MW

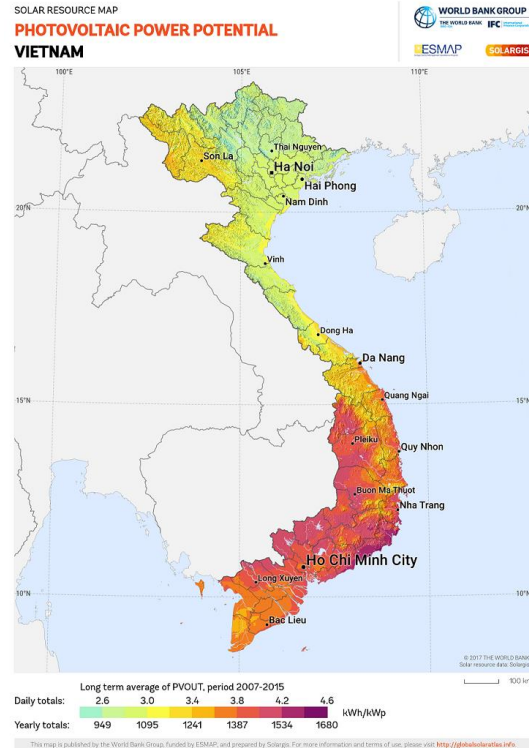
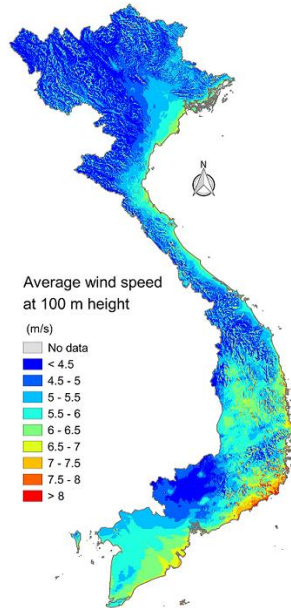
Geothermal

Potential: 340 MW
Current use: 0 MW

Tidal

Potential: 100-200 MW
Current use: 0 MW

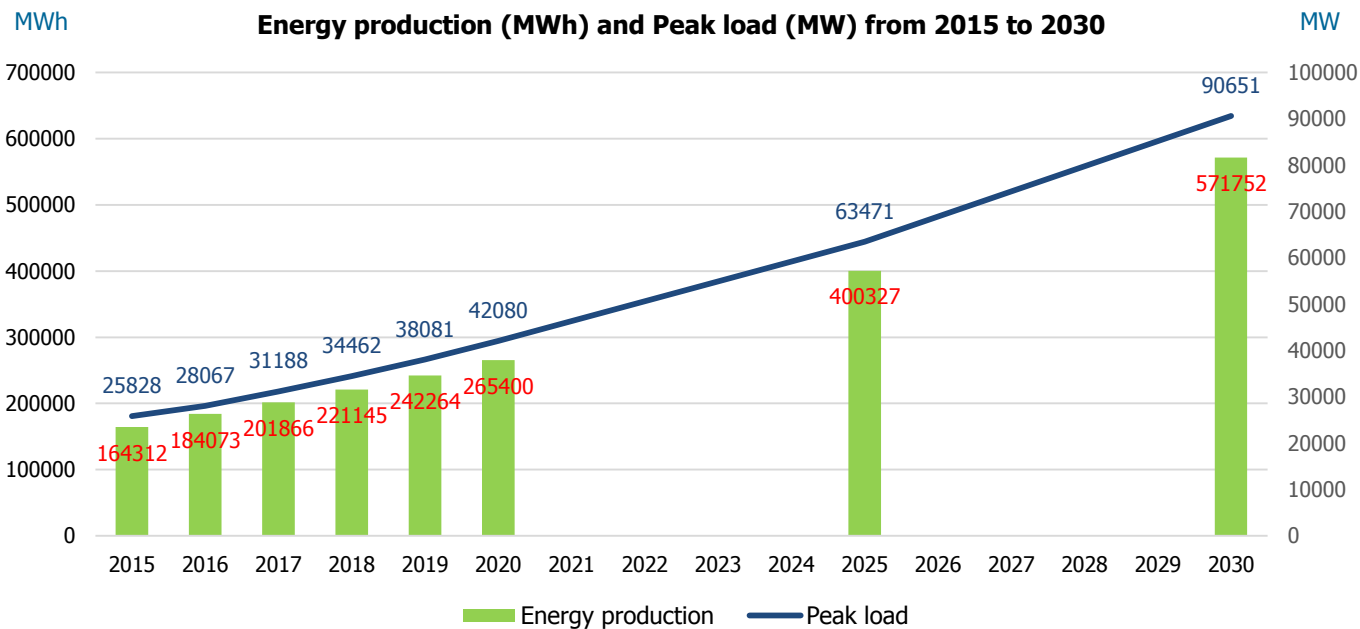
WIND AND SOLAR POTENTIAL



Wind maps: <https://energypedia.info/>

Solar maps: <https://solargis.com/>

DEMAND FOR RE DEVELOPMENT



Average growth rate (%)

	2016-2020	2021-2025	2026-2030
Peak Load	10.26	8.57	7.39
E. Production	10.07	8.57	7.39

DEMAND FOR RE DEVELOPMENT

- ❑ All the big potential hydro source have been exploited.
- ❑ From 2017, Vietnam begins importing big amount of Coal for power generation.
- ❑ Natural gas supply for electricity is not enough from 2018:
 - ⇒ Start to import LNG from 2021.
- ❑ All nuclear projects cancelled until at least 2030
- ❑ Results of COP 21 will lead to the fact that renewable energies will be pushed worldwide in order to avoid climate turbulences and boost the transition towards resilient, low-carbon societies and economies.



STRATEGIC TARGET & POLICY

Renewable Energy Development target (PDP7 – revised)

- Renewable energy capacity and energy shares are shown as the below

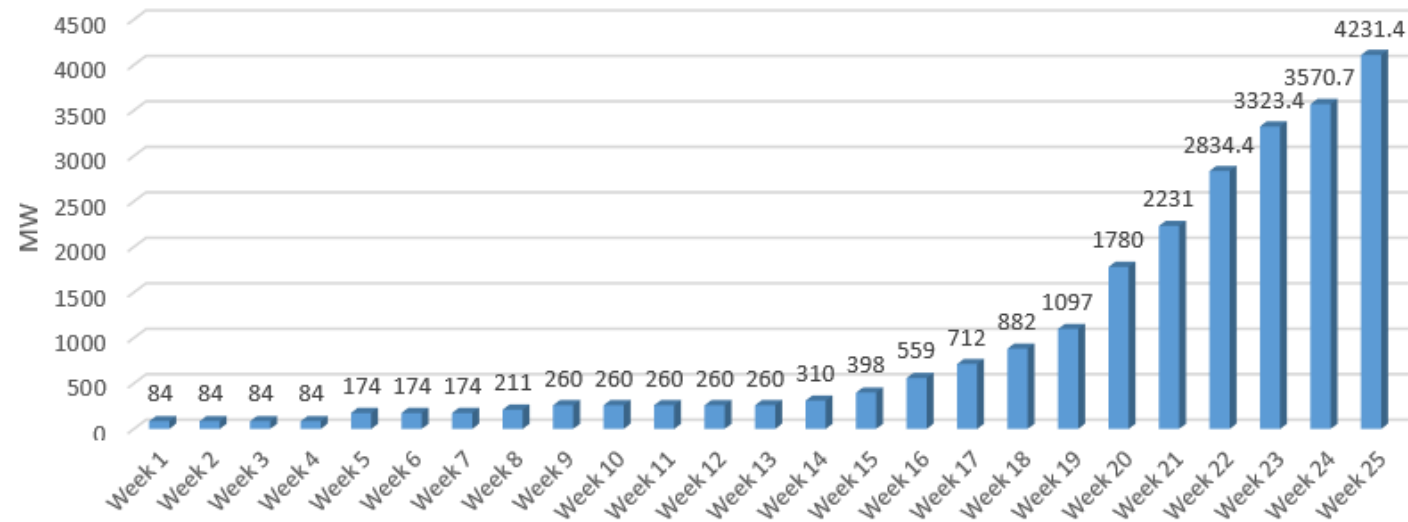
	2020		2025		2030	
	Capacity (MW)	Energy %	Capacity (MW)	Energy %	Capacity (MW)	Energy %
Wind	800	0.8	2000	1	6000	2.1
Solar	850	0.5	4000	1.6	12000	3.3

Policy:

	Feed in Tariff (UScents/kWh)	COD	Decision
Onshore wind farm	8.5	01/11/2021	39/2018/QD-TTg
Offshore wind farm	9.8	01/11/2021	39/2018/QD-TTg
Solar	9.35	30/06/2019	11/2017/QD-TTg

SOLAR PROJECTS DEVELOPMENT IN 2019

SOLAR PROJECTS in 2019



TENTATIVE FIT FOR SOLAR AFTER 30/06/2019

	Price in Uscent / kWh			
	Zone 1	Zone 2	Zone 3	Zone 4
Solar Project -Floating	9.98	8.59	7.69	7.24
Solar Project	9.20	7.91	7.09	6.67
Rooftop	9.35	9.35	9.35	9.35

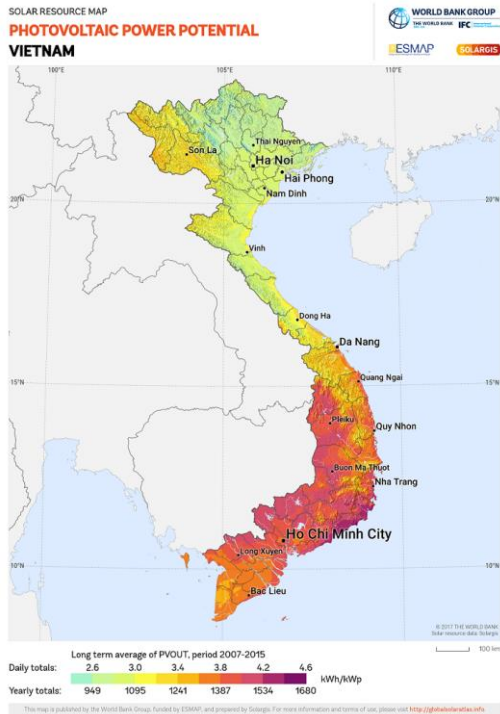
Tentative only!

03

POWER SYSTEM OPERATION CHALLENGES



CONGESTION

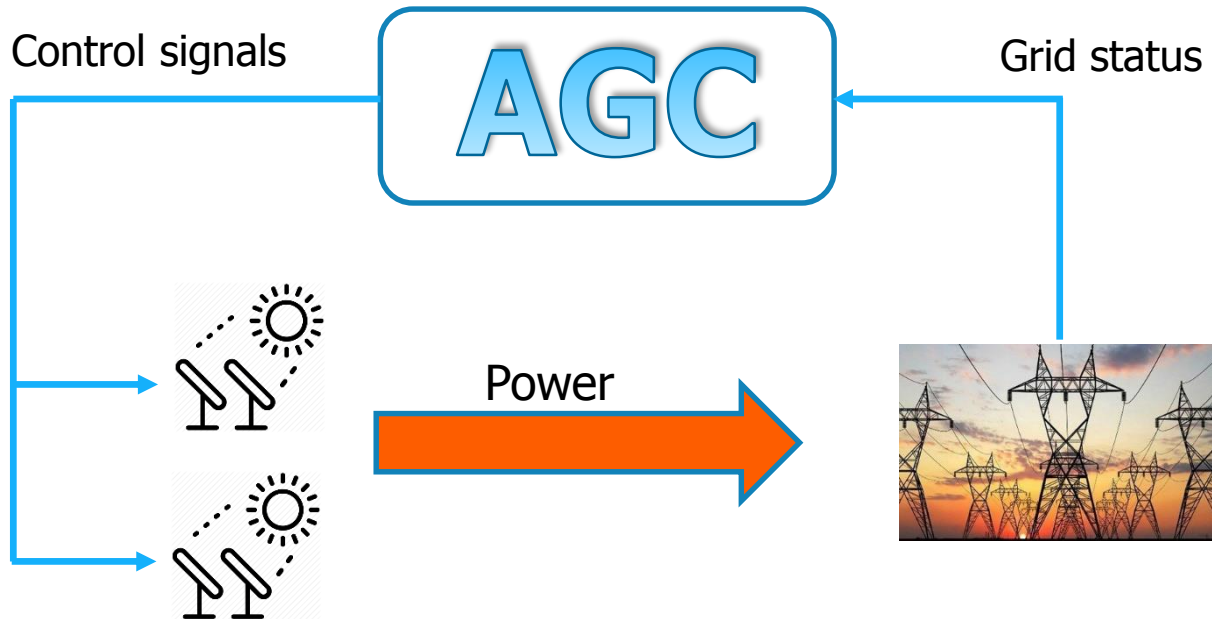


Heavy overload

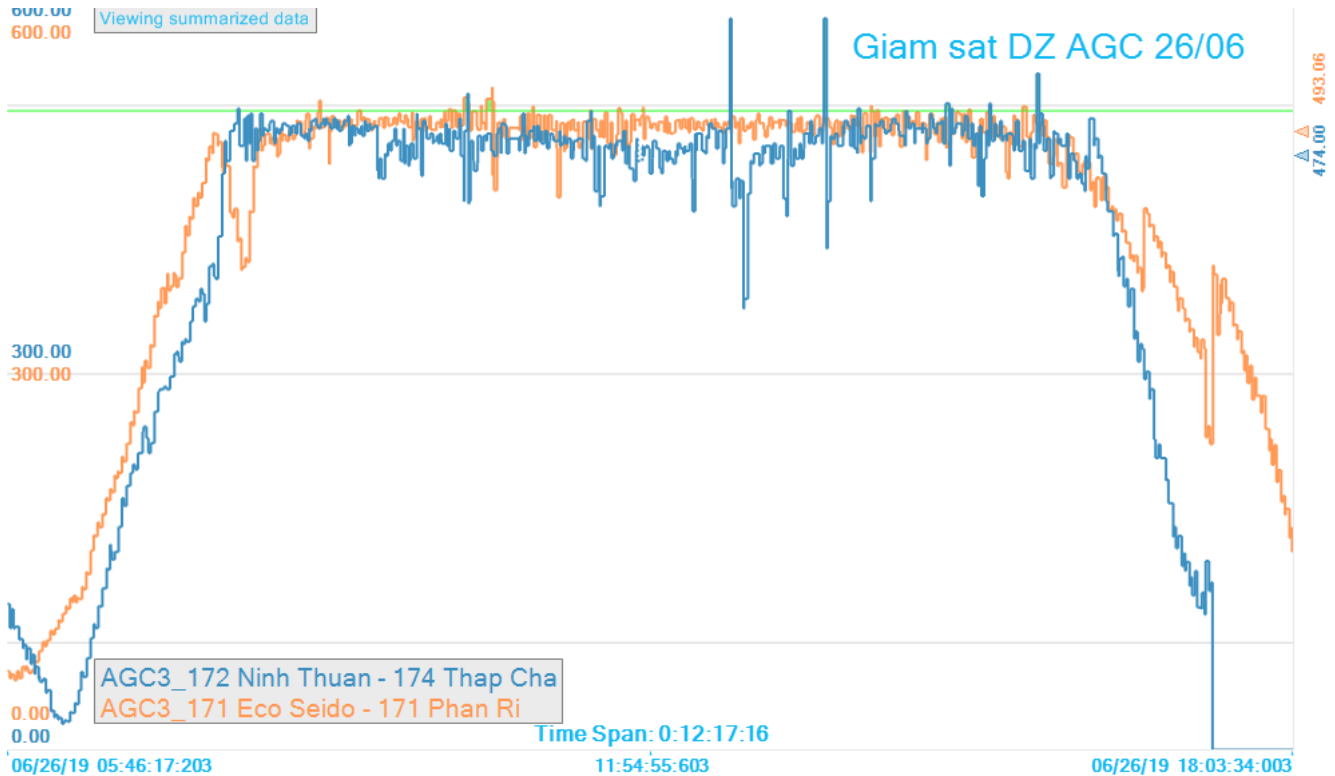


110 / 220 / 500 kV

USING AGC TO AVOID GRID OVERLOAD

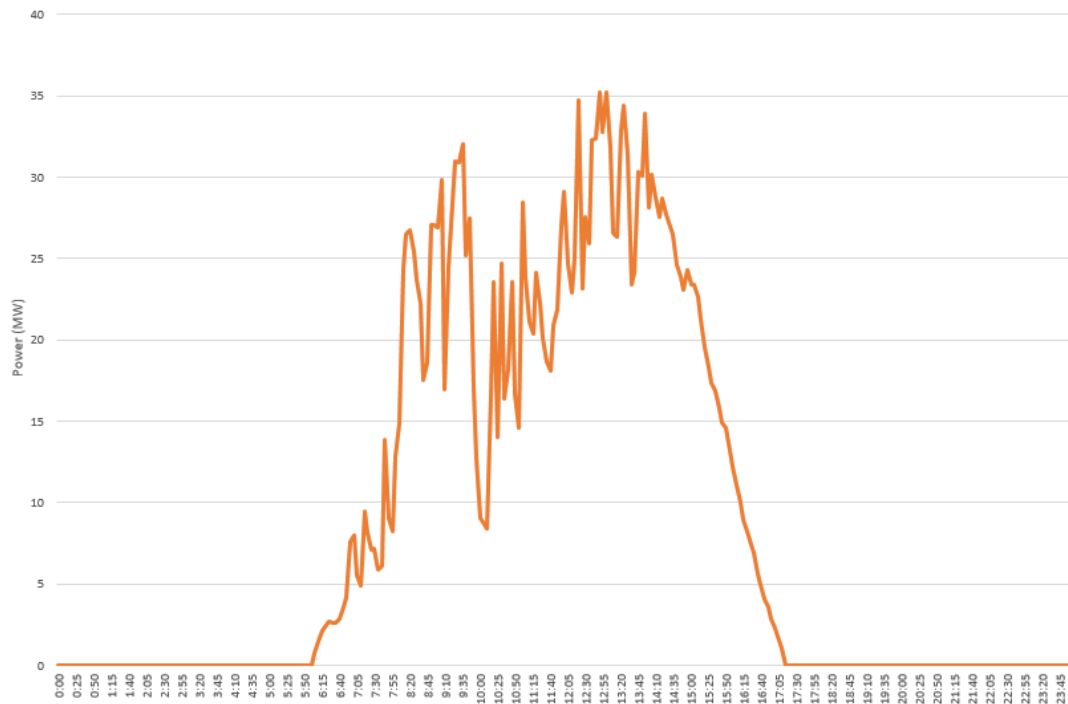


USING AGC TO AVOID GRID OVERLOAD



RES POWER OSCILLATION

Phong Điền output power- 05/10/2018



FREQUENCY CONTROL

	2020	2025	2030
Hydro Installed Capacity	~ 21.6 GW (30 %)	~24.6 GW (21%)	~27.8 GW (16%)
Solar	~ 0.85 GW	~ 4 GW	~12 GW
Wind	~0.8 GW	~ 2 GW	~6 GW
Peak demand	~ 42 GW	~ 63 GW	~ 90 GW

- ✓ **Currently, good operation flexibility thanks to high percentage of hydro power plants**
- ✓ **In the future:**
 - ✓ Proportion of hydro will gradually reduced
 - ✓ Thermal coal-fired will dominate the generation mix
 - ✓ Renewable energy share will be increased

NEED FOR RESERVE CAPACITY

❑ Result of Consultant Project with EGI

<i>In MW</i>	<i>Forecast error (2025)</i>			
	<i>0%</i>	<i>2%</i>	<i>5%</i>	<i>10%</i>
<i>Total reserves (2+4)</i>	1055	1085	1250	1685
<i>Spinning reserves (up) (2)</i>	668	741	1027	1672
<i>Spinning reserves (down)</i>	-657	-737	-1052	-1708
<i>Non-spinning reserves (4)</i>	387	344	223	15

<i>In MW</i>	<i>Forecast error (2030)</i>			
	<i>0%</i>	<i>2%</i>	<i>5%</i>	<i>10%</i>
<i>Total reserves (2+4)</i>	1190	1425	2365	4375
<i>Spinning reserves (up) (2)</i>	668	1149	2365	4375
<i>Spinning reserves (down)</i>	-657	-1188	-2484	-4649
<i>Non-spinning reserves (4)</i>	522	276	0	0

04

PROSPECT OF BATTERY ENERGY STORAGE SYSTEM



CURRENT STATUS OF BESS DEVELOPMENT



0 MW of BESS



Lack of experience



Lack of regulation



Lack of incentive mechanism



Grid issues may need BESS

CURRENT TECHNICAL ASSISTANT PROJECTS

- ❑ Feasibility Study of using advanced energy storage technology to solve issues of the Vietnamese power system:
 - ❑ Funded by USTDA
 - ❑ Consultant: GE
 - ❑ Expected results: technical & economical analysis, recommendations on technologies, evaluation of benefits and risk, policy recommendations for BESS use cases ...
 - ❑ Completion date: September 2020
- ❑ Technical assistance on BESS Pilot Investment Preparation and BESS Technical Requirement
 - ❑ Funded by Asian Development Bank (ADB)
 - ❑ Consultant: Consortium of INTEC (Germany), CENER (Spain) and IE (Vietnam)
 - ❑ Expected result: development of a detailed design of BESS to serve the specific purposes, drafting of technical requirements for BESS to be added into the Grid Codes

PROSPECT OF BESS DEVELOPMENT



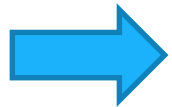
BESS might be solution to grid issues



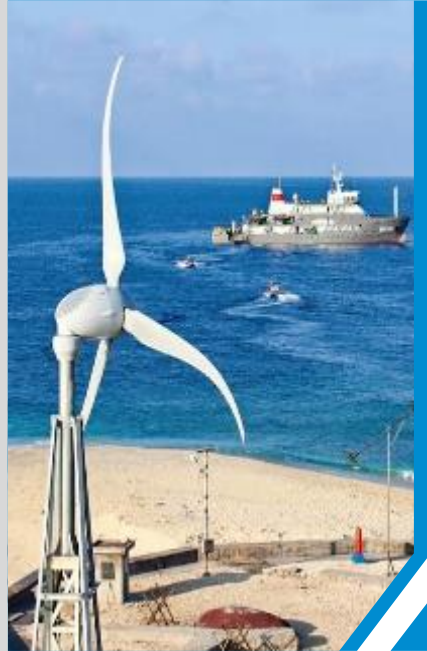
Preparation process is being conducted



BESS price is progressively reduced



Potentially first project in 2 – 5 years



THANK YOU FOR
YOUR LISTENING