



EVN

NATIONAL

LOAD DISPATCH CENTER

OVERVIEW OF THE VIETNAM POWER SYSTEM AND RECOMMENDATION ON BESS INSTALLING

NATIONAL LOAD DISPATCH CENTER



ISO
9001:2015



Member of SN Registrars (Holdings) Ltd



8327



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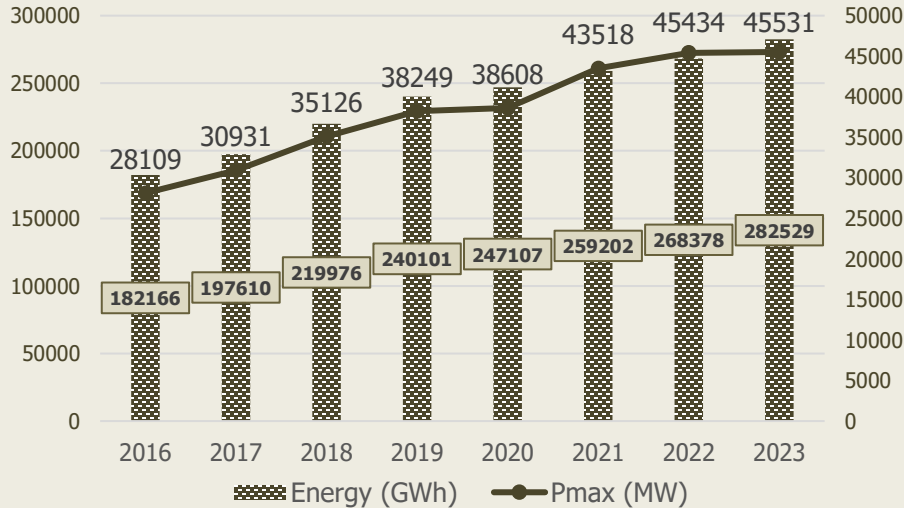
OVERVIEW OF

THE VIETNAM POWER SYSTEM



LOAD DEMAND

ELECTRICITY DEMAND



282,003 GWh
Energy consumption estimate
(according to Sept 2023
operation plan)

45,531 MW
Pmax 2023

AVERAGE GROWTH 2016-2023

6.5%/year Energy growth

7.3%/year Pmax growth

BY CATEGORY

**CONSTRUCTION
& INDUSTRY**
54.18%

**RESIDENTIAL
CONSUMPTION &
MANAGEMENT**
33.19%

OTHER
4.19%

COMMERCIAL
4.95%

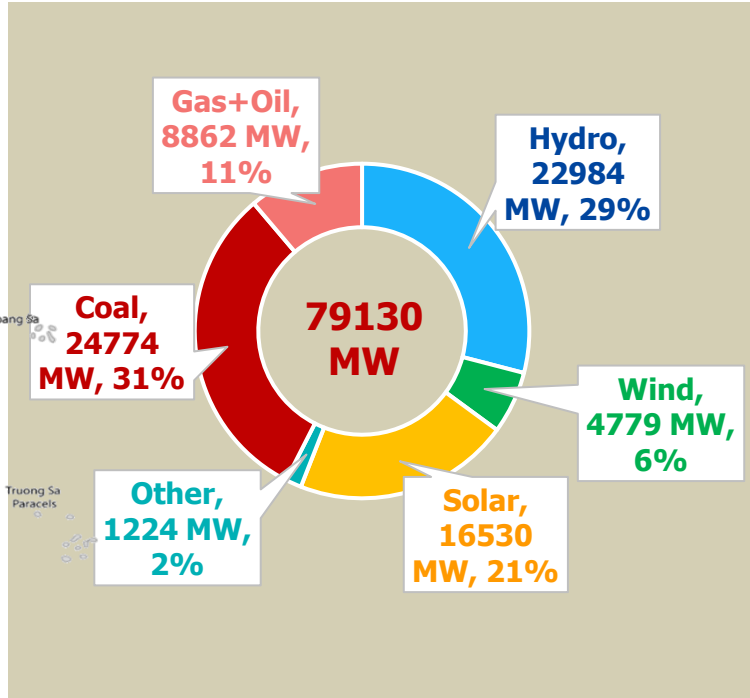
**AGRICULTURE,
FORESTRY AND
FISHERIES**
3.50%



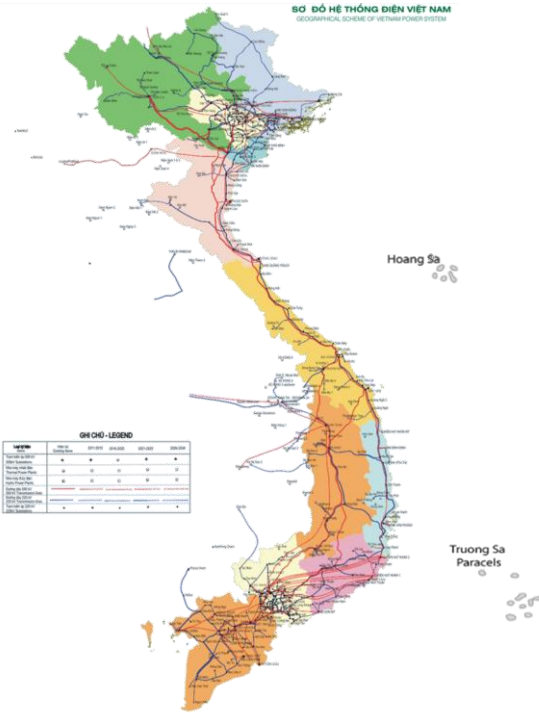
POWER GENERATION

INSTALLED CAPACITY 2023
(Update Sept 2023) **79130 MW**

PRODUCTION 2023
(Estimated) **282,003 GWh**

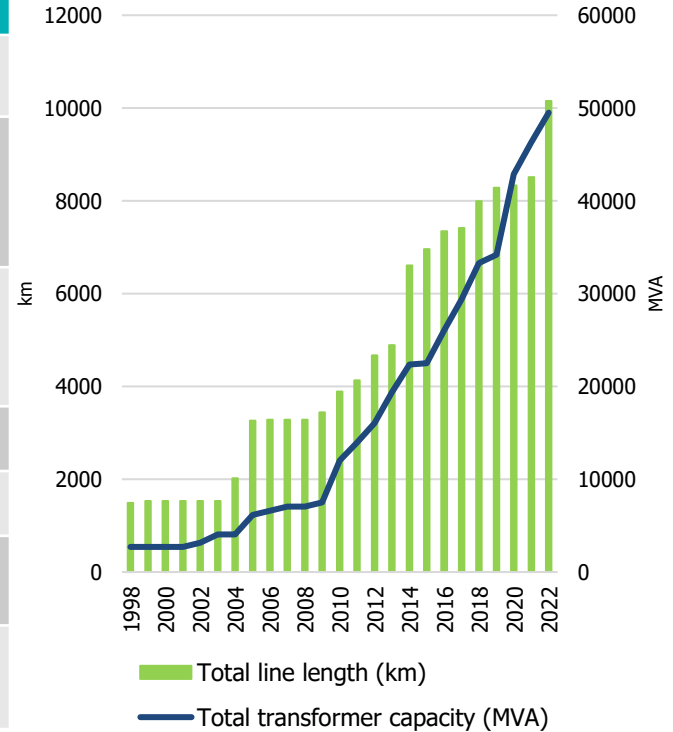


SCALE OF ELECTRICAL SYSTEM - ELECTRIC GRID



	500 kV	220 kV
Line	10152 km	19567 km
Shunt reactor	7330.4 MVar	25 MVar
Series capacitor	19/21.5/3 0.5 Ohm 2000 A	-
Shunt capacitor	-	-
SVC	-	-
Substation	49500 MVA	72848 MVA
Transformer	450/600/9 00 MVA	63/125/25 0 MVA

Development of 500kV power grid over the years



CHALLENGES IN POWER SYSTEM & MARKET OPERATION

Due to fast-paced development of power demand and renewables, NLDC is facing several challenges

01

OPERATION OF POWER SYSTEM

- Curtail power generation due to congestion
- Difficult to schedule outage
- High/low voltage
- **Inadequate available power generation in the North**



02

MANAGEMENT OF MARKET TRADING

- Plenty of constraints: price order, TOP, downstream water supply, maximize RE deployment,...
- Share of market participation in the system is still moderate.
- Incentive mechanism for ancillary services is not incentive enough.



03

RE FORECAST & MONITOR

- Variability and intermittency
- Forecast from generation owners is not always reliable



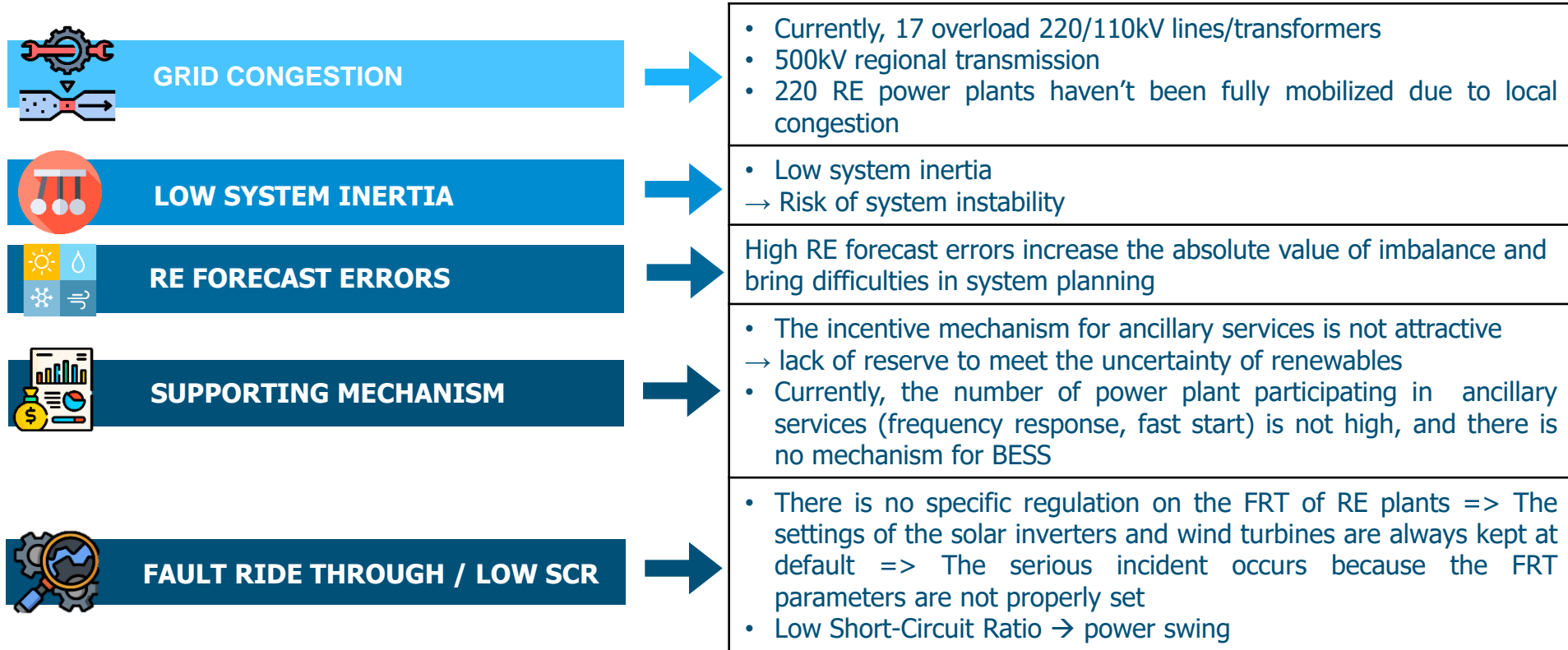
04

MID-LONG TERM

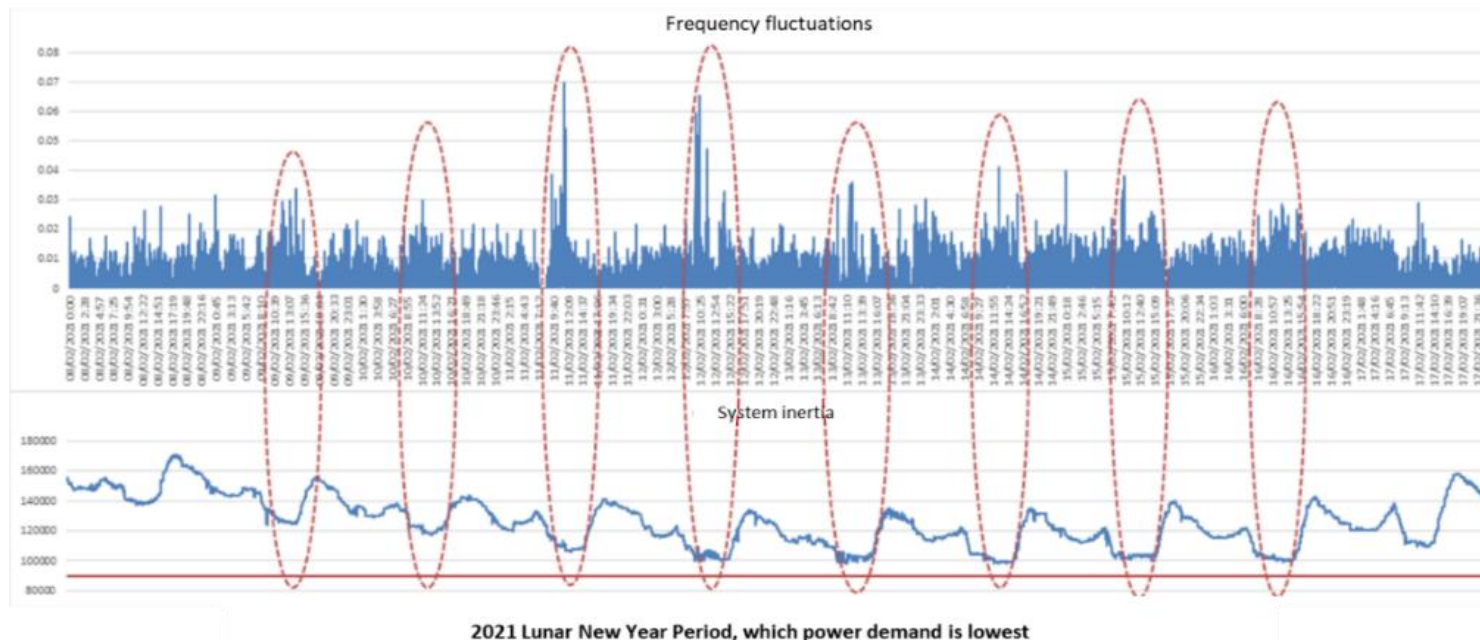
- Development of power generation is not adequate compared to demand growth.
- More RE to be integrated while not much conventional/flexible source are going to be added.



CHALLENGES IN OPERATING RENEWABLE ENERGY



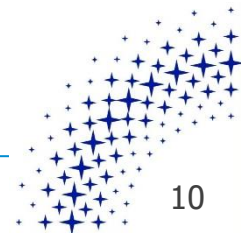
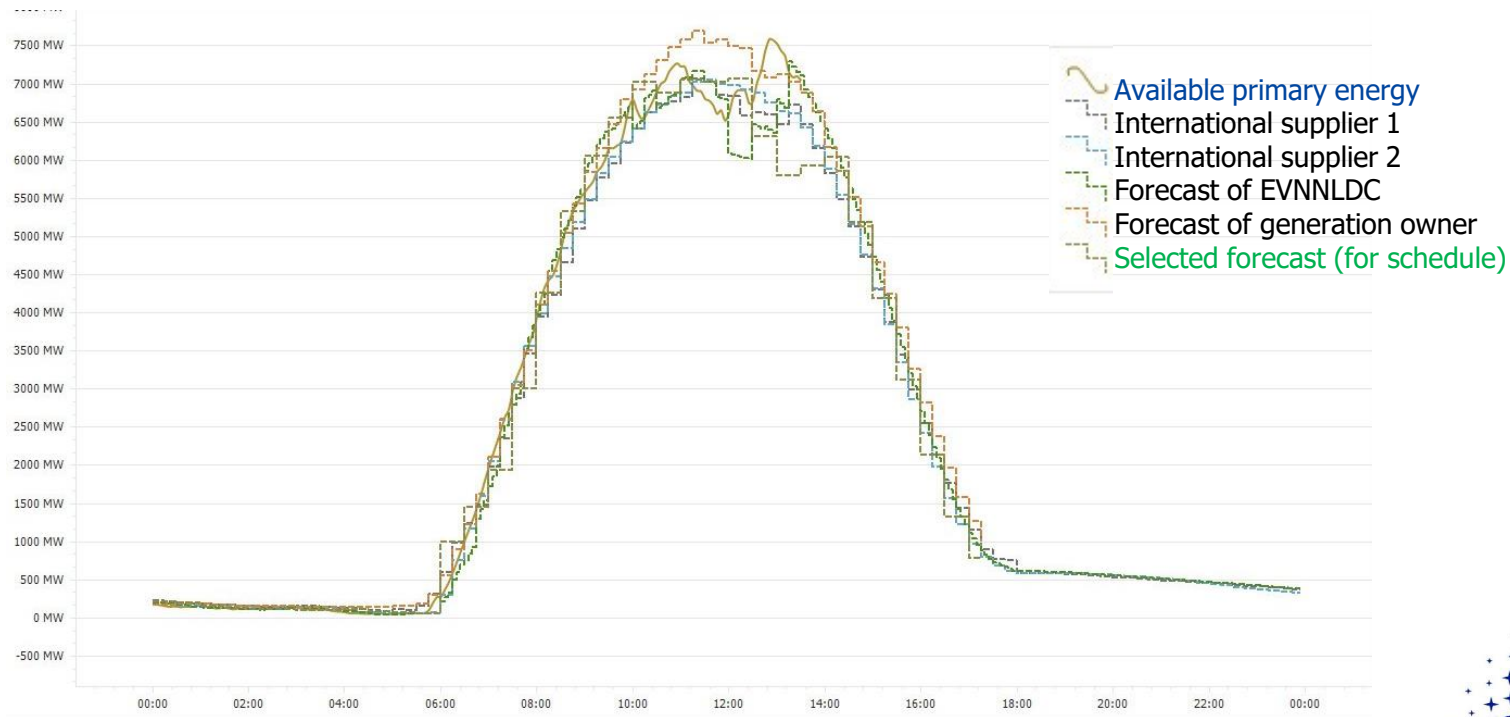
SYSTEM INERTIA



During low-load conditions such as New Year holidays, the Vietnamese power system has faced low system inertia during midday when solar-generated maximum power while conventional generators have to be switched off due to low demand => **frequency fluctuation**

FORECAST ERRORS

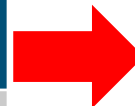
Errors in renewable forecasts will cause difficulties in the operation of power system. After a period of coordination with various forecast data providers, the forecast error has been improved, in general, the average RE forecast error now does not exceed 10%.



HIGHER DEMAND ON RESERVE & FLEXIBLE RESOURCES

- Frequency reserve demand for intermittency of Renewables

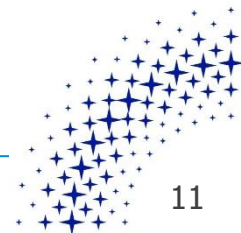
Renewable capacity (MWAC)	Secondary frequency response reserve (MW)	
	Reserve for largest generating unit	Reserve for intermittency of Renewables
5000	700	950
10000	700	1200
20000	700	1700



- Difficult to arrange enough frequency reserve for both ramp-up & ramp-down
- Difficult to arrange for outage schedule

- Hydroelectric plants have to operate more flexibly → violate water limits, less water for dry season.
- Coal-thermal, gas turbine plants have to ramp-up/ramp-down, start/stop more frequently → increase EOH, failure rate

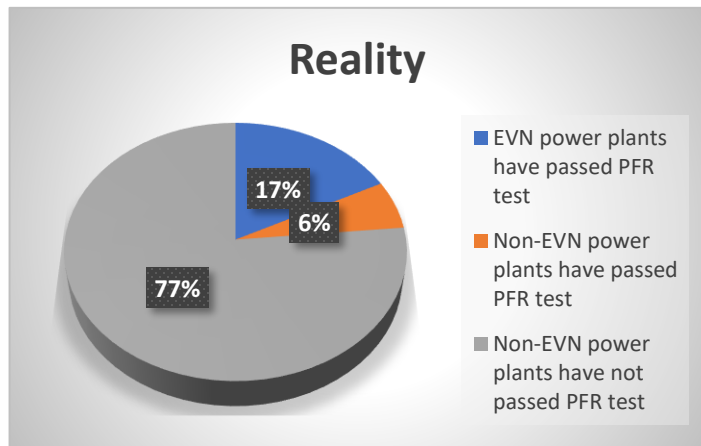
Year	2019	2020	2021
Number of starts, stops	74	192	775



CHALLENGES IN OPERATING RENEWABLE ENERGY

Primary frequency response

- **Regulation:** Conventional generators have to participate in primary frequency response
- **Reality:** Ratio of power plants (Non-EVN) that have not fulfilled primary frequency function is still high



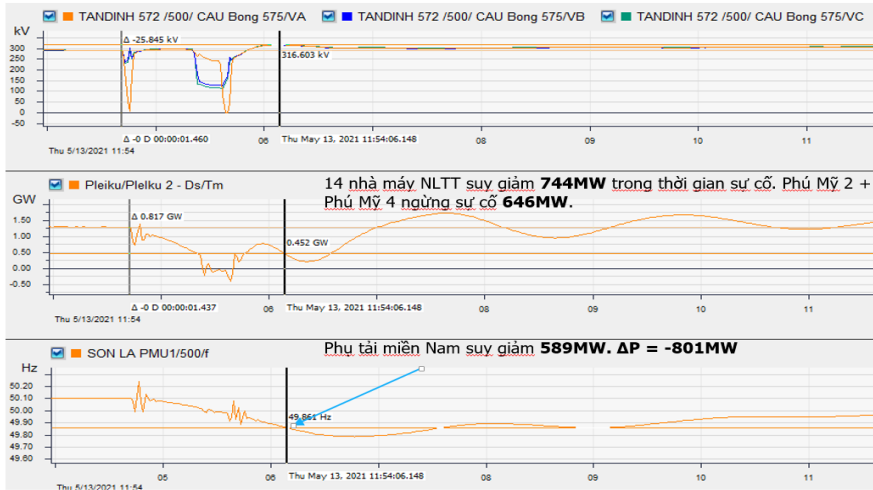
Secondary frequency response

- **Regulation:** Power plant (> 30MW) have to invest in equipment, control system, AGC system and connect to SMO's AGC system
- **Reality:**
 - 99/149 conventional power plants have connected to AGC ~ 50080 MW
 - ~100% renewable power plants (solar and wind farms) have AGC connection

FAULT RIDE THROUGH / LOW SCR

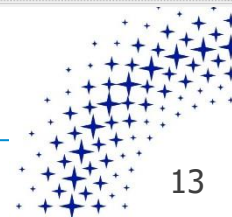
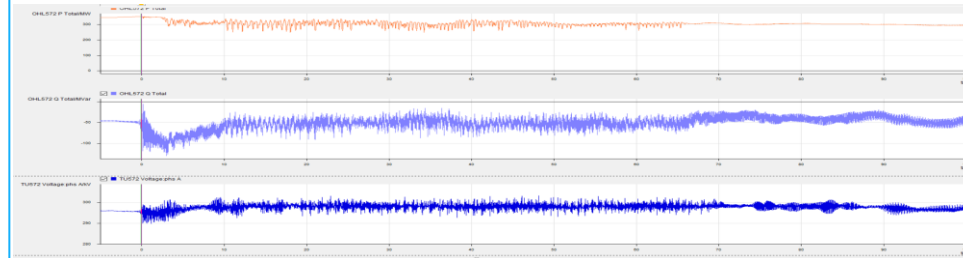
FRT

On May 13th 2021, after a fault at T500 Tan Dinh substation, the behaviors of renewable power plants were different (ramped down/shutdown/restarted/...) because their settings were not appropriate.



Low SCR

On November 28th 2021, SCADA system recorded that the Easup solar plant had very high generation capacity, reaching 349.93 MW. Following the event, the voltage of the plant fluctuated, and high-order harmonics were detected. It was later found out that low SCR was the cause of the event, as the SCR of Easup solar plant is only 5.4



02

RECOMMENDATION ON BESS INSTALLING



NLDC's PERSPECTIVE ON BESS INSTALLING

Purposes

- ❑ BESSs that are beneficial for renewable investors should be implemented by those investors
- ❑ EVN should implement pilot projects to serve "global objectives":
 - Power supply in the North
 - System frequency response

Regulation for BESS

NLDC propose MOIT, ERAV soon issue gridcode for BESS

BESS for power supply in the North

Should be implemented in the North

BESS for frequency response

- ❑ Can be installed anywhere in the system
- ❑ NLDC have proposed mechanisms for BESS participating in frequency response (FR):
 - For main FR: to make full use of high-speed ramping ability.
 - For backup FR: secondary FR through AGC

	Adjustable range	Minimum adjustable resolution
Deadband	0 - \pm 2 Hz	\pm 0.01 Hz
Static characteristic slope of primary FR	0.2%-10%	0.1%

- The dead band value and characteristic slope will be calculated and determined by the electricity system and market operator during operation process in accordance with the design of the BESS and the agreement to participate in the service.



THANK YOU FOR LISTENING!