IEEE PES Dinner Talk 2024

The New Electric and Energy Systems : Reinvention and Resilience

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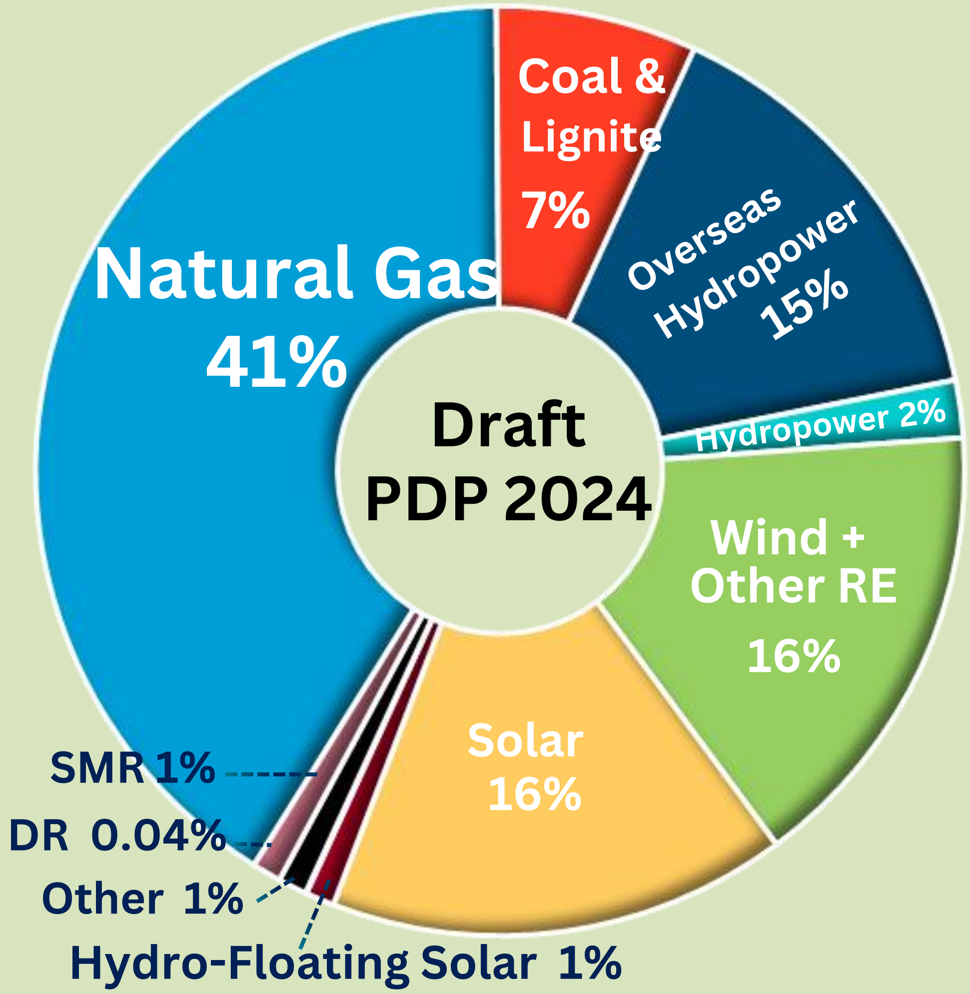
55th EGAT

Energy Transition From Fossil Fuels to Renewable Energy



RE > 50%

- The share of electricity generation from **fossil fuels** is likely to **decrease** due to the rapid growth of renewable energy
- The Proportion of **renewable energy** in draft PDP 2024 is **more than 50 %** in 2037
- Expected that the **renewable energy will grow 65 – 80%** of global electricity production by 2050

Sources : EGAT and supporting documents for the public hearing on the draft Power Development Plan of Thailand 2024-2037 (PDP2024)

Variable Renewable Energy vs Conventional Power Plant

	VRE  VRE = Variable Renewable Energy i.e. solar and wind	**Conventional Power Plant** 
• **Power System Stability** 1. Plant/Capacity factor (PF) (Yearly Actual Generating Hours)	**Solar** PF **18%** (1,577 Hours) **Wind** PF **25%** (2, 190 Hours)	Combined Cycle Power Plant PF 85% (7,446 Hours)
2. Dispatchable (Controllable by System Operator)	✗	✓
3. Inertia (Frequency regulation under power system disturbance)	✗	✓
• **Cost of Electricity** 	Solar (Ground mounted) FiT **2.17** THB/kWh **Wind** FiT **3.10** THB/kWh Refer to Under Feed-in Tariff Scheme for the year 2022-2030	2.99 THB/kWh Refer to The Power Plant Generation Cost for January to June 2024

Development Grid Modernization

Flexible Power Plant

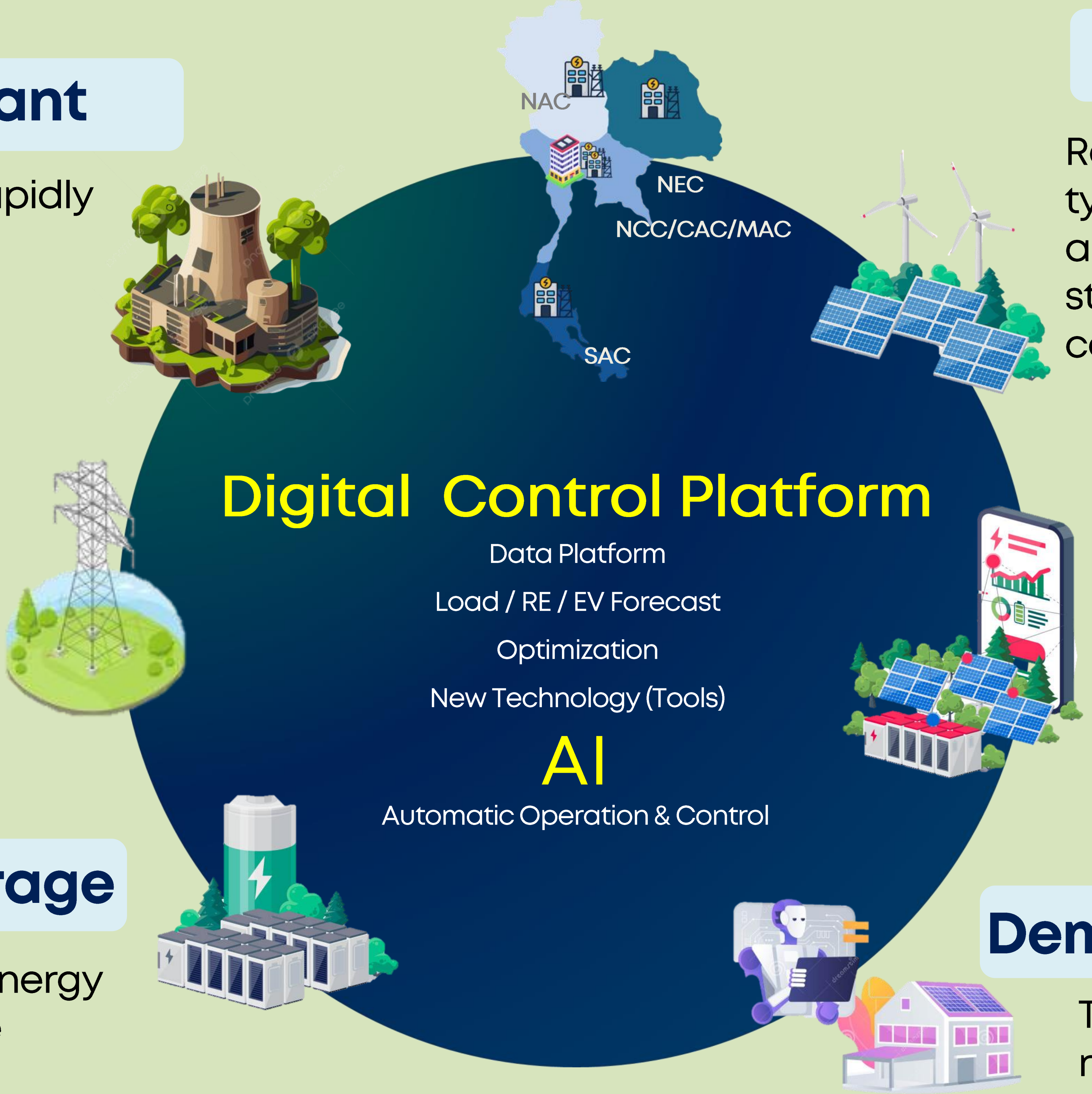
Dispatch effectively and rapidly to support Fluctuation of VRE generation.

Flexible Grid

Smart grid integrate with communication system to monitoring the grid data and install STATCOM for enhance power system stability.

Grid-Scale Energy Storage

Install Pump Storage and Battery Energy Storage System as the Grid – Scale Energy Storage to maintain grid's stability and resilience contributing to VRE penetration.



Virtual Power Plant (VPP)

Refer to platform that Integrated all multi type of renewable power plant to dispatch according to the demand, utilizing the strengths of each type to ensure continuous operation.

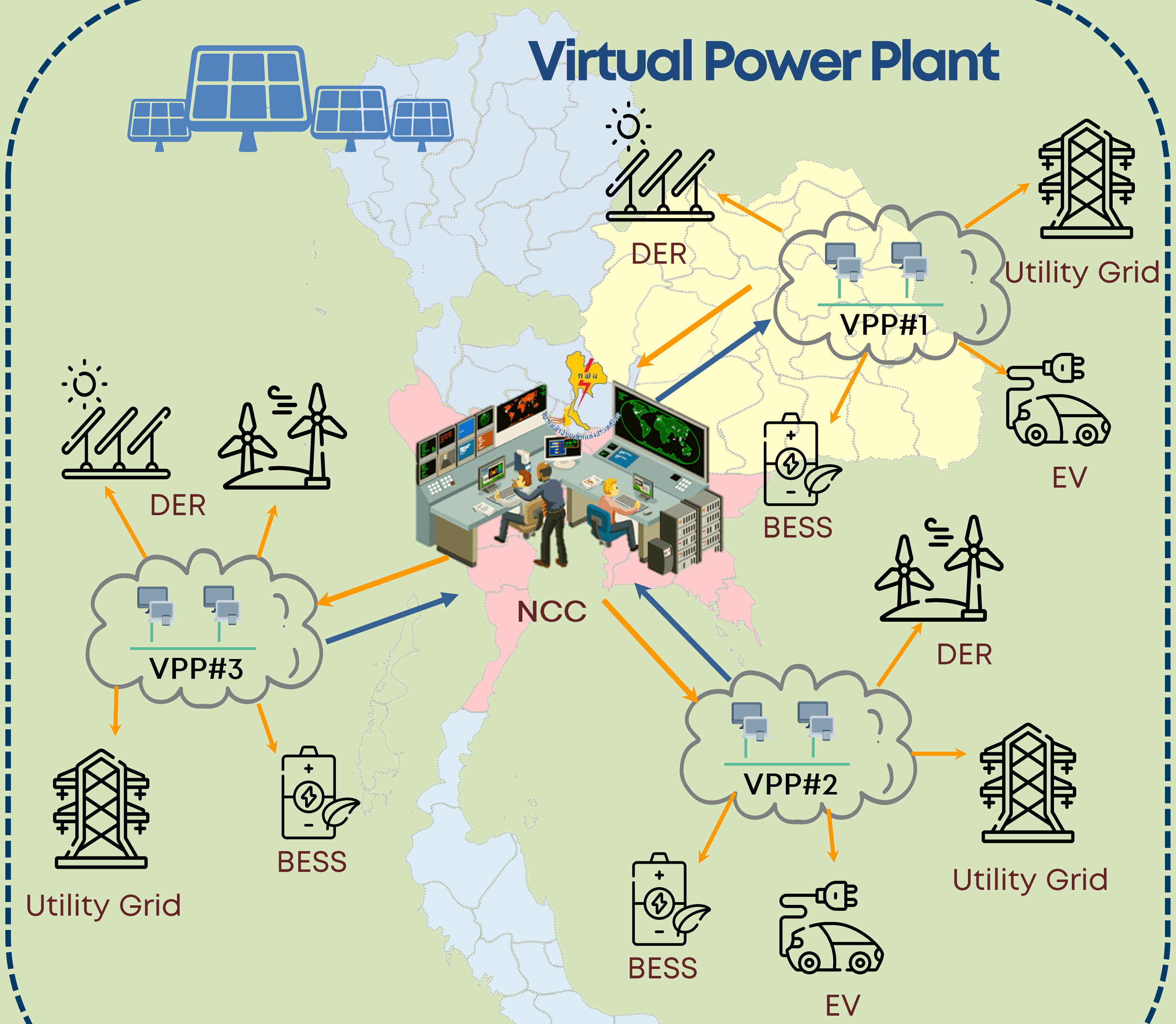
RE Energy Forecast Center

Organize 5 RE Forecast Center at RCC (REFC) countrywide.

Demand Response Control Center

The pilot project involves a 50 MW load reduction With MEA and PEA serving as LAs.

Grid Modernization : VPP, REFC, DRCC

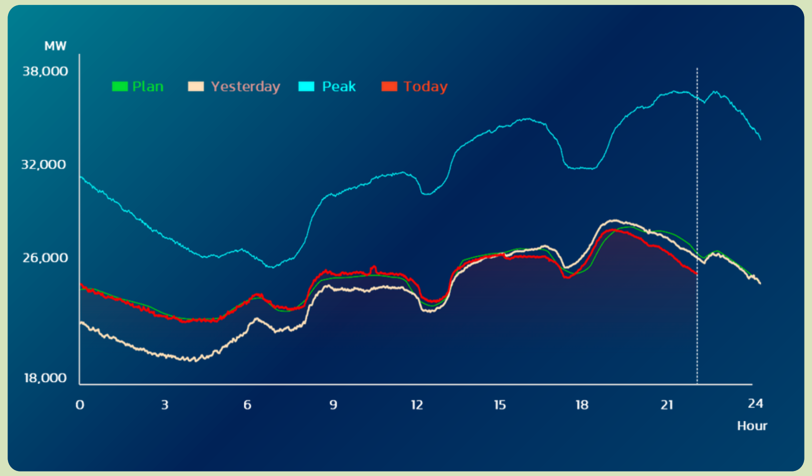


Virtual Power Plant (VPP): integrated Distributed Energy Resource and energy storage systems

Renewable Energy Forecast Center: REFC

- **Forecasting electricity generation from renewable energy**, including wind and solar power from SPP
- **Using the forecast results to plan electricity generation** in conjunction with other power plants, ensuring that the electricity system can accommodate fluctuations and uncertainties from the electricity generated by renewable energy.
- **Developing a simulation system** to cover Very Small Power Producers (VSPP), including Solar Rooftop levels.

Demand Response Control Center: DRCC



- **The central hub for controlling electricity consumption reduction.**

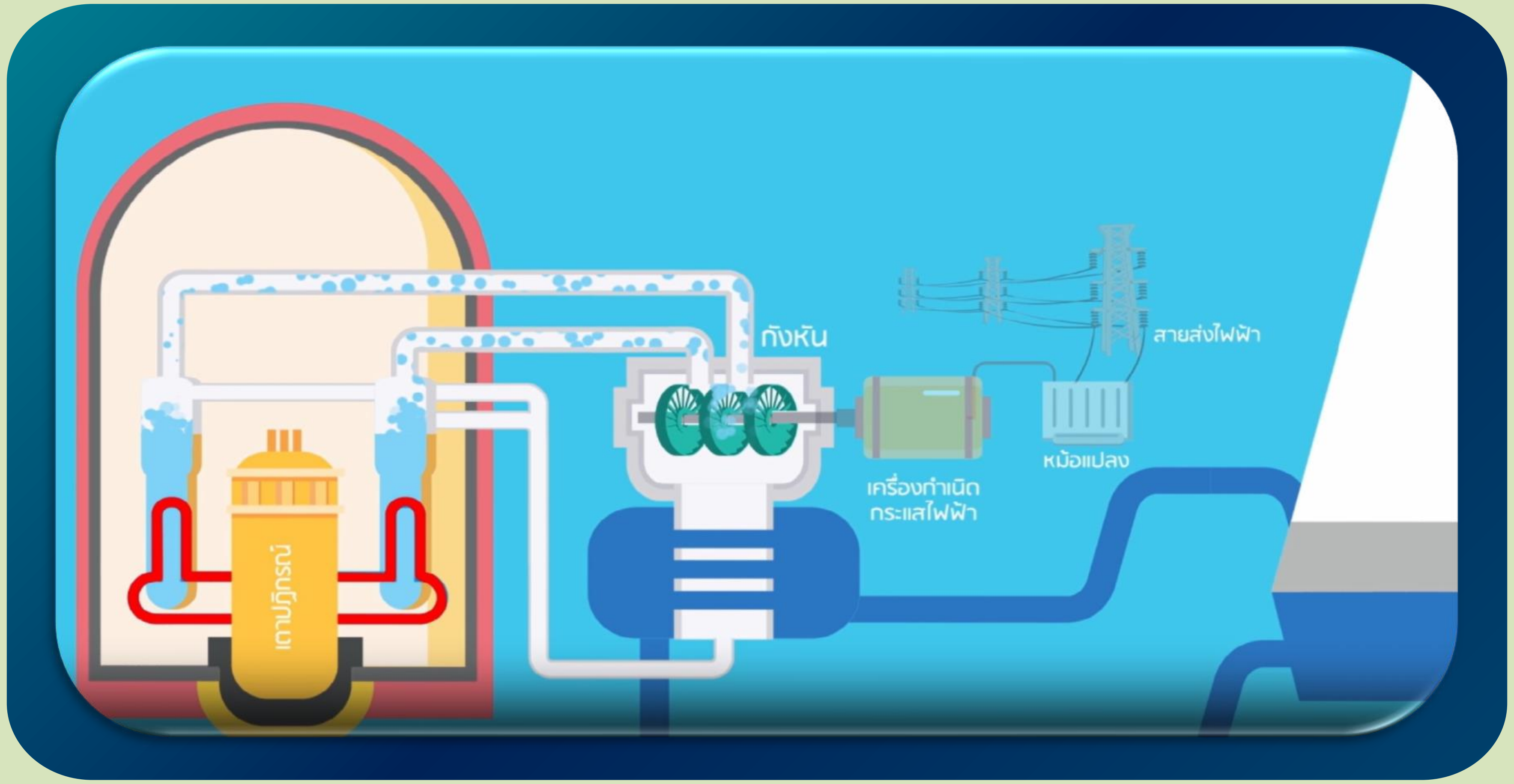
When fuel prices are high or during peak demand periods, as increasing power generation would raise electricity production costs, which could lead to a higher fluctuation in electricity prices (Ft) for the public. Therefore, reducing electricity consumption is a better alternative.

Small Modular Reactors : SMRs

“ The draft Power Development Plan of Thailand (PDP2024) incorporate 2 units of 300 MW Small Modular Reactors (SMR)”

Integrating primary system within the reactor module, this helps reduce the use of pumps, the number of pipes and connectors, thereby reducing accidents caused by coolant leakage.

Key components are **integrated within the reactor, minimizing the use of pumps, pipes, and fittings.** This significantly reduces the risk of accidents caused by water or coolant leakage. SMRs feature enhanced safety systems, including passive cooling technology that operates without electricity or operator intervention, relying instead on natural principles such as gravity and heat transfer



Advantages of Small Modular Reactors

- Generating capacity less than 300 MW
- Carbon-free
- Land used 100 rai
- Construction period 3-4 years
- **Modularity**
  Allows for scalable and flexible deployment.
- **Emergency planning zones (EPZ)**
  Less then 1 km (Design Concept)
- **Passive cooling system**
  ensuring the reactor remains cool even in the event of a power loss or other emergency.
- **Greater Efficiency**
  SMR can generate electricity 24/7 and offer high energy density, producing up to 100,000 times more heat than coal and 50,000 times more than gas
- **Economic Competitiveness** (60 Years)
  With a 60-year operational life, SMRs are cost competitive
- Stable Fuel prices

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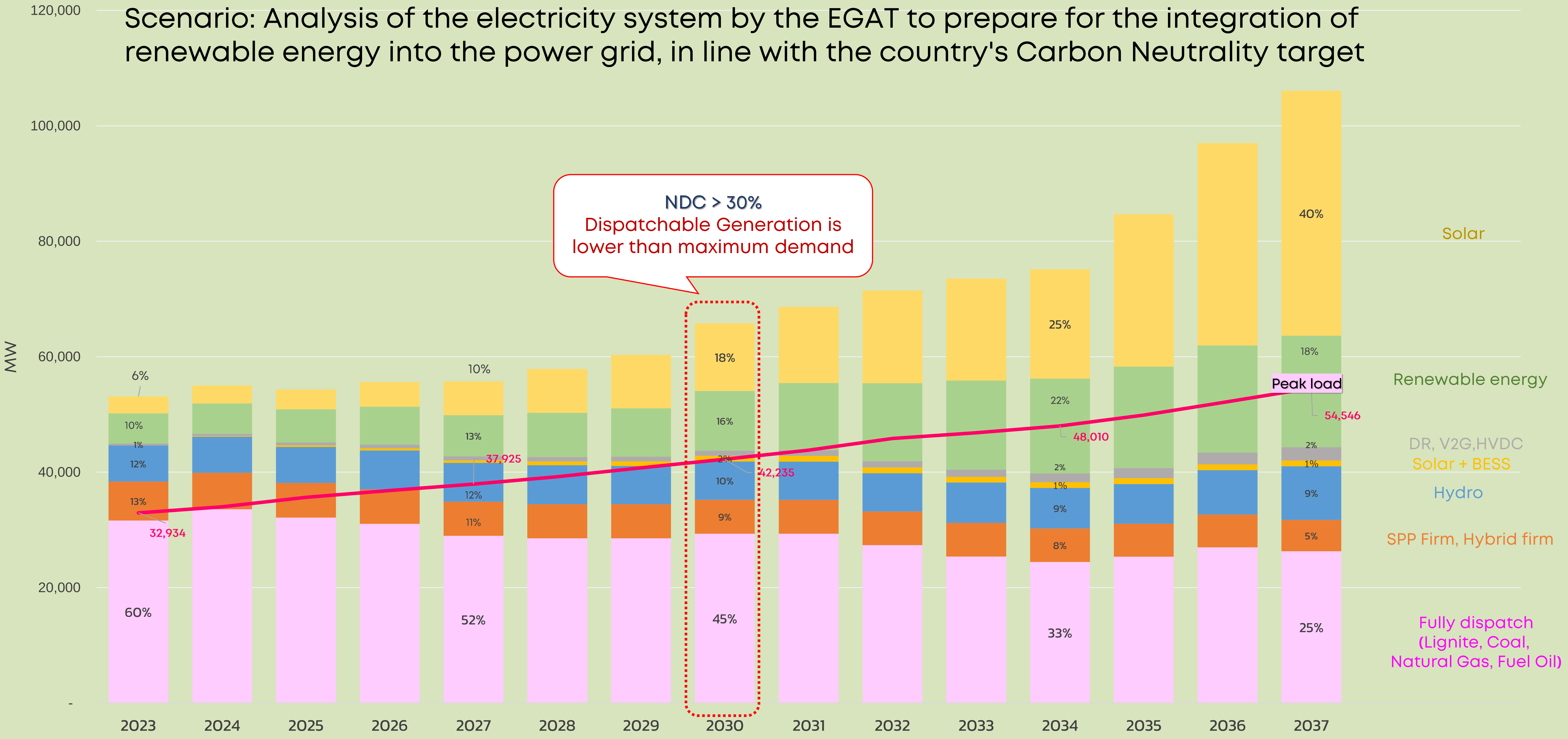
In conclusion, Small Modular Reactors (SMRs) represent **a stable, clean energy source** that can provide consistent, low-carbon making them a **vital part of the future** energy landscape

THANK YOU

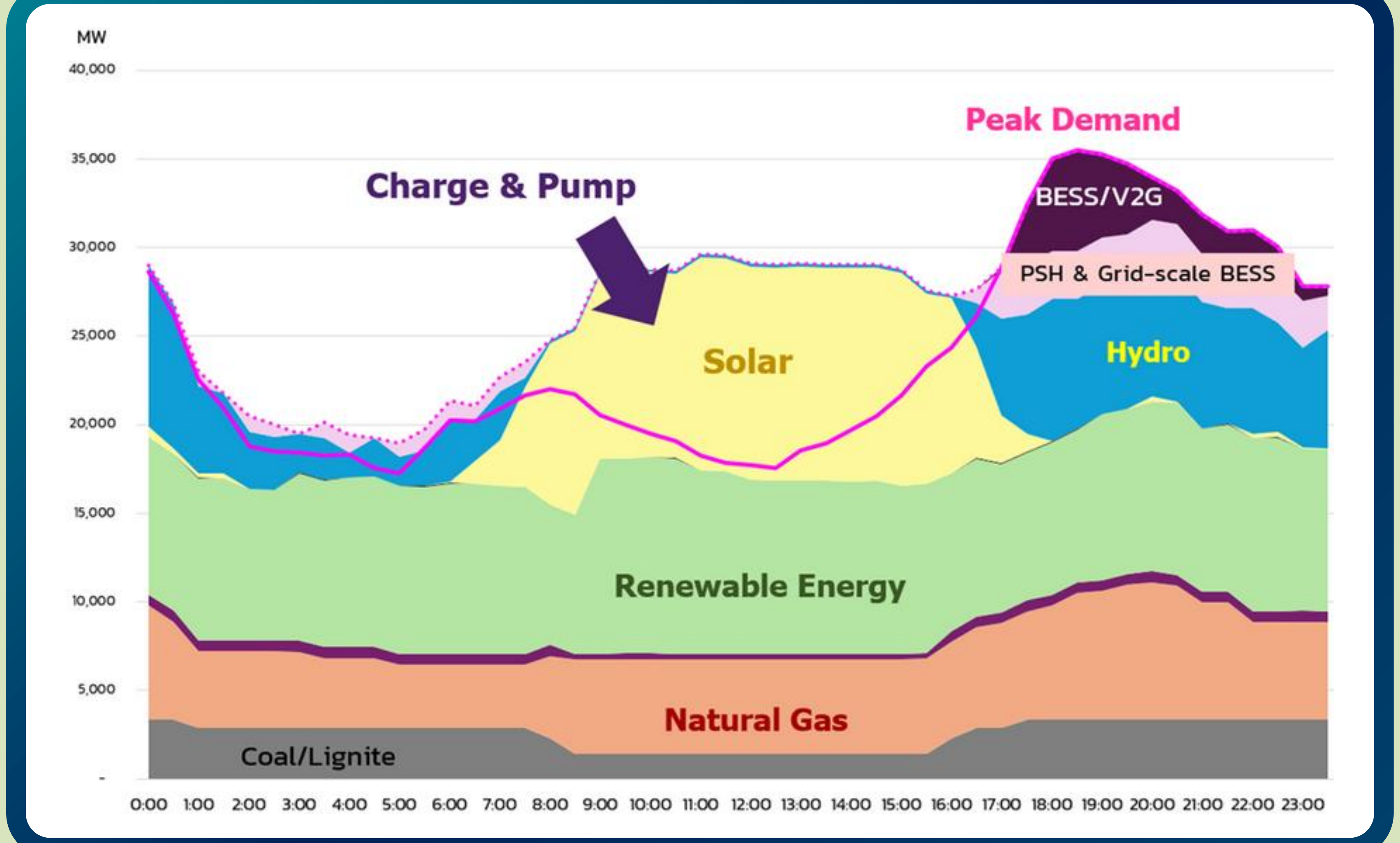
The increase in the proportion of renewable energy

Scenario: Analysis of the electricity system by the EGAT to prepare for the integration of renewable energy into the power grid, in line with the country's Carbon Neutrality target



Challenge of Developing Green Energy

" Excess Power Generation Management "



- During the period when **solar power generation exceeds daytime demand** (8:00 AM - 4:00 PM), **pumped-storage hydropower plants and grid-scale battery energy storage systems can absorb the excess energy**. This stored energy can then be used to **support power supply during peak load periods** (6:00 PM - 10:00 PM), **alongside wind energy** (high fluctuation with a low plant factor) to enhance the stability of the power system.
- Our mission is managing power generation to **maximize the benefits of electricity usage for the country** (Energy Management). This plays a crucial role in driving the green economy and enhancing Thailand's competitiveness.

Our commitment to achieving a sustainable energy transition

EGAT, as the nation's energy security provider, is prepared to tackle challenges arising from new innovations and technologies by developing modern and stable power system management approaches that simultaneously address energy security needs.

ENERGY SECURITY

Develop the national power grid to ensure stability and resilience,enabling regional electricity trade and exchange while enhancing the stability of renewable energy integration into the system

ECONOMY

Collaborate with the government to manage fuel resources, **optimize electricity production costs, and ensure appropriate investments** in the power system to avoid burdening the public with higher electricity bills

ENVIRONMENT

Increase the proportion of electricity generation from renewable energy, upgrade power plants and systems with new technologies, and promote participation from all sectors in efficient and environmentally friendly energy usage