



# Country Update: Thailand

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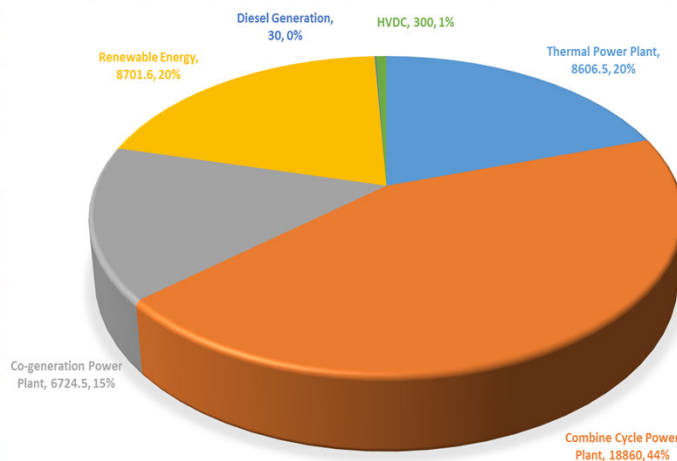
# Outline

- ❖ **Status of National Generation, Transmission and Distribution Master Plans**
- ❖ **Cross border cooperation (import and export)**
- ❖ **Overview of National Grid Codes**
- ❖ **New development/initiative for renewable energy, energy efficiency and conservation, demand side management**
- ❖ **Latest policy initiatives being taken by the country**

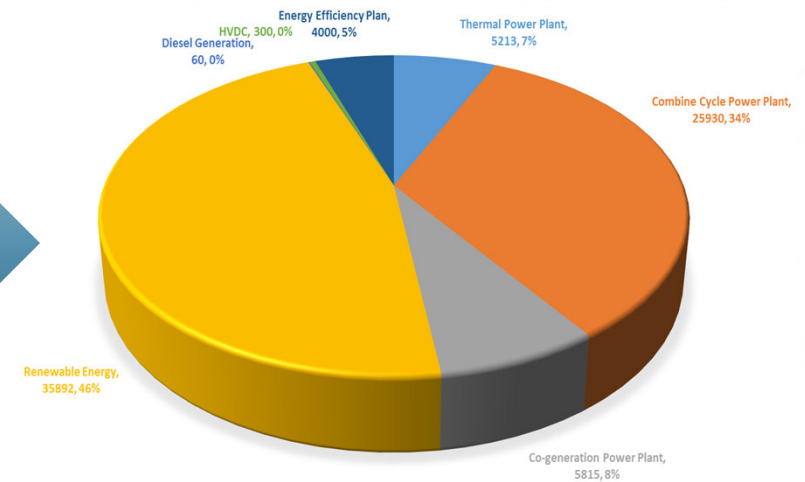


# Status of National Generation, Transmission and Distribution Master Plans

# Generation in Thailand



Now Thailand have total Contract Capacity of 43,222.6 MW.



According to PDP 2018, In year 2037 the total Contract Capacity will be 77,210 MW.

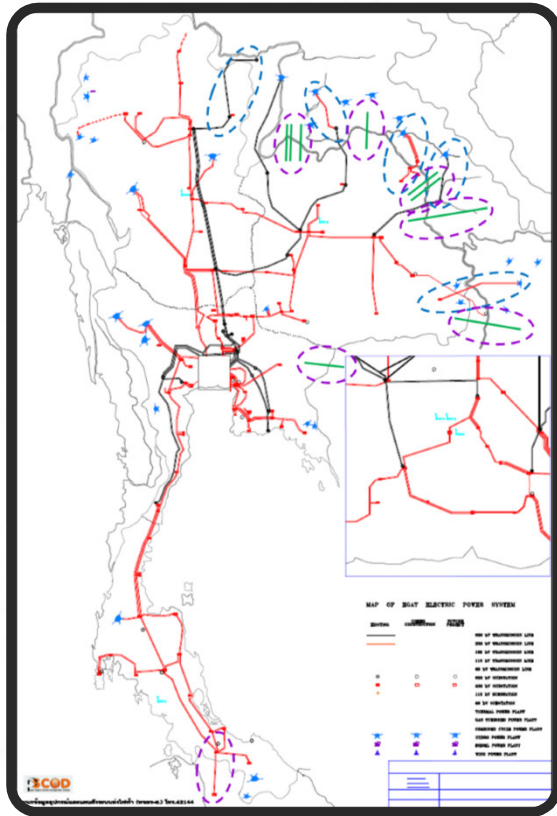
## Existing Transmission & Distribution System in Thailand

Substation, Transformer Rated & Transmission Line Length October 2019				
	Voltage Level	Substation		Transmission Line Length (Circuit-Kilometers)
		Number of Substation	Transformer Rated (MVA)	
Summation of Transmission System (EGAT)	500 kV	22	39,949.71	6,575.182
	230 kV	82	64,000.01	15,142.307
	115 kV	125	14,998.16	13,792.814
	132 kV	-	133.40	8.705
	69 kV	-	-	18.800
	300 kV HVDC	-	388.02	23.066
<b>Total</b>		<b>229</b>	<b>119,469.30</b>	<b>35,560.874</b>



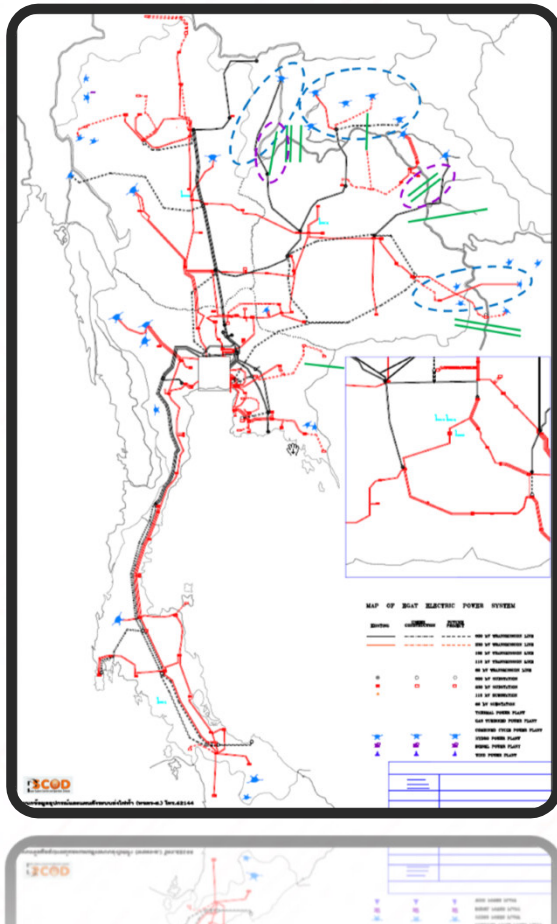
# Cross border cooperation (import and export)

# Existing Foreign Generation & Interconnection



	FIPP	Contract Capacity (MW)	Interconnection	Circuits
FIPP	Theun-Hinboun	434	230 kV Nakhon Phanom 2 - Thakhek	2
	Houay Ho	126	230 kV Ubon Ratchathani 2 - Houay Ho	2
	Nam Theun 2	948	500 kV Roi Et 2 - Nam Theun 2	2
	Nam Ngum 2	596.6	500 kV Udon Thani 3 - Nabong	2
	Hongsa Power	1,473	500 kV Nan - Hongsa	2
	Nam Ngieb	261	500 kV Udon Thani3 – Nabong	2
	Xaiyaburi	1,285	500 kV Thali - Xaiyaburi	2
Interconnection	EDL		115 kV Nong Khai - Thanaleng	1
	EDL		115 kV Nong Khai - Phone Tong	2
	EDL		115 kV Bung Kan - Pakxan	1
	EDL		115 kV Nakhon Phanom - Thakhek	2
	EDL		115 kV Mukdahan 2 - Pakbo	1
	EDL		115 kV Sirindhorn - Bangyo	1
	EDC		115 kV Wathana Nakhon – Siem Preap	1
	TNB	300	300 kV HVDC Khlong Ngae - Gugun	1

# Foreign Generation, Interconnection & Transmission Plan



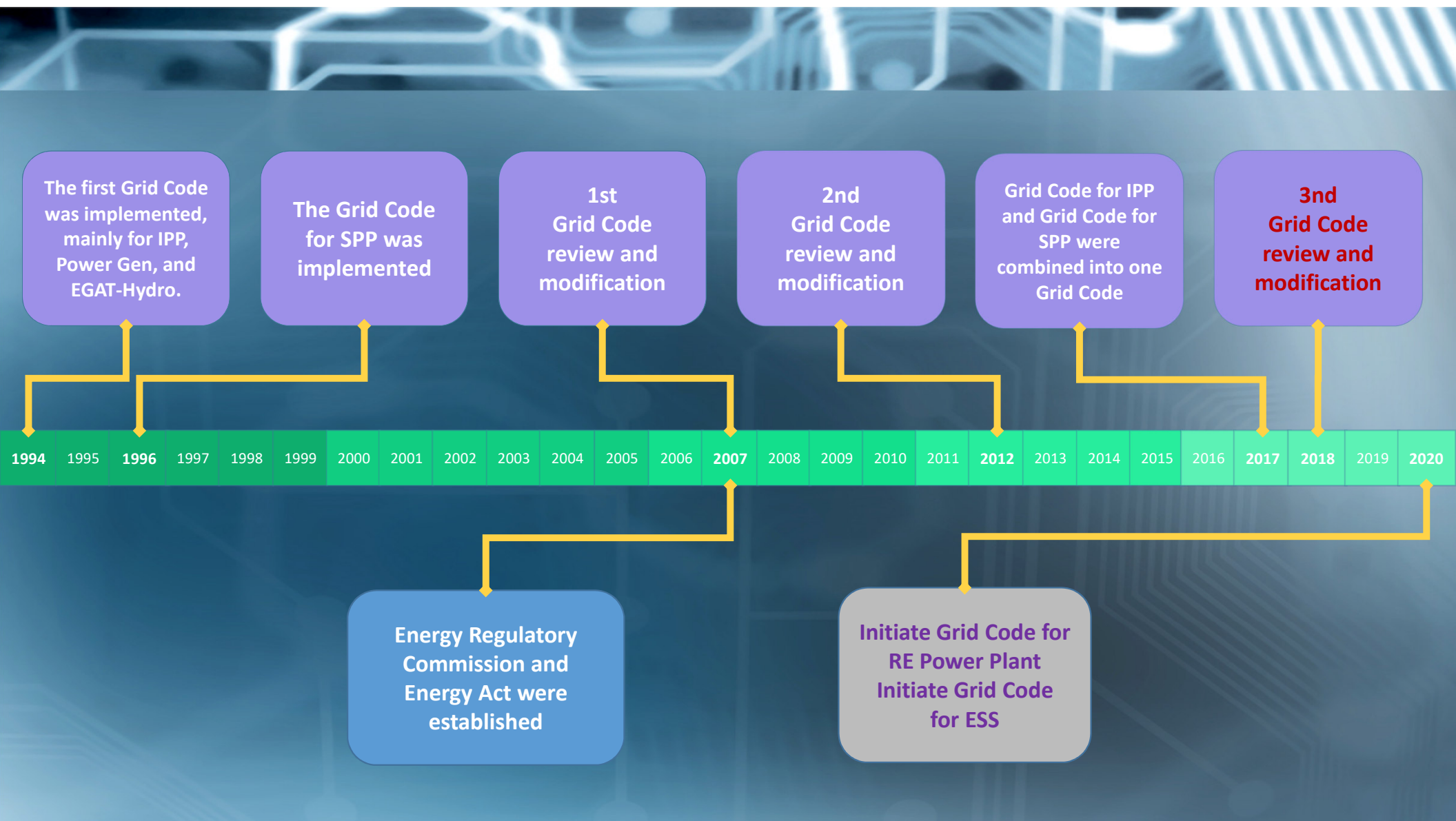
	FIPP	Contract Capacity (MW)	Interconnection	Circuits	Complete
FIPP	Xe-Pain Xe-Namnoy	390	230 kV Ubon Ratchathani 3 - Xe-Pain Xe-Namnoy	2	6 DEC 2019
	Nam Theun1	523	500 kV Udon Thani 3 – Nabong (existing)	2	23 MAY 2022
	Nam Ngum3	440	500 kV Udon Thani 3 – Nabong (existing)	2	DEC 2026
Interconnection	EDL		115 kV Nakhon Phanom – Thakhek *	2	Waiting for Laos
	EDL		115 kV Sirindhorn 2 - Bangyo	2	JUN 2020
	EDL		115 kV Thali - Paklai	1	JAN 2021

	Future 500 kV Transmission Line	Circuits	Complete
North-Eastern Area	500 kV Chaiyaphum 2 - Roi Et 2	2	DEC 2019
	500 kV Roi Et 2 - Ubon Ratchathani 3	2	MAR 2020
	500 kV Nakhon Ratchasima 3 - Ubon Ratchathani 3	2	SEP 2023
	500 kV Nakhon Ratchasima 3 - Chaiyaphum 2	2	SEP 2023
Metropolitan Area	500 kV Nakhon Ratchasima 3 - Khlong Mai	2	OCT 2023
	500 kV Tha Tako - Sam Khok	2	OCT 2022
Southern Area	500 kV Chom Bung - Bang Saphan 2	2	SEP 2021
	500 kV Bang Saphan 2 - Surat Thani 2	2	SEP 2021
	500 kV Surat Thani 2 - Puket 3	2	SEP 2021
	500 kV Surat Thani 2 - Thung Song	2	DEC 2022
	500 kV Thung Song - Hat Yai 3	2	DEC 2022





# Overview of National Grid Codes



The first Grid Code was implemented, mainly for IPP, Power Gen, and EGAT-Hydro.

The Grid Code for SPP was implemented

1st Grid Code review and modification

2nd Grid Code review and modification

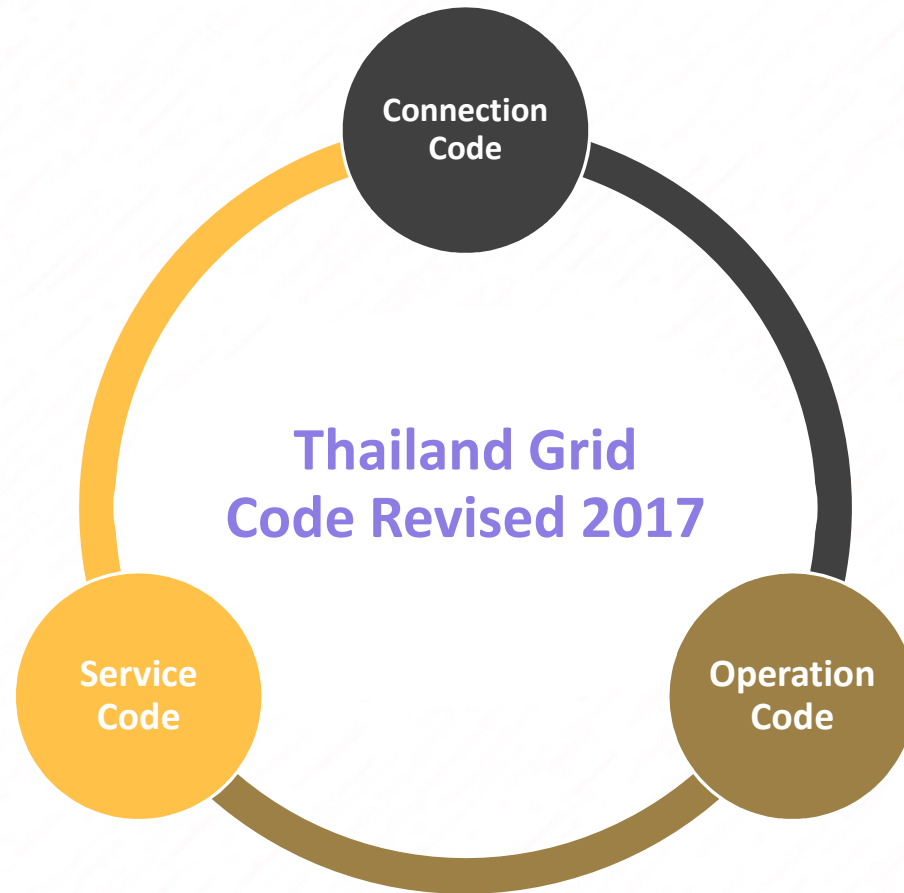
Grid Code for IPP and Grid Code for SPP were combined into one Grid Code

3rd Grid Code review and modification

Energy Regulatory Commission and Energy Act were established

Initiate Grid Code for RE Power Plant  
Initiate Grid Code for ESS

# Thailand Grid Code Structure





## Thailand Grid Code Structure

### Connection Code

- Independent Power Producer (IPP)
- Small Power Producer (SPP)
- Independent Power Supplier (IPS)
- Connection Rule for Distribution System and EGAT  
Concerning Connection of Generation System to the Grid



## Thailand Grid Code Structure

### Operation Code

- General Topics
- Independent Power Producer (IPP)
- Small Power Producer (SPP)
- Independent Power Supplier (IPS)
- Distribution System



## Thailand Grid Code Structure

### Service Code

- Service Definitions and Qualifications of System Users
- Use of EGAT's Transmission System Requesting Form and Documents
- Regulations and Conditions for Using EGAT's Transmission System
- Service fees, and payment terms
- Duties and responsibilities of System Users



## Thailand Grid Code Structure

The current National Grid Code needs to be revised for better operation and management of wind farms and solar farms.

- Who shall forecast RE generation?
- RE generation forecasting error/accuracy management
- What are the data (static and dynamic) that RE power plants shall submit to TSO?
- RE curtailment rules and procedures



## Thailand Grid Code Structure

The current National Grid Code also needs to be revised to support new technologies and operating tools.

- Define the operation of Demand Response Control Center (DRCC)
- Data or information exchange between Load Aggregators and DRCC
- Battery Energy Storage System operation
- Operation of other new technologies



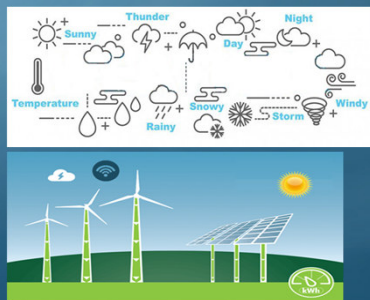


New development/initiative for renewable energy,  
energy efficiency and conservation, demand side management

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### RE Forecast Center

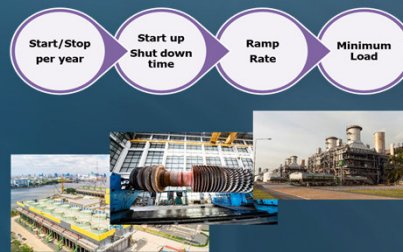
Forecast the electricity generated from RE for generation planning and power system control and operation by NCC



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### Generator Flexibility

Increase combined cycle generator flexibility



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### Energy Storage System

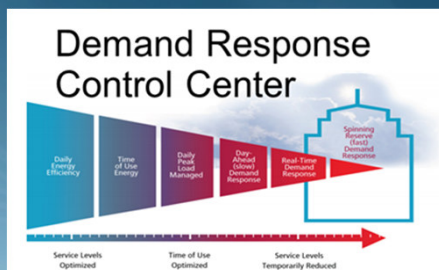
- Pump Storage
- Battery Energy Storage System
- Hydrogen Energy Storage



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### Demand Response Control Center

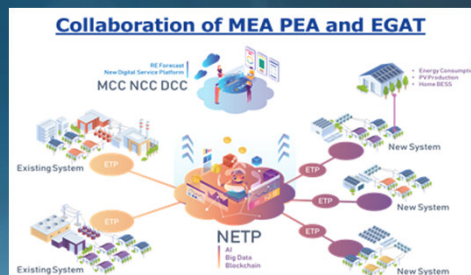
Demand side management as a tool for more system flexibility that is controllable by NCC



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### National Energy Trading Platform

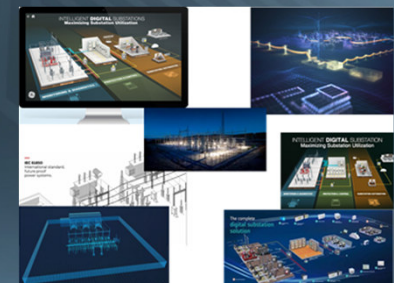
Real-time energy trading platform using block chain to enable peer2peer energy trading



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### Digital Substation

Utilize Intelligent electronic devices (IEDs) for power system control and operation





Latest policy initiatives being taken by the country

## Energy Policy Highlight

# Roadmap towards The Energy Transformation



**4D+1E**



**DECARBONIZATION**



**DECENTRALIZATION**



**ELECTRIFICATION**



**DIGITALIZATION**



**DE-REGULATION**

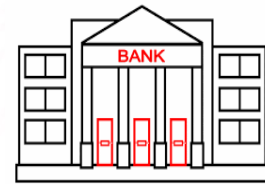
# Energy for All

## Community Power Plant



### Community Power Plant Format

Proposed generation capacity based on local demand and availability of the transmission and distribution systems.



Initial investment is provided by the private entity, then communities may invest after SCOD.

Community-based enterprise (Shareholder)

Communities sell agricultural residues as fuel to the power plants.



Private Entity (Shareholder)

PEA/MEA

Purchased price based on FIT

Financial benefits returns to the community





# Comments on RPTCC Activities and Recommendations for the Future

As the trend of renewable energy continues to spread across the world including GMS, it is advisable for RPTCC to look at **Inter-regional renewable energy forecast for GMS** for renewable energy management purposes, especially for wind farms and solar farms.



- Thank You -