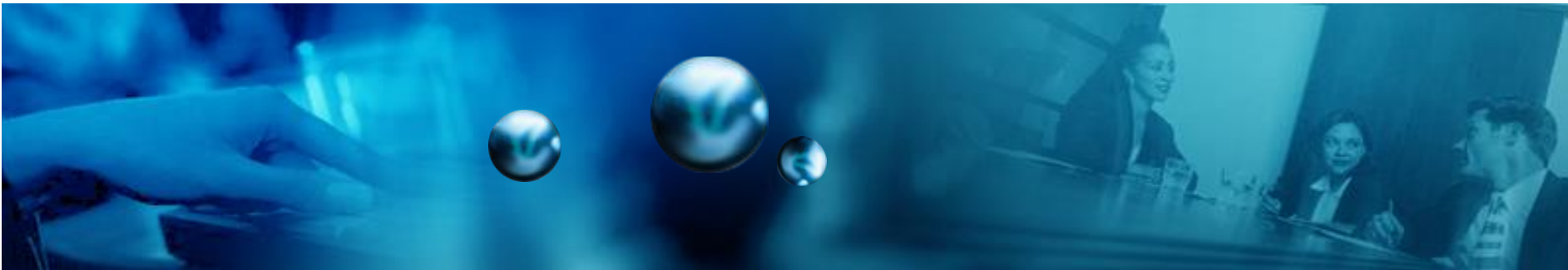




**MINISTRY OF INDUSTRY AND TRADE**  
**Electricity Regulatory Authority of Vietnam**

# **Smart Grids in Viet Nam – Market Development, Frameworks and Project Examples**



Presented by: Mr. Nguyen The Huu  
Power System Dept.

**Frankfurt, Jul 2019**

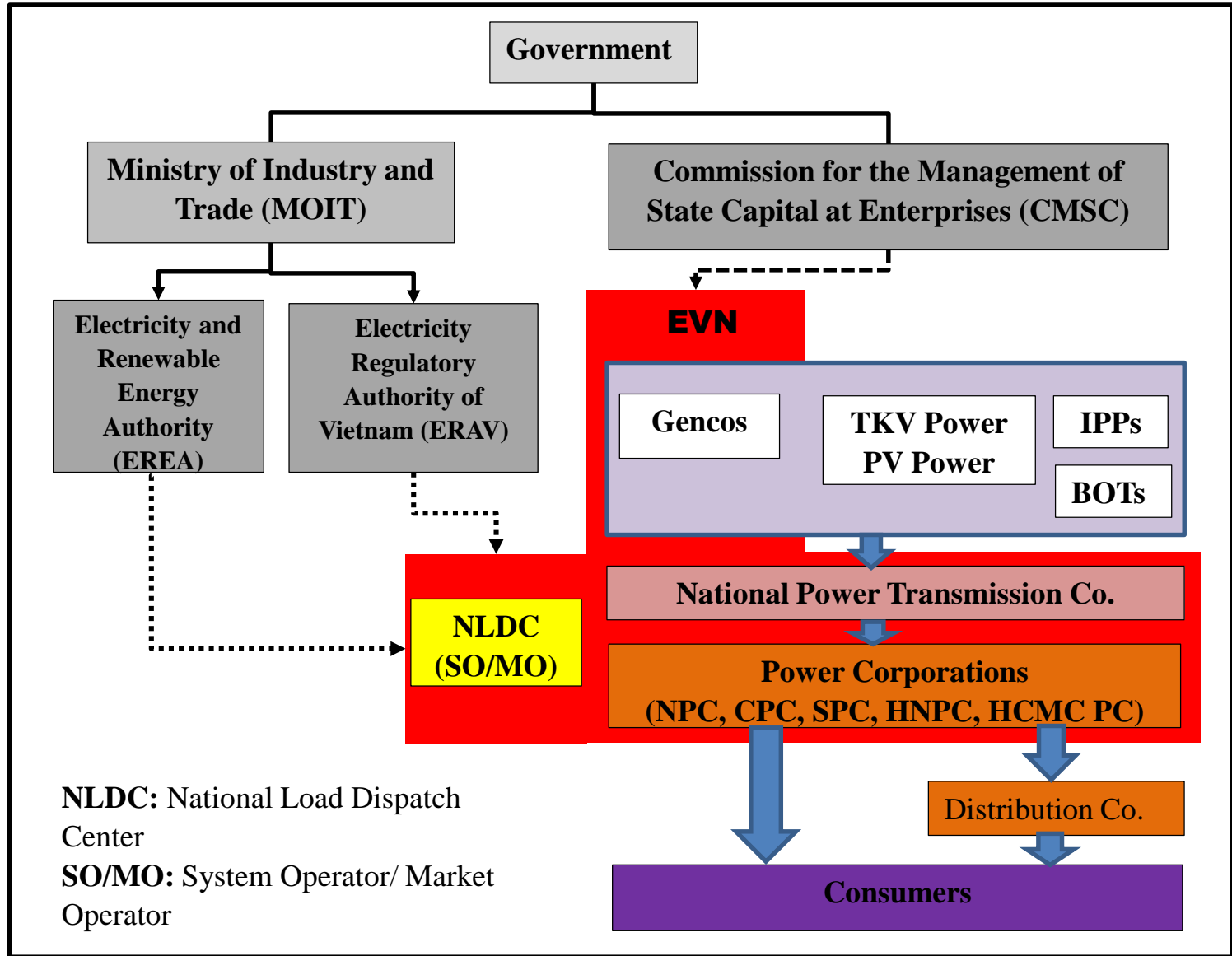
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# 1. Vietnam Power Sector Overview

## Power Sector Structure



# 1. Vietnam Power Sector Overview

## Electricity Regulatory Authority of Vietnam (ERAV)

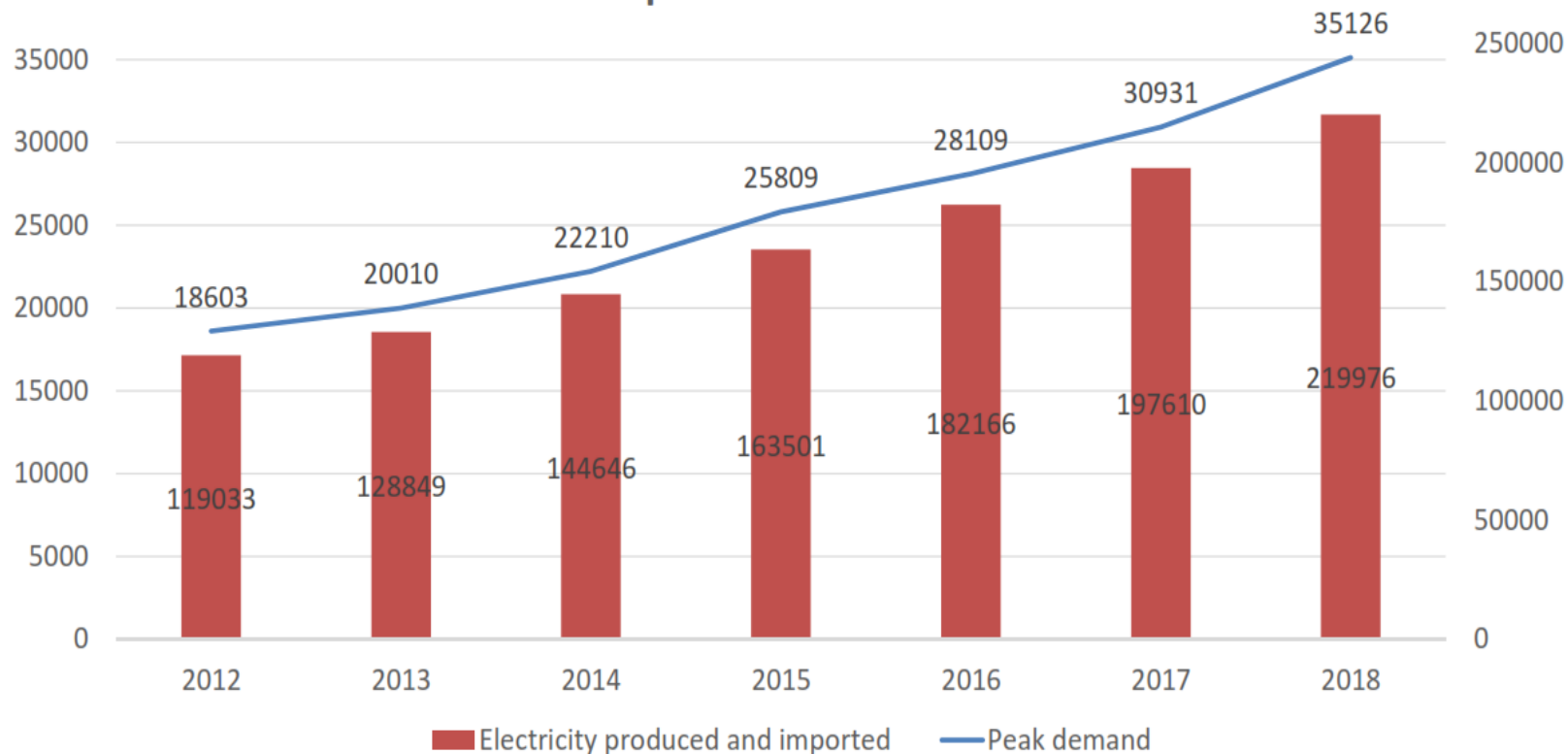
- ❖ Established in October 2005 as a subsidiary of MOIT
- ❖ Taking the roles of electricity regulator
- ❖ Key functions: assisting the MOIT in:
  - Development of competitive electricity market and market-oriented sector reform
  - Economic regulation (electricity pricing)
  - Monitoring supply/demand balance to assure secure, stable and reliable power supply
  - Power supply quality, smart grid development and demand side management program
  - Licensing
  - Dispute resolving in electricity activities



# 1. Vietnam Power Sector Overview

## Load growth rate

Annual Electricity produced (million kWh) and Peak demand (MW) in the period of 2012-2018



Average growth rate of the period 2012-2018	(%)
Peak demand	<b>11.21</b>
Annual Electricity produced and imported	<b>10.79</b>





# 1. Vietnam Power Sector Overview

## Elasticity between Electricity – GDP growth rate

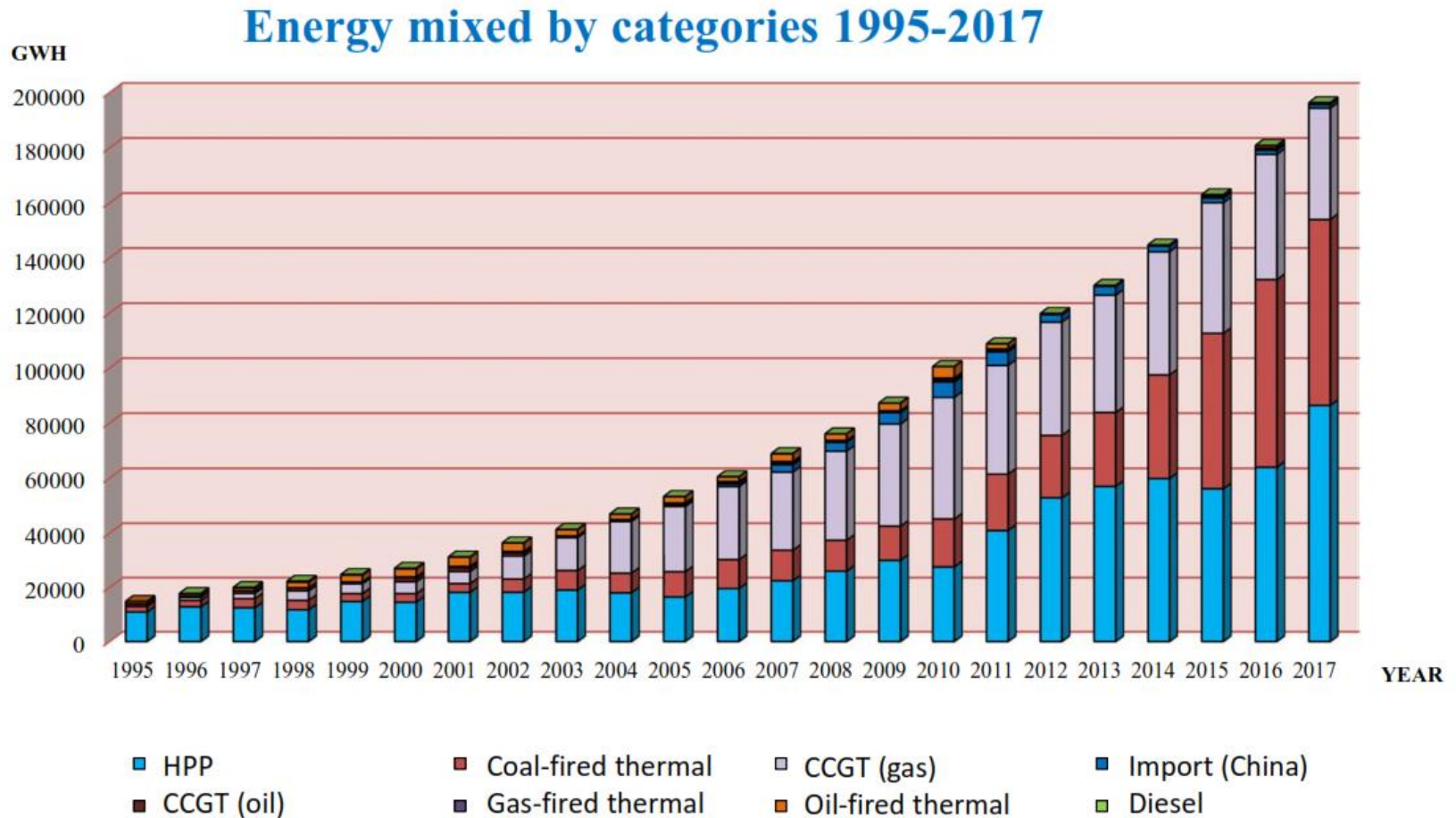
Year	Population (thousand)	GDP growth rate (%)	Elasticity
2012	88.809,3	5,03	2,27
2013	89.759,5	5,42	1,72
2014	90.728,9	5,8	2,00
2015	91.713,3	6,2	1,89
2016	92.695,1	6,7	1,60
2017	93.682,4	6,81	1,37
2018	94.670	7.08	1,60

Source: General Statistics  
Office of Viet Nam



# 1. Vietnam Power Sector Overview

## Energy mixed by categories 1995-2017



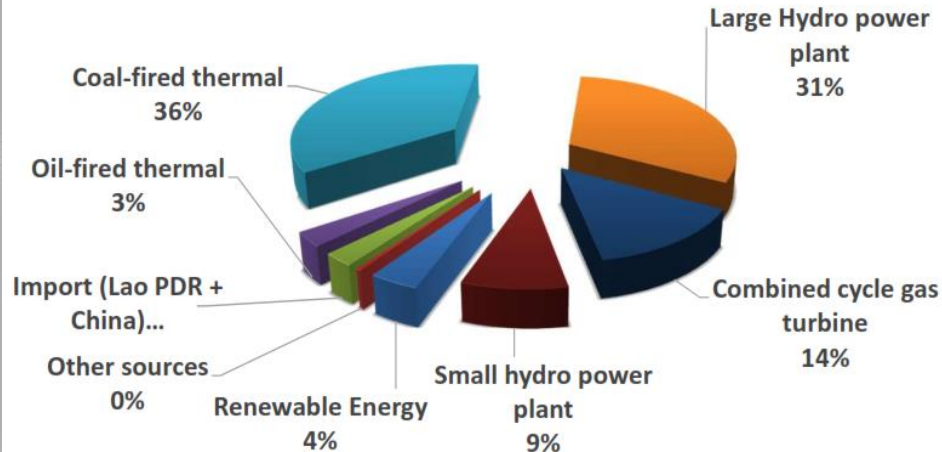
**Source:** Production report – NLDC 2017



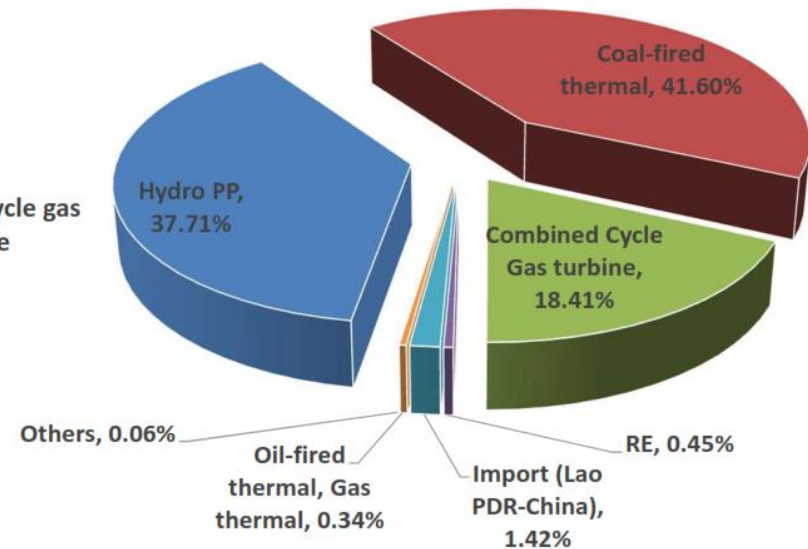
# 1. Vietnam Power Sector Overview

## Installed capacity - Energy mixed by categories 2018

Installed capacity by categories in 2018



Energy mixed by categories 2018



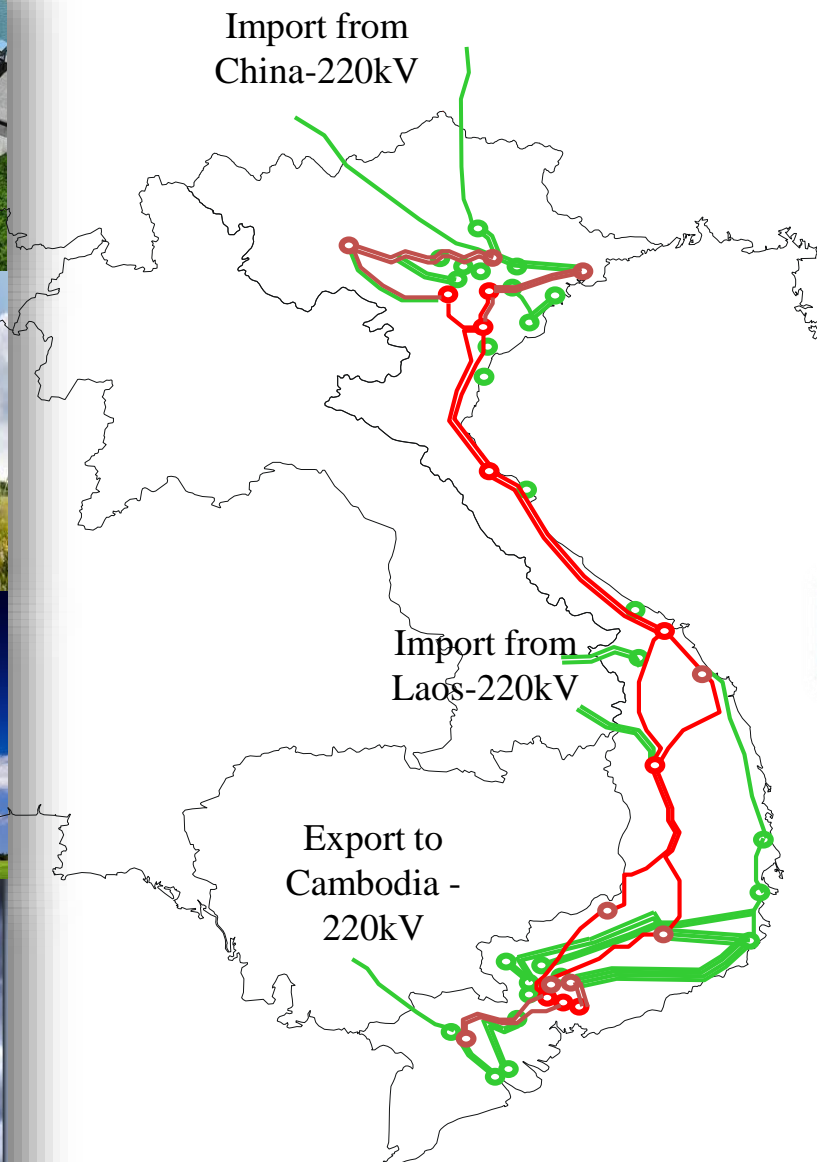
<b>Total (MW)</b>	<b>51200</b>
Renewable Energy	2076
Other sources	218
Import (Lao PDR + China)	1340
Oil-fired thermal	1507
Coal-fired thermal	18448
Large Hydro power plant	16008
Combined cycle gas turbine	7182
Small hydro power plant	4422





# 1. Vietnam Power Sector Overview

## Transmission grid



### Transmission grid (12/2018)

- Connect 3 regions
- Voltage level: 500-220kV
- 500 kV: 27 substations – 29400 MVA;
- OHL 500 kV: 7994 km

	Unit	Quantity
500kV substation	MVA	<b>33300</b>
500kV lines	km	<b>7994</b>
220kV substation	MVA	<b>57441</b>
220kV Lines	km	<b>17059</b>

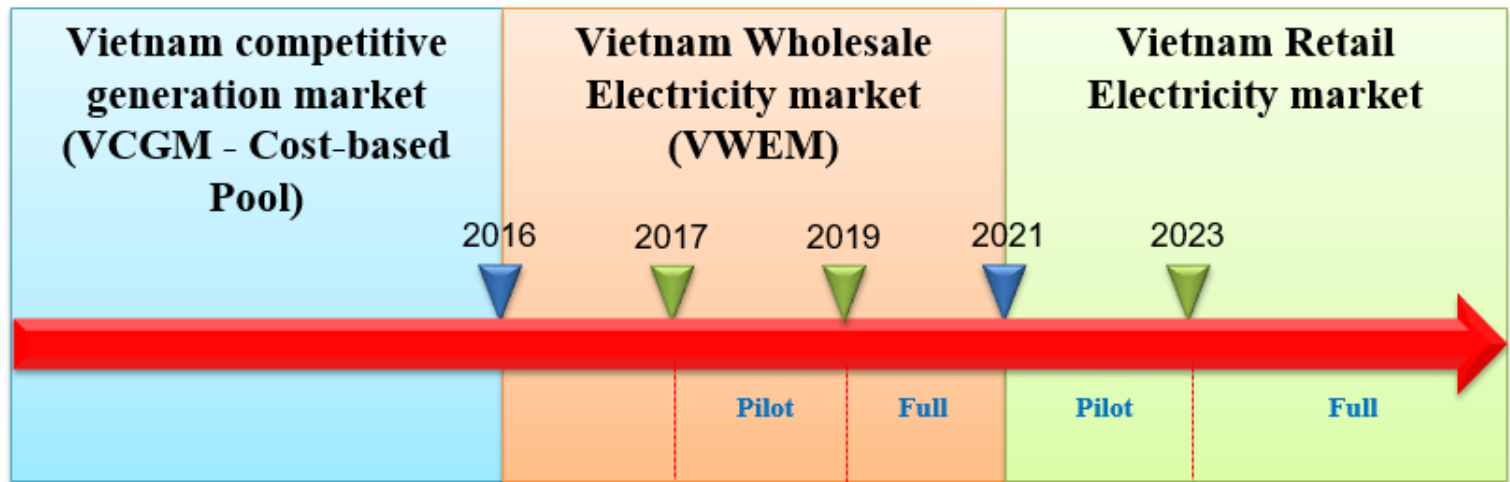
### Transmission limit (MW)

Year	North – Center	Center – South
2015	<b>1800</b>	<b>3500</b>
2016	<b>2200</b>	<b>4000</b>
2017-2020	<b>2400</b>	<b>4000</b>

# 1. Vietnam Power Sector Overview

## Power market development roadmap

- Power market development market in Vietnam:  
Decision number 63/2013/QĐ-TTg of Prime Minister



## 2. Smart Grid Development Roadmap

### Overview



8 Nov  
2012

**Prime Minister approved the Smart Grid Development Project in Vietnam - 3 phases Roadmap**

17 Jan  
2013

**Minister of MOIT established the SG Development Steering Committee in Vietnam (ERAV is the permanent office)**

2012-2016

**Phase 1/initial phase (2012-2016)**

**Phase 2 (2017-2022)**

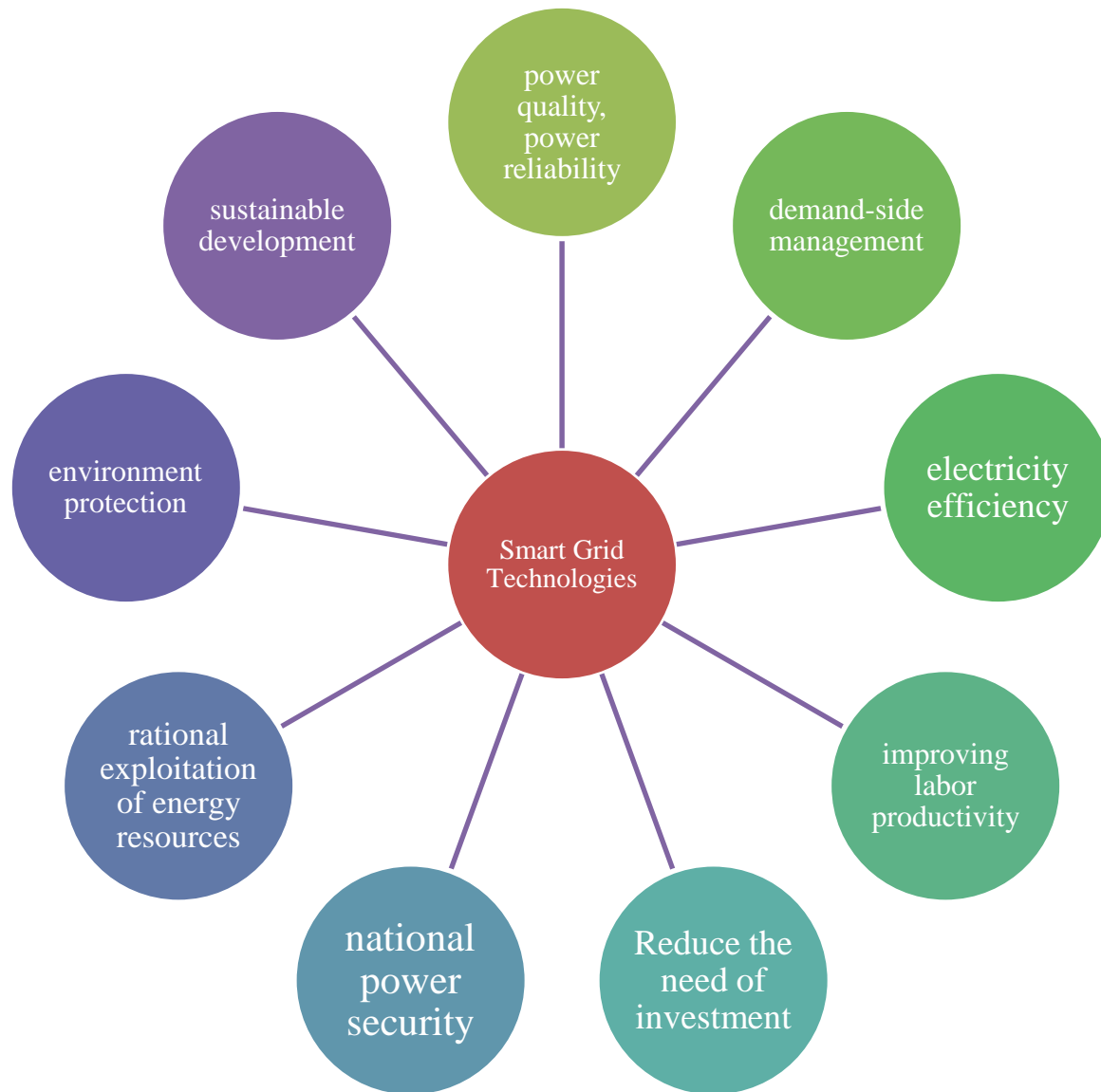
2017-2022

2023

**Phase 3 (After 2022)**

## 2. Smart Grid Development Roadmap

### Targets - Overall





## 2. Smart Grid Development Roadmap

### Targets - Detail

- Complete the legal documents for smart grid development:
- Build the IT infrastructure, Supervisory Control and Data Acquisition (SCADA):
  - 2013: new SCADA systems established, connect to all power plant (above 30 MW) and substation (from 110 kV and above)
  - 2016: applied all EMS functions
  - 2022: SCADA/DMS for all provincial power companies
- Improve power reliabilities: reduce SAIDI by 20%, SAIFI by 10% per 5 years
- Improve labor productivity: unmanned substation, remote control for medium voltage grid.
- Advance Metering Infrastructure (AMI): cut 1-2% of peak load
- Losses: reduce from 9,23% (2011) to 8% (2015)
- Encourage Renewable Energy
- Smart Customer: well-informed, proactive in using electricity



## 2. Smart Grid Development Roadmap

**Decision 1670/QĐ-TTg of the Prime Minister dated 8 November 2012 approving on Smart Grid Development Program**

### Smart Grid Program

Smart  
Transmission  
and System  
Operation  
Subprogram

Smart  
Distribution  
Network  
Subprogram

Smart  
Metering  
Subprogram

Smart  
Customers  
Subprogram

Transversal – Social Friendly subprogram

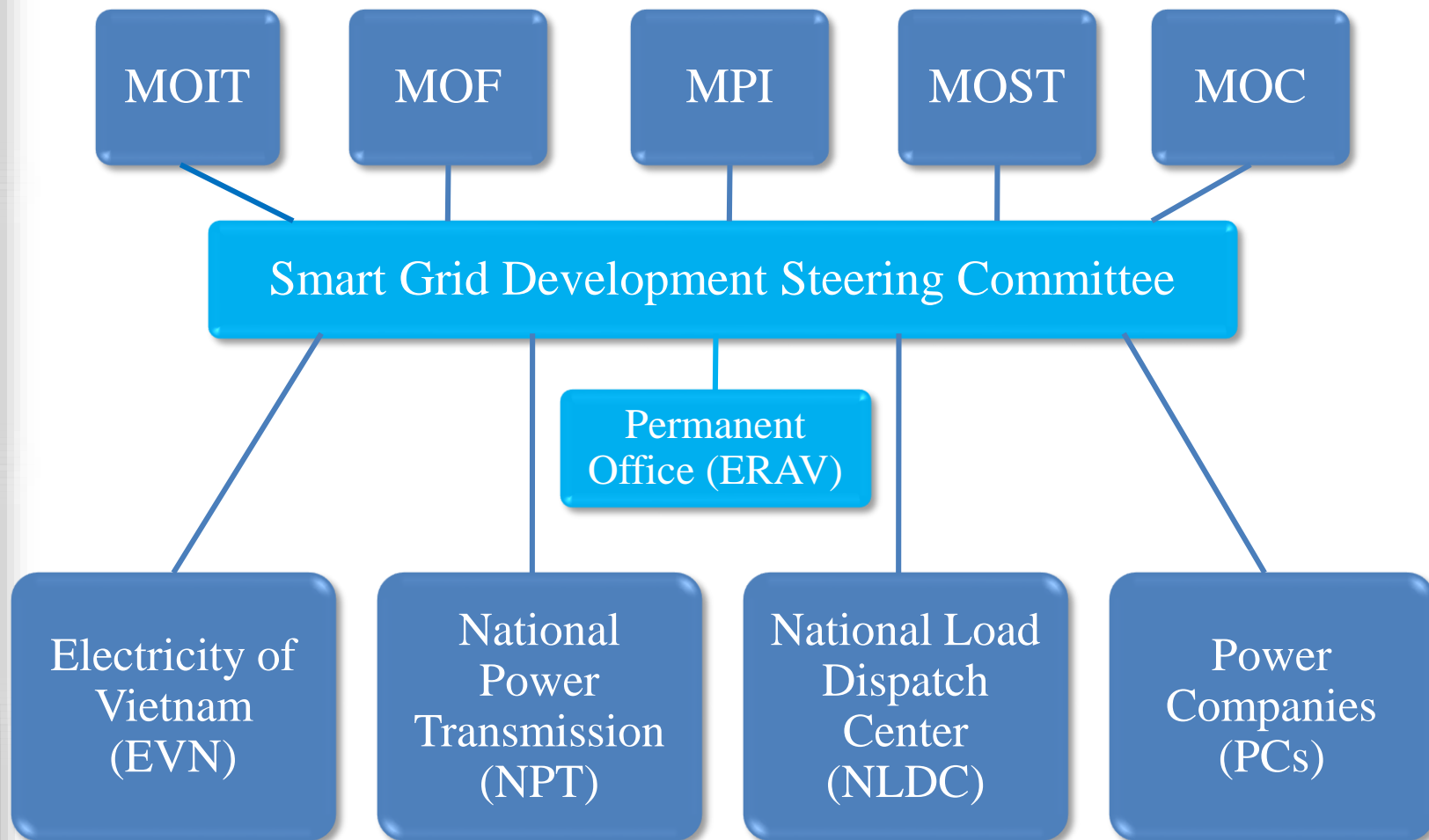
**Phase 1**  
**2012-2016**

**Phase 2**  
**2017-2022**

**Phase 3**  
**2022 and upward**

## 2. Smart Grid Development Roadmap

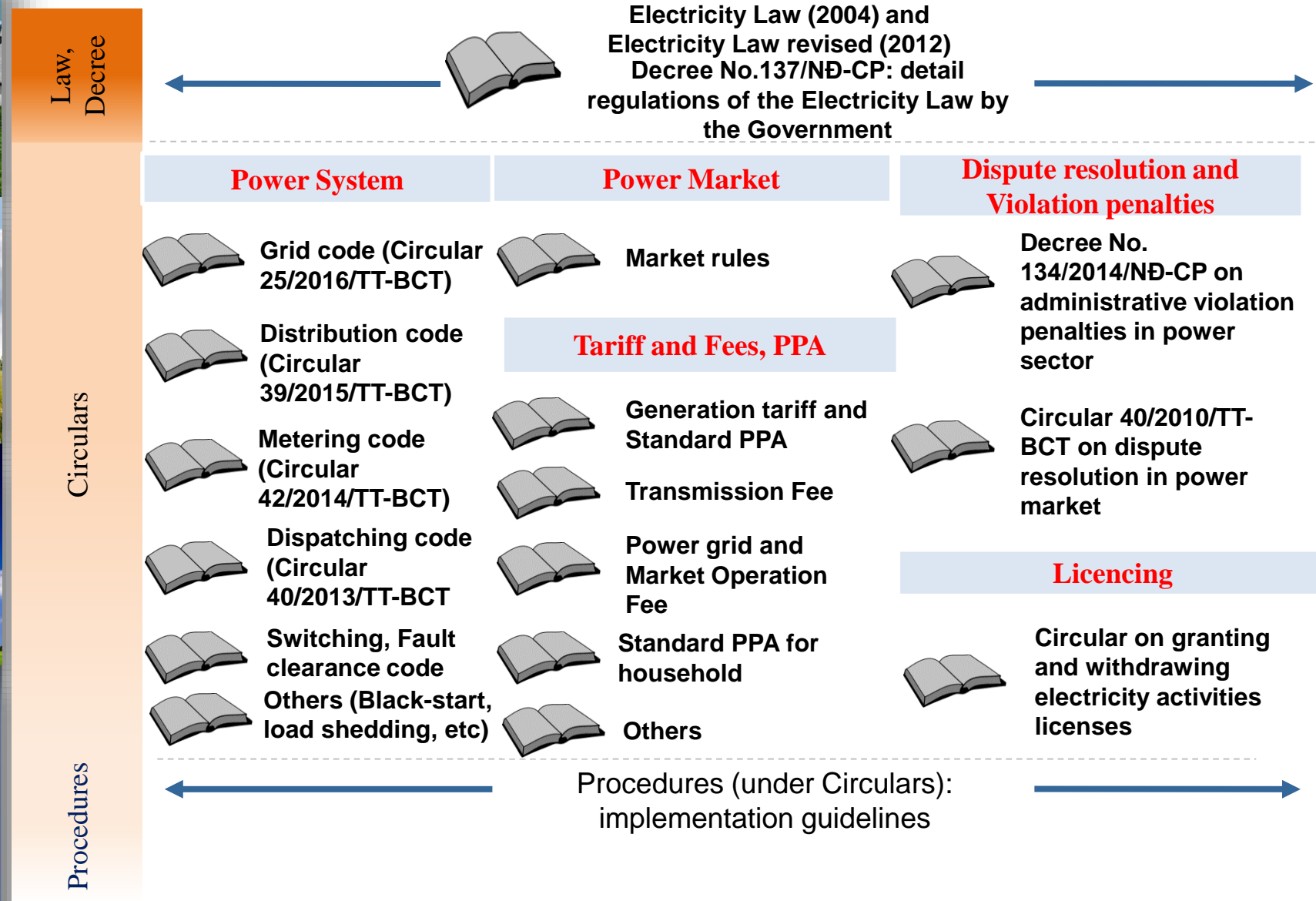
### Smart Grid Development Steering Committee





# 3. Smart Grid Frameworks and Results

## Legal framework





## 3. Smart Grid Frameworks and Results

### Legal framework

- New regulation on: unmanned substation, control center for power plants/substations, RE technical requirements (wind, solar), getting electricity (reduce time and requirement),
- Demand-side Management (DSM):
  - National program for Demand-side management of the period 2018-2020, towards 2030 (Decision 279/QĐ-TTg dated 08/3/2018 by Prime Minister)
  - Demand Response Roadmap and Implementation plan (Decision 175/QĐ-BCT dated 28/01/2019 by MOIT Minister)
- Wind power:
  - New FiT for wind (Decision 39/2018/QĐ-TTg dated 10/9/2018 by Prime Minister): 8,5 US cents/kWh – onshore; 9,8 US cents/kWh – offshore
  - Standard PPA for wind project (Circular 02/2019/TT-BCT dated 15/01/2019 by MOIT Minister)
- Solar power:
  - New FiT for solar (Decision 11/2017/QĐ-TTg dated 11/4/2017, Decision 02/2019/QĐ-TTg dated 08/01/2019 by Prime Minister): 9,35 US cents/kWh
  - Standard PPA for solar project (Circular 16/2017/TT-BCT dated 12/9/2017 by MOIT Minister)



### 3. Smart Grid Frameworks and Results

#### Result – SCADA/EMS/DMS

- New SCADA/EMS equipped in National Load Dispatch Center (2016)
  - Activated functions: State estimator, Automatic Generation Control (AGC), Open OTS, Open SOM
- SCADA connection (03/2019)
  - Big Power Plant (over 30MW): 99% connected (4% temporally lost connection)
  - 500kV Substation: 100% connected
  - 220kV substation: 100% connected (2% temporally lost connection)
  - 110kV substation: 96% connected (7% temporally lost connection)
- Remote metering (12/2018):
  - 99,7 % power plants
  - 100% substations (from 110kV and above)
  - 35,6% customer meters
- Unmanned substation:

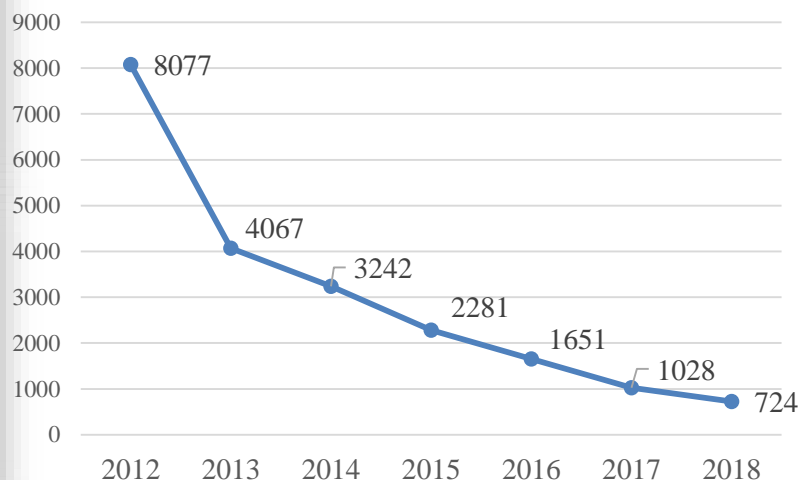


# 3. Smart Grid Frameworks and Results

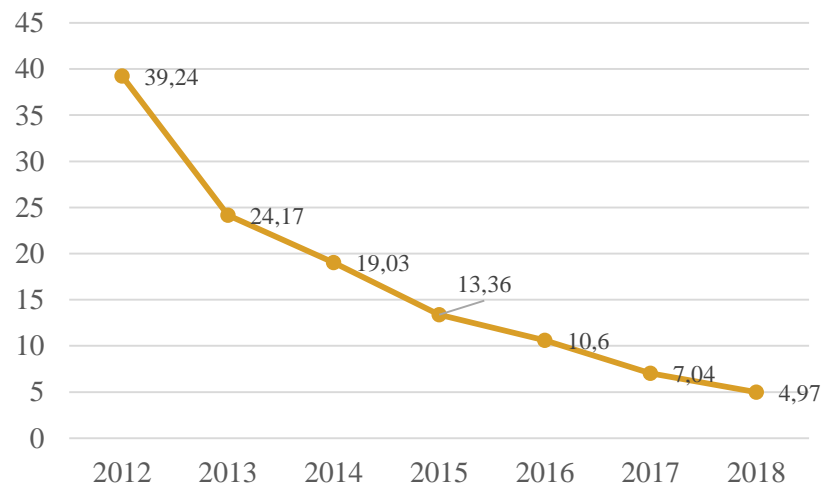
## Result – Reliability and Losses



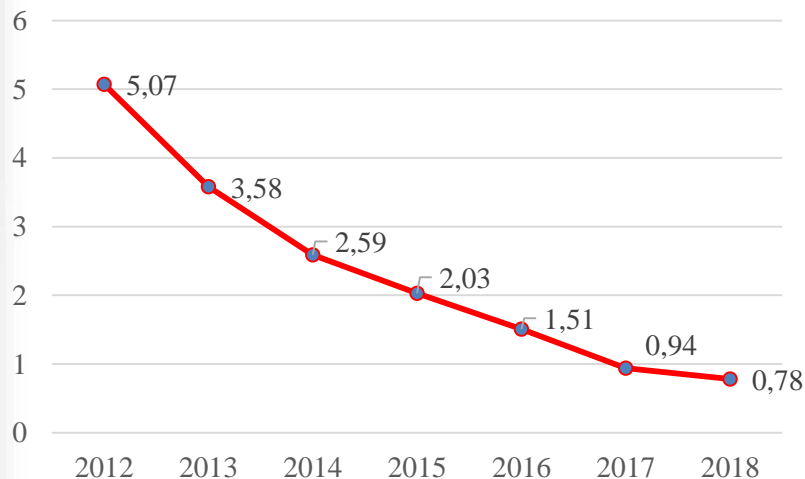
**SAIDI**



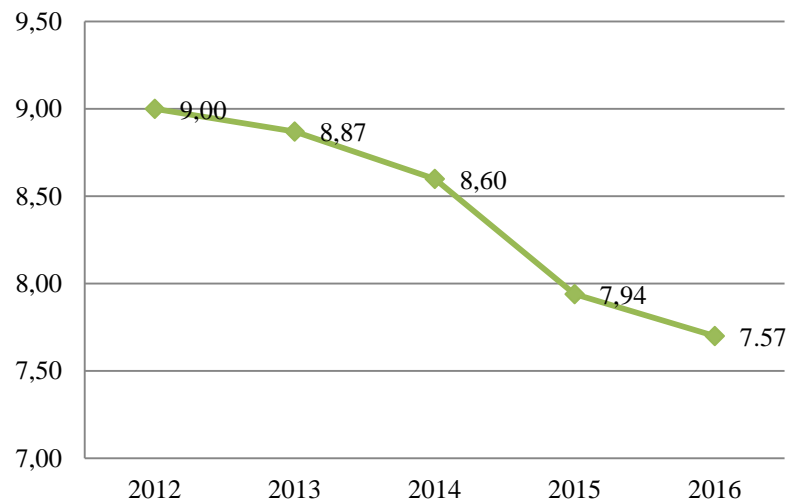
**SAIFI**



**MAIFI**



**Power Losses**



## 4. Project Examples

### Demand Response Pilot Project

In 2015, Ho Chi Minh City Power Corporation implemented successfully the Demand Response Pilot Project that include 02 programs as below:

- *Curtaible Load Program – CLP.*
- *Voluntary Emergency Demand Response Program – VEDRP.*





## 4. Project Examples

### **Demand Response Pilot Project – Required Processes**



Customer Registration

DR Event Notification

DR Event Baseline Determination

DR Event Performance  
Determination

DR Reduction and Incentive Rate  
Computation

## 4. Project Examples

### Demand Response Pilot Project - Summary

Events	Duration time	No. Participant	Average DR	% Reduction vs baseline	Total incentives (VNĐ)
CLP # 1	14h – 16h 7/10/2015	9	647 kW	5%	2.307.056
VEDRP # 1	10h – 12h 21/10/2015	10	653 kW	4%	10.578.765
CLP # 2	8h – 10h 4/11/2015	12	752 kW	6%	3.875.120
VEDRP # 2	15h – 17h 18/11/2015	11	461 kW	4%	3.465.392
<b>Total</b>			<b>628.25 kW</b>	<b>4.75%</b>	<b>20.226.333</b>



## 4. Project Examples

### Smart Grids for Renewable Energy and Energy Efficiency (SGREEE)

<http://gizenergy.org.vn/en/project/smart-grids-for-renewable-energy-and-energy-efficiency>

Period: 1/2017 - 12/2020

#### Action Area 1: Legal and Regulatory Framework

The action area will focus on strategic advice on future Smart Grids; stakeholder dialogue on a sector-wide ICT infrastructure; and regulations with ICT emphasis.

#### Action Area 2: Capacity Development

Main activities include fostering knowledge on Smart Grids; trainings on scenario techniques, forecasting and choice of technology and study tours of decision makers and practitioners.

#### Action Area 3: Technology Cooperation

The activities under this action area will help establish partnerships in research and development between German and Vietnamese sides. In addition, the action area also promotes the application of state-of-the-art technologies.



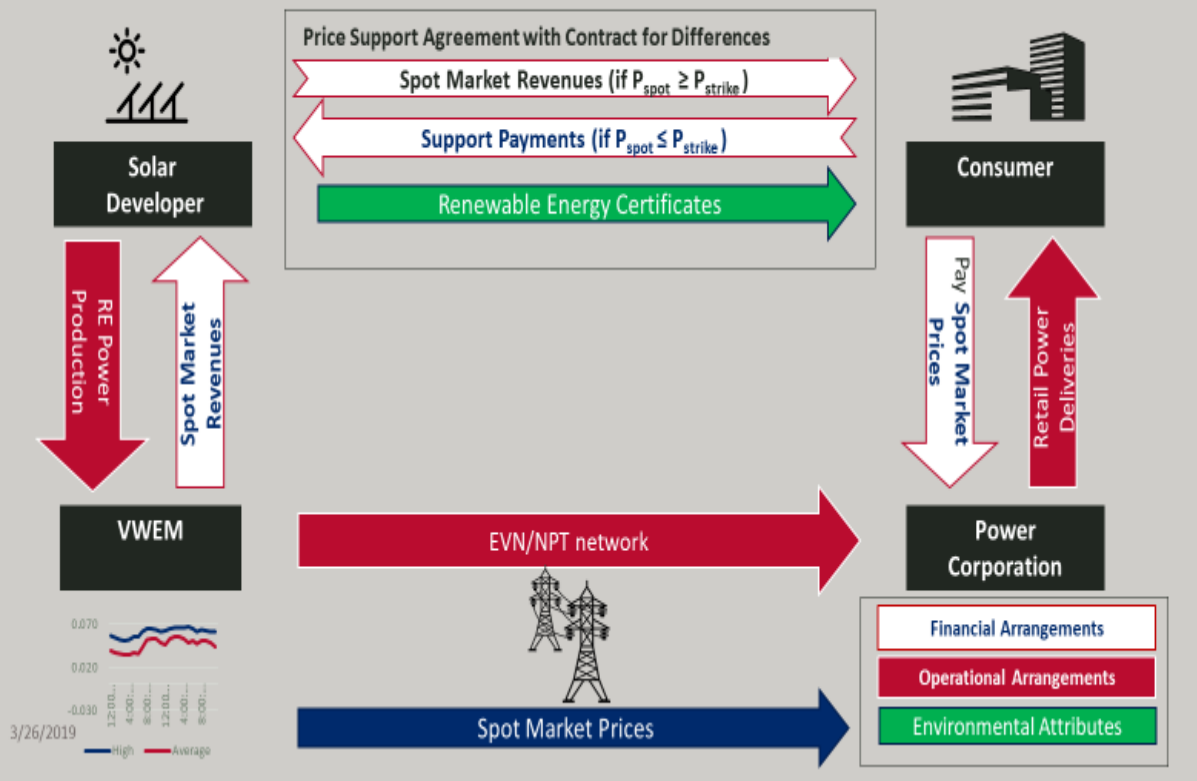


## 4. Project Examples

### Direct Power Purchase Agreement (DPPA) – Definition & Model

DPPAs are long-term contracts under which an off-taker, typically a commercial or industrial consumer, purchases electricity directly from a power generation company (GENCO)

#### DPPA Arrangements | Financial & Operational



**Seller:** RE GENCOs

**Buyer:** Customer (off-taker)

**Spot price:** VWEM's hourly spot market price (become half-hourly in the future)

**Strike price:** RE GENCOs long-term production costs

**DPPA:** a synthetic Contract for Difference PPA between Seller and Buyer though which Buyer pays the difference between strike price and spot price for a scheduled quantity of Seller production.



## 4. Project Examples

### Direct Power Purchase Agreement (DPPA) – Definition and Model

- DPPA tenure: 10-20 years, with the mutually agreeable option to extend
- Buyer (Consumer):
  - Access to wholesale market for up to 100% of power consumption and pays at spot market prices
  - DPPA fee: an additional charge for network cost and other extra cost of power sector agencies.
  - Pays (or be paid) to the Seller a difference between strike price and spot price for a scheduled quantity of Seller's production.
  - Receive Renewable Energy Certificate from RE GENCO.
- Seller (RE GENCO):
  - Sells 100% of generation into the wholesale market, receiving the spot market price
  - Receives an hourly price support payment (equal to strike price minus spot market price) for scheduled quantities of generation as specified in the DPPA between Buyer and Seller



## 4. Project Examples

### Direct Power Purchase Agreement (DPPA) – Pilot Program

- Pilot DPPA program:

- Target: 150 – 300 MW
- Min/Max Project size: Projects accepted into the DPPA Pilot Program shall have an installed capacity of no less than 5MWp and no more than 50 MWp (for solar)
- Pilot program location: Buyers shall be located in Southern Power Corp service area. Sellers shall be allowed to site projects at any location which best fits the projects criteria, while making best efforts to avoid areas currently considered “congested”. Projects accepted into the Pilot Program must be located in low congestion regions as determined by EVN.
- Proposed Timelines:

<b>Pilot Program Release</b>	<b>Nov/Dec 2019</b>
<b>GVN Review/Approval of Project</b>	<b>Jan-Mar 2020</b>
<b>Projects Finalize Pilot Agreements</b>	<b>Apr- June 2020</b>
<b>Projects Financial Close</b>	<b>Oct 2020</b>
<b>Project COD</b>	<b>Mar 2021</b>
<b>Monitoring and Evaluation</b>	<b>Mar 2021 – Dec 2023</b>
<b>Pilot Program Completion</b>	<b>Dec 2023</b>





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**Electricity Regulatory Authority of Vietnam**

A blue-tinted background image showing a business meeting. In the foreground, a hand is pointing at a document. In the background, several people are seated around a table, engaged in discussion.

**Thank you for  
your attention!**

**For further information:**

Email: [huunt@moit.gov.vn](mailto:huunt@moit.gov.vn)

Electricity Regulatory Authority of Vietnam

D10 Khuat Duy Tien, Thanh Xuan, Ha Noi