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2. Overview of National Grid Codes
3. Update on new policy development in Vietnam
4. Recommendations for future cooperation
Status of National Power System and Cross border cooperation
TOTAL INSTALLED CAPACITY

<table>
<thead>
<tr>
<th>Energy Type</th>
<th>Capacity</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hydro</td>
<td>20411 MW</td>
<td>37.2%</td>
</tr>
<tr>
<td>Coal</td>
<td>19258 MW</td>
<td>35.1%</td>
</tr>
<tr>
<td>Oil &amp; Gas</td>
<td>8696 MW</td>
<td>15.9%</td>
</tr>
<tr>
<td>Import</td>
<td>1400 MW</td>
<td>2.6%</td>
</tr>
<tr>
<td>Renewable Energy</td>
<td>5080 MW</td>
<td>9.2%</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>54845 MW</strong></td>
<td><strong>95.1%</strong></td>
</tr>
</tbody>
</table>

Data: 10/2019
ENERGY PRODUCTION 2019

<table>
<thead>
<tr>
<th>Energy Source</th>
<th>Gwh</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hydro</td>
<td>69379</td>
<td>28.7%</td>
</tr>
<tr>
<td>Coal</td>
<td>118869</td>
<td>49.1%</td>
</tr>
<tr>
<td>Oil &amp; Gas</td>
<td>45473</td>
<td>18.8%</td>
</tr>
<tr>
<td>Import</td>
<td>3666</td>
<td>1.5%</td>
</tr>
<tr>
<td>Renewable Energy</td>
<td>5307</td>
<td>1.9%</td>
</tr>
</tbody>
</table>

Total: 242050 Gwh

Data: 10/2019
Solar PV Development in Vietnam

Cumulative installed Solar PV capacity in MWac

- January 2019: 84 MW
- February 2019: 0 MW
- March 2019: 260 MW
- April 2019: More than 4000 MW added in 3 months
- May 2019
- June 2019
- July 2019: 4440 MW

"Feed-in-Tariff Deadline" 30 June 2019
TRANSMISSION SYSTEM

Vietnam Transmission System (10/2019)
- 03 interconnected regions

<table>
<thead>
<tr>
<th></th>
<th>Quantity</th>
<th>No of Subs/Lines</th>
</tr>
</thead>
<tbody>
<tr>
<td>500kV substation</td>
<td>35100 MVA</td>
<td>33</td>
</tr>
<tr>
<td>500kV line</td>
<td>8000 km</td>
<td>85</td>
</tr>
<tr>
<td>220kV substation</td>
<td>57441 MVA</td>
<td>128</td>
</tr>
<tr>
<td>220kV line</td>
<td>17861 km</td>
<td>413</td>
</tr>
</tbody>
</table>

Transmission capacity of 500kV System

<table>
<thead>
<tr>
<th>Year</th>
<th>North - Central</th>
<th>Central - South</th>
</tr>
</thead>
<tbody>
<tr>
<td>2019</td>
<td>2200-2400</td>
<td>4000</td>
</tr>
<tr>
<td>2021</td>
<td>4000</td>
<td>4000</td>
</tr>
</tbody>
</table>
Update on rural electrification

- Electrification:
  - 100% of the communes
  - 99.37% of the households
  - 99.05% of the rural households
  - 20/63 (31.74%) cities have reached 100% of the households having access to electricity
Overview of National Grid Codes
Reasons for Amendment

- The penetration of RE increase very fast
  - Technical requirements: connections, operation
  - Ancillary services
  - Frequency control/spinning reserves
- Smart grid technologies are applied
  - SCADA/EMS-DMS
  - Establishment of OCC and Unmanned substation
  - SAS/DAS,…
  - Remoted control
- Implementing Wholesale competitive power market; changed in structure of power sector
Changed the Frequency control approach

**PRIMARY FREQUENCY CONTROL**
- From 0s – 30s. Peak at 10-15s

**SECONDARY FREQUENCY CONTROL**
- Signal sent to unit at 10s. Unit start to response at 30s, keep upto 25 mins.  
  Peak at 8-10 mins  
- Control automatically by AGC

**TERTIARY FREQUENCY CONTROL**
- Response if the available power for primary and secondary response can not be recovered
Ancillary Services

5 Ancillary services in Grid Code

1. Frequency Control (including spinning Reserve)
2. Fast Start
3. Voltage Control
4. Reliability Must Run
5. Black Start
Connection Conditions for RE

- Frequency ranges of operation
- Active power limitations at low and high frequencies
- Voltage ranges of operation
- Reactive power capability
- Voltage/reactive power control concepts
- Frequency response (low-/high frequency response)
- Power quality aspects
- Protection and communication
03

Update of new policy development in Vietnam
3.1. Policy development on RE in Vietnam
Status of waste, SOLAR, wind energy industry

**Solar farm:**
- Total capacity registered 26,000 MW (22,100 MW) period 2019-2025.
- Total capacity included into master plan 8,100 MW.
- Around 122 solar farm projects were signed PPA with EVN with installed capacity of 6,543 MW.

**Solar roof-top:**
- Total installed capacity of more than 200 MW (update to October, 2019)
Status of **WASTE**, solar, wind energy industry

- 12 projects with installed capacity of 360 MW were put into operation which fired sugar cane (Co-generation).
- 02 fired waste projects with installed capacity of 10 MW which are in progress of construction.
- Some projects are proposed to add in Master plan
- Some off-grid projects
Status of waste, solar, **WIND** energy industry

1. Operated plants: 9 plants / 305MW
2. Under construction and got PPA: 13 plants / 650MW
3. 11 Provinces developed and are approved Wind power master planning:
   - Technical potential: 23,000MW
   - Approved in master plan: 94 plants/4000MW
4. After PM issues Decision 39 (new FIT)
   - Capacity: around 16700MW is proposing for approval in Master Plan
   - Location: **Quang Tri, Bac Lieu, Ben Tre**, Ca Mau, Soc Trang, Phu Yen, Tra Vinh, Gia Lai, Daklak, ....
Status of waste, solar, wind energy industry

General incentive mechanism for RE projects

✓ EVN has obligation to buy electricity from RE projects
✓ Duration of PPA is 20 years
✓ Electricity tariff is adjusted following the rate of USD/VND
✓ Incentive income tax: 0% in first 4 years, reduce 50% in next 9 years, reduce 10% from the year 10-15.
✓ Exemption of imported tax, reduce tax of environment, land usage etc.
## Status of waste, solar, wind energy industry

<table>
<thead>
<tr>
<th>RE type</th>
<th>Status</th>
<th>FIT Level</th>
<th>Note</th>
</tr>
</thead>
<tbody>
<tr>
<td>Wind power</td>
<td>FIT</td>
<td>8.5 UScent/kWh for on-shore projects 9.8 UScent/kWh for off-shore projects</td>
<td>COD before 31 Oct 2021</td>
</tr>
</tbody>
</table>
| Biomass (CHP)                | revised | - CHP: 5.8 UScent/kWh  
- Generation Cost from imported coal power plant (~ 7.6 UScent/kWh for 2016) |                               |
| Power plant from solid waste | FIT     | - Land fill gas: 7.28 UScent/kWh  
- Incineration: 10.05 UScent/kWh |                               |
| Solar (PV)                   | FIT     | Revising  
- Solar Farm: FIT 9.35 UScent/kWh  
Future Policy for RE Development

- Revise and update the FIT for Solar energy
  - Rooftop solar PV promotion program 2019-2025 is approved
  - Solar farm is revising and proposing.

- Auction scheme ?
  - Studying and developing proposals
  - 2 models are proposed by WB
  - Applying in some countries

- Direct PPA – DPPA ?
  - Pilot program is developed and reported
  - Completing and developing the model and detailed design
  - 2021-2023: Implement the pilot project

- Power market ?
- Renewable Portfolio Standard, RE Certificates (RECs), ...
- Energy Storage System (ESS)
Challenge for RE Development

- Limit the connection capacity/network
  - Transmission Grid expansion did not design for large amount of Solar and Wind farm.
  - Building time of new transmission lines and substations is much longer than building Solar and Wind farm.
  - Interrupt temporarily trading, risks in real time operation
- Stability, security, reliability.
- Forecasting, dispatching in real time
- Ancillary services: Frequency and Spinning Reserve
3.2. Policy development on DSM in Vietnam

- Peak Clipping
- Conservation
- Load Building
- Valley Filling
- Flexible Load Shape
- Load Shifting
### Target
*(Decision No. 279/QĐ-TTg dated 08/3/2018)*

#### General Target:
- Contribute to improve power quality, power supply reliability; environmental protection and socio-economic development; sustainable development.
- Consistent with the trend of energy development; optimal, efficient chain of electricity production, supply and consumption.
- Curtail the peak load of power system, reduce pressure on investment and electricity price increase, ...
- Raising awareness of customers as well as society in electricity consumption and management.

#### Specific Target (summary):
- Reduce the peak load of national power system by **300 MW** in 2020, **1000 MW** in 2025 and **2000 MW** in 2030.
- The load factor of national power system will increase from **1% ± 2%** in 2018-2020 and **3% ± 4%** in the period of 2021-2030.
- Step by step attracting and expanding the number of customers to participate, especially resident customers.
- Coordinate and implement integrated with EE, Smart Grid and RE development to achieve the highest efficiency.
ROAD MAP AND IMPLEMENTATION PLAN OF DR PROGRAM

(Decision No. 175/QĐ-BCT dated 28/1/2019)

- National DR program is the central, strategic program of National DSM program:
  - Reduce ratio of peak load: at least 30% compare to target of DSM program.
  - Become one of solutions to provide ancillary service for power system operation.
  - Main contribution in improving load factor of national power system ($K_{pt}$), regional power system and PCs.
- Contribute to reducing transmission losses on the North – Central – South transmission grid
- After 2020, execute widely with voluntary and active participation of different type of customers
- An activity in production and business plan to optimize these activities
- Transform from traditional electricity consumption customers to smart customers
DR Roadmap and implementation plan

From pilot/trial phase, do step by step (from small scale-foundation to large scale–advance) and finally execute widely with different customers

From national, regional, PCs, Province PCs and 110kV substations

Period 2018-2020
- Complete legal framework; organization structure
- Execute marketing, raise awareness
- Implement DR’s program

Period 2020-2030
- Propose new programs, etc.
3.3. Update on Competitive Power Market Development and Electricity Tariff
Competitive Power Market Development

Roadmap (Decision 63/2013/QD-TTg):

<table>
<thead>
<tr>
<th>Competitive Generation Market (VCGM)</th>
<th>Electricity Wholesale Market (VWEM)</th>
<th>Electricity Retail Market</th>
</tr>
</thead>
<tbody>
<tr>
<td>2015 Pilot Operation</td>
<td>2016 Full Operation</td>
<td>2021 Pilot Operation</td>
</tr>
<tr>
<td>2019 Full VWEM (MOIT Decision No. 8266)</td>
<td>2019 onwards: Long Term VWEM</td>
<td></td>
</tr>
</tbody>
</table>

Stages of VWEM implementation:
- 2019: Full VWEM (MOIT Decision No. 8266)
- 2019 onwards: Long Term VWEM
Averaged Electricity retail tariff

- **Average price** = 1720.65 đ/kWh
- **Average price** = 7.4 US cent

- Increased 8.36% in March 2019, to 1.864 VNĐ/kWh (around 8 US cents/kWh)
Recommendations for future cooperation
Recommendations for future cooperation

- Promote the MOU for exchange power between countries (Vietnam-Laos, etc)
- Support bilateral interconnection in near-term and multilateral interconnection in longer-term
- Continuously finalize the GMS GC as well the roadmap to adopt in each country
- Greater focus on promotion of investment and grid interactivity of smaller-scale RE installations