MINISTRY OF INDUSTRY
GENERAL DIRECTORATE OF ENERGY

OVERVIEW

VIETNAM ENERGY

November 2015
1. OVERVIEW OF SOCIO-ECONOMIC
OVERVIEW OF SOCIO-ECONOMIC

GENERAL INFORMATION
- Area: 331,698 km²
- Population: 90 mil (2014); Urban/rural percentage: 20%/80%
- Number of provinces: 63 provinces and cities
- Member of WTO, APEC and ASEAN

VIETNAM ECONOMY
- GDP period 1990-2010: 7.3%/pa
- GDP 2010: 6.78%; 2011: 5.89%; 2012: 5.5%; 2013: 5.4% and 2014: 5.98%
- GDP per capita in 2014: 2028 USD/per person

ECONOMY ORIENTATION
- 2015-2020: average GDP per annum 6-7%.
- GDP per capita 3000 USD/per person
2 NATIONAL ENERGY STRATEGIES
INTRODUCTION OF ENERGY SECTOR
EXISTING POWER SYSTEM OF VIETNAM

Overview

Total capacity: 33,964 MW
* Statistical data in 2014

<table>
<thead>
<tr>
<th>Item</th>
<th>Quantity</th>
<th>Unit</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total length of 500kV transmission lines</td>
<td>6.611</td>
<td>km</td>
</tr>
<tr>
<td>Total length of 220kV transmission lines</td>
<td>12.941</td>
<td>km</td>
</tr>
<tr>
<td>Number of 500kV transformers (unit)</td>
<td>40</td>
<td>-</td>
</tr>
<tr>
<td>Number of 220kV transformers (unit)</td>
<td>192</td>
<td>-</td>
</tr>
<tr>
<td>Total capacity of 500kV transformers</td>
<td>21,900</td>
<td>MVA</td>
</tr>
<tr>
<td>Total capacity of 220kV transformers</td>
<td>35,041</td>
<td>MVA</td>
</tr>
</tbody>
</table>
EXISTING POWER SYSTEM OF VIETNAM

Power source – Power trading

Total: 33,964 (MW)

* Statistical data in 2014

Hydro
Power plants

Import - China
(220/110kV) (through Ha Giang, Lao Cai, Quang Ninh), Pmax = 900 MW

Import - Laos
(220kV from Xe Kaman 3 hydropower plant): Pmax = 375 MW;

Coal – fired
Power plants

(Quang Ninh, Pha Lai, Hai Phong, etc.)

Gas/oil – fired
Power plants

(Phu My, Nhon Trach, Ca Mau, O Mon)

Coal – fired
Power plants

(Formosa, Vinh Tan, Duyen Hai etc.)

Export - Cambodia

Buying from CSG of China

Import from Laos

Export to Cambodia, Pmax = 200 MW through the 220 kV Chau Doc – Takeo T/L
EXISTING POWER SYSTEM OF VIETNAM

Power source – Power trading

Total capacity: 33,964 MW

* Statistical data in 2014
Figures as of 2014

Coal production: 39.8 mil. tons

Of which:

+ Domestic consumption: 32.6 mil. tons
+ Coal export: 7.2 mil. tons
Figures as of 2014

- Crude oil exploitation: 15.5 mil. tons
- Gas exploitation: 10.2 bil. m3

(Around 90% of the gas is for power generation and 10% of the gas for other consumers)
Existing Gas Infrastructures

LPG Facilities

- *Domestic Production:*
  - Dung Quat Refinery Plant: 400,000 ton/year
  - Dinh Co GPP at capacity of 300,000 ton/year.
- *Storage and trading:*
  - More than 100 LPG trading companies.
  - PVGas is the main player with 70% accounted for market share and facilities.

CNG Plants

- Total capacity: 135 million cubic meter per year.
Gas Consumption

Dry Gas Consumption:

- **Power Generation:**
  - Demand: 10.3 bcm in 2020.
- **Fertilizer Production:** ~ 11%
- **Other End-User:** 4%
Coal

Total coal reserves: about 48.7 bill. tons, of which:

- **Dong bac Basin**: 8.8 bill. tons
- **Song Hong Basin**: 39.3 bill. tons
- **Others**: 0.6 bili. tons
Oil & Gas

2P reserves discovered: 1,436 mill. m$^3$ oil equivalent, of which:

- Oil: 711 mill. m$^3$ (49.5%).
- Gas: 725 t m$^3$ (50.5%).
### VIETNAM ENERGY RESOURCES

#### Wind power

Wind energy theoretical potential based on the Wind Resource Atlas of Vietnam  
(assumed an average density of 10 MW/km²)  
(Source: WB report 2011)

<table>
<thead>
<tr>
<th>Mean Speed at 80 m Height (m/s)</th>
<th>Estimated Developable Land Area (km²)</th>
<th>Percentage of Developable Land</th>
<th>Approximate Megawatt Potential</th>
</tr>
</thead>
<tbody>
<tr>
<td>&lt;4</td>
<td>95,916</td>
<td>45.7%</td>
<td>959,161</td>
</tr>
<tr>
<td>4-5</td>
<td>70,868</td>
<td>33.8%</td>
<td>708,678</td>
</tr>
<tr>
<td>5-6</td>
<td>40,473</td>
<td>19.3%</td>
<td>404,732</td>
</tr>
<tr>
<td>6-7</td>
<td>2,435</td>
<td>1.2%</td>
<td>24,351</td>
</tr>
<tr>
<td>7-8</td>
<td>220</td>
<td>0.1%</td>
<td>2,202</td>
</tr>
<tr>
<td>8-9</td>
<td>20</td>
<td>0.01%</td>
<td>200</td>
</tr>
<tr>
<td>&gt;9</td>
<td>1</td>
<td>0.00%</td>
<td>10</td>
</tr>
<tr>
<td>Total</td>
<td>209,933</td>
<td>100.00%</td>
<td>2,099,333</td>
</tr>
</tbody>
</table>
### Solar radiation map of Vietnam

**Annual average of daily Global Horizontal Irradiation**  
(Source: CIEMAT report, 2014)

<table>
<thead>
<tr>
<th>Area</th>
<th>Annual average of daily Global Horizontal Irradiation (kWh/m²/day)</th>
</tr>
</thead>
<tbody>
<tr>
<td>North</td>
<td>3.4</td>
</tr>
<tr>
<td>North central coast</td>
<td>3.8</td>
</tr>
<tr>
<td>South, central highlands and south central coast</td>
<td>4.8</td>
</tr>
</tbody>
</table>
VIETNAM ENERGY SECTOR DEVELOPMENT STRATEGIES

• Gradually introducing the energy market; diversifying the ownership and business approaches; Abolishing subsidies, monopoly and forwarding eventually to the comprehensive elimination of social policy implementation through energy prices.
• Electricity, coal and oil and gas sectors will be operated complying with the competitive market mechanism and under State regulation. Coal and oil and gas market will be set up in the period up to 2015.
• Focusing intensively on the clean energy, prioritizing the new and renewable energy development with the target of reaching 4.5% of the total installed capacity in 2020 and around 11% in 2050.
• Protecting the ecology and environment will be tied to the energy development.
• Boosting the international relation in the energy sector and shaping the power and gas interconnection among ASEAN countries.
3 ENERGY PLANNING BY SECTOR
ELECTRICITY SECTOR DEVELOPMENT

• Improving the electricity quality.
• Reducing the power system technical losses. Encouraging the application of new and modern technologies.
• Focusing on the nuclear energy development (4,000MW in 2020-2030 and 10,700MW after 2030).
• Making the new and renewable energy percentage reach 4.5% in 2020 and 6% in 2030.
• Equitizing electricity sector’s enterprises
• Electricity tariff will be followed the market mechanism under State regulatory which ensures the cost recovery and acceptable benefit.
• Restructuring the electricity sector for the sake of shaping the transparent competitive market.
• Protecting the ecology and environment and reaching the sustainability are the utmost goals for the electricity sector development. Spurring power projects in accordance with the CDM mechanism.
• Encouraging and boosting the application of saving-energy and efficiency programs...
VIETNAM POWER MARKET DEVELOPMENT
The Roadmap of the Power Market

- **Phase 2** – Vietnam Competitive Wholesale Market (2015 – 2021)
- **Phase 3** – Vietnam Competitive Retail Market (2021 onwards)
# RENEWABLE ENERGY

<table>
<thead>
<tr>
<th>RE type</th>
<th>Status</th>
<th>Level</th>
<th>Note</th>
</tr>
</thead>
<tbody>
<tr>
<td>Small hydro</td>
<td>Existing</td>
<td>By year, by season (about 5 US cents/kWh)</td>
<td></td>
</tr>
<tr>
<td>Wind power</td>
<td>Proposing</td>
<td>7.8 US cents/kWh</td>
<td>Under revising</td>
</tr>
<tr>
<td>Biomass</td>
<td>FIT</td>
<td>- CHP: 5.8 US cent/kWh</td>
<td>Under studying</td>
</tr>
<tr>
<td></td>
<td></td>
<td>- Generation Cost from imported coal power plant</td>
<td></td>
</tr>
<tr>
<td>MSW</td>
<td>FIT</td>
<td>- Land fill gas: 7.28 US cent/kWh</td>
<td>Under studying</td>
</tr>
<tr>
<td></td>
<td></td>
<td>- Direct combustion: 10.05 US cent/kWh</td>
<td></td>
</tr>
<tr>
<td>Biogas</td>
<td>FIT</td>
<td>Under studying</td>
<td></td>
</tr>
<tr>
<td>Solar PV</td>
<td>FIT</td>
<td>Under studying</td>
<td></td>
</tr>
<tr>
<td>Geothermal</td>
<td>FIT</td>
<td>Under studying</td>
<td></td>
</tr>
</tbody>
</table>
COAL SECTOR DEVELOPMENT

- Speeding up the coal exploitation and estimating coal resource and volume.
- Coal business will be active complying with the market mechanism under State regulatory.
- Meeting the maximum domestic consumption. Exporting only domestic coal that domestic consumption has not required.
- Protecting the ecology and environment is the utmost goal for the sustainable coal sector development.
OIL AND GAS SECTOR DEVELOPMENT

• Prioritizing the search, survey and exploitation in the deep offshore water.
• Establishing the competitive gas market mechanism under State regulatory. Coorporating for the implementation of inter-regional gas pipeline system.
• Developing imported LNG projects; Increasing the capacity of LNG storages in the Southern region with the size of 7-10 bil. cubic meter per annum.
• Developing the refining and petrochemical projects to meet 50-70% domestic demand.
• Striving the stock pilling of crude oil and petroleum products reached a minimum of 90 days net import (to meet the criteria of the International Energy Agency - IEA).
• Protecting the ecology and environment.
MASTER PLAN FOR POWER DEVELOPMENT
### PERIOD 2011-2015

- **Power generation:**
  - New installed capacity: 18,152 MW
  - Of which:
    - + Thermal: 9,600 MW
    - + Hydro: 8,552 MW

- **Grid**
  - 500kV:
    - + Transmission line: 3,833 km
    - + Substation: 17,000 MVA
  - 220kV:
    - + Transmission line: 10,635 km
    - + Substation: 35,988 MVA

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### PERIOD 2016-2020

- **Power generation:**
  - New installed capacity: 29,350 MW
  - Of which:
    - + Thermal: 24,210 MW
    - + Hydro: 5,140 MW

- **Grid**
  - 500kV:
    - + Transmission line: 4,889 km
    - + Substation: 26,750 MVA
  - 220kV:
    - + Transmission line: 5,305 km
    - + Substation: 39,063 MVA
<table>
<thead>
<tr>
<th>PERIOD 2021-2025</th>
<th>PERIOD 2026-2030</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Power generation:</strong></td>
<td><strong>Power generation:</strong></td>
</tr>
<tr>
<td>New installed capacity: 32,600 MW</td>
<td>New installed capacity: 33,500 MW</td>
</tr>
<tr>
<td>Of which:</td>
<td>Of which:</td>
</tr>
<tr>
<td>+ Thermal: 29,380 MW</td>
<td>+ Thermal  30,900 MW</td>
</tr>
<tr>
<td>+ Hydro: 3,220 MW</td>
<td>+ Hydro: 2,600 MW</td>
</tr>
<tr>
<td><strong>Grid:</strong></td>
<td><strong>Grid:</strong></td>
</tr>
<tr>
<td>500kV:</td>
<td>500kV:</td>
</tr>
<tr>
<td>+ Transmission line: 2,234 km</td>
<td>+ Transmission line: 2,724 km</td>
</tr>
<tr>
<td>+ Substation: 24,400 MVA</td>
<td>+ Substation: 20,400 MVA</td>
</tr>
<tr>
<td>220kV:</td>
<td>220kV:</td>
</tr>
<tr>
<td>+ Transmission line: 5,552 km</td>
<td>+ Transmission line: 5,020 km</td>
</tr>
<tr>
<td>+ Substation: 42,775 MVA</td>
<td>+ Substation: 53,250 MVA</td>
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</tbody>
</table>
TOTAL INVESTMENT BY PERIOD

TOTAL CAPITAL INVESTMENT NEEDED/
AVERAGE CAPITAL INVESTMENT PER YEAR TO 2030
(Million USD)

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<tr>
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<tbody>
<tr>
<td>I- Generation</td>
<td>22,076/4,415</td>
<td>28,830/5,766</td>
<td>27,005/5,401</td>
<td>32,441/6,482</td>
<td>110,322/5,516</td>
</tr>
<tr>
<td>II- Grid</td>
<td>7,245/1,449</td>
<td>10,523/2,105</td>
<td>12,345/2,469</td>
<td>15,868/3,174</td>
<td>45,981/2,299</td>
</tr>
<tr>
<td>Total</td>
<td>29,321/5,864</td>
<td>39,353/7,871</td>
<td>39,349/7,870</td>
<td>48,280/9,656</td>
<td>156,303/7,815</td>
</tr>
</tbody>
</table>
Total Grid - connected installed capacity (MW)

- Period 2011-2015: 1,198 MW
- Period 2016-2020: 2,408 MW
- Period 2021-2030: 9,588 MW
COAL SECTOR DEVELOPMENT
PLANNING
PLANNING TARGETS

Planned Annual coal production

- Period 2011-2015: 40-43 mil. tons
- Period 2016-2020: 50-53 mil. tons
- Period 2021-2025: 55-57 mil. tons
- Period 2026-2030: above 60 mil. Tons
## COAL DEMAND

<table>
<thead>
<tr>
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</tr>
</thead>
<tbody>
<tr>
<td>Domestic Coal Demand (for Power Plants)</td>
<td>21.9</td>
<td>26.8</td>
<td>29.1</td>
<td>33.2</td>
<td>35.9</td>
<td>37.5</td>
<td>44.5</td>
<td>48.0</td>
<td>639.9</td>
</tr>
<tr>
<td>Sales coal</td>
<td>40.4</td>
<td>41.9</td>
<td>43.0</td>
<td>44.5</td>
<td>46.7</td>
<td>47.4</td>
<td>50.6</td>
<td>52.6</td>
<td>767.9</td>
</tr>
<tr>
<td>Other Sectors' Demand</td>
<td>11.2</td>
<td>9.8</td>
<td>9.8</td>
<td>9.8</td>
<td>10.3</td>
<td>10.8</td>
<td>10.8</td>
<td>10.8</td>
<td>170.9</td>
</tr>
<tr>
<td>Import Coal</td>
<td>0.75</td>
<td>1.1</td>
<td>3.4</td>
<td>5.5</td>
<td>11.0</td>
<td>17.4</td>
<td>43.9</td>
<td>78.3</td>
<td>516.9</td>
</tr>
</tbody>
</table>

Unit: Mil Tons
GAS SECTOR DEVELOPMENT
PLANNING
PLANNING TARGETS

Period up to 2015

- Natural gas exploitation above 14 bil. m³/year
- Expansion of existing LPG storage to meet the demand of 1,6-2,2 bil. m³/year.
- Expected gas market size: 17-21 bil. m³/year.

Period 2016-2025

- Natural gas exploitation above 15-19 bil. m³/year.
- Expansion of existing LPG storage to meet the demand of 2,5-4,6 bil. m³/year.
- Developing imported LNG projects with the size of 7-10 bil. m³/year.
- Expected gas market size: 22-29 bil. m³/year.
1. Investors

2. Consultation

3. EPC Contractors

4. Equipment suppliers

5. Other forms
Thank You!