

**APEC WORKSHOP ON SMALL HYDRO AND RENEWABLE GRID INTEGRATION
HA NOI, VIETNAM
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**CURRENT PROBLEMS FACED IN VIETNAM ASSOCIATED
WITH THE INTEGRATION OF SMALL HYDRO INTO ELECTRIC
GRID VIET NAM**

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- 1. Vietnam Power Sector Overview**
- 2. Current situation and Potential for development of small HPP in Vietnam**
- 3. Benefit and Advantage**
- 4. Legal framework for development of small HPP**
- 5. Problems arising with small HPP**
- 6. Solutions**



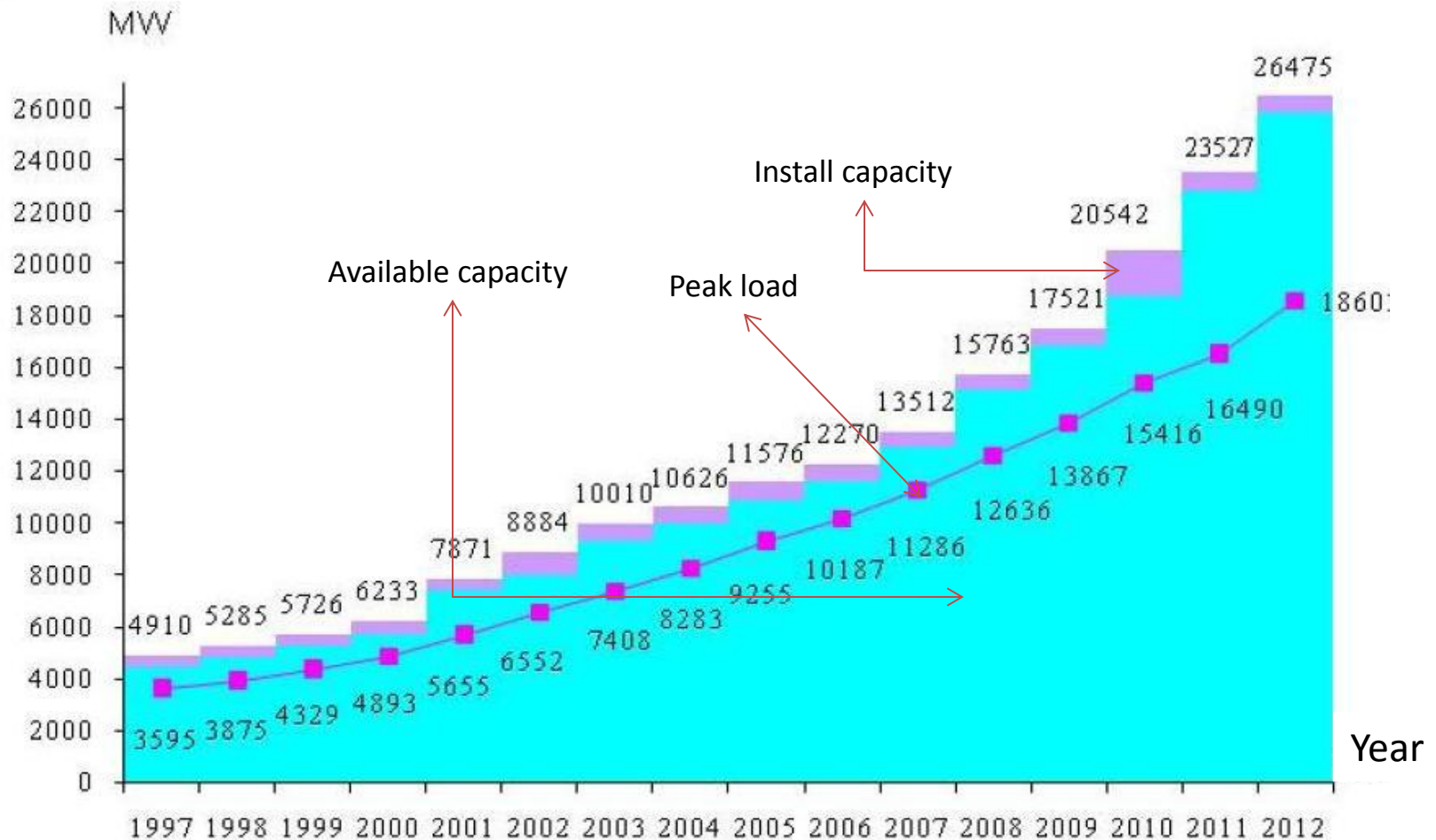
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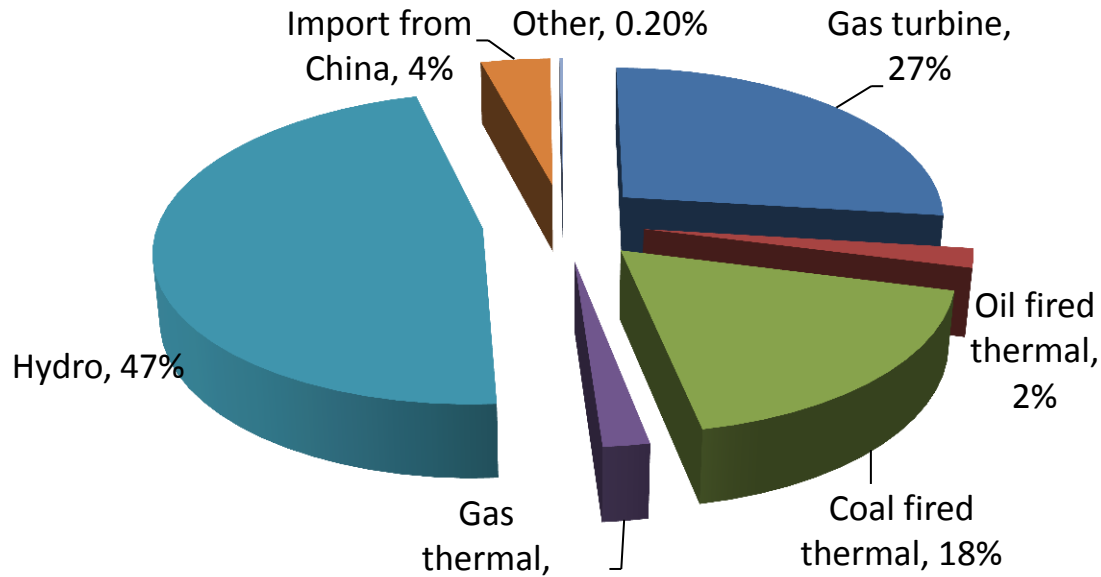
I. Vietnam Power Sector Overview

Correlation between Peak load, installed and available capacity in 2012



- Average electricity consumption growth rate in 1997-2012: 12,2%
- Energy Consumption in 2012: 119.033 Billion kWh

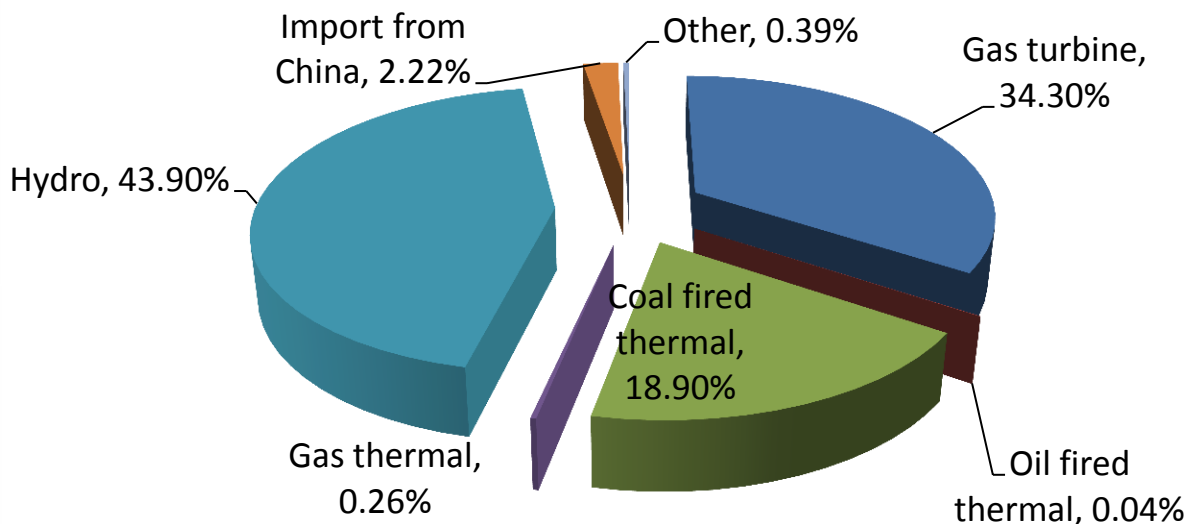
Vietnam Power Sector Overview - Installed Capacity (2012)



EVN: 54.9%
IPP, BOT and other: 45.1%

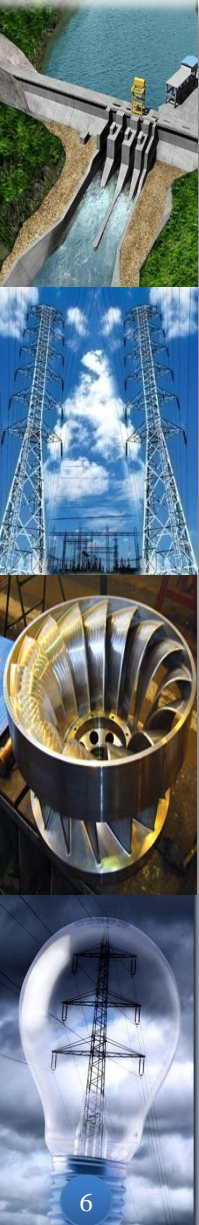
Total (MW)	26,475
Hydro	12,009
Coal fired thermal	4,900
Oil fired thermal	550
Gas turbine	7,446
Gas thermal	468
Diesel & Small hydro	1,170
Other	110

Vietnam Power Sector Overview – Electricity generation (2012)

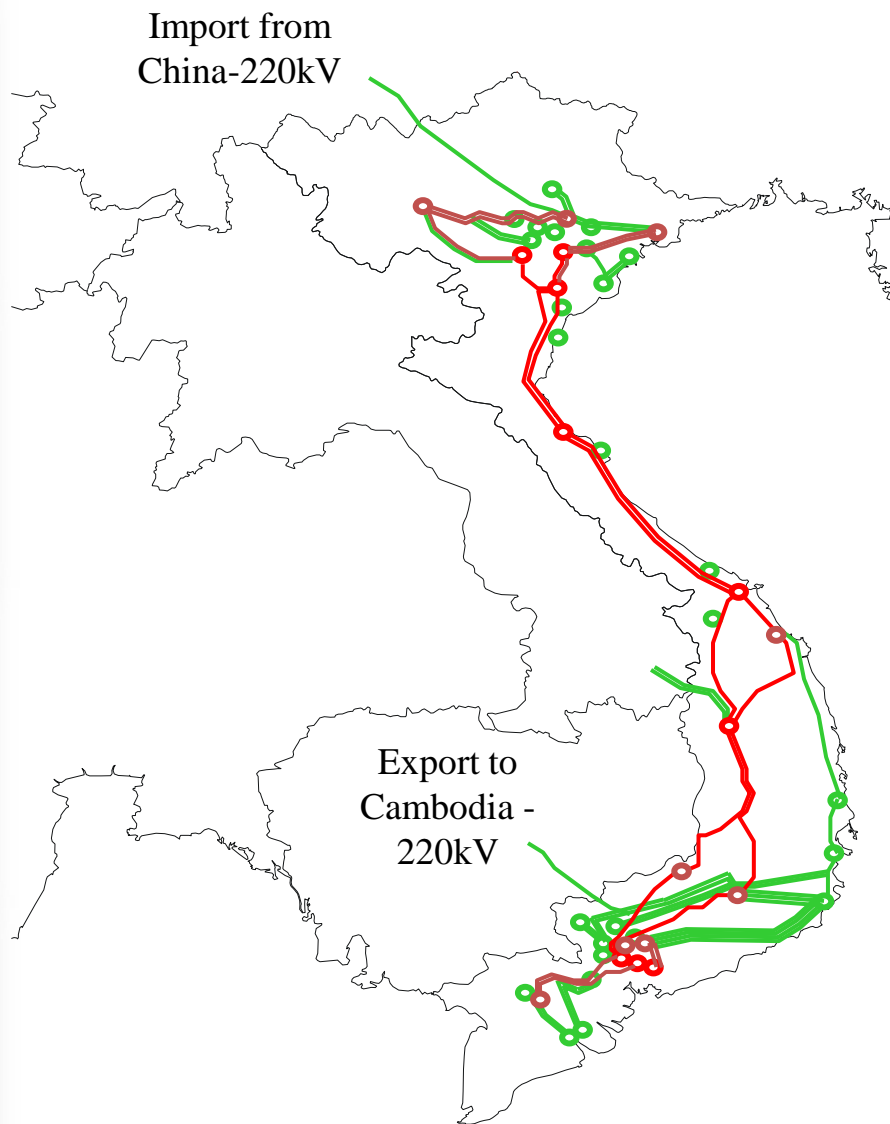


EVN: 59.81%
IPP, BOT, import: 40.19%

Total (Million kWh)	120,257
Hydro	52,795
Coal fired thermal	22,716
Oil fired thermal	43
Gas turbine	41,250
Gas thermal	311
Import from China	2,676
Export to Cambodia	1,224
Other	467



Vietnam Power Sector Overview - Network

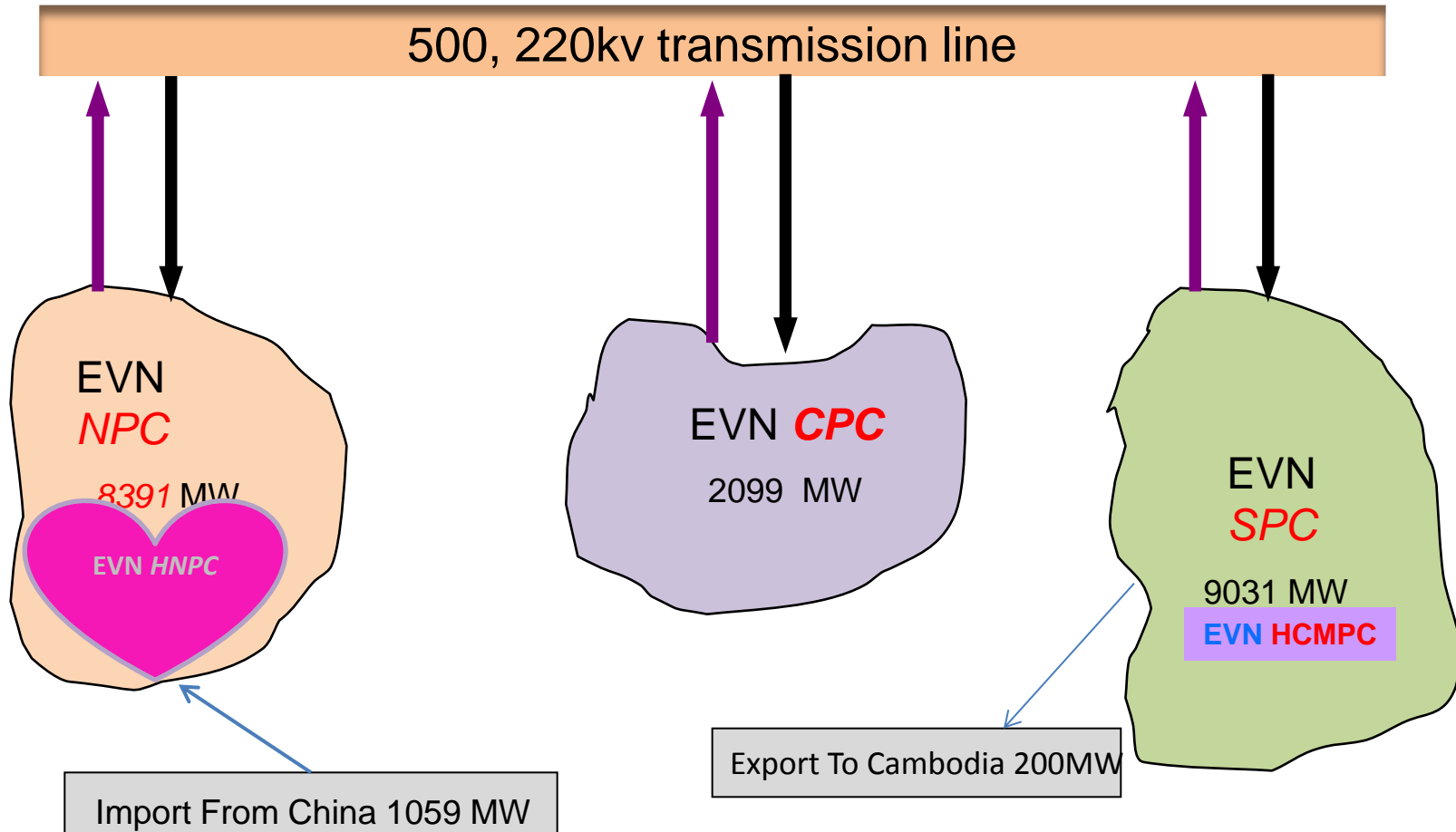


Transmission Voltage Level:
500kV, 220kV, 110kV

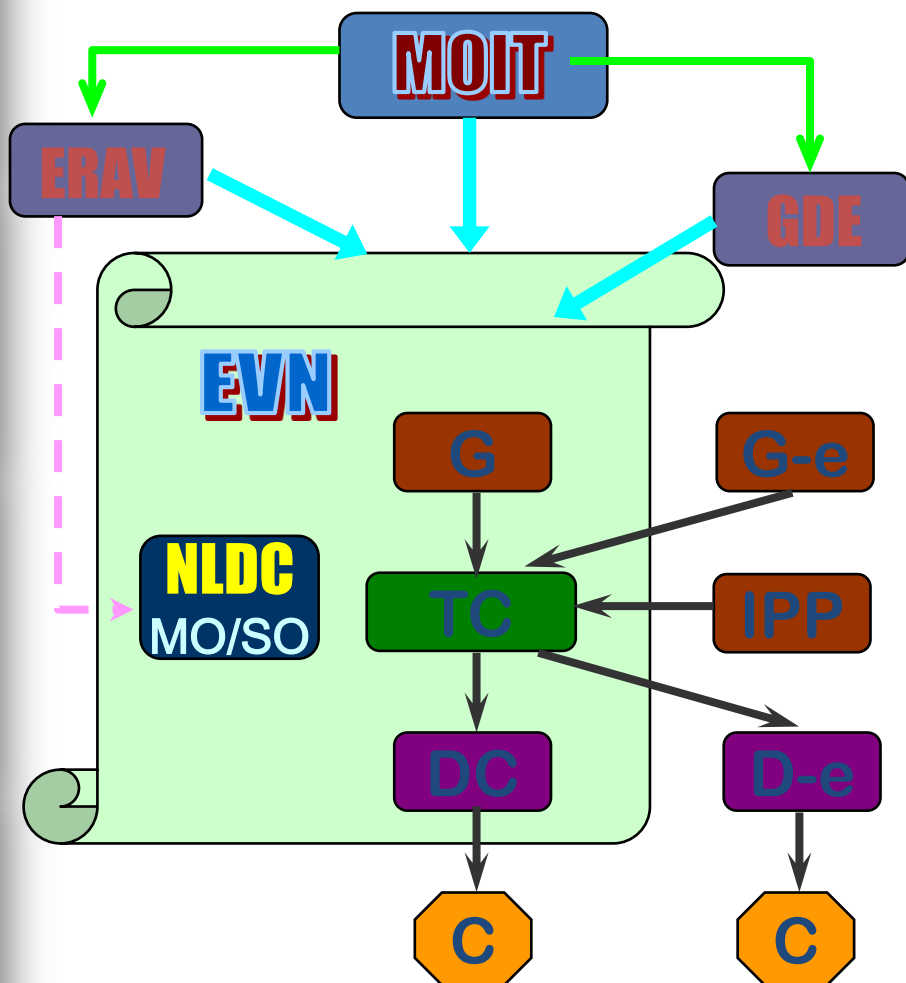
- 500kV: Spine line, 3 region link
- 220kV: Transmission line in each region, 2 region link
- 110kV: Connected to 220kV Substations or power plans.
- Electrification: 96,1%

Vietnam Power Sector Overview - Network

Network 2012



Vietnam Power Sector Overview – Organization structure of electricity industry



- MOIT** – Ministry of Industry and Trade
- GDE** – General Directorate of Energy
- ERAV** – Electricity Regulatory Authority of Vietnam
- EVN** - Electricity of Vietnam
- NLDC** – National Load Dispatch Centre
- IPP** – Independent Power Producer
- G** – EVN Owned Generation Companies
- G-e** – Equitized Generation Companies
- TC** – Transmission Companies
- DC** – Distribution Companies
- D-e** – Equitized Distribution Companies
- C** - Consumers



Vietnam Power Sector Overview – Power Master Plan

- **National Power Development Plan VII** – in period of 2011-2020, vision to 2030
- Renewable Energy : **2010**: 3.5%. **2020**: 4.5%; **2030**: 6.5%.
- Energy efficiency: **2015**: 5-8%; **2020**: 8-10%.

Period	2011 - 2015	2016 - 2020	2021 - 2025	2026 - 2030
BASE SCENARIO	14.1%	9.9%	8.1%	7.2%

Year	2015	2020	2025	2030
Base Scenario				
Energy Production (GWh)	194.304	329.412	489.621	695.147
Peak Load (MW)	30.803	52.040	77.084	110.215

Period	2011-2015	2016-2020	2021-2025	2026-2030	2011-2030
Total Capital/Annual average (Bill.USD)	5.864	7.871	7.870	9.656	5.864

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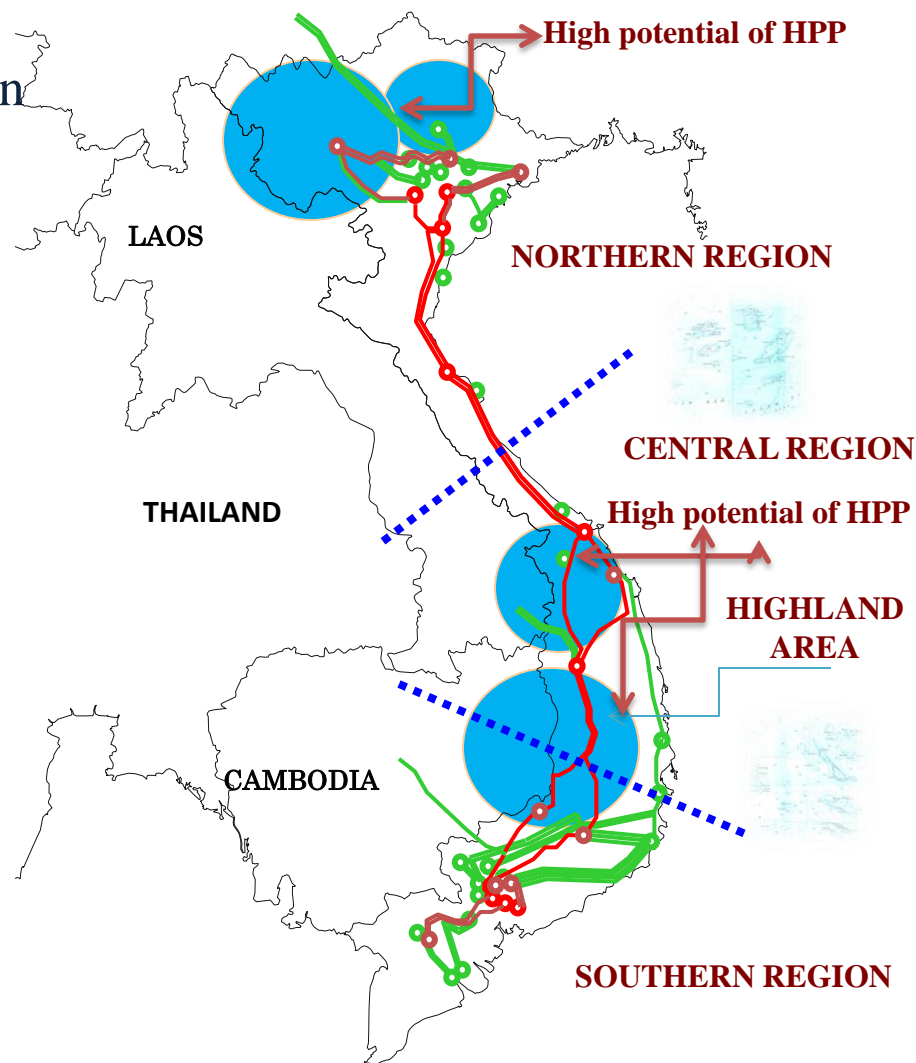
Current situation and Potential for development of small HPP in Vietnam

- Definition of small hydro power plants: installed capacity less or equal 30MW.
 - Total installed capacity in 2012: 1,166MW (contributed 4.4% in whole system).
 - Energy generation in 2012: 4,493 million kWh (contributed 3.73% in whole system).
- Operation and scheduling: depend on the season, weather and type of HPP, capacity of reservoir, etc.



Current situation and Potential for development of small HPP in Vietnam (Cont.)

- Location and distribution in three main region and area: the Northern region, the central region and highland area
- According to Minister of MOIT's Decision on approval of connection planning of small and medium HPP in North, South and Central region, in 2015 the potential of small HPP is as follows:
 - North: 345 projects, total installed capacity is around 3,800MW
 - Central, South and concentrated in Highland: 329 projects, total installed capacity is around 3,500MW



Source: Decisions 1864/QĐ-BCT dated 14/4/2008 and 0643/QĐ-BCT dated 09/2/2009 issues by MOIT

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Benefit and Advantage

- Contributed to balance the power supply – demand of national power system.
- Ensure power supply at local province, increase electrification rate.
- Contributed to development of social-economic.
 - Develop infrastructure system (transportation, water transport, etc).
 - Increase the employment opportunities in the local.
 - Reasonable cost.
- Supplement the green energy for power system.
- Contributed to prevent from flood.
- Reduce greenhouse gas emissions



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Legal framework for development of small HPP

■ Development and Planning:

- Provincial People's Committee develop small HPP planning in their provincial and submit to MOIT for approval
- General Directorate of Energy develop the hydroelectric ladder planning and submit MOIT for approval
- Orientation of connection voltage level in planning:
 - + Less than 3MW: Connect to medium voltage at current local network
 - + From 3MW to 10MW: Consider connect to medium bus bar of 110kV sub-station.
 - + From 10MW to 30MW: connect directly to 110kV network or medium voltage.

Legal framework for development of small HPP (Cont.)

■ **Technical regulation:**

- Distribution Code stipulated:
 - + Technical standards and requirements
 - + Communication, operational and safety standards: Procedure of operation cooperation
 - + Technical requirements of connection/integration of power plants (HPP)
 - + Coordination in operation
 - + Metering requirements,...etc
- Technical procedures, connection procedure: Will be specified for each kind of renewable energy (Wind, small HPP,..)

- ## ■ **Scheduling and dispatching:**
- It depend on the ability of small HPP (reservoir, ability of daily, weekly,.. Regulation) and be consistent with the provisions in the SPPA, PCs will dispatch accordingly.

Legal framework for development of small HPP (Cont.)

■ Generation pricing

- Complied with Avoided Cost regulation: issued the avoided cost tariff for small renewable energy power plants and Standard PPA.
 - All the PPAs will use the standard PPA (according to Decision No.18)
 - Generator will sign the contract with the Power Corporation according to the authorization of EVN.
 - Priority is carried out scheduling the Small HPP in wet season.
 - Every year, Electricity Regulatory Authority of Vietnam will issue the new generation charge structure for Renewable energy including small HPP in wet/dry season and peak/off-peak hour.

- ## ■ Participation in to Vietnam Competitive Generation Market:
- Small and medium HPPs are not obligated to participate in VCGM

Legal framework for development of small HPP (Cont.)

Avoided cost tariff in 2013, issued by ERAV

	Dry season			Wet season			
	Peak time	Normal time	Off-peak	Peak time	Normal time	Off-peak	Energy surplus
Energy tariff (VND/kWh)							
Northern region	647	624	582	624	585	566	283
Central region	617	611	579	577	566	561	281
Southern region	666	657	624	611	602	587	293
Capacity tariff (for three regions) (VND/kWh)	1.805						

Average price of small HPPs:

- 2011: 804 VND/kWh
- 2012: 910 VND/kWh

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Problem Statements

■ Technical issues:

- Connection planning issues: In some case the investment boundary of network connection to power system was not clear, and it depend on the planning process.
- Power flow management: Sometime (wet season or off-peak of system), the power flow turn back to China in the Northern (Lao Cai, Yen Bai, Ha Giang province,..)
- Grid congestion: Capacity of transmission and distribution network are not enough to transfer all the power of small HPP in some area to national power system (the Northern and Highland).
- Quality of voltage normally was not meet the requirement in Technical code.
- Communication and information (SCADA/EMS/DMS) do not meet the requirements or can not operate.
- The operation cooperation was not good, still exist contradiction.



Problem Statements (Cont.)

- Lacking the benefit sharing mechanism between stakeholder to invest connection network.
- The avoided cost tariff may not enough interested to attract investors
- The avoided cost tariff do not reflect all the cost of project (example: cost to invest the network connection,..)



Problem Statements (Cont.)

2. Problem Statements

- **Social and environment:**
 - Quality of EIA was not good
 - Change the natural flow on the river (downstream).
 - Deforestation.
 - Impact to ecosystem
 - Migration and resettlement.
 - Impact on the agriculture in dry season.
 - There is not the benefit sharing mechanism for affected people.



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Development perspective

- Potential development as ensuring the balance between energy resources type (Hydro, thermal, Gas, nuclear, other RE,...)
- But should focus on sustainability in development of hydropower
 - Optimize the social, economic, and environment aspects
 - Focus on development of place/area that have the low rate of Electrification or off-grid.

Solutions

- Develop, issue specific and reasonable technical regulations on small HPP.
 - Enhance IT/automation infrastructure of small HPPs i.e. SCADA, communication system to support the optimization of operation and communication between dispatch centers and HPPs
 - Develop technical requirements customized for embedded generators including small HPPs to improve the quality of voltage, energy losses
 - Enhance and enforce the process of reservoir operation cooperation between HPPs/stakeholders



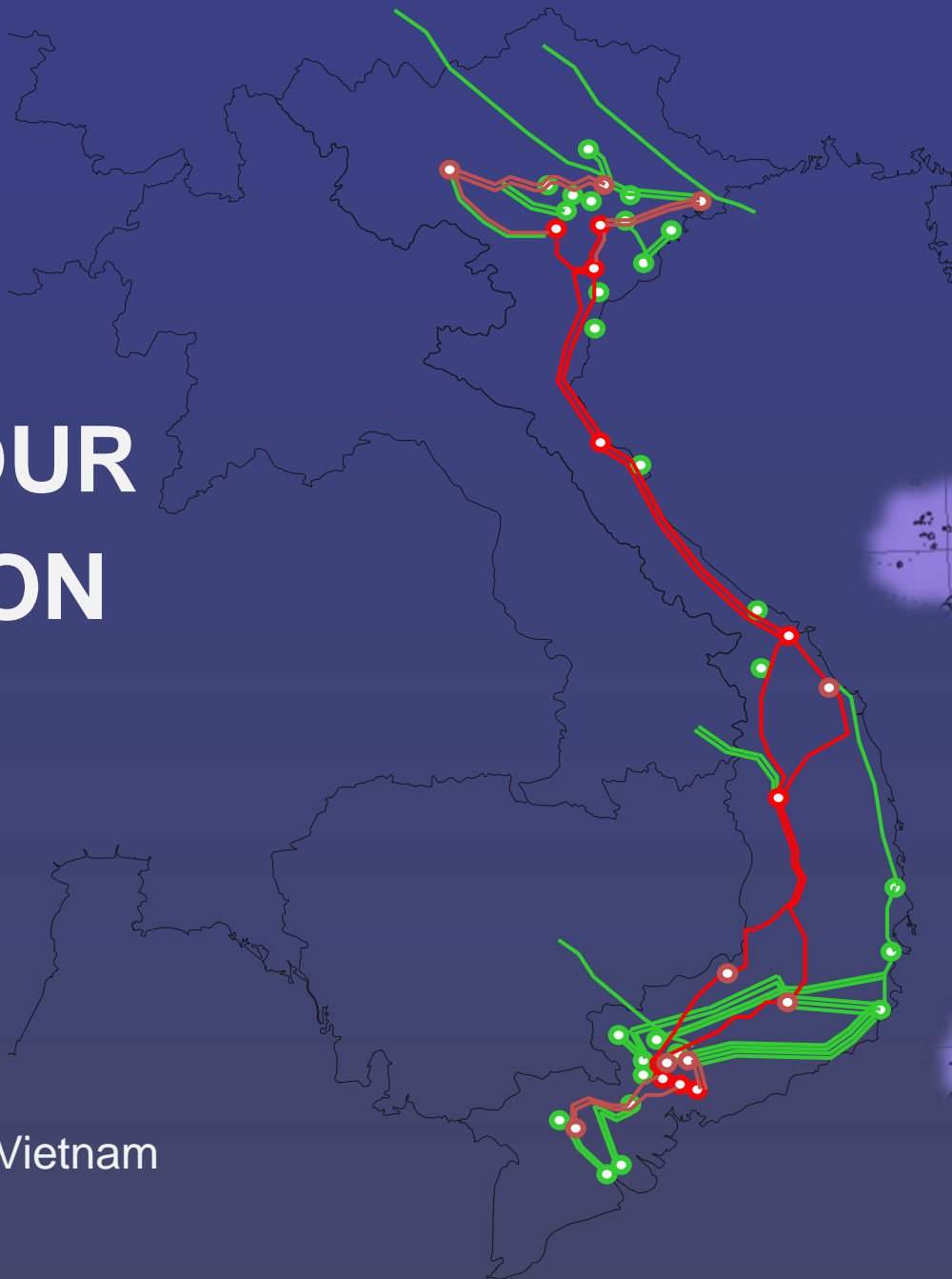
Solutions

- Review small HPP plan, eliminate projects are not efficient and feasible (technical, economic, social and environmental aspects)
- Issue specific mechanism for development of small HPP
 - Pricing mechanism should be reviewed to achieve the attraction of investors.
 - The benefit sharing mechanism for affected peoples by HPP should be considered.



ERAV

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THANK FOR YOUR KIND ATTENTION

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