

**BỘ CÔNG THƯƠNG
TỔNG CỤC NĂNG LƯỢNG**

POWER MASTER PLAN AND RENEWABLE ENERGY DEVELOPMENT IN VIETNAM



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VIETNAM**

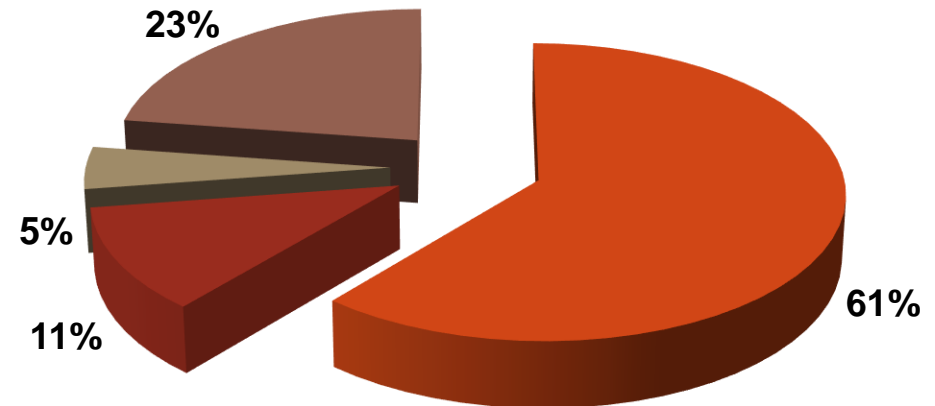
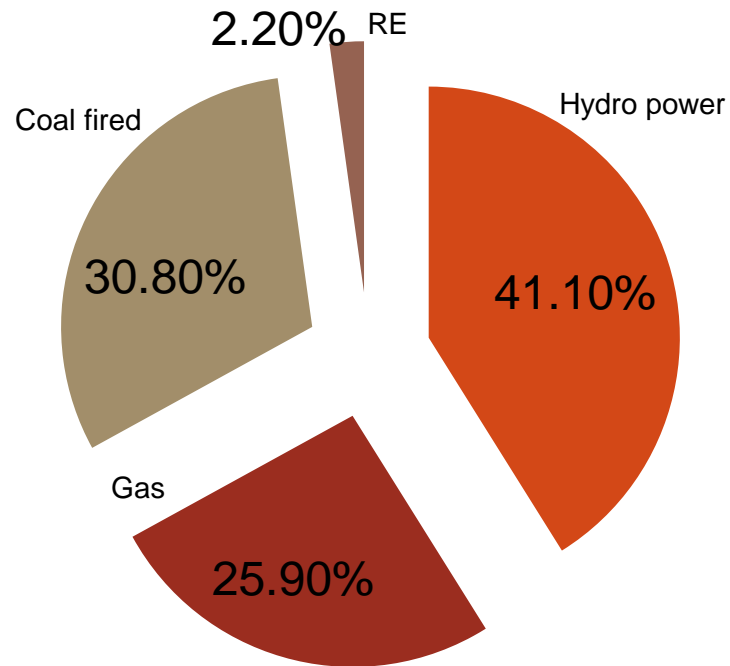
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- 1. NATIONAL MASTER PLAN FOR POWER DEVELOPMENT**

(revised & approved in March 2016)

Power generation by December 2015



- EVN
- PetroVN
- VNCoalmin
- BOT & others

Total installed capacity: 38.553 MW

Power Sector's Key Challenges

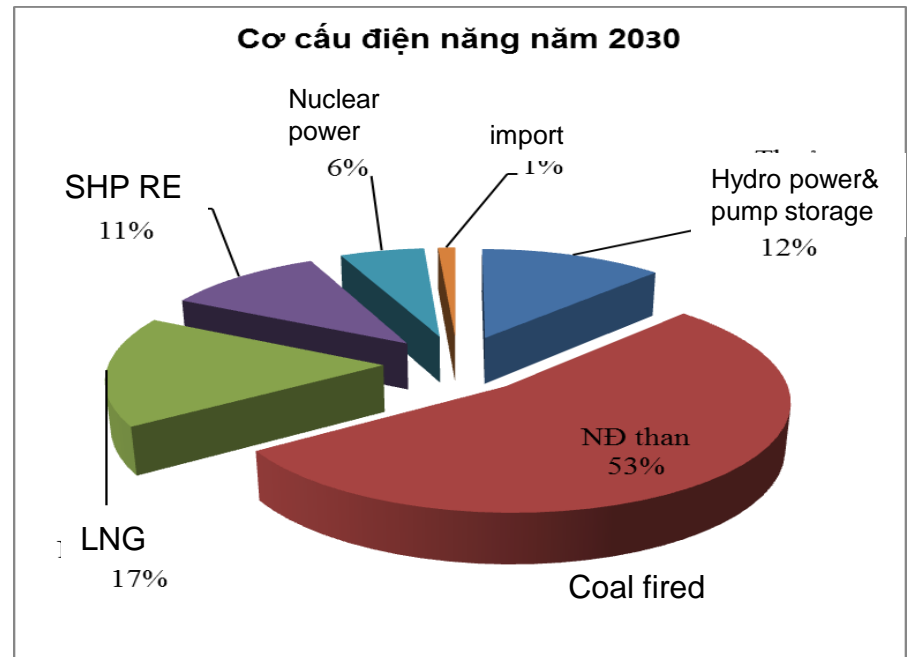
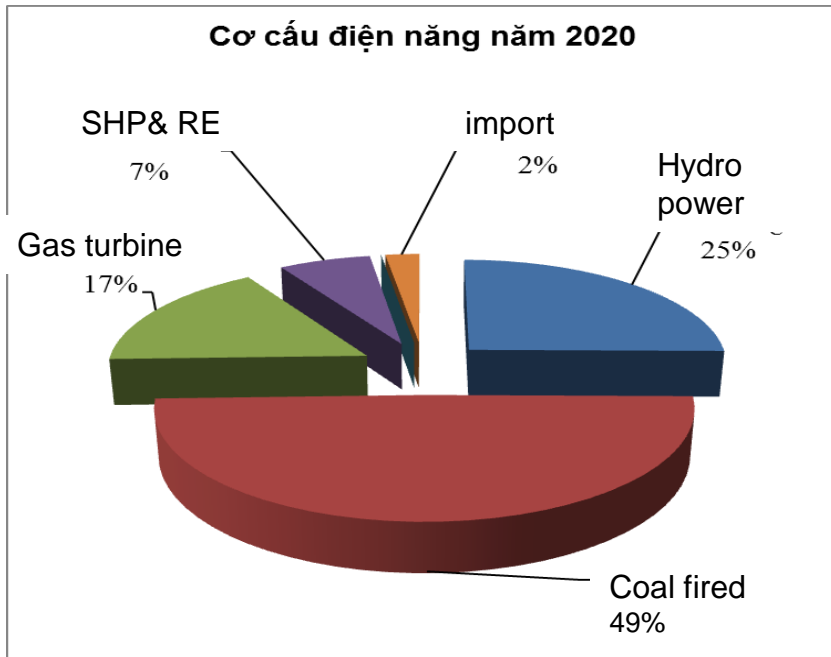
Electricity demand forecast for period of 2015-2030 (in Revised PDP VII)

Item	Unit	2015	2016	2017	2018	2019	2020	2025	2030
Low option									
Total power generation	GWh	161 250	179 044	197 738	217 395	238 099	258 777	382 648	515 747
Total commercial electricity	GWh	141 800	157 487	173 970	191 308	209 585	227 724	336 730	456 436
Pmax	MW	25 295	28 140	31 135	34 293	37 628	41 029	60 668	81 771
BAU scenario									
Total power generation	GWh	161 250	180 075	199 933	220 901	243 076	265 406	400 327	571 752
Total commercial electricity	GWh	141 800	158 394	175 901	194 393	213 966	234 558	352 288	506 001
Pmax	MW	25 295	28 302	31 481	34 846	38 415	42 080	63 471	90 651
High option									
Total power generation	GWh	161 250	182 167	204 388	228 023	253 206	278 927	431 207	632 078
Total commercial electricity	GWh	141 800	160 234	179 820	200 660	222 883	245 456	379 462	559 389
Pmax	MW	25 295	28 631	32 182	35 969	40 015	44 224	68 367	100 215

Electricity demand forecast is on average 10.5%/year for 2016-2020

Power Sector's Key Challenges

Generation structure for period of 2020 - 2030 (in Revised PDP VII)



Power growth rate 2016 – 2020: 11 %/annum

Power growth rate 2021 – 2030: 7,8 – 8,3 %/annum

Dominant share in 2030: electricity from coal fired power plants – 53%

Power Sector's Key Challenges

Challenges in power generation

Meeting demand
10,5%–11%

Reasonable price
resources

Friendly with
environment

Hydro power
almost utilized
by 2025

No Nuclear
power
(4000 MW in
MP VII)

Coal fired power?

- Cheap resources
- Polluted?
- Coal import 2015-2030: 520 mil. ton?

Imported LNG

Pump storage
(2100 MW)

Energy
Efficiency

Smart grid

RENEWABLE ENERGY

- Decreasing price
- Environment friendly
- Less independent on imported coal

Power Sector's Key Challenges

Challenges in power generation

- ❖ **Domestic Coal Resources:** sufficient for meeting demand of existing power plants (capacity of approx. 6,700 MW) and new installations with total capacity of 7,600 MW. Domestic coal reserves will not be sufficient for 2021–2030 period.
- ❖ **Coal Import:** Currently 600,000 ton/year and will increase by 17 mil. tons in 2020, 44 mil. tons in 2025 and 78 mil. tons in 2030. Estimated coal import for 2015-2030 period will be 520 mil. ton. Needs accelerating development of transit port for coal transport
- ❖ After 2023, **LNG import** is expected – LNG terminal is in sync with Son My gas-fired PP of 2,000 MW to be operated in 2022 and of 4,000 MW in 2030.
- ❖ **Pump Storage** Bac Ai: 4 x 300 MW
Pump Storage Phu Yen: 3 x 300 MW

Renewable Energy???

Power Sector's Key Challenges

Total investment needed for period of 2016 - 2030

Period	2016-2020	2021-2025	2026-2030	2014-2030
Total power generation sources (bill USD) <i>Per year on average</i>	21.36 <i>4.26</i>	25.63 <i>5.13</i>	26.39 <i>5.28</i>	84.43 <i>4.79</i>
Total power network (bill USD) <i>Per year on average</i>	9.13 <i>1.83</i>	10.23 <i>2.05</i>	12.93 <i>2.59</i>	35.53 <i>2.09</i>
Total power sector (bill USD) <i>Per year on average</i>	30,43 <i>6,09</i>	35,86 <i>7,17</i>	39,33 <i>7,87</i>	116,96 <i>6,88</i>

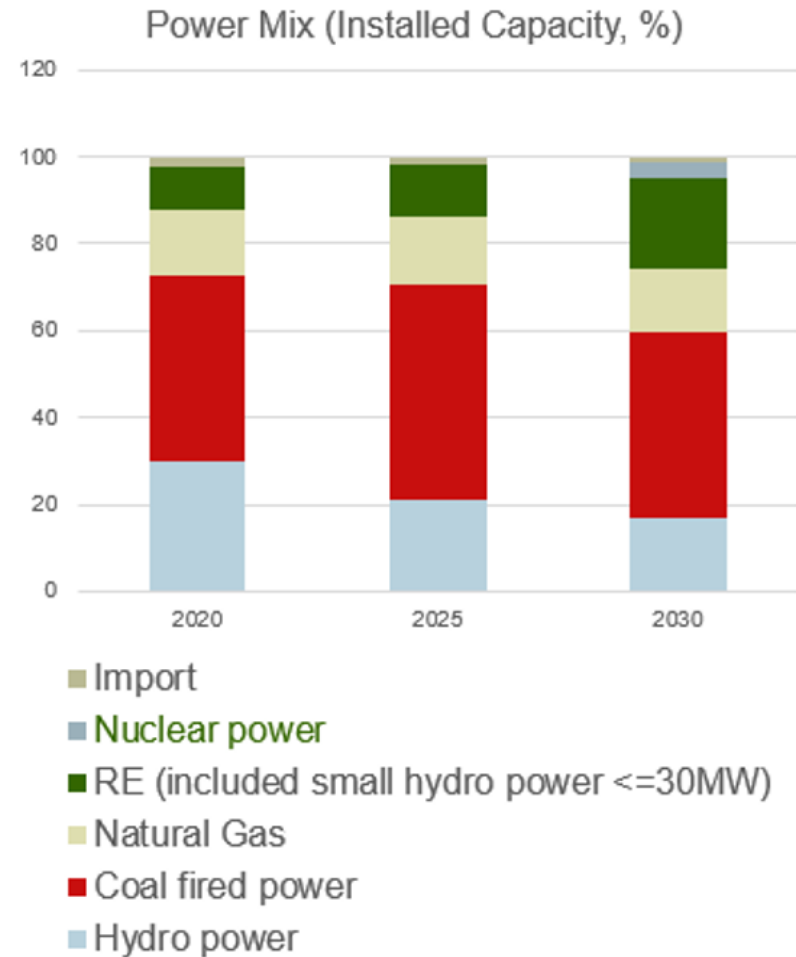
- USD, average 6,09 billion USD/year (58% for power sources, 42% for power transmission and distribution).
- Marginal cost of the power system to 2020: 9.2 US cent/kWh (in which 6.7 \$c/kWh for power generation, 2.5 \$c/kWh for power transmission and distribution).

2. POLICIES FOR RENEWABLE ENERGY DEVELOPMENT IN VIETNAM

Renewable energy target

(in revised Master Plan VII)

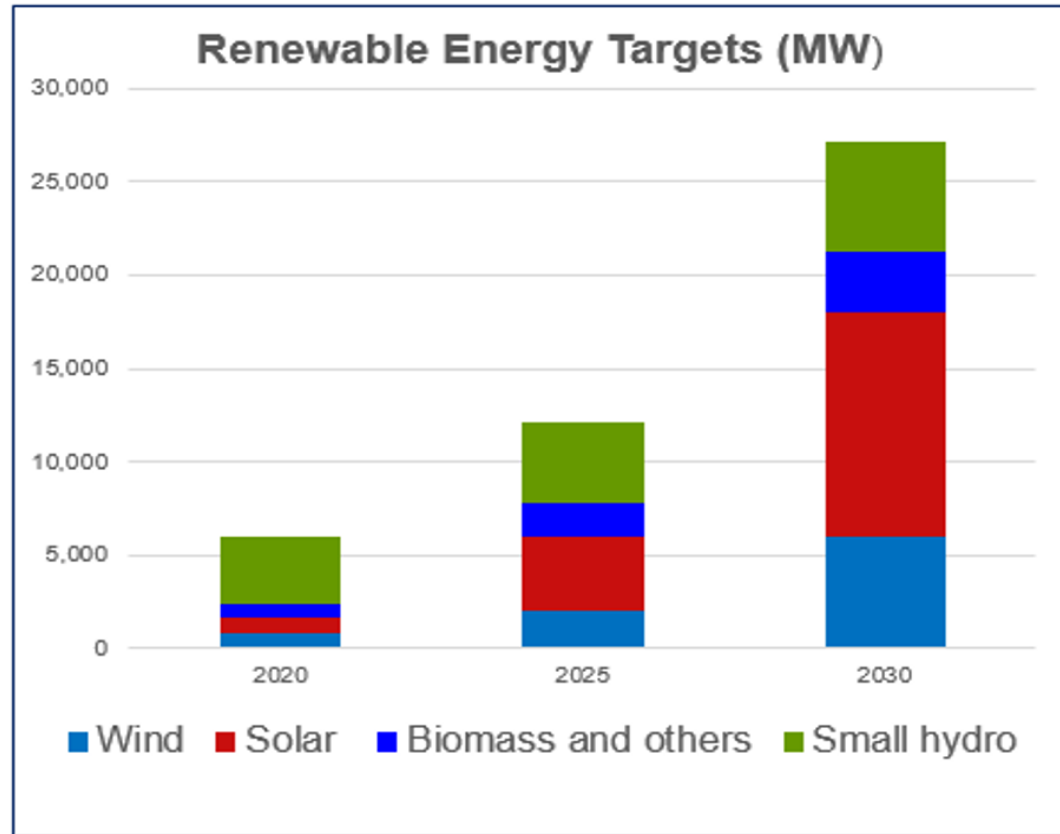
Power Mix (Installed Capacity, MW)	2020	2025	2030
Hydro power	18,060	20,362	21,886
Coal fired power	25,620	47,575	55,167
Natural Gas	8,940	15,054	19,037
RE (included SHP<=30 MW)	5,940	12,063	27,195
Nuclear power	0	0	4,662
Import	1,440	1,448	1,554
Total installed capacity (MW)	60,000	96,500	129,500



Renewable energy target

(in revised Master Plan VII)

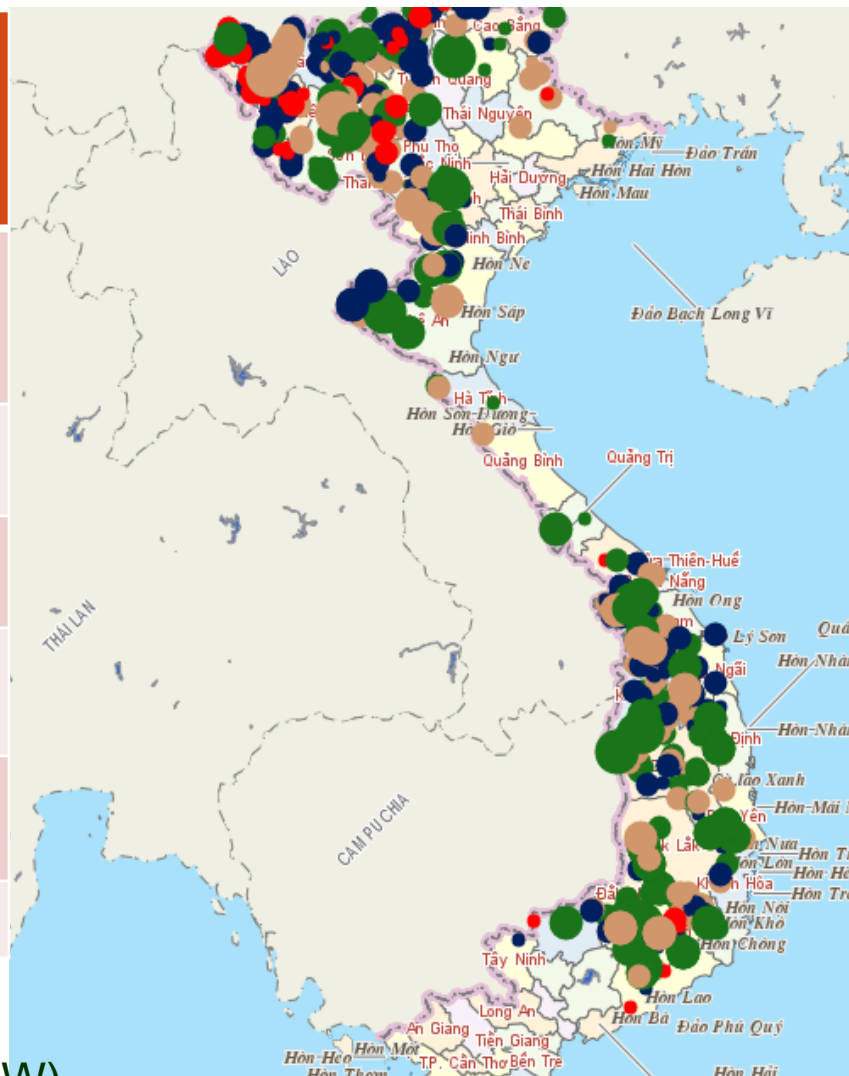
Renewable Energy (MW)	2020	2025	2030
Wind	800	2,000	6,000
Solar	850	4,000	12,000
Biomass and others	750	1,824	3,281
Small hydro	3,540	4,239	5,915
Total	5,940	12,063	27,195



RE Potential and Status

Hydro Power Projects

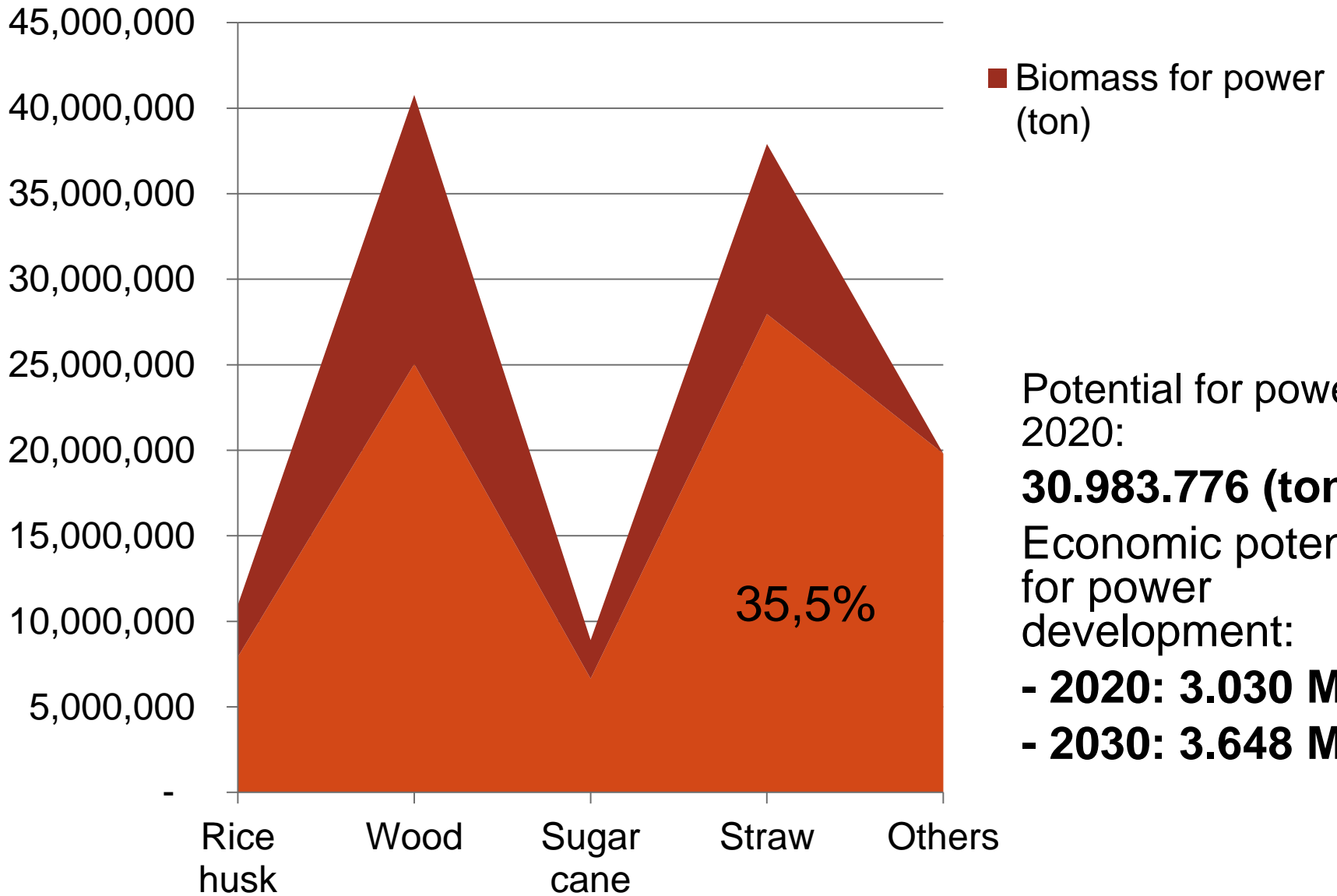
	Small and medium		Large hydropower projects	
	Number of projects	Capacity	Number of projects	Capacity
O	229	2152	63	13017,5
C	168	2067	32	3678,0
FS	244	2460	14	706,5
P	66	384	5	388,0
Total	707	7.065	114	17.790,0



Theoretical potential: 300 bil. kWh

Technical potential: 123 bil. kWh (31.000MW)

Biomass – potential & current status



Potential for power 2020:

30.983.776 (ton)

Economic potential for power development:

- **2020: 3.030 MW**

- **2030: 3.648 MW**

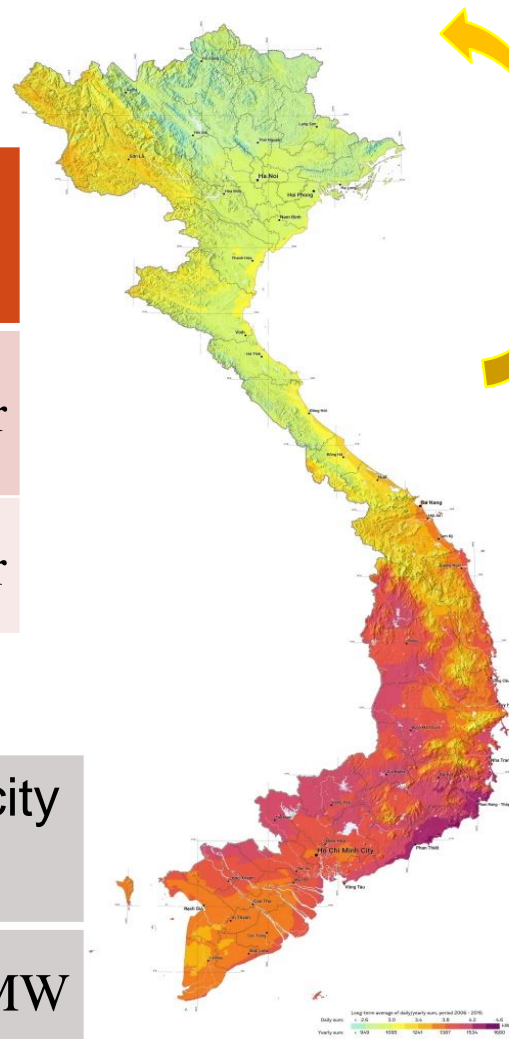
PV power – potential & status

SOLAR RESOURCE MAP
PHOTOVOLTAIC
POWER
POTENTIAL
VIETNAM

	Theoretical potential
CSP System	100 GWh/year
PV	1.2 GWh/year

Source: CIEMAT report, 2014

Projects in planning	Total capacity
14	1742 MW



GHI = 3.4 kWh/m²/day

GHI = 4.8 kWh/m²/day

Incentive mechanism for RE development

Technology	Status		Price	Note
	Supporting	Issued		
SHPs	Avoided cost	2008	5 UScent/kWh	TT 32/2014/TT-BCT
Wind power	FIT	2011	7.8 UScents/kWh	QD 37/2011/QD-TTg
Biomass	FIT	2013	- Co-generation: 5.8 UScent/kWh - Other type of biomass for electricity generation: 7.6 UScent/kWh (2017)	QD 24/2014/QD-TTg
Waste to energy	FIT	2013	- land fill gas: 7.28 UScent/kWh - incineration: 10.05 UScent/kWh	QD 31/2014/QD-TTg TT 32/2015/TT-BTC
PV Power & Net-metering	FIT	April 2017	9.35 UScent/kWh	QD 11/2017/QD-TTg

Other supporting mechanism for RE

- Must-taken regulation
- Standard PPA for SHPs, wind, biomass and solar power projects
- Import tax: Import tax and VAT exemption for equipment which is not domestically manufactured.
- Corporate income tax:
 - Tax rate: 10% for the first 15 years.
 - Tax exemption for the first 4 years, 50% reduction for next 9 years
- Fast depreciation: 1.5 times faster than other kind of projects.
- Exempt from land-use tax/charges.
- Exempt from environmental protection fees.

Barriers

1. National reliable, systematic and consistent database.
2. Economic and financial aspects:
 1. Levelized cost of energy;
 2. Limited access to commercial loan;
 3. Developers' competence;
3. Infrastructure: Goods transportation is of great difficulties.
4. Connection: Grid code issued for wind and PV power project. Rather long transmission line to the connection point.
5. Supply of auxiliary equipment and services: almost main and auxiliary equipment for RE is not localized.
6. Professional human resource.

3. Strategy and Road map for RE

2017 – 2020

1. Legal framework development

- ✓ Application of FIT mechanism for RE development;
- ✓ Assessment and setting up suitable mechanism for RE after 2020 (RPS; auction);
- ✓ Study for the development of smart grid;
- ✓ Development of home-scale renewable energy system;
- ✓ Development of standard for Green cities.

2. Potential assessment and RE development planning

3. Establishment of RE database management system

4. Development of local manufacture and service

5. Enhancement of cooperation in R&D

2020 – 2025

- Development of forecasting system
- Smart grid development
- Smart cities development



Thank you!

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