VIET NAM ENERGY PARTNERSHIP GROUP (VEPG)

TECHNICAL WORKING GROUP 5 - ENERGY MARKET

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Key updates to the Revised National Energy Master Plan for the period 2021 – 2030, with a vision to 2050

Hanoi, April 2026

Content

1. Current state of national energy
2. Socio-economic development forecast and national energy supply assessment
3. Master plan for National energy development
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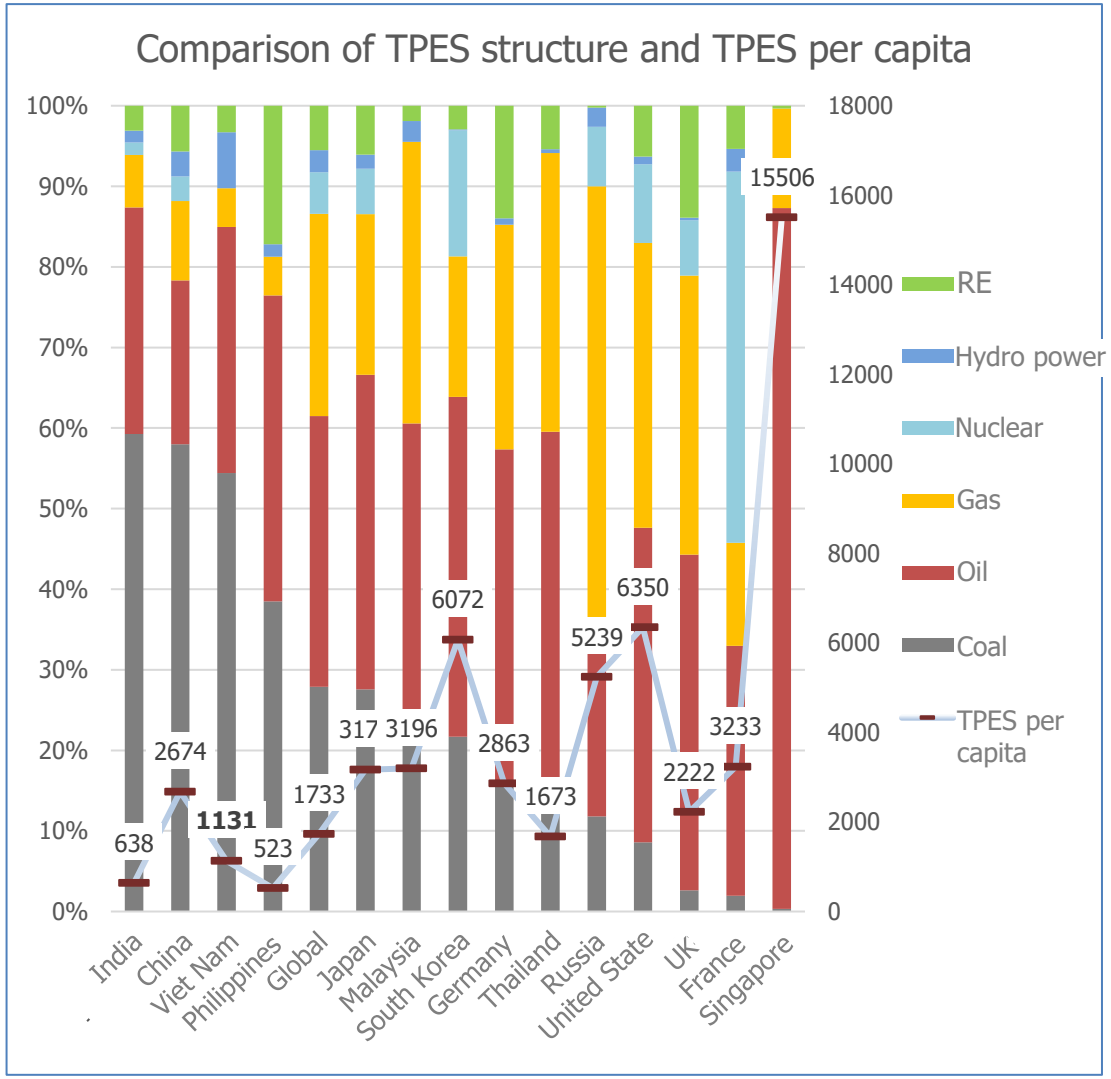
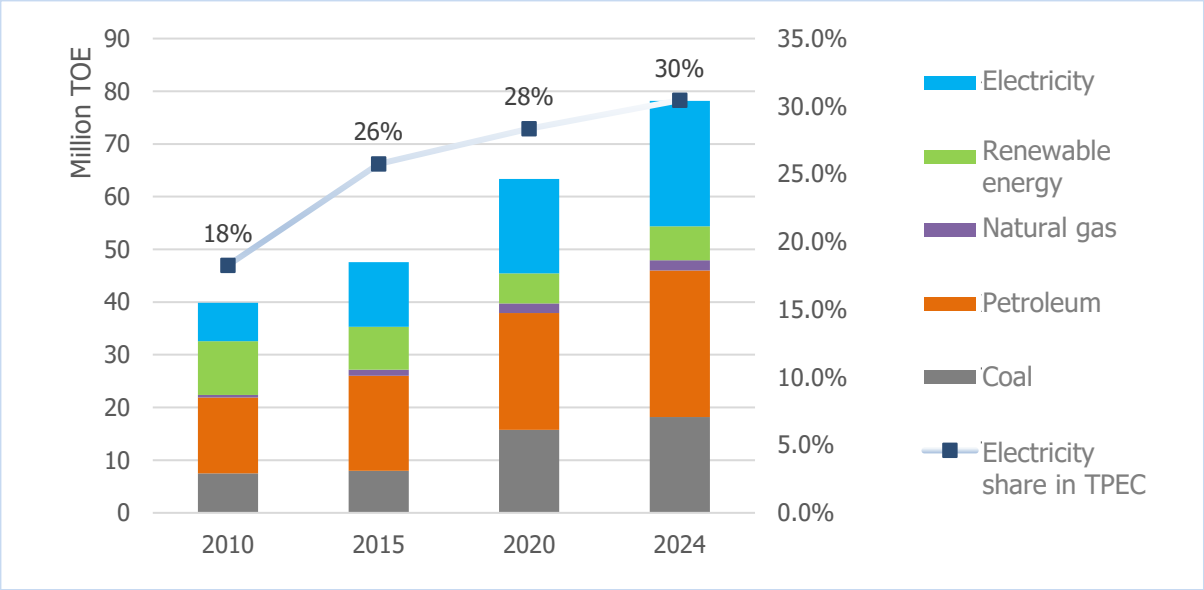
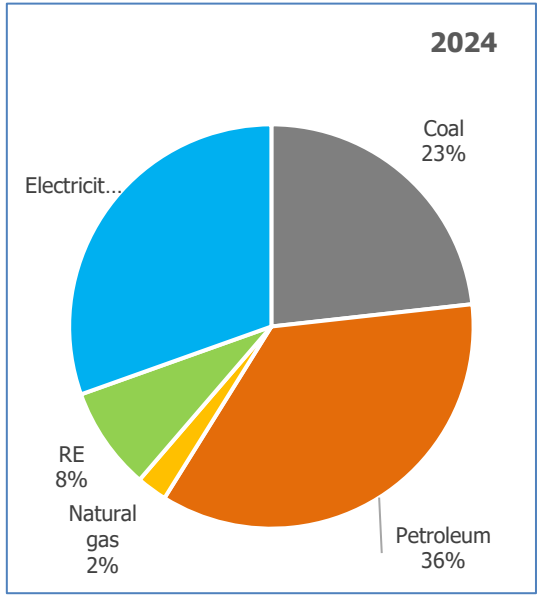
Current state of national energy

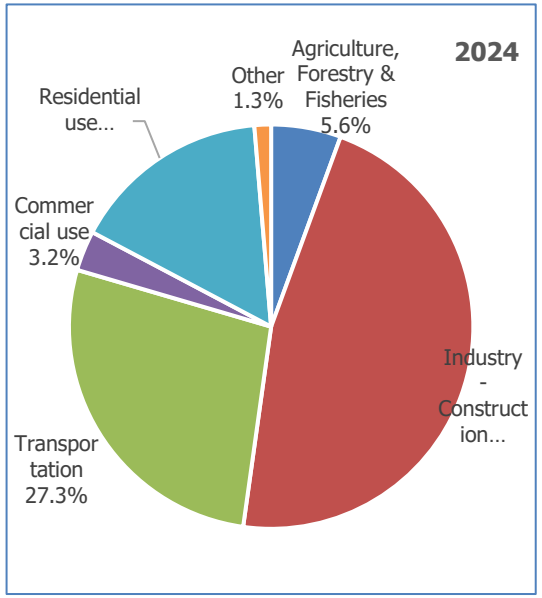
No.	Indicator	Unit	2010	2015	2020	2024	Increase (times)
1	GDP at constant 2010 prices	Quadrillion VND	2.739	3.697	5.006	6.269	2.3
2	Population	Million people	87.1	92.2	97.6	101.3	1.2
3	Urban population share	%	30.39	33.48	36.76	38.49	1.3
4	GDP per capita at current price	USD	1,690	2,596	3,552	4,700	2.8
5	Total Primary Energy Supply (TPES)	Million TOE	51.6	63.0	95.0	114.6	2.2
6	Total Final Energy Consumption (TFEC)	Million TOE	39.8	47.6	63.7	78.5	2.0
7	Primary energy intensity per capita	kgOE/person	592	683	973	1131	1.9
9	Net energy import share of TPES	%	-17.6	8.4	41.3	41.9	-
10	Electricity consumption per capita	kWh/person	972	1,548	2,140	2,731	2.8
11	Electricity share in TFEC	%	18.3	25.7	28.2	30.3	1.7
12	Total GHG emissions from energy sector	Million tons of CO_2	147	158	268	309	2.1



Final energy demand



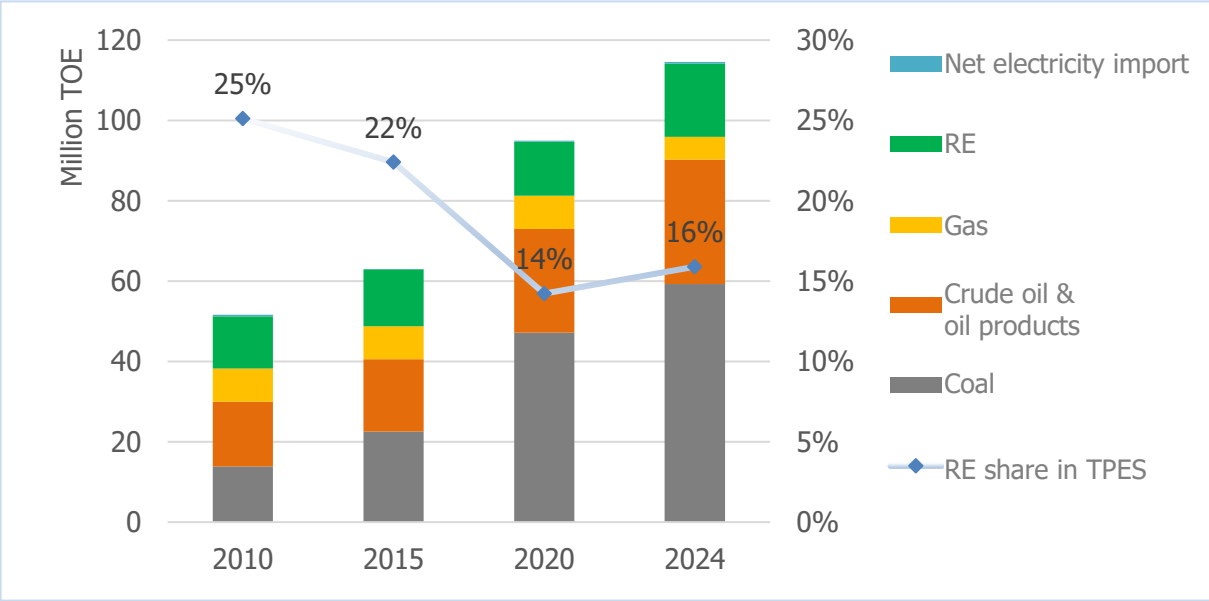




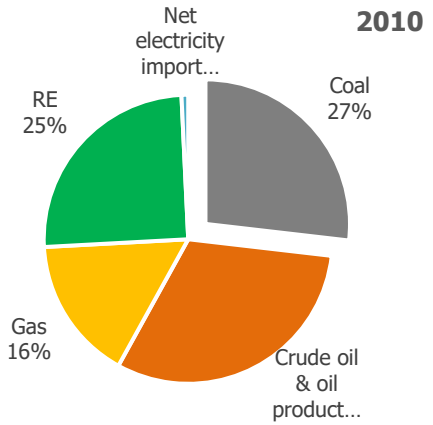
No.	Type of energy	2010	2015	2020	2024
1	Coal	7,513	7,960	15,765	18,164
2	Petroleum products	14,361	18,030	22,124	27,855
3	Natural gas	493	1.167	1.838	1.904
4	Renewable energy (RE)	10,185	8,159	5,690	6,445
5	Electricity	7,278	12,246	17,957	23,803
6	**Total**	**39,830**	**47,562**	**63,374**	**78,172**
7	Electricity share in TPEC	18.3%	25.7%	28.3%	30.5%

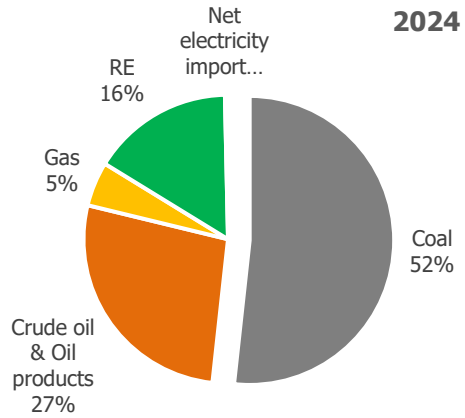
- Average growth of TPEC is 5.1%/year; lower than the 6.1% recorded in the period of 2016-2020.
- Petroleum products account for 36%, coal 23%; electricity 31% with the highest growth rate;
- Demand growth by sector: Transportation 7.3%/year; Industry-Construction 4.4%/year; Residential use 4.1%/year; Other industries: Agriculture–Forestry–Fisheries 5.6%/year, Commercial-Service 5.5%/year, and Others 7.3%/year.
- Consumption by sector (2024): Industry-Construction, Transportation and Residenital use accounted for 91.3% of TFEC (respectively 54.0%, 23.5% and 13.7%).

Primary energy supply



No.	Type of energy	2010	2015	2020	2024
1	Coal	13,850	22,590	47,191	59,254
2	Crude oil & oil products	16,099	17,984	25,791	31,009
3	Gas	8,316	8,223	8,280	5,688
4	RE	12,959	14,121	13,510	18,216
5	Net electricity import	386	84	186	392
6	**Total**	**51,610**	**63,002**	**94,959**	**114,560**
7	RE share in TPES	25.1%	22.4%	14.2%	15.9%



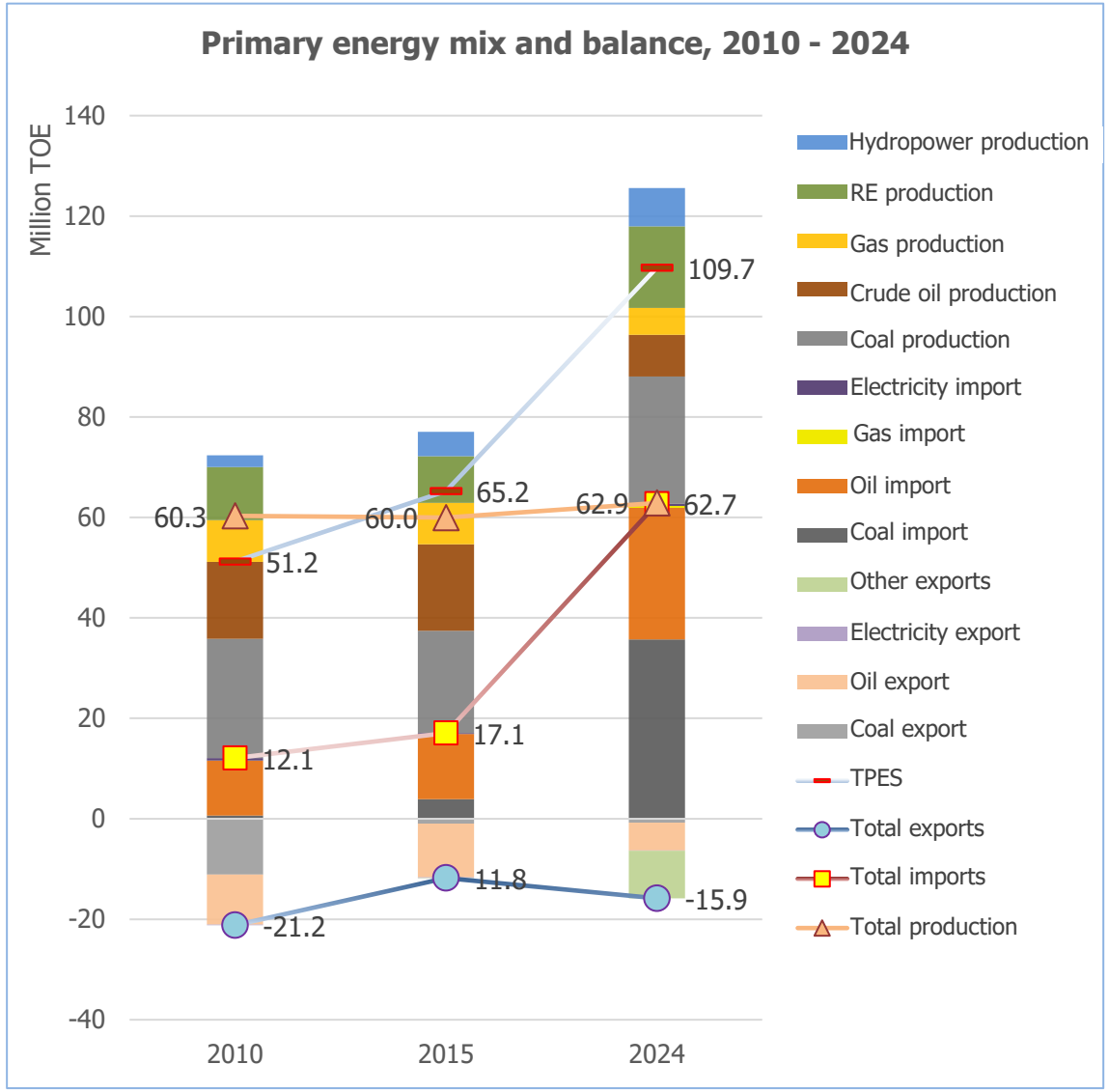


Trends in TPES, 2021-2024:

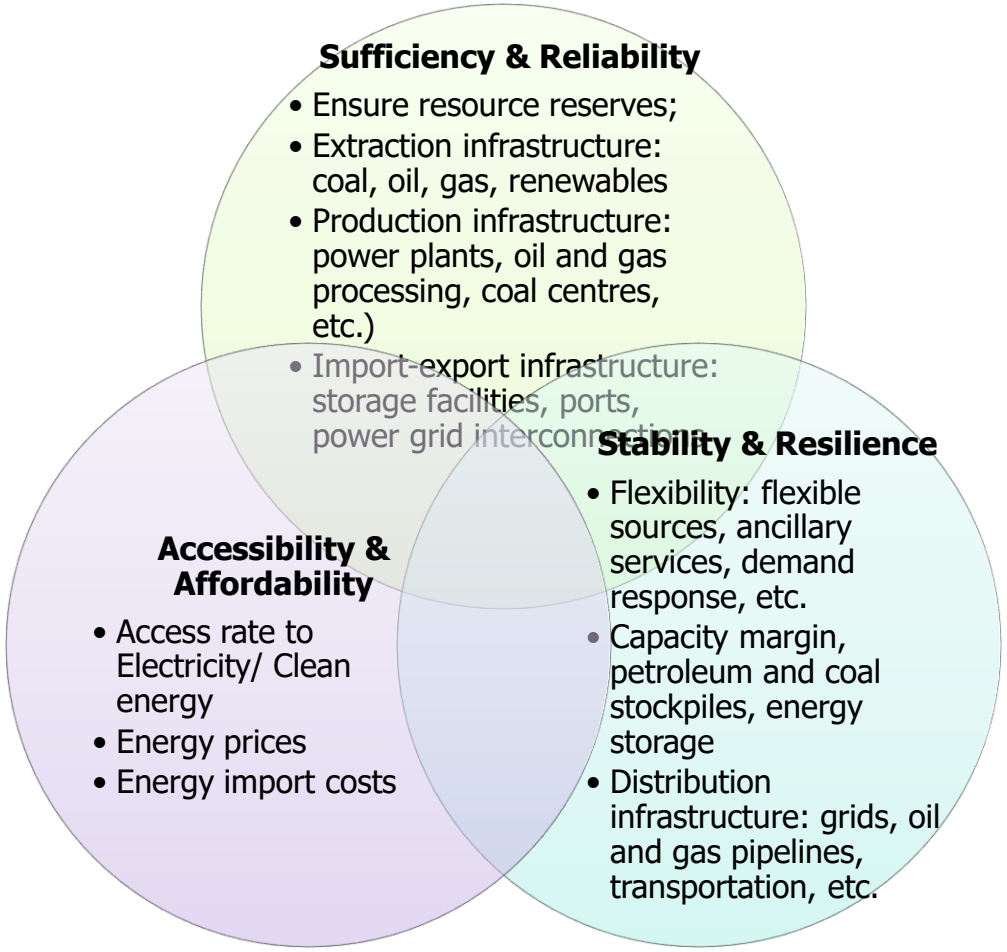
- Coal, crude oil and oil products accounted for ~ 78% of TPES.
- Coal reached 59.2 million TOE, with an increase of 5.9%/year.
- Crude oil stood at 19.4 million TOE, a rise of 4.3% during 2021-2024 period.
- Oil products totaled 11.6 million tons, increasing 5.4% over the same period.
- Natural gas decreased by 2.6 million TOE compared to 2020.
- RE reached 18.2 million TOE, growing at 7.8%/year.

Primary Energy Mix, 2015 - 2024

Item	Unit	2010	2015	2024
GDP at current prices	Million USD	147,109	239,425	476,069
Agri - Forestry - Fisheries	%	15.4%	13.3%	10.4%
Industry - Construction	%	33.0%	34.3%	36.5%
Commercial - Service	%	40.6%	42.6%	44.2%
Taxes/Subsidies	%	11.0%	9.8%	8.8%
GDP per capita	USD	1,689.6	2,596.0	4,699.6
Total primary energy supply	KTOE	51,610	63,002	109,102
Coal	%	26.0%	35.7%	55.0%
Crude oil	%	31.7%	30.0%	26.3%
Gas	%	16.2%	12.6%	5.2%
Renewable energy	%	20.7%	14.2%	6.2%
Hydropower	%	4.6%	7.4%	7.0%
Electricity import	%	0.8%	0.1%	0.4%
Share in TPES				
Renewable energy	%	25.3%	21.6%	13.1%
Energy import	%	23.4%	27.1%	57.5%
Net energy import	%	-17.6%	8.4%	42.9%
Ratio of energy import value to				
/ total import turnover	%	7.6%	3.7%	6.2%
/ total export turnover	%	8.9%	3.8%	5.8%
/ GDP	%	4.4%	2.6%	5.0%



Energy security



$HHI = s_1^2 + s_2^2 + \cdots + s_n^2$ HHI = 0 ÷ 10.000;
HHI > 2,500: Highly concentrated market;
1,500 < HHI < 2,500: Moderately concentrated market;
HHI < 1,500: Unconcentrated market.

Energy Security Index Development: 2010–2024

Index	2010	2015	2020	2024
Primary energy supply per capita (TOE/person) World avg: 1.73; Europe: 2.51; Asia: 1.53	0.59	0.68	0.97	1.13
Electricity consumption per capita (kWh/person) World avg: 3,494; OECD: 7,755; East Asia: 5,569	972	1,548	2,140	2,731
Reserves-to-Production ratio (R/P) (years) World avg: Coal: 139; Oil: 53.5; Gas: 48.8	Coal: ~70; Crude oil: 20; Gas: ~40			
Net import share in TPES (%)	-17.6	8.4%	41.0%	41.9%
HHI for petroleum import diversification	1,700	1,835	1,210	1245
HHI for TPES diversification	2,078	2,773	3,595	3418
Gross capacity reserve margin (%)	30.8	32.4	37.2	42.0
Average outage duration (SAIDI) - min/customer OECD avg: 43.8; Japan: 2.4; New Zealand: 226.2		2,281	356	220
Petroleum reserves (days of net imports) IEA standard: 90 days of net imports (prior year basis)				~63 days
Electrification rate (%) World avg: 91.6				99,8
Average electricity price (USD/kWh) World avg: 0.170; EU: 0.255, Asia: 0.084	0.056	0.074	0.078	~0.083
Average gasoline price (USD/litre) World avg: 1.31				~0.735
Share of energy import costs in GDP	4.4	2.6	2.9	5.0

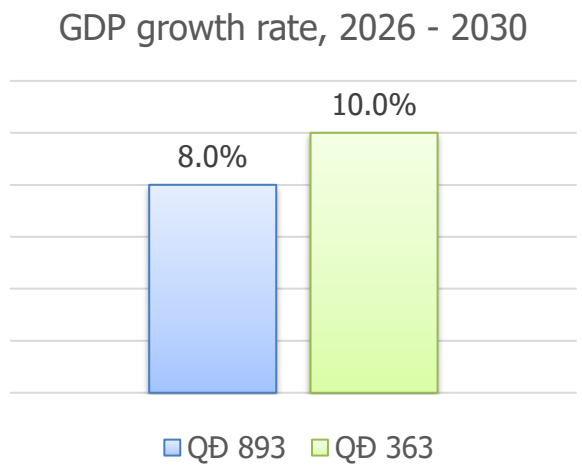
Socio-economic development scenarios

Basis for socio-economic development scenarios:

- Resolution of the 14th National Party Congress
- Resolution 252/2025/QH15 of the National Assembly, amending and supplementing several articles of Resolution 81/2023/QH15 dated 09 January 2023 of the National Assembly on the National Master Plan for the period 2021 - 2030, with a vision to 2050

Targets: Average annual GDP growth rate of over 8.0% during 2021 – 2030 period; with the 2026 – 2030 phase reaching 10% or higher per year.
By 2030, GDP per capita at current price shall reach approximately 8,500 USD.

Scenario/ Index	2030	2035	2040	2045	2050
Base scenario					
GDP (VND billion, 2010 constant prices)	9,939,977	14,537,581	21,016,571	28,504,026	36,165,071
GDP per capita (USD/person/year)	7.8	11.5	16.4	21.8	27.0
Average GDP growth in 5-year periods (%/year)	8.0%	7.9%	7.6%	6.3%	4.9%
High-development scenario					
GDP (VND billion, 2010 constant prices)	10,975,508	17,678,584	26,402,926	36,520,339	46,551,549
GDP per capita (USD/person/year)	8.5	14.0	20.6	27.9	34.8
Average GDP growth in 5-year periods (%/year)	10.1%	10.0%	8.4%	6.7%	5.0%



Analysis of national energy sources

Domestic sources

- Coal: 2026 - 2030 period: 40-45 million tons/year; by 2050: ~40 million tons/year
- ↓ Crude oil: 2026 – 2030 period: 5.8 – 8.0 million tons/year; 2031-2035 period: 6.0 – 9.0 million tons/year; 2036 - 2050 period: 4.8 – 7.8 million tons/year.
- ↓ Natural gas: 2026 – 2030 period: 5.4 – 11.0 billion m3/year; 2031 – 2035 period: 10.0 – 15.0 billion m3/year; 2036 – 2050 period: 14.0 – 18.8 billion m3/year.

Renewable power generation

- ↑ Onshore and near-shore wind power: 221,000 MW
- ↑ Offshore wind power: 600,000 MW
- ↑ Utility-scale solar PV: 914,000 MW (837,000 MW ground-mounted and 77,000 MW floating solar)
- ↑ Rooftop solar: 48,000 MW
- ↑ Medium- and large-scale hydropower (additional): 6000 MW
- ↑ Small-scale hydropower: 2700 MW; hydropower from irrigation reservoirs: 820 MW
- ↑ Pumped-storage hydropower: 24,000 MW
- ↑ Biomass power: ~7000 MW; Waste to energy: ~1700 MW; Geothermal energy: 460 MW

Biomass energy

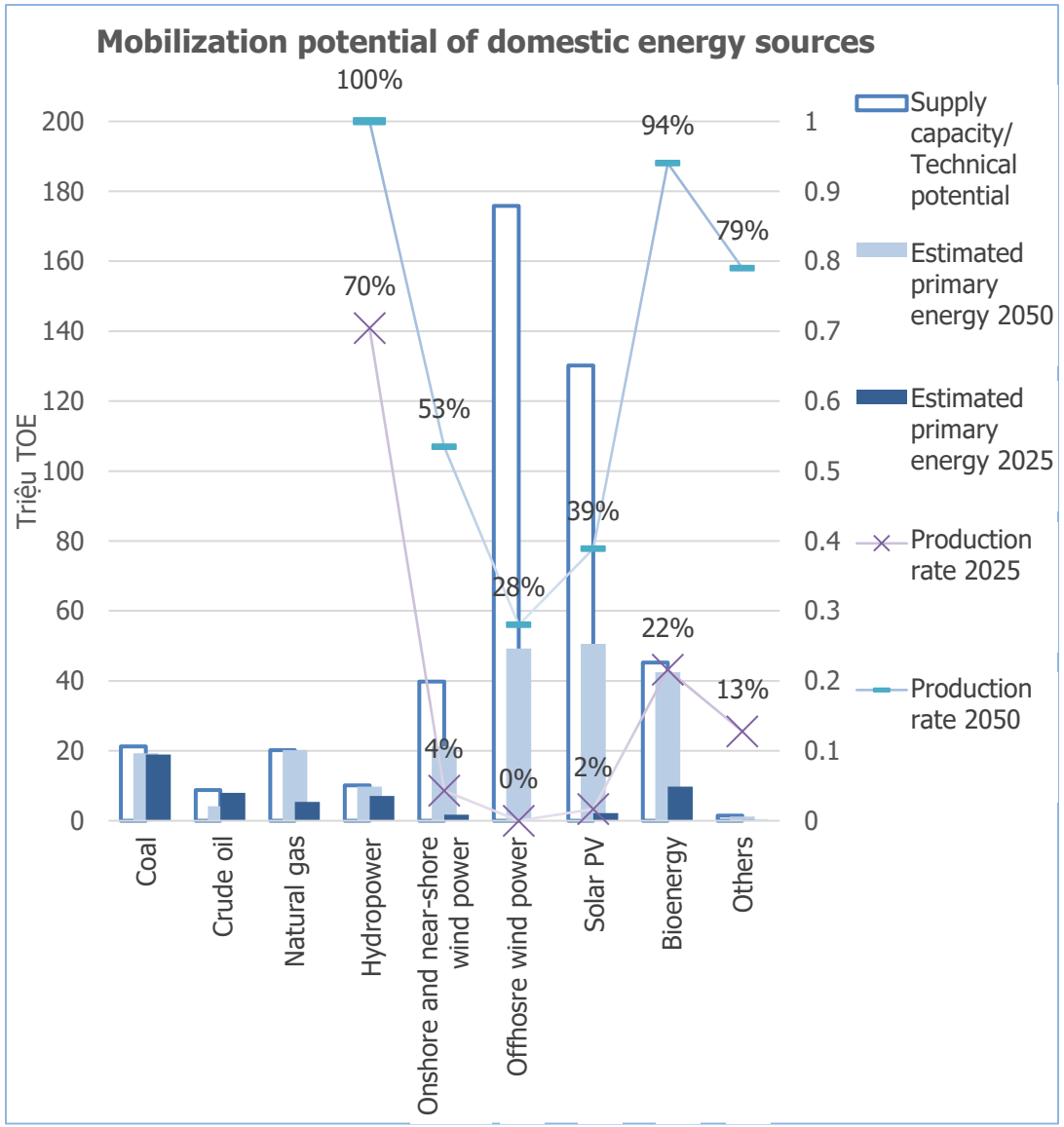
- ↑ ~45 million tons of oil equivalent (wood fuel, wood waste, agricultural by-products and others)

Hydrogen-based energy

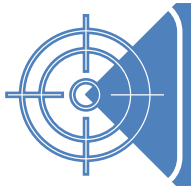
- Based on the potential of renewable power generation and coal gasification with Carbon Capture and Storage

Energy imports

- LNG: potential import markets including the Middle East, Australia, United State, Southeast Asia
- Coal: In the medium term, focus on Australian and Indonesian markets; in the long term, consider investment in coal imports from Russia, South Africa, and other countries.
- Petroleum: Targets Asian markets to leverage tax incentives.

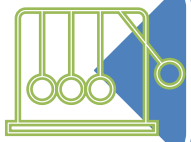


Planning principles



Develop energy development plan that ensure energy security based on optimized, least-cost solutions, providing reliable, stable and affordable energy while meeting international goals and commitments

Formulate revised energy master plan based on socio-economic development objectives, fully integrating the Revised PDP 8 and aligning with the National Master Plan and other relevant plans;



Achieve a harmonious balance between the coal, oil & gas and power sectors while maximizing the mobilization of other domestic energy sources; enhance the extraction and utilization of domestic energy sources to reduce import dependency; strengthen strategic energy reserves and energy storage;

Establish integrated energy industrial hubs with natural gas, LNG, power, oil refineries and petrochemicals, and renewables in provinces with competitive advantages; prioritize the integration of centralized LNG terminals and coal transshipment hubs to ensure regional balance;

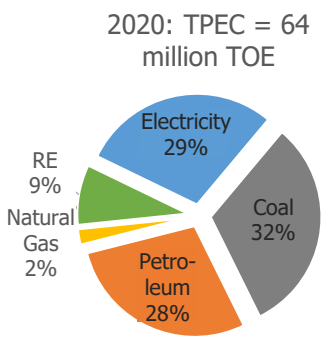
Ensure flexibility, define energy investment orientations, the participation of various economic sectors in the energy industry's development in line with the Party guidelines and state regulations.

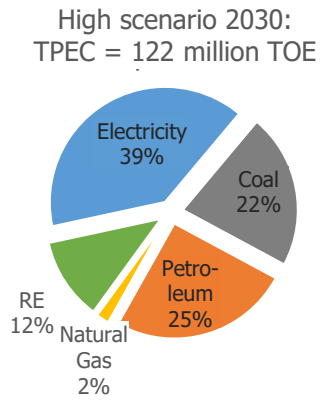
National energy demand forecast

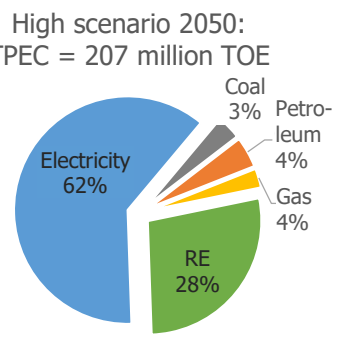
- TPEC is projected to be approximately 122 milllion TOE by 2030 and oriented toward 207 million TOE by 20250.
- Energy savings will reach ~10 million TOE by 2030, equivalent to 8.8% - 9.2% compared to BAU scenario.

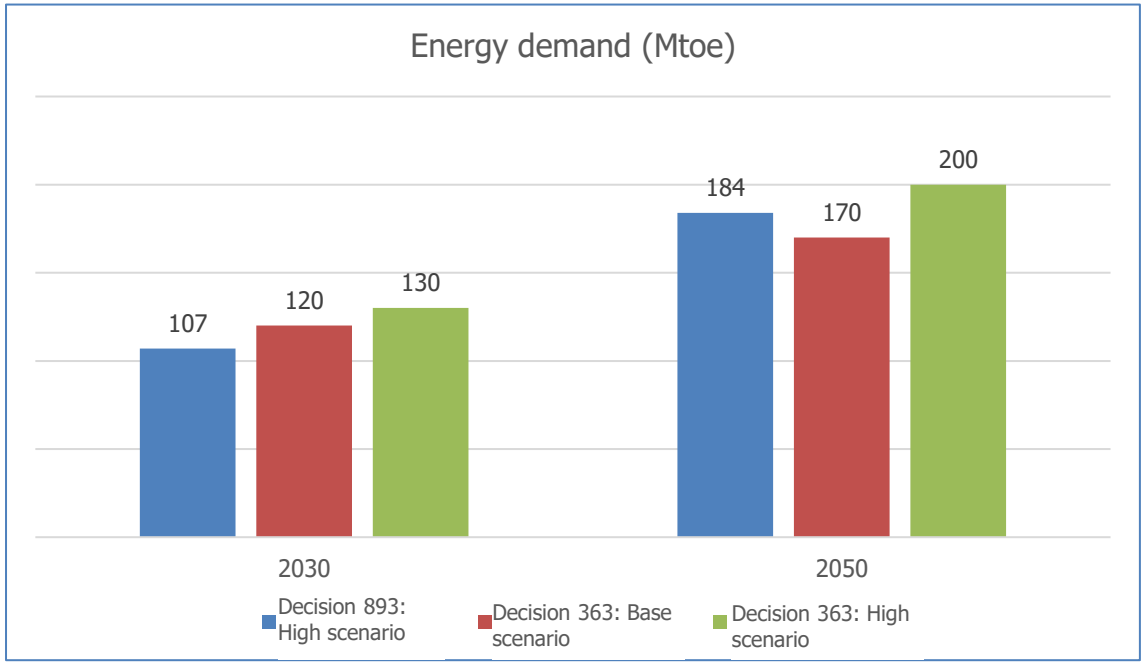
Final energy demand Unit: million TOE

	2020	High planning scenario		
		2025	2030	2050
Coal	20.5	21.4	26.4	7.2
Petroleum*	5.9	7.8	8.0	0.3
Jet fuel*	0.8	1.3	1.4	0.0
Kerosene	0.0	0.0	0.0	0.0
DO*	8.8	13.6	17.4	3.4
FO	0.4	0.4	0.4	0.0
LPG	2.6	3.0	3.5	5.4
Natural gas	1.5	1.1	2.3	5.7
Bio fuels	0.1	0.2	0.3	11.9
Sustainable Aviation Fuel	0.0	0.0	0.0	4.8
Hydro	0.0	0.0	0.0	12.8
Amoniac	0.0	0.0	0.0	12.3
Biomass	5.6	9.4	13.7	14.9
Solar PV	0.0	0.0	0.1	0.5
Electricity	17.9	26.7	48.0	127.3
Total	**63.9**	**84.8**	**121.5**	**206.5**









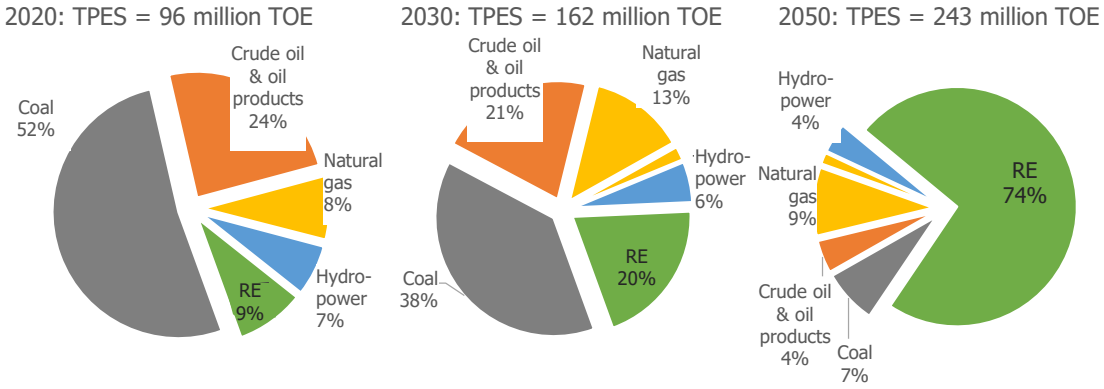
* Domestic petroleum demand excludes fuel supplied to international airlines and temporary import for re-export at bonded warehouses.

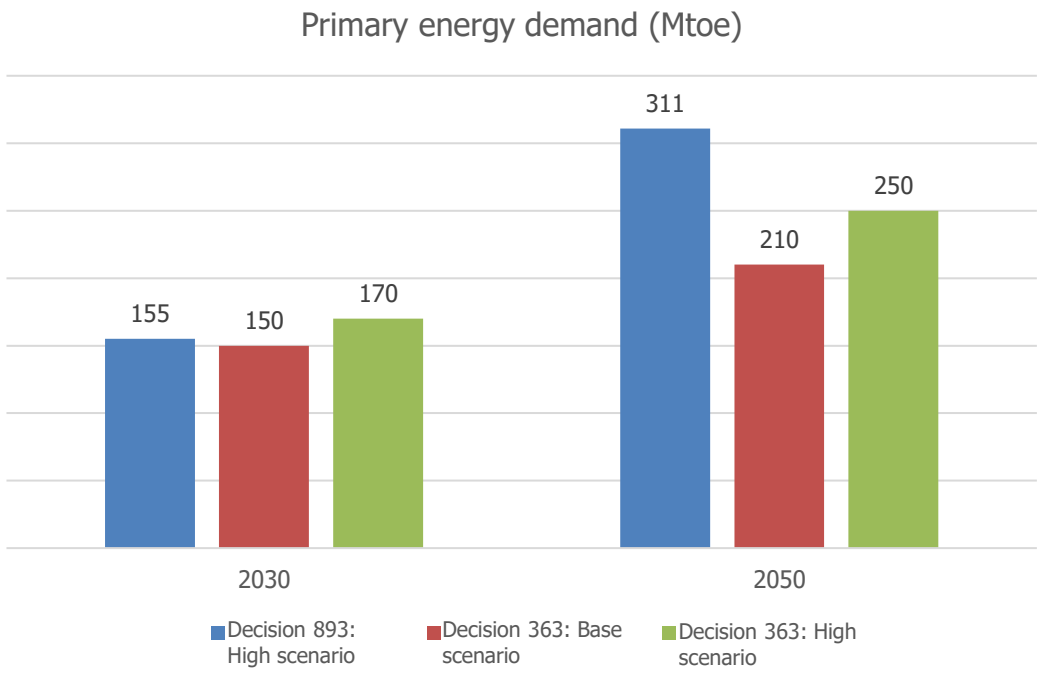
Primary energy supply

- TPES will reach 162 million TOE by 2030; and oriented toward approximately 243 million TOE by 2050;
- Share of RE will reach about 24.7% - 27.9% by 2030, around 56 – 58% by 2045 and around 74% - 77% by 2050
- Net import share will reach ~44% by 2030, 25% by 2045 and ~10% by 2050.

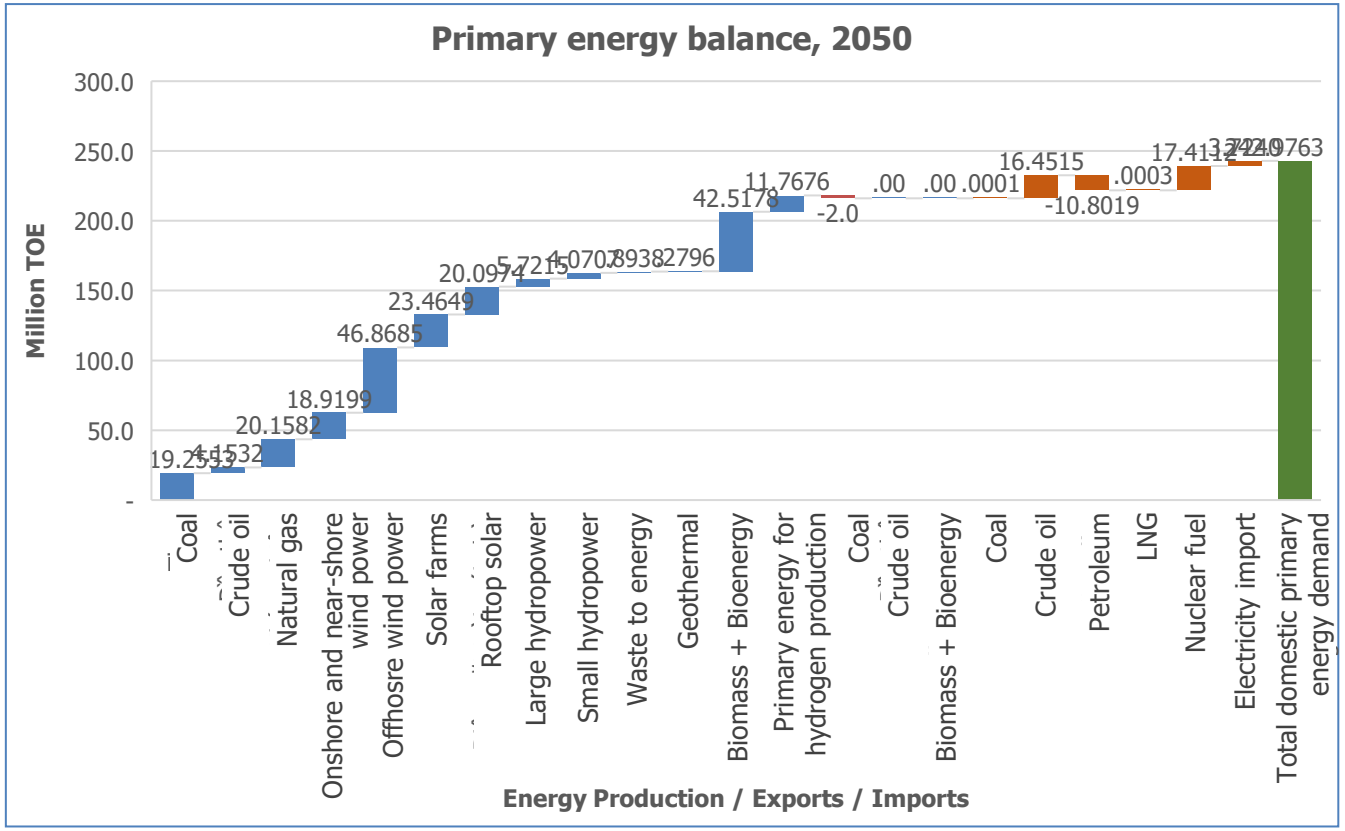
Primary energy supply *Unit: million TOE*

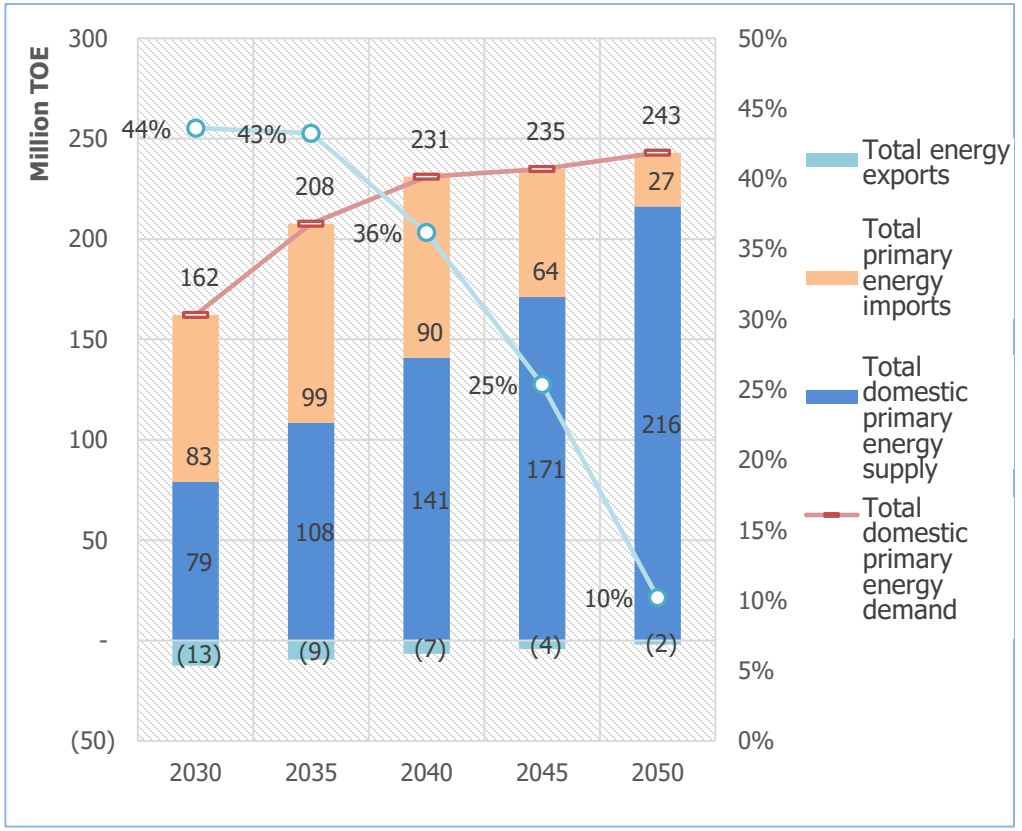
Source of energy	2020	High planning scenerio		
		2025	2030	2050
Coal	49.8	51.2	61.4	17.8
Oil	23.4	31.0	33.8	10.8
Gas	7.8	6.5	20.9	22.4
Electricity import	0.1	0.6	3.0	3.7
Hydropower	6.3	7.1	9.0	9.8
Bioenergy	7.5	9.5	16.7	42.5
Nuclear energy	-	-	-	17.4
Solar PV	0.8	2.2	8.6	48.0
Wind power	0.1	1.7	9.0	70.5
Total	**95.8**	**109.8**	**162.2**	**243.0**





Primary Energy Supply Mix: Production & Trade





- Step-by-step energy transition by promoting solar, wind, biomass, and biofuels to reduce import dependency.
- Declining domestic coal and crude oil extraction capacities. Ensuring domestic natural gas production plays a vital role.
- Investing in coal and LNG import infrastructure to ensure energy security.
- Preparing for investments in nuclear power, hydrogen, Sustainable Aviation Fuel (SAF), and other emerging energy sources.

- 2026 – 2030 period: transitional phase marked by import dependency
- 2031 – 2040 period: acceleration phase for renewables and a slowdown in imports.
- 2041 – 2050 period: Progressing toward energy self-suffiency and sustainable energy security.

Comparision of planning targets

No.	Specific targets	Decision 893/QĐ-TTg		Revised National energy master plan	
		By 2030 (2021 - 2030)	Vision to 2050	By 2030 (2026 - 2030)	Vision to 2050
1	Provide sufficient energy for socio-economic development with average GDP growth	7%	6.5% - 7.5%	≥10%	6.5% - 7.5%
2	Total final energy consumption (million tons of oil equivalent)	107	165 - 184	120 - 130	
3	Total primary energy supply (million tons of oil equivalent)	155	294 - 311	150 - 170	210 - 250
4	Petroleum reserves (days of net imports)	75 - 80	90	90	90
5	Share of RE in TPES (%)	15 - 20	80 - 85	25 - 30	80
6	Energy savings compared to BAU scenario (%)	8 - 10%	15 - 20	8 - 10%	
7	GHG emission reduction targets (%)	17% - 26%		15% - 35%	
8	Crude oil extraction outout (million tons/year)	6.0 – 9.5	7.0 – 9.0	5.8 – 8.0	6.0 – 9.0 (2031 - 2035) 4.8 – 7.8 (2036 - 2050)
9	Natural gas extraction output (billion m3/year)	5.5 - 15	10 - 15	5.4 – 11.0	10.0 – 15.0 (2031 - 2035) 14.0 – 18.8 (2036 - 2050)
10	Coal extraction output (million tons of commercial coal/year)	41 - 47	33 (2050)	38 - 45	45.1 (2035), 42.4 (2040), 40.9 (2050)
11	Development of clean energy hubs (including production, utilization, RE equipment manufacturing, petrochemicals, and related services)	Northern, South Central, and Southern regions		Red River Delta, South Central Coast & Central Highlands, and Southeast regions	
12	Green hydrogen production scale (million tons/year)	0.1 – 0.2	10 - 20	0.1 – 0.2	10 - 20

Objectives and development plans for the electricity sector are to be implemented in accordance with Decision No. 768/QD-TTg approving the Revised Power Development Plan VIII (Revised PDP VIII).

[1] According to updated coal production figures in the Draft Adjusted Master Plan for the exploration, extraction, processing, and utilization of minerals for the 2021–2030 period, with a vision to 2050.

Energy investment orientations

ANNEX 1. POTENTIAL INVESTMENT ORIENTATIONS IN THE OIL AND GAS SECTOR

Table 1. Basic Petroleum Survey Projects
Table 2. Oil and Gas Exploration
Table 3. Crude oil extraction
Table 4. Gas and condensate extraction
Table 5. Offshore gas pipelines
Table 6. LNG Terminals (excluding LNG storage for LNG-to-power plants in the Revided PDP VIII)
Table 7. LNG Terminals integrated with LNG-to-power plants in the Revised PDP VIII
Table 8. Onshore gas liquefaction and processing
Table 9. Onshore gas pipelines
Table 10. Oil and gas processing

ANNEX 2. INVESTMENT ORIENTATIONS IN THE COAL INFRASTRUCTURE SECTOR

Table 1. Infrastructure for Coal industry development
Table 2. Production Maintenance in the Coal industry

ANNEX 3. INVESTMENT ORIENTATIONS IN THE RENEWABLE ENERGY AND NEW ENERGY SECTORS

Table 1. Production of Biofuels and Sustainable Aviation Fuels
Table 2. Production of Hydrogen and Ammonia
Table 3. New Eneergy Projects proposed by the PetroVietnam
Table 4. Renewable energy, Other new energy sources for back-up

Roadmap for energy security and energy transition

Energy Efficiency

Electrification & energy storage

Renewable energy development

New energy development (green H2, NH3)

Carbon capture, utilization and storage

>>2030 - 2035

Promote the extraction of domestic oil, gas, and coal resources;

Strongly develop the gas-to-power industrial chain and centralized LNG terminals;

Offshore wind: 6 GW; Onshore wind: 38 GW; Solar power: 36 GW; Nuclear power: 4.8–6.4 GW;

100% E10 gasoline in transport; Electric road vehicles >10%;

>70% of households having access to high-efficiency technologies;

Minimize new investment in coal-fired technologies; promote the use of gas and biomass in industrial production;

Implement energy-efficient and green building standards;

Ensure petroleum reserves of 90 days of net imports.

>>2040 - 2045

Production of non-energy products from oil, gas, and coal;

Promote fuel conversion for thermal power plants: H2, NH3, and biomass;

Develop High-Voltage Direct Current (HVDC) power transmission;

80% – 90% of households having access to high-efficiency technologies;

Production and use of advanced biofuels in transport;

Share of electric road vehicles: 20% – 40%;

Implement carbon-neutral building standards;

Green H2 production capacity: ~2 – 6 million tonnes;

CO2 capture capacity: ~1 – 3 million tonnes.

>>2050

Complete fuel conversion for thermal power plants: H2, NH3, and biomass;

Renewable Energy (RE): Offshore wind: 113–139 GW; Onshore wind: 84–91 GW; Solar power: 293–295 GW;

100% use of green fuels in transport;

Share of electric road vehicles: >50%;

100% of households having access to high-efficiency technologies;

100% of new buildings are carbon-neutral;

Green H2 production capacity: 10–20 million tonnes;

CO2 capture capacity: ~5–10 million tonnes.

Implementation solutions

Solutions for investment capital mobilization and allocation

- Develop breakthrough mechanisms and policies to attract all social resources for energy development, ensuring sufficient capital for energy development plans:
  - Ensure adequate capital, interest rate support, and sufficient credit for State-Owned Enterprises (SOEs) to focus on strategic infrastructure, energy extraction, transmission, centralized terminals, and reserves to safeguard energy security. (Resolution 70, 79)
  - Enhance and prioritize access to capital and green credit for Private Enterprises for power source development, as well as the production and use of renewable and emerging energy. (Resolution 68)
  - Attract foreign investment and resolve bottlenecks to leverage ODA, international support, and JETP funding for energy projects. (Resolution 70)
  - Encourage and create a favorable regulatory environment for private enterprises and households to invest in small and medium-scale renewable energy projects and "prosumer" projects (producing and consuming energy simultaneously). (Resolution 70)
- Allocate preferential credit and apply Government guarantees for national energy hub investments and large-scale, urgent, and nationally significant energy projects. (Resolution 70)
- Establish financial autonomy mechanisms and increase capital for State energy groups by raising the ratio of after-tax profits retained by enterprises; review and re-evaluate fully depreciated assets that still possess utility value. (Resolution 79)

Solutions on mechanisms and policies

- Perfect regulations for synchronous energy market development across the electricity, coal, oil & gas, and renewable energy sub-sectors, ensuring connectivity with regional and global markets. Establish transparent energy pricing determined by market forces. (Resolution 70)
- Develop mechanisms for assigning the implementation of large-scale energy projects invested in areas sensitive to national defense and security. (Resolution 70)
- Establish policies for strategic procurement (placing orders) and restricted bidding in the energy industrial sector to rapidly increase the localization rate, domestic production value, and self-reliance across the entire energy sector, ensuring the development of the domestic energy industry. (Resolution 68)

Risks management for the implementation of the Master plan

Tổng thể

- Monitor Master plan implementation
  - Develop and issue a set of evaluation criteria to measure the performance of agencies and organizations against the Mater plan;s objectives and tasks.
  - Establish regulations for an "alert mechanism": if a project is delayed by more than six months compared to planned milestones or commitments, the system will automatically trigger a special reporting process to enable corrective interventions.
- Institutional and financial risks:
  - Conduct biennial reviews; if bottlenecks remain unresolved, flexibly adjust the master plan.
  - Enhance decentralizeation for SOEs to autonomously decide on investments for urgent projects within their existing equity.

Oil and gas

- Reserves and Production risks:
  - Flexible energy import mechanisms that do not require Master Plan adjustments.
  - Prioritize resources and apply special mechanisms for the fast-track development of small and marginal fields with existing commercial discoveries
- Import infrastructure risks:
  - Allow for the urgent deployment of floating LNG sotrage and regasification units as supplementary solutions while onshore terminals are under construction.
  - Maximize the utilization of existing terminals and establish LNG/petroleum transport bridges.
- Petroleum production risks:
  - Optimize, enhance the capacity and effficiency of existing plants
  - Promote the production and use of biofuels.
  - Encourage the use of electricity and new energy in tranport and industrial production.
- Petroleum reserve risks:
  - Flexibly adjust national reserve projects.
  - Establish specific mechanisms for the purchase, sale, import, export, purpose conversion, and rotation of strategic petroleum reserves.

Power and RE

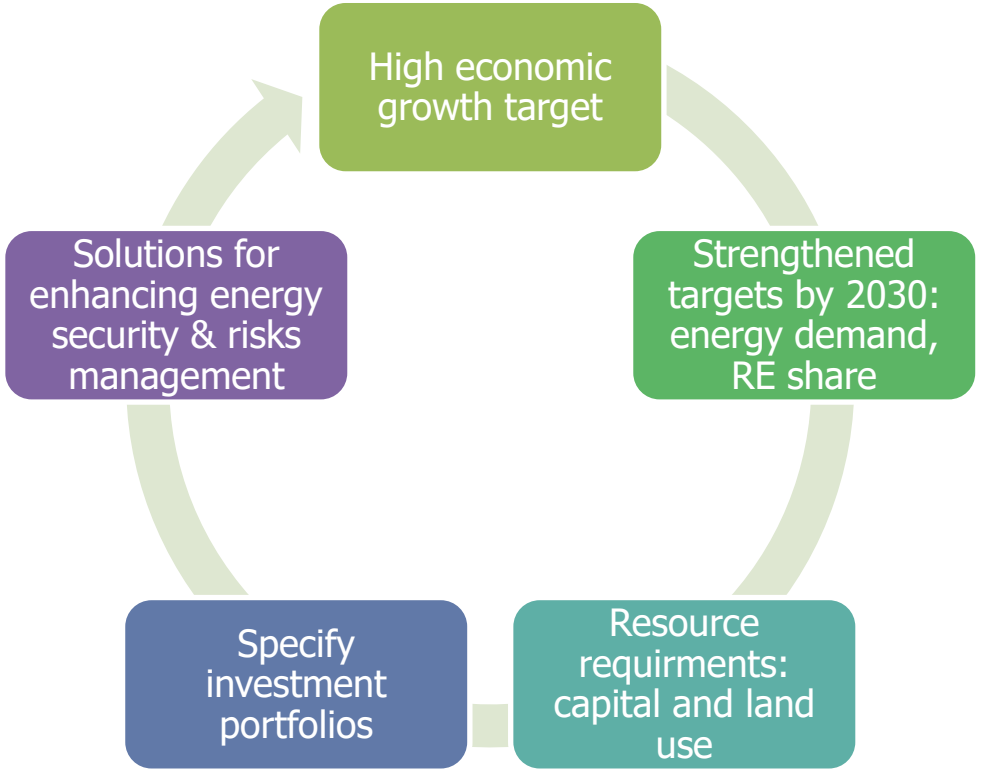
- Power source and Grid risks:
  - Develop a portfolio of back-up power sources with shorter lead times;
  - Enhance electricity imports in the short term;
  - Adjust dispatch strategies for existing power sources;
  - Strengthen energy efficiency measures, Demand Side Management (DSM), and Demand Response
- Risks of RE projects:
  - Allow for the implementation of renewable energy projects within the reserve capacity limits of the Master Plan.

Coal infrastructure

- Coal insfrastructure risks:
  - Maximize the existing capacity of entities operating within the same locality
  - Restore national coal reserves to ensure timely response to import risks and extreme weather fluctuations.
  - Strengthen cooperation between intra-industry and inter-industry enterprises to invest in a system of coal import hubs, transshipment terminals, and facilities for coal transshipment, blending, and storage.

Discussion

- Double-digit high economic growth targets for the 2026–2030 period
- Renewable energy targets in Total Primary Energy Supply
  - Rooftop solar and utility-scale (centralized) solar power;
  - Offshore wind (post-2030);
  - Biomass power and solid waste-to-energy;
  - Biofuels and biomass energy;
  - Electric vehicles (EVs);
  - Green energy for transport (H2, NH3, SAF…);
- Strengthen GHG reduction targets
- Significant increase in investment capital demand driven by RE development
- Open-ended portfolio for renewable energy investment orientations (biofuels, hydrogen, ammonia, SAF…)
- Risk management solutions for implementation and strengthening energy security.



Thank you!

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