



MINISTRY OF INDUSTRY AND TRADE
INSTITUTE OF ENERGY



The role of Energy storage/Hydrogen for the energy industry by 2050

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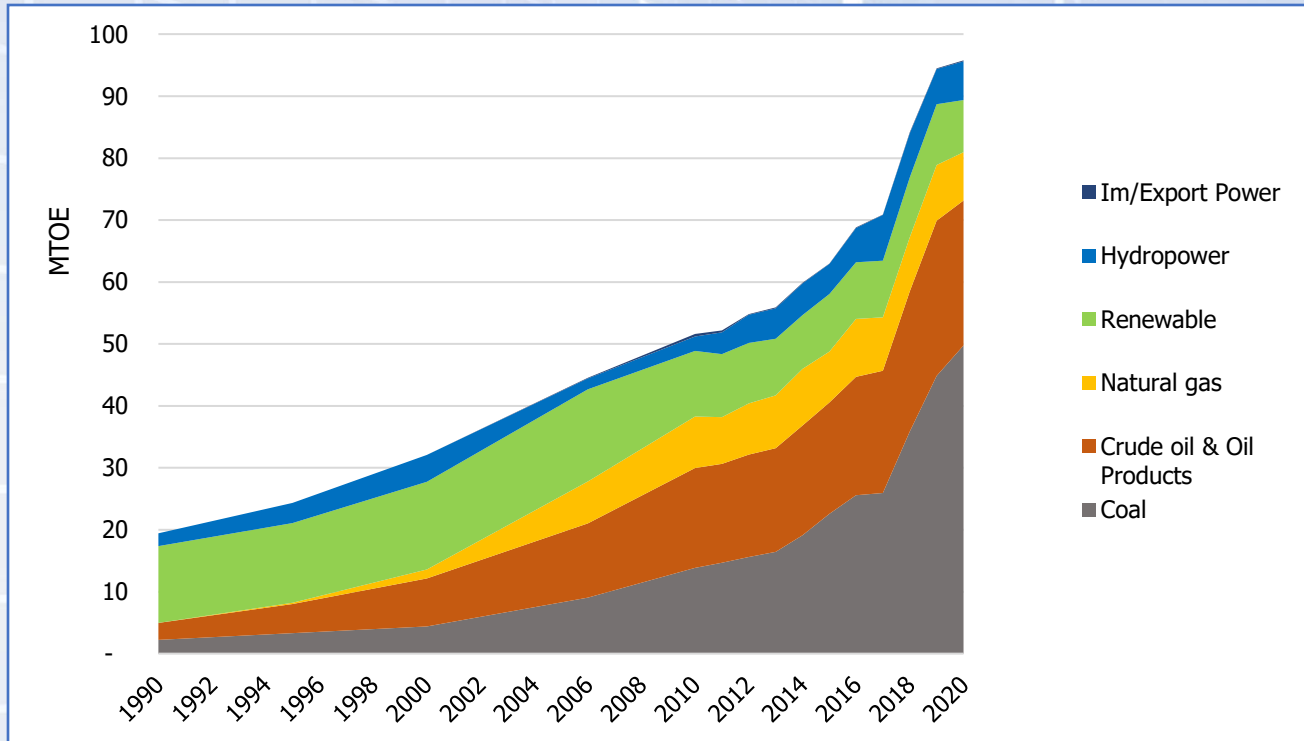
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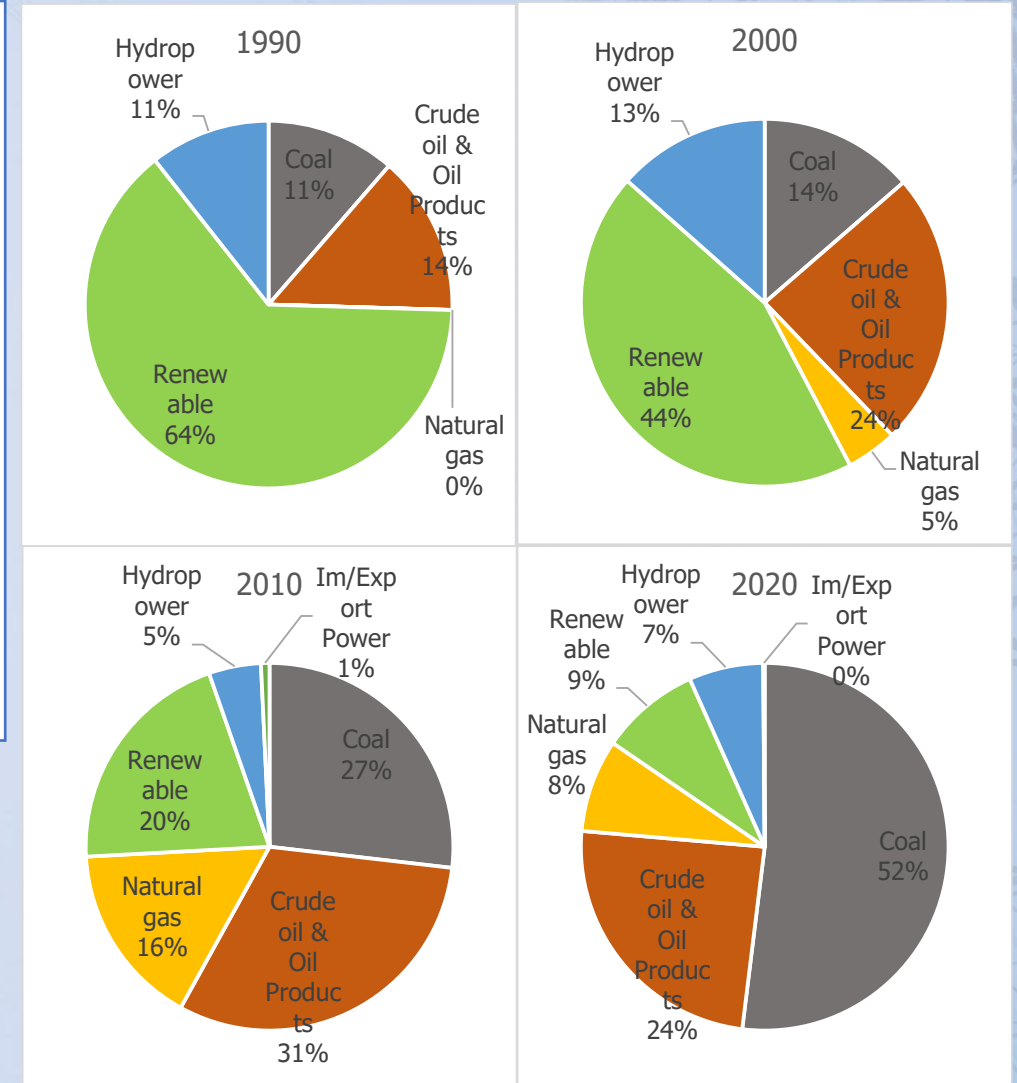
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- Energy transition scenarios
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- The role of storage, hydrogen technology

Primary energy supply 1990-2020



- Strong shift from non-commercial biomass energy to commercial energy structure
- Petrol has a good and even growth rate in the whole period
- Coal has increased dramatically in recent years
- Increasing dependence on imported energy

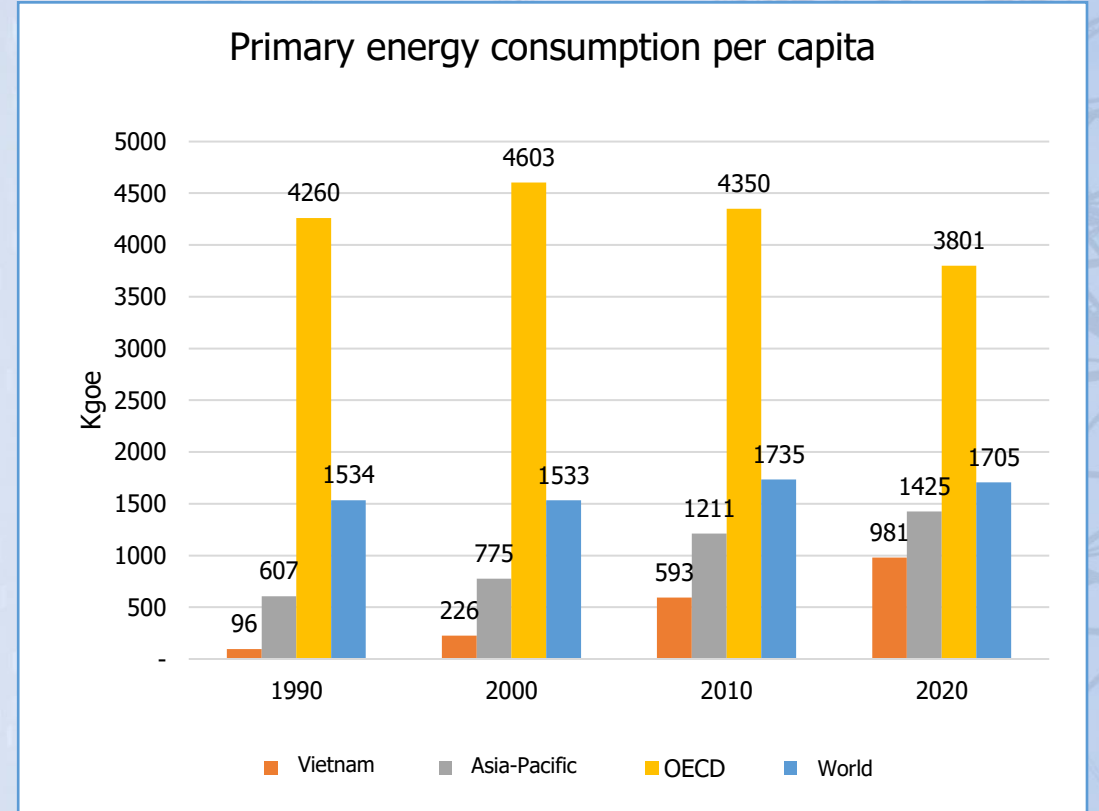
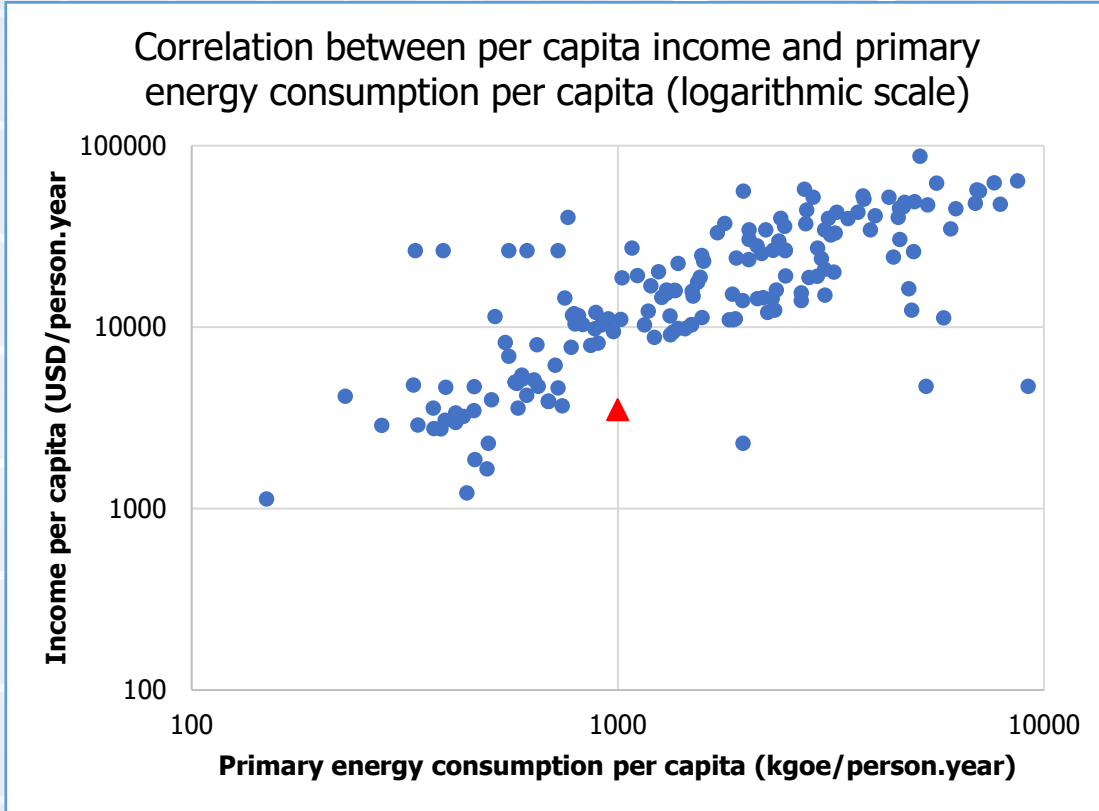


Context of energy conservation in Vietnam

Targets	Unit	2020	The increase compared to 2010
GDP	Trillion VND @2010	5.005	1.78
Population	Million people	97.6	1.12
Urban population structure	%	36.82	
GDP per capita	USD/person	3.552.0	2.18
Total Primary Energy Supply	Thousand TOE	95,762	1.86
Total Final Energy Consumption	Thousand TOE	66.014	1.66
Total Primary Energy Supply per capita	kgOE/person	981	1,650
Primary Energy Supply intensity over GDP	kgOE/1000USD	463	1.04
Ratio of Net Energy Imports to Total Primary Energy Supply	%	48.0	
Electricity consumption per capita	kWh/person	2.229	2.29
Total CO2 emissions from energy activities	Million tons of CO2	273	1.86

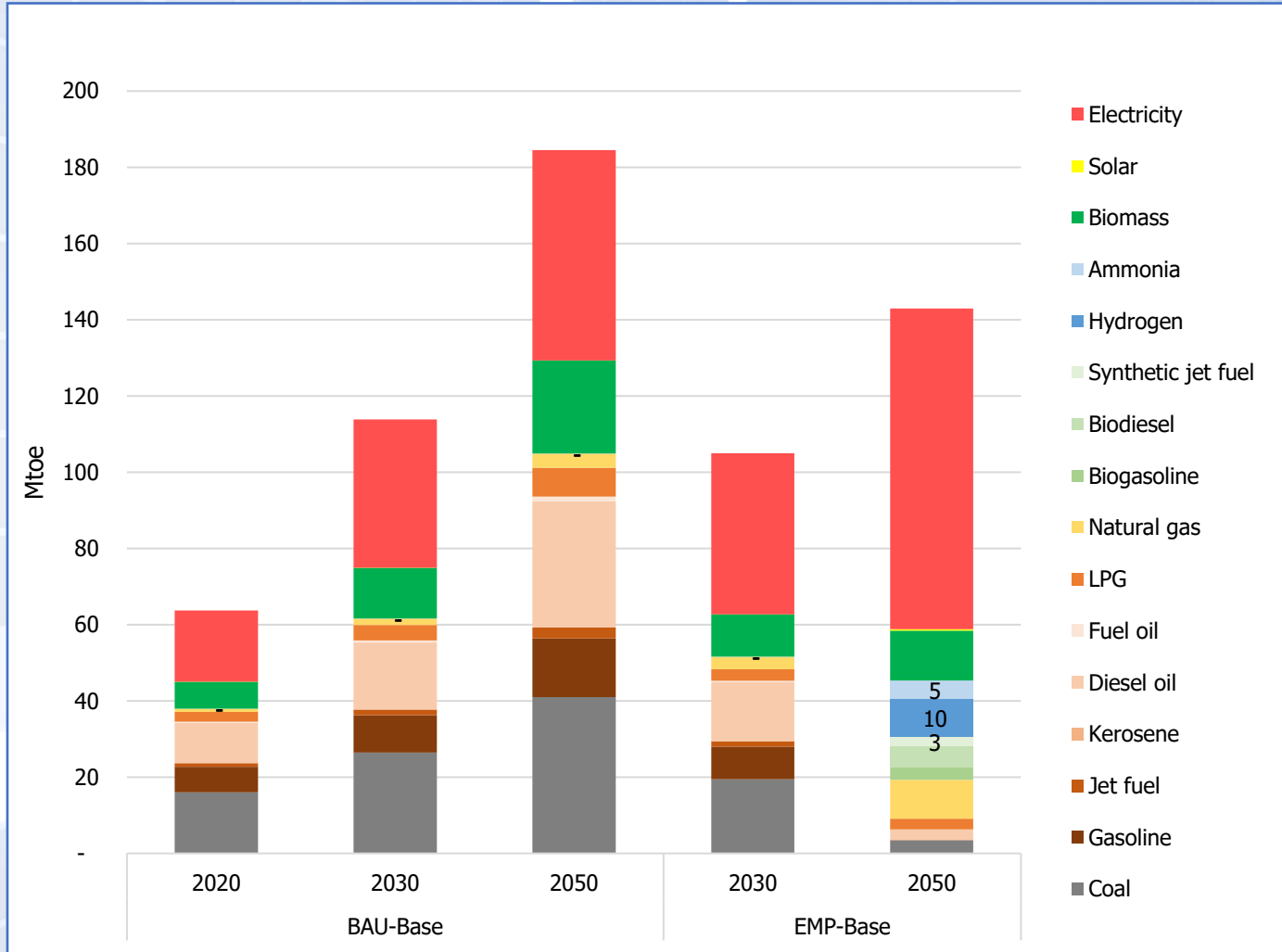
- ✓ Energy demand: economic growth, urbanization, mechanization of transportation, improvement of living standards
- ✓ Final energy: electricity consumption per capita and electrochemical rate in Final Energy Consumption increase rapidly
- ✓ Primary energy: rapid growth of renewable energy, high proportion of coal, low proportion of renewable energy
- ✓ Dependence on imported energy: the share of net imports in total Primary Energy Supply increased sharply
- ✓ Energy intensity to GDP: at a high level compared to the region and the world
- ✓ Energy emission intensity: increased rapidly due to the increase in the proportion of fossil energy.

International comparison



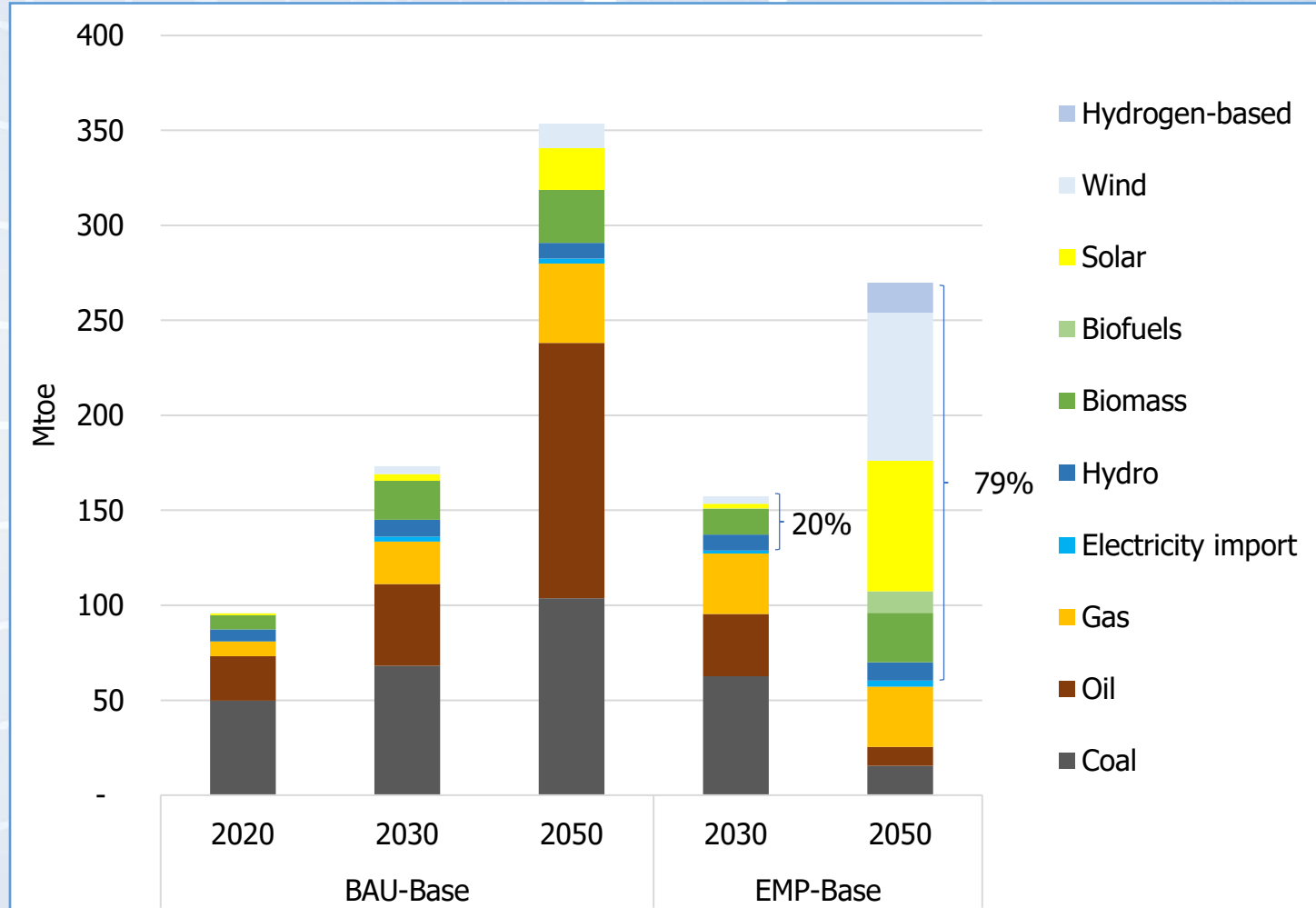
- ❖ Energy demand and income per capita are still low compared to international ones
- ❖ Energy demand still needs to grow rapidly to meet basic needs

Energy Master Plan: Final energy demand



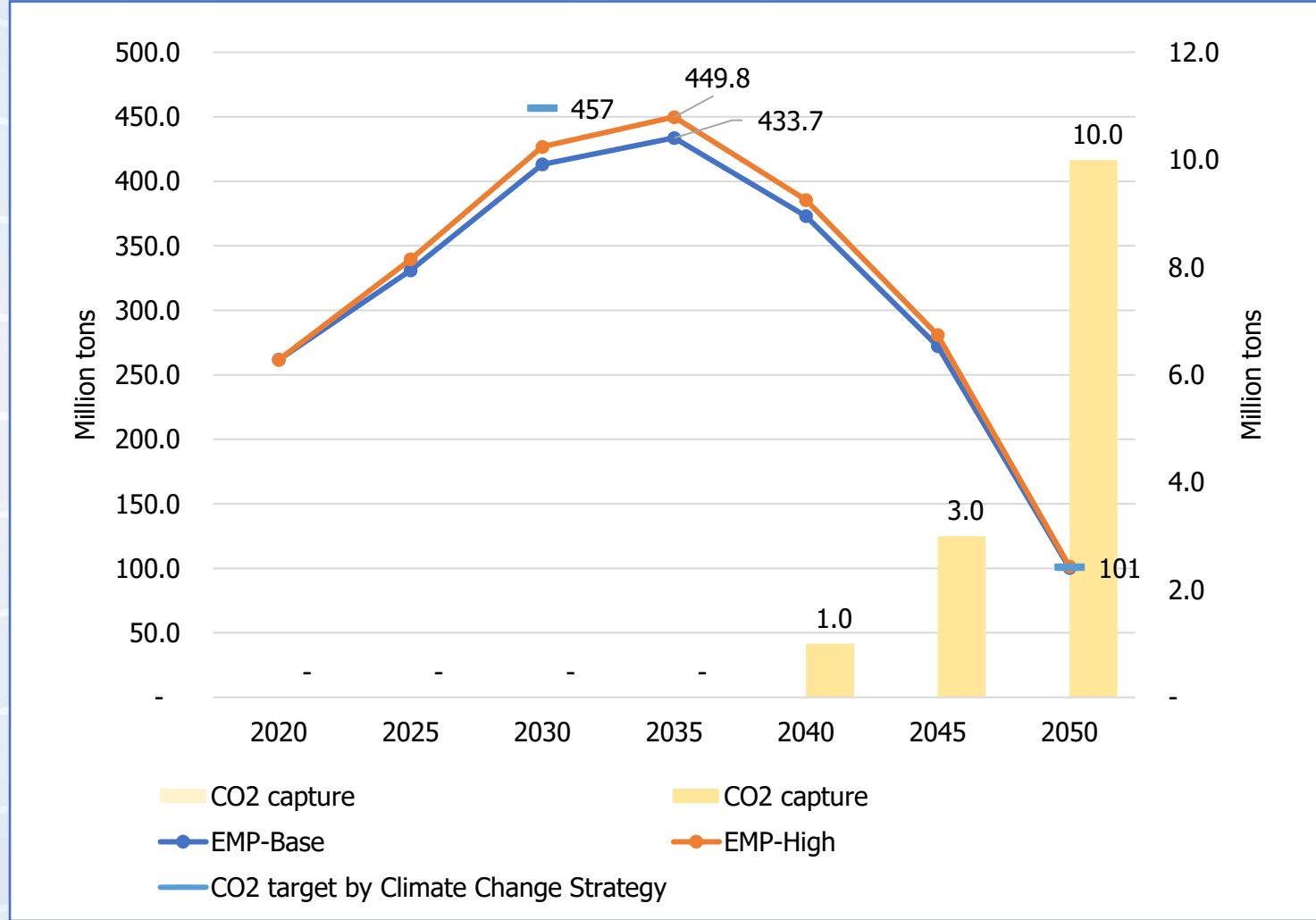
- **Energy demand:** saving ~8% in 2030, ~22% in 2050;
- **Energy structure for decarbonization:**
 - Electrification (40% by 2030, 59% by 2050)
 - Advanced biofuels
 - Hydrogen-based fuels: hydrogen, ammonia, synthetic fuels (e-fuels)

Energy Master Plan: Primary energy



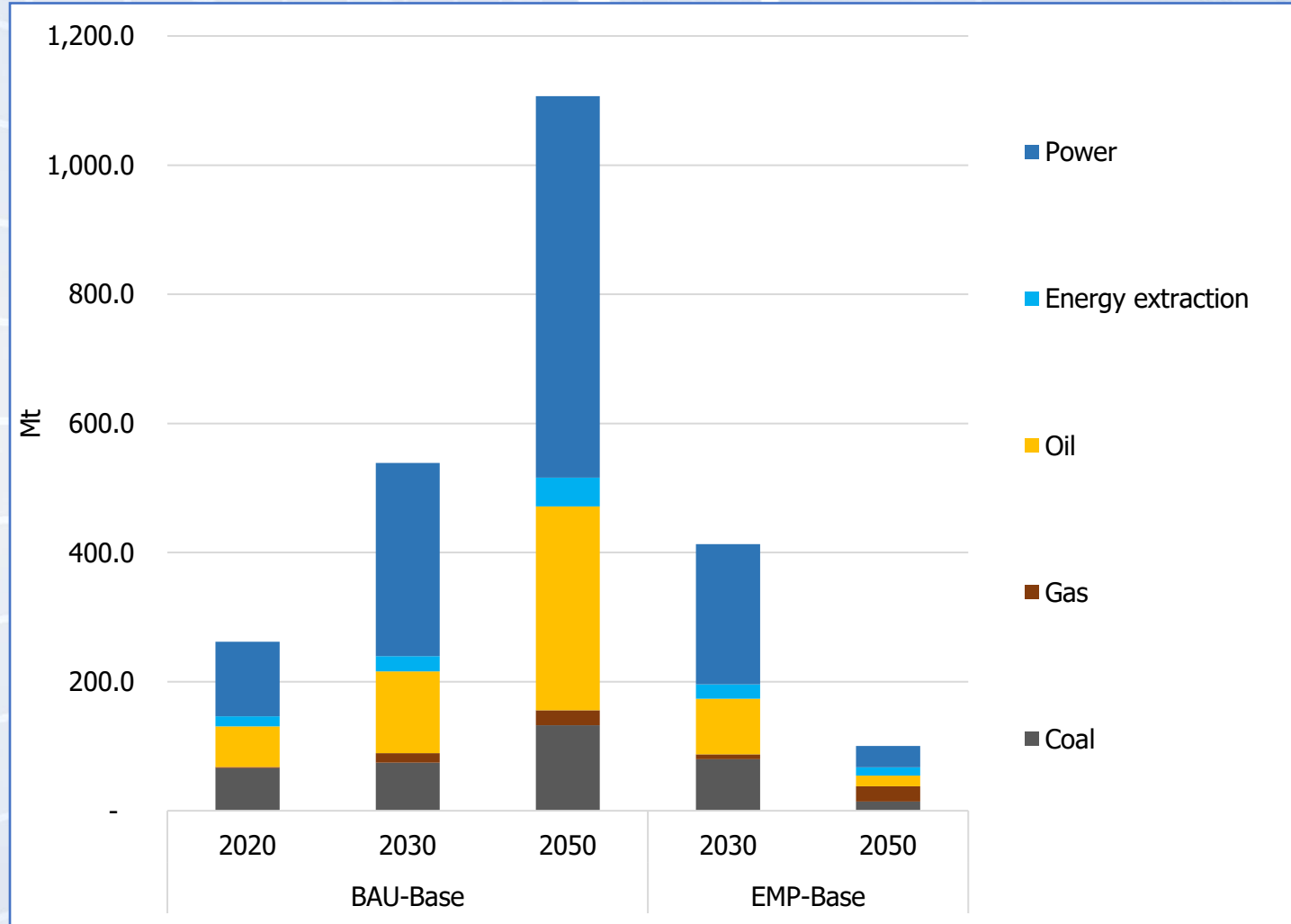
- **Energy demand:** decreased sharply due to the reduction of the final energy and the shift to a structure with more renewable energy
- **Decarbonization through energy transition:**
 - Renewable energy generation
 - Electrolysis produces hydrogen fuel
 - Shift from using coal for non-energy
 - Producing advanced biofuels

Energy Master Plan: CO2 emissions



- **CO2 emissions peak in 2035:** ~450 million tons of CO2
- Emission limits under the Climate Change Strategy: 457 million tons in 2030, 101 million tons in 2050;
- Developing the scale of CO2 capture at 10 million tons/year

Energy Master Plan: CO2 emissions



- Emission scale is reduced by more than 10 times compared to normal development scenario
- Decarbonization through: renewable energy, alternative fuels in power plants, biofuels, hydrogen fuels;
- Areas difficult to de-emission: heavy industry (cement, iron and steel, chemicals); Air and water transportation

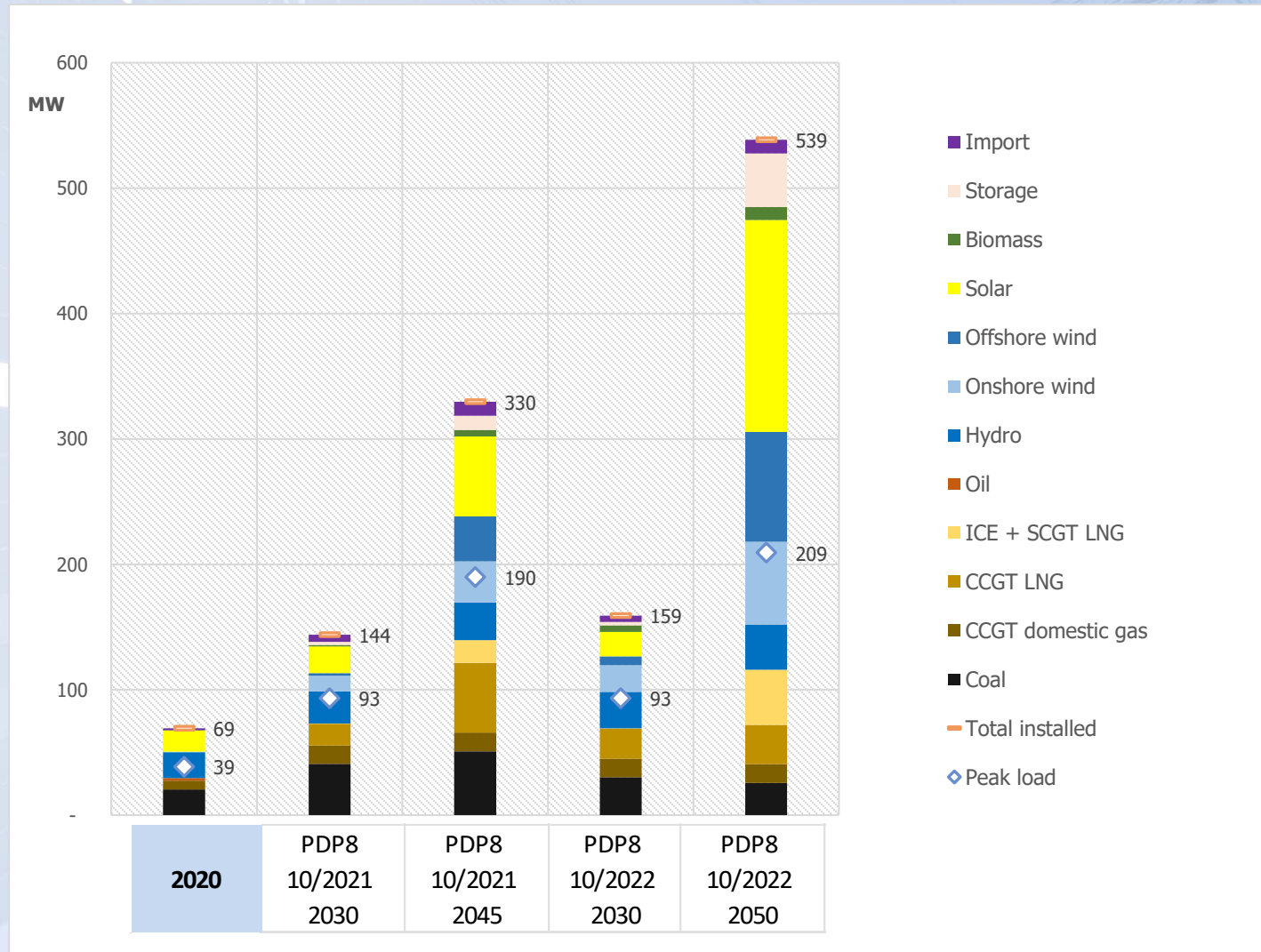
Energy Master Planning: Hydrogen demand and production (million tons)

TT	Categories	2030	2040	2050
	Base scenario			
1	H2 demand for electricity production	0.0	5.6	16.6
2	H2 requirement for NH3	-	1.6	4.4
3	H2 demand for final energy	-	1.6	8.3
3.1	Construction industry	-	0.1	0.9
3.2	Transportation	-	1.5	7.4
4	Total domestic demand for H2	0.0	8.8	29.3
5	Domestic production of H2	0.0	7.5	24.9
5.1	From coal gasification	-	0.19	1.14
5.2	From electrolysis	0.0	7.3	23.7

- Convert H2 to NH3, methanol, synthetic fuel
- Shipping by sea, pipeline to the place of consumption
- Use of fuel in aviation, shipping, industry, oil refining, fertilizer production, power generation, heat production...

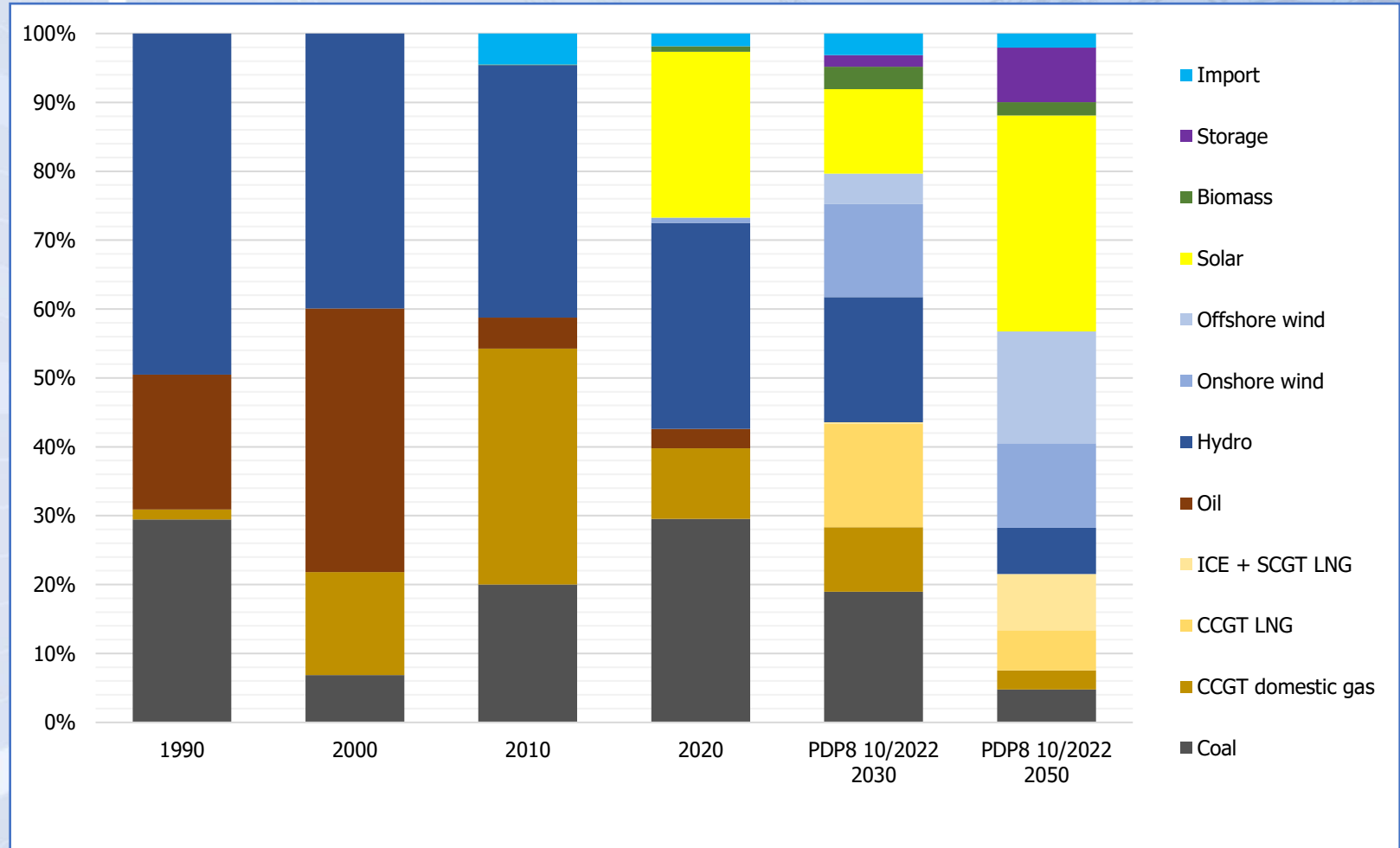
PDP VIII: Total installed capacity

- Increase the total installed capacity
- Reducing the scale of coal-fired power plants, increasing RE generation
- Scale up storage, flexible power



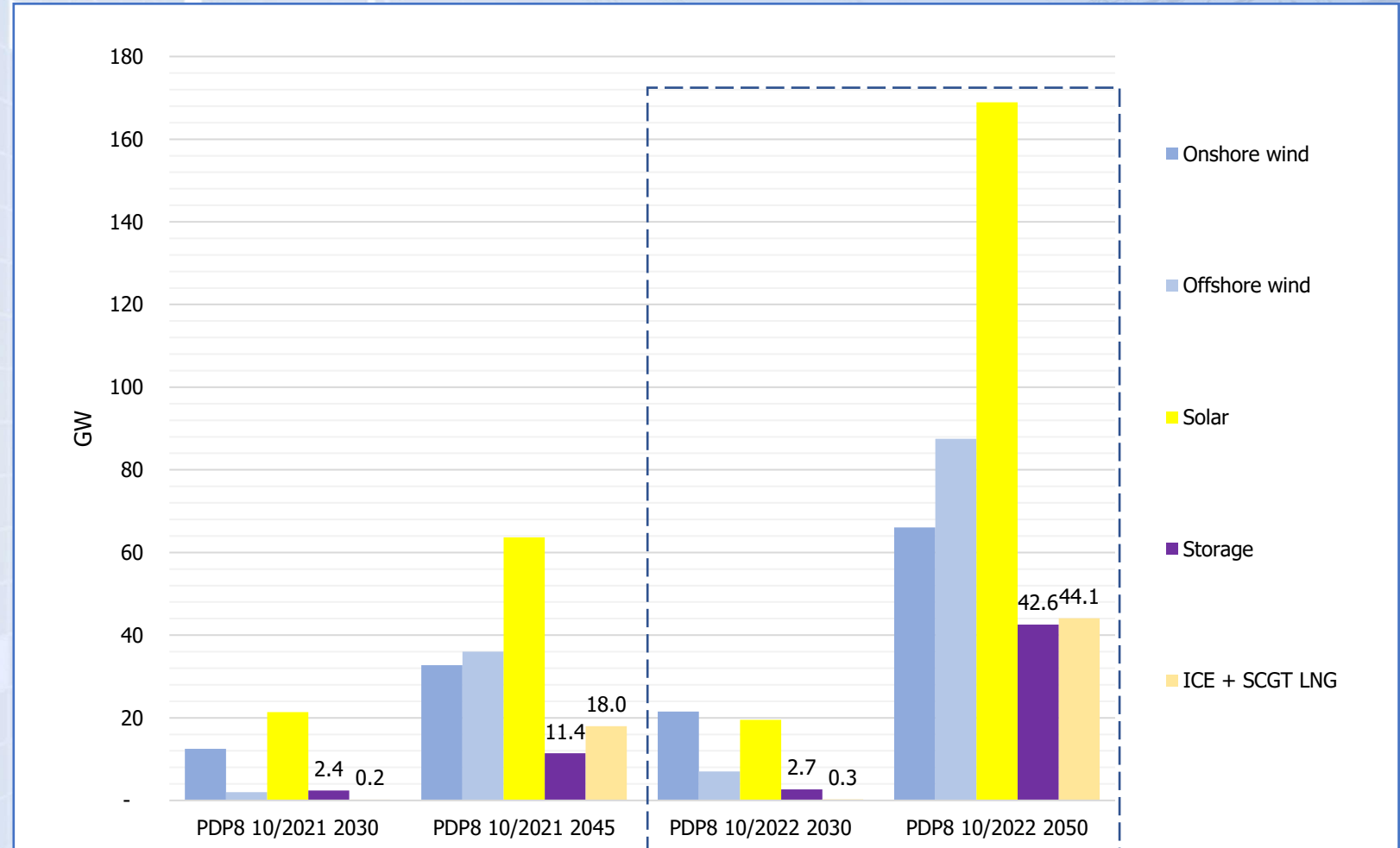
Features of electricity development

- Developing with a reasonable proportion of gas-fired power plants with high efficiency and high flexibility;
- Fuel blending for existing thermal power plants;
- Energy storage: hydro pumped storage (HPS); Storage battery (BESS);
- High voltage DC transmission



Storage needs and flexible power

- Electrical energy required capacity BESS
- Need more storage capacity, but not until 2035.
- Charging demand for electric vehicles
- Electricity demand varies with heat pump
- It is necessary to have demand respond options



Findings

- Energy storage:
 - First pumped hydro and then BESS play important role in integrating VRE
 - In 2030, pumped hydro capacity 2.4GW and BESS 0,3 GW
 - In 2050, over 40GW of storage capacity needed
- Hydrogen:
 - Hydrogen-based fuels plays key part for decarbonization in long-distance transport, heavy industries, power generation
 - Transport: fuel cell for road transport, ammonia for ship, synthetic jet fuels for airplane
 - Heavy industries: iron & steel, refineries, chemical
 - Power generation: blended fuels for coal (NH₃) and gas (H₂)



Thank you

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