

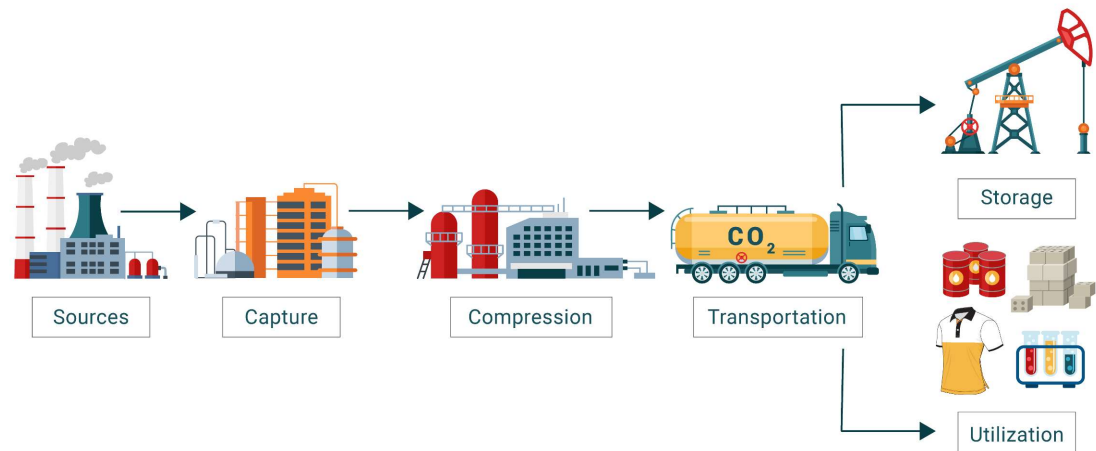


POTENTIALS FOR DEVELOPMENT OF CCUS & HYDROGEN VALUE CHAINS IN VIETNAM

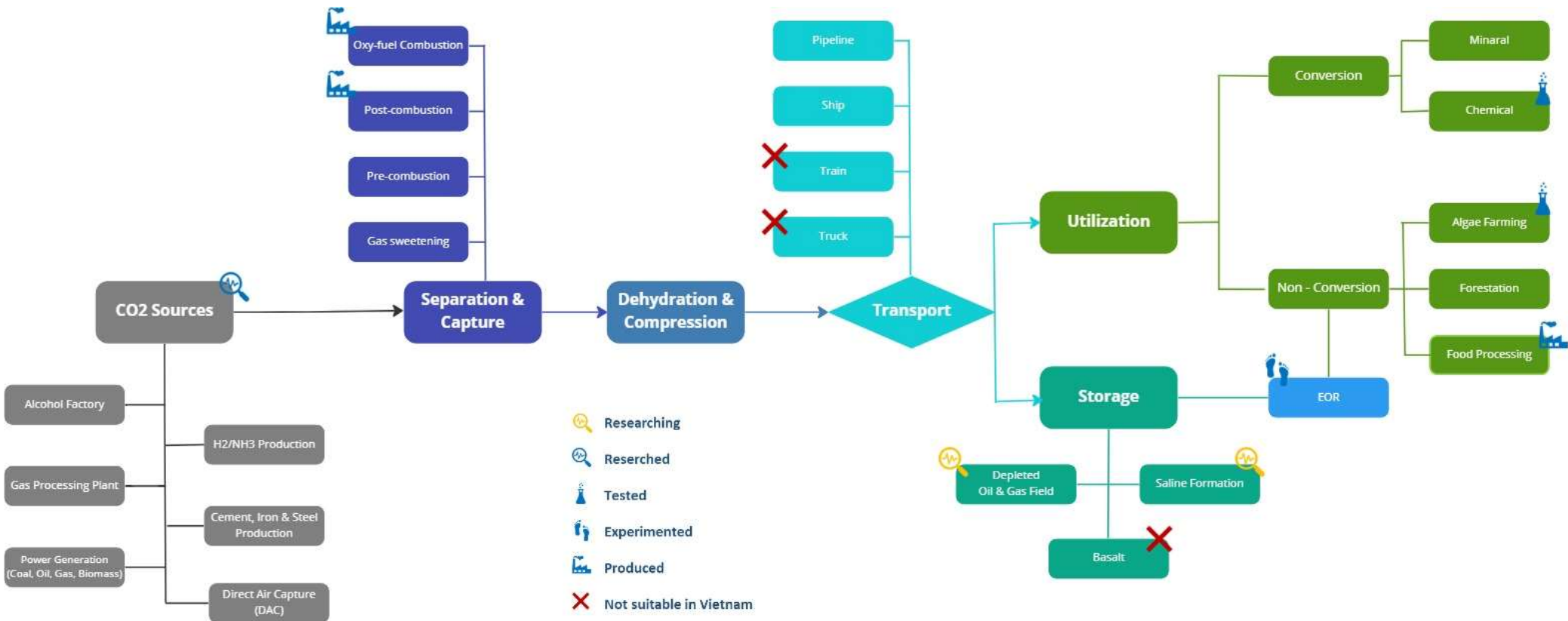
Tokyo, January 25, 2024



POTENTIALS FOR DEVELOPMENT OF CCUS VALUE CHAIN IN VIETNAM

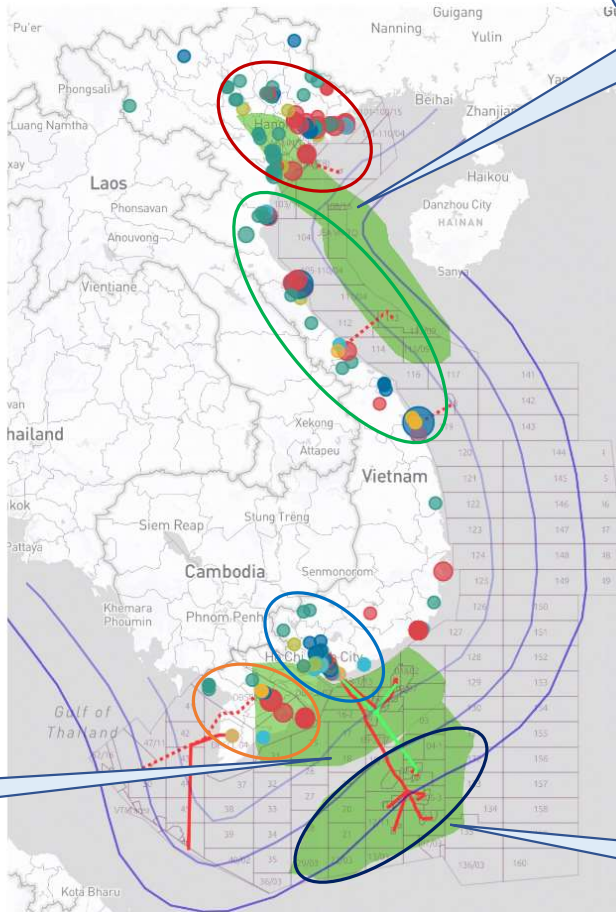


CCUS Value Chain



CCS Opportunities in Vietnam

- Subsector**
- Cement
 - Coal-fired power
 - Fertilizer
 - Gas-fired power
 - GPP
 - LNG-fired power
 - Refinery
 - Steel



North

- **Capture:** Steel, Power, Hydrogen
- **Storage:** Onshore Saline Formation

North Central Coast

- **Capture:** Steel, Power, Gas Fields (Bao Vang, Ken Bau, Ca Voi Xanh)
- **Storage:** Offshore Saline Formation in Southern Song Hong Basin

Song Hong Basin
~ 39 Gigatons

Southeast

- **Capture:** Power, Petrochemical
- **Storage:** Depleted Oil & Gas Field, Onshore Saline Formation

Nam Con Son Basin

- **Capture:** Import by Ship
- **Storage:** Depleted Oil & Gas Field

Mekong River Delta

- **Capture:** Power, Block B Gas Field
- **Storage:** Onshore Saline Formation

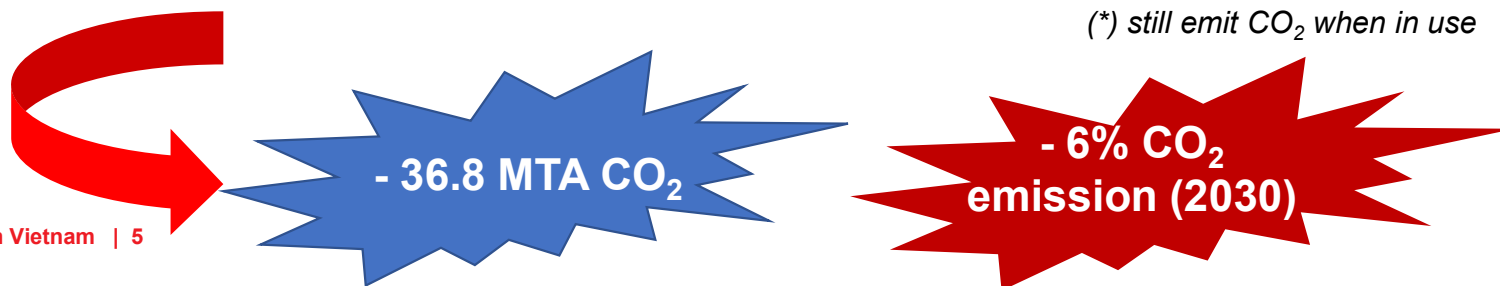
Cuu Long Basin
~ 10 Gigatons

Nam Con Son Basin
~ 22 Gigatons

Potential CO₂ Conversion in Vietnam by 2030

Sector	Production with CO ₂ Conversion (MTA Product)	CO ₂ Conversion Volume (MTA CO ₂)	Integration capabilities of PVN	Maturity of Technology	Size
Urea (*)	1.60	2.215	Integration	Commercialization	Large
Methanol	0.70	1.375	Integration	Semi-commercialized/Pilot	Large
Ethanol (*)	0.44	0.84	Integration	Pilot	Medium
DME (*)	2.70	7.00	Integration	Commercialization	Large
PE	1.00	10.80	Integration	Commercialization	Large
PP	1.75	16.20	Integration	Commercialization	Large
PS	0.53	5.70	Integration	Commercialization	Large
Other Chemical	0.15	1.50	Integration	Commercialization	Medium
CNTs	0.004	0.008	Integration	R&D/Pilot	Small
Concrete	20.0	0.500	Linkage	Pilot	Medium

(*) still emit CO₂ when in use



Implementation of CCUS projects in Vietnam



Cost Reduction

- Scale up capacity such as hubs or clusters
- CO₂ Capture (~70-80% of CCUS cost):
 - ✓ Promote revolutionary technology
 - ✓ Give priority to factories with high CO₂ concentration
 - ✓ Convert combustion technology
- Use directly from exhaust smoke



Revenue Increase

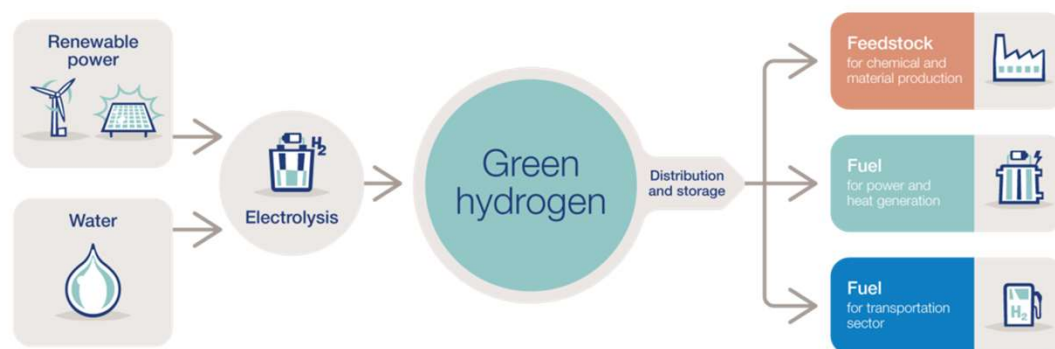
- Sell Carbon credits for:
 - ✓ Foreign companies from Japan, Korea, Singapore
 - ✓ Domestic company related to CBAM
- Corporate income tax deduction
- Green low-interest loans



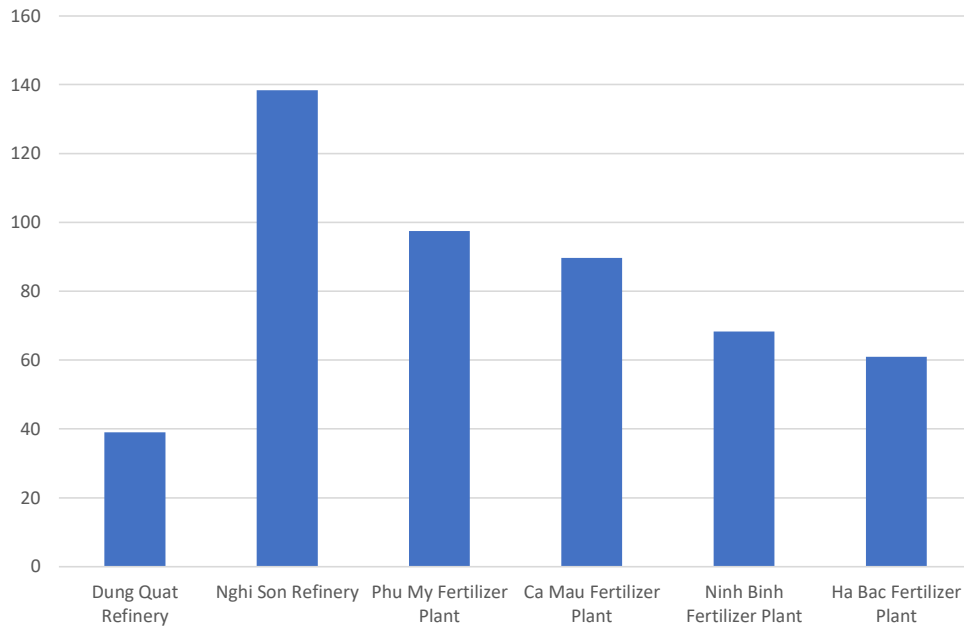
Legal Clarity

- Supplement existing law or new law
- Standards for CCUS projects
- Government incentives
- Carbon pricing such as carbon market, carbon tax

POTENTIALS FOR DEVELOPMENT OF HYDROGEN VALUE CHAIN IN VIETNAM



CURRENT HYDROGEN MARKET IN VIETNAM



Hydrogen capacity at refineries and fertilizer plants (KTA)

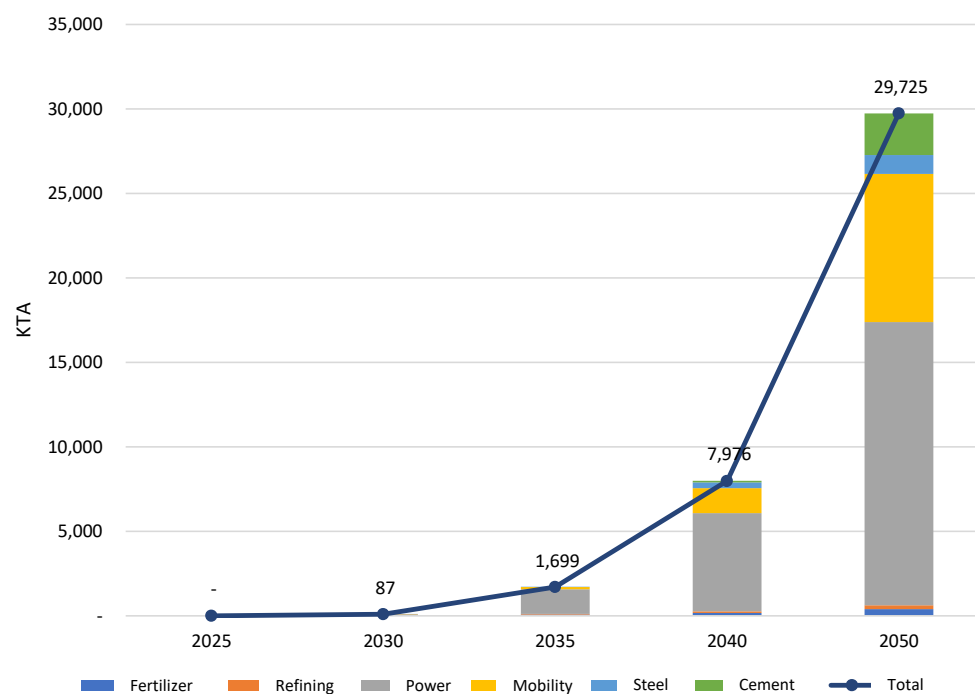
VPI, 2022

- Hydrogen is produced and used onsite at refineries and fertilizer plants with its total capacity of 500 KTA & PVN's capacity makes up 80%;
- A very small amount of hydrogen is used for steel, glass, electronics, and food industries (~0.5% of the total hydrogen capacity);
- Hydrogen is produced from fossil fuels → grey/brown hydrogen;
- A complete hydrogen value chain has not been established at large scale.

FORECASTED HYDROGEN MARKET IN VIETNAM

	From solar power (GW)		From wind power (GW)	
	2030	2050	2030	2050
Potential RE	963	963	821	
PDP8	21	189	28	169
Extra RE	943	774	793	652
Potential of theoretical productivity of green hydrogen	40 million tons	33 million tons	66 million tons	55 million tons

PDP8, 2023



VPI, 2023

PVN'S DIRECTIONS FOR HYDROGEN DEVELOPMENT

1
Technologies for hydrogen production, storage and transportation

2
Integration of blue/green hydrogen in PVN's refineries, petrochemical, and power plants

4
Strategy and roadmap on hydrogen development

3
Demonstration of hydrogen value chain in Vietnam

After 2030, PVN is participating in value chain of blue/green hydrogen.



Thank you

