CCS Hub-and-Cluster Strategy

Powering Thailand's Next Wave of Economic and Climate Leadership

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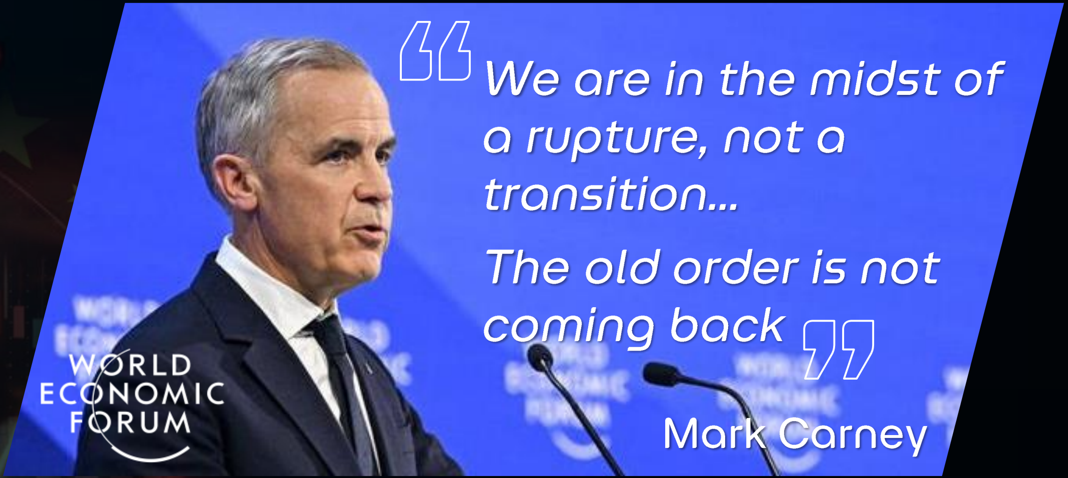
Global Energy Landscape under **Geopolitical Risks**

Brent crude prices surging past $120 per barrel

Regional LNG exports stranded; supply chain collapse

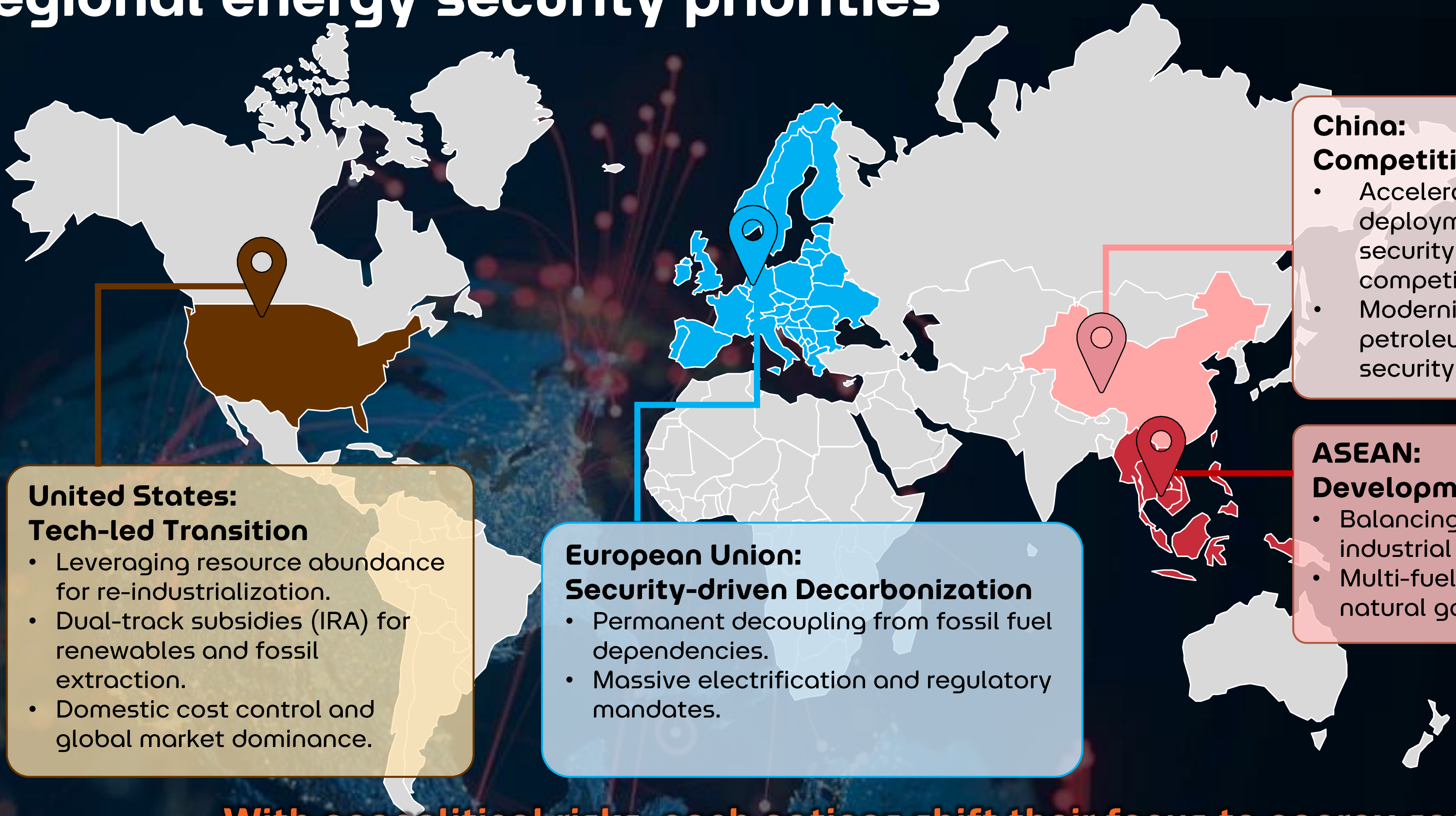
Strategic shifts toward domestic energy sovereignty

"The closure of the Strait of Hormuz has triggered the largest supply disruption in history."



With geopolitical instability, national energy security becomes the priority.

Geopolitical conflicts reshape regional energy security priorities



United States:
Tech-led Transition
- Leveraging resource abundance for re-industrialization.
- Dual-track subsidies (IRA) for renewables and fossil extraction.
- Domestic cost control and global market dominance.

European Union:
Security-driven Decarbonization
- Permanent decoupling from fossil fuel dependencies.
- Massive electrification and regulatory mandates.

China:
Competitive-first Transition
- Accelerating RE and nuclear deployment to strengthen energy security and maintain export competitiveness.
- Modernizing coal plants and petroleum reserves as energy security safeguards.

ASEAN:
Development-Constrained
- Balancing energy equity with industrial growth.
- Multi-fuel mix including coal, natural gas, and transition finance.

With geopolitical risks, each nations shift their focus to energy security. However, "security" varies depending on a country's geography, economic structure, and resource wealth.

Geopolitical tensions are shifting energy security priorities, while long-term climate risks become more severe.

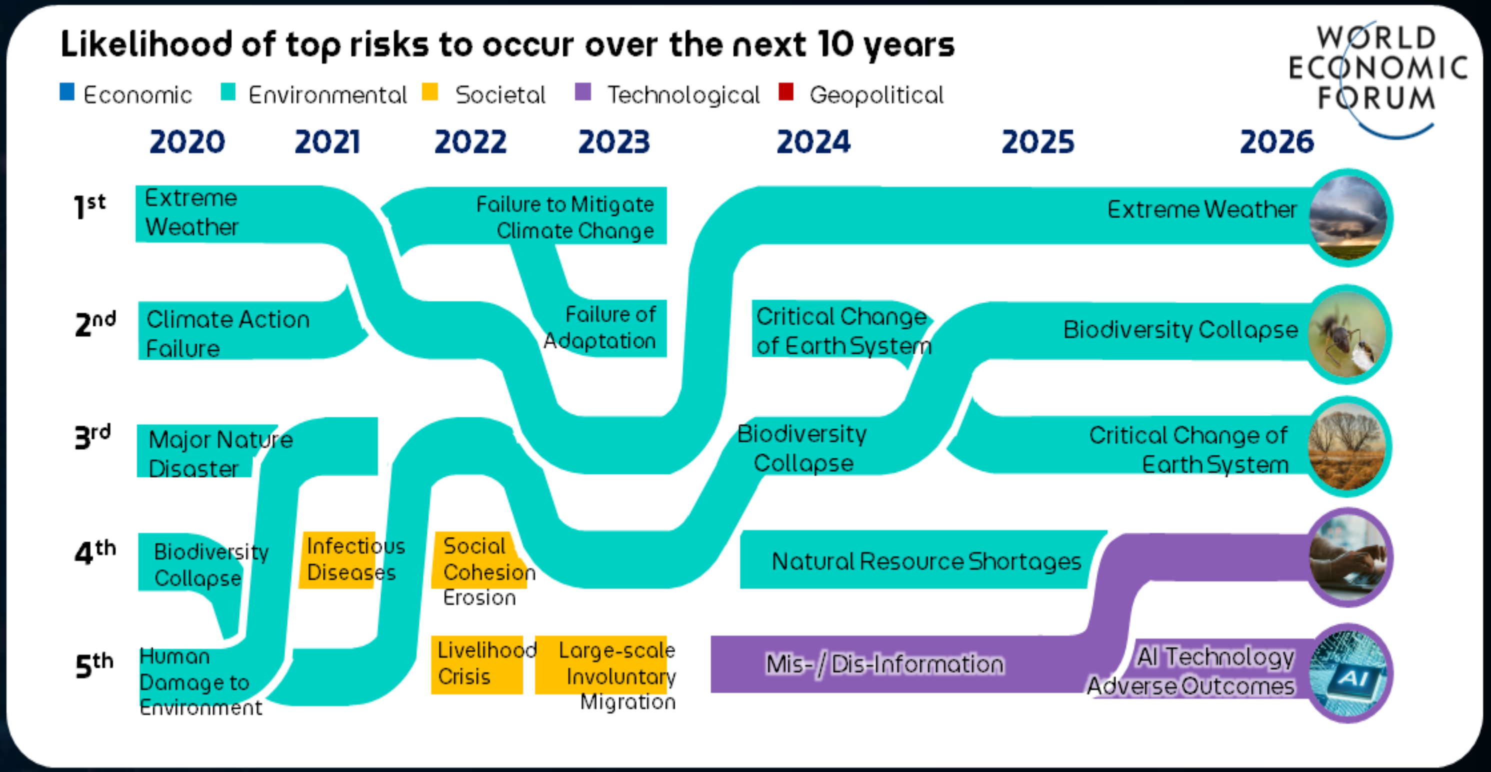
Short-term Global Risks

Energy security takes priority.
Thus, Natural gas and LNG expands its roles in global energy mix

Fossil Lock-in
for developing countries

Reliable Backup
for RE intermittency

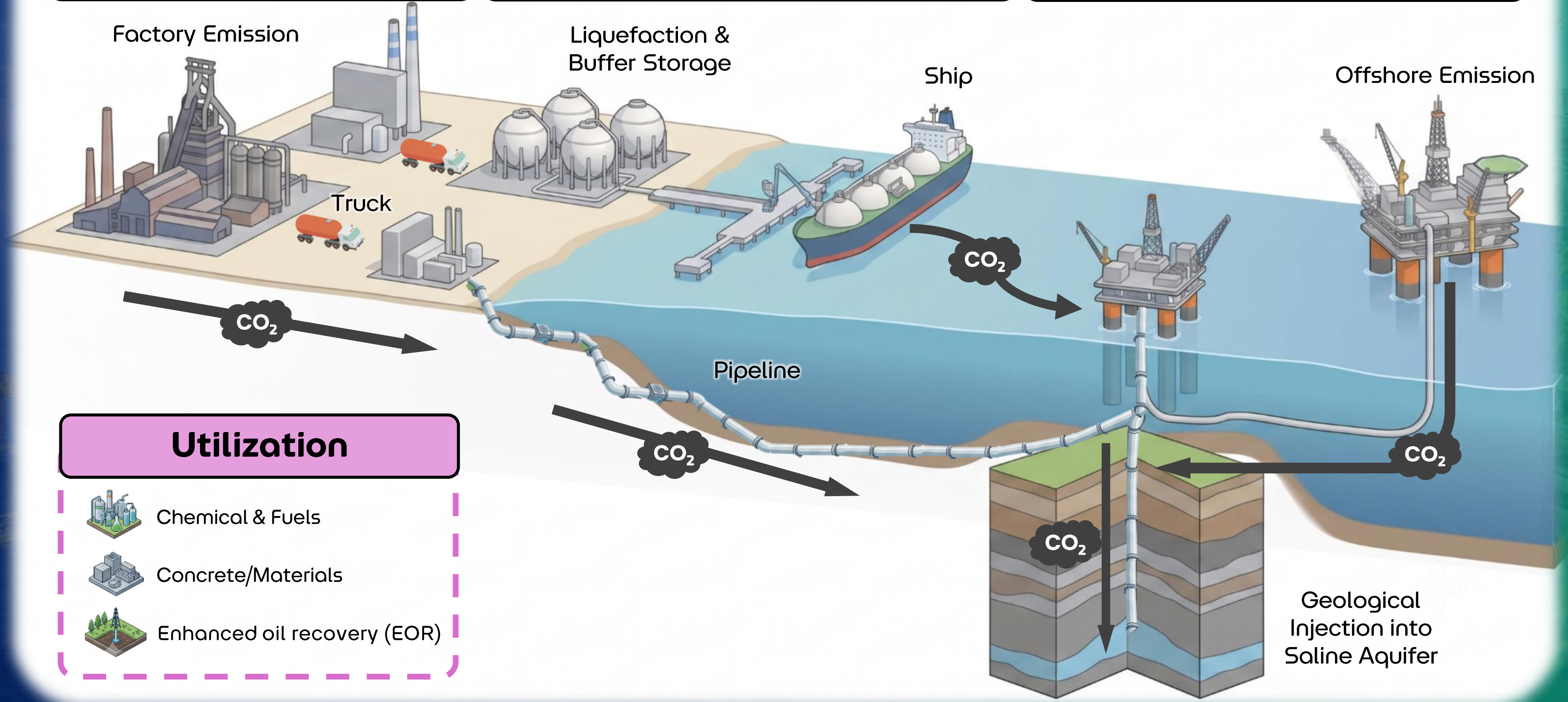
Long-term Global Risks



Mitigating climate risks while ensuring energy security necessitates enablers like CCS to decarbonize fossil-based industries.

Carbon Capture Utilization and Storage Value Chain

Capture	Transport	Storage
Capture CO_2 from point-source	Transportation of CO_2 from source by pipeline, ship or truck	Storing CO_2 in saline aquifer or depleted field



Utilization

- Chemical & Fuels
- Concrete/Materials
- Enhanced oil recovery (EOR)

Advantages of CCS Hub & Cluster Model

Financial Efficiency (CAPEX & OPEX Optimization)

- Infrastructure Sharing
- Marginal Cost Reduction
- Asset Utilization

Technical Reliability

- System Backup
- Modular Scalability
- Standardized Quality

Regulatory & Risk Governance

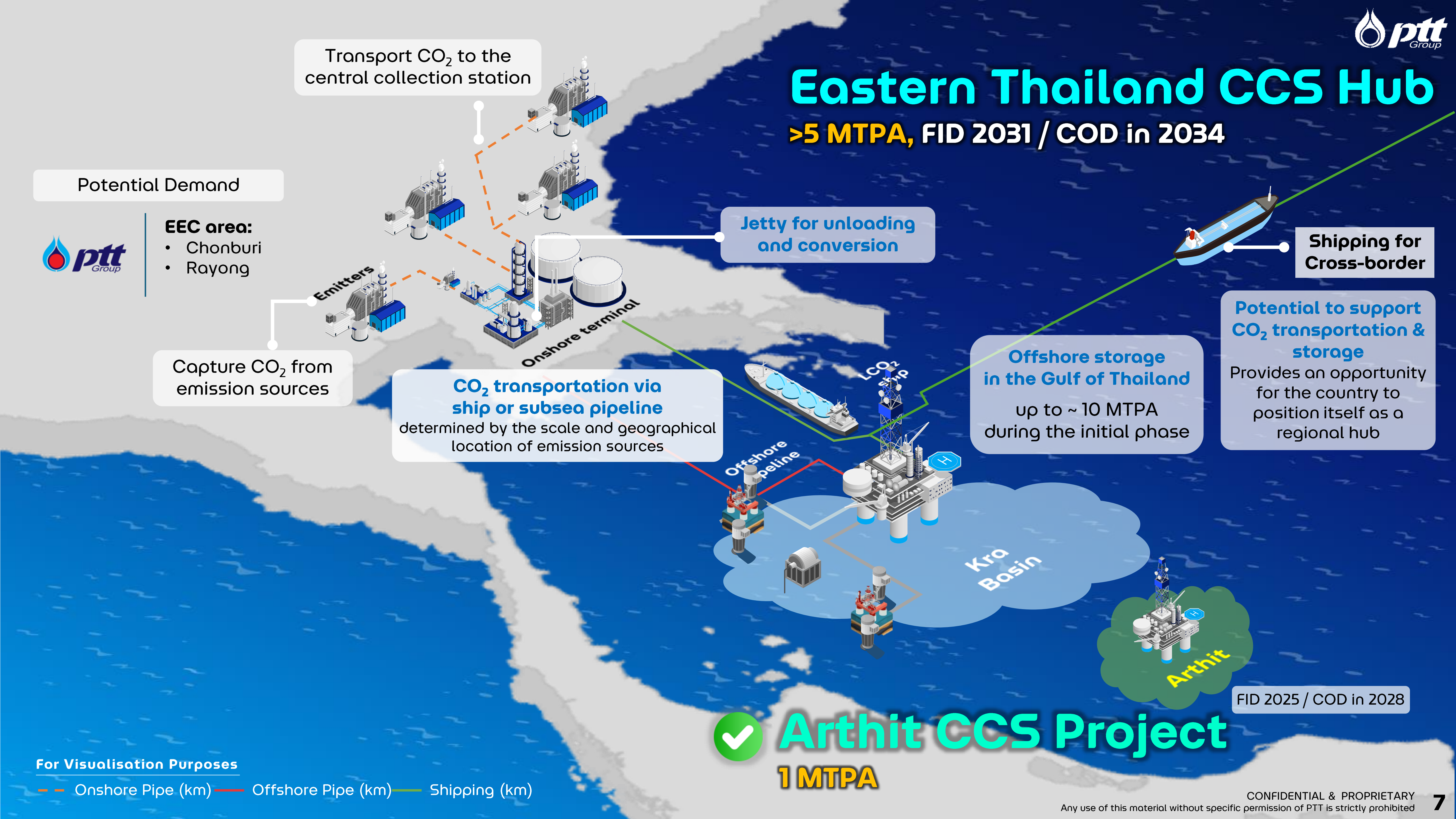
- Centralized MMV
- Simplified Permitting

Competitiveness

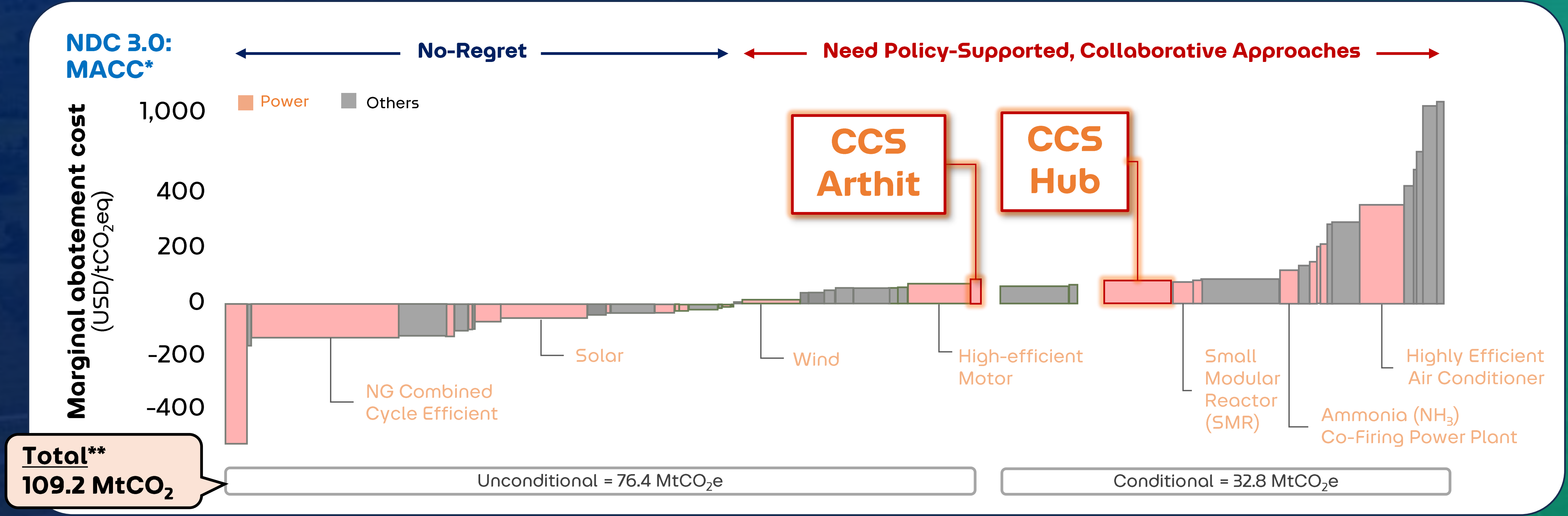
- Decarbonization Acceleration
- Cross-Border Revenue
- Industrial Retention

Eastern Thailand CCS Hub

>5 MTPA, FID 2031 / COD in 2034



In Thailand's NDC 3.0, CCS is positioned for GHG reduction, yet its value reaches well beyond mitigation



Decarbonization

10 MTPA
GHG reduction 2035
(Conditional Initiative List)

Net Zero
in 2050

Economic

>11,000 Job
Position Created

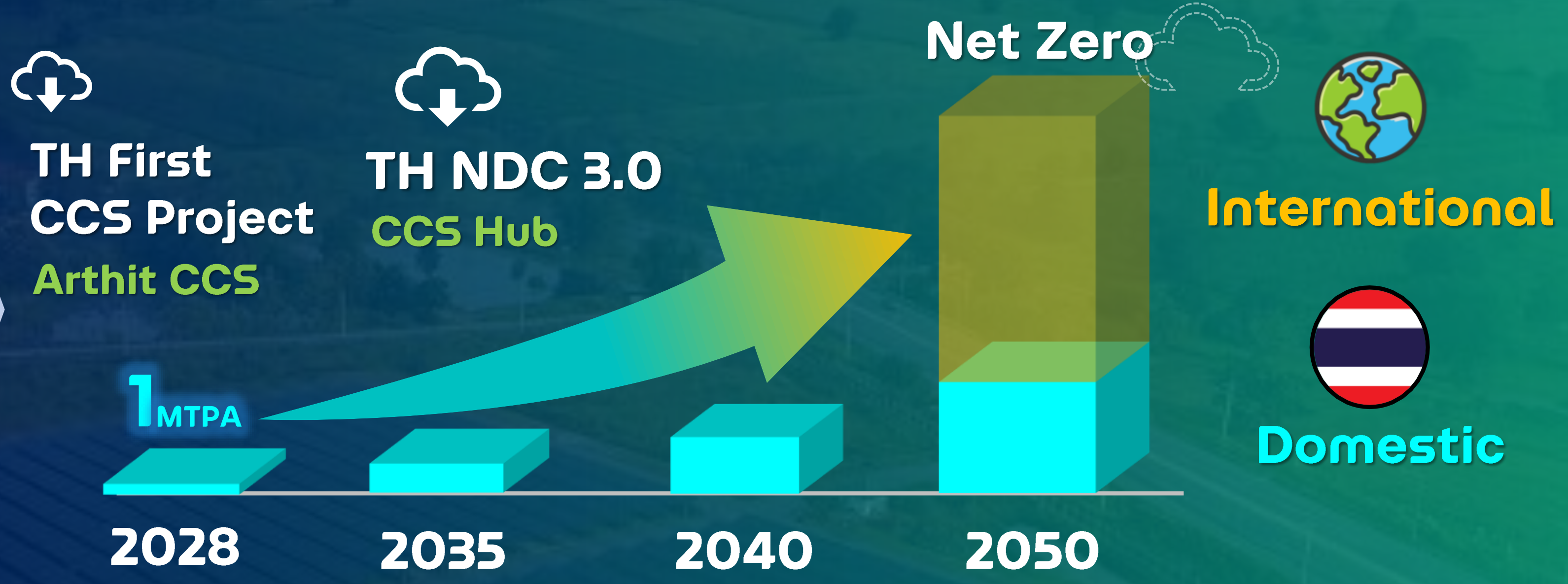
>18,000 MTHB per Year
Economic Boost

*อ้างอิงเอกสารการประชุมชี้แจงเป้าหมาย แนวทาง และมาตรการลด GHG ของประเทศไทย ภายใต้ NDC 3.0 และรับฟังความคิดเห็น และการประชุมเป้าหมายการมีส่วนร่วมที่ประเทศกำหนด ฉบับที่ 2 (NDC 3.0 ของประเทศไทย) และแผนการลงทุน **Excluding LULUCF

A strong start in CCS* can power a new national growth engine for the next 10-20 years

Rising global and domestic demand for low-carbon energy creates an opportunity for Thailand to be an ASEAN CCS hub, transforming environmental necessity into a sustainable economic engine.

- Competitive business models
- Unlock operational policies
- Establish incentive instruments
- Capture rising domestic & cross-border demand



- Increasing Employment
- Attracting Investment
- Low-carbon Infrastructure
- Enhancing Industrial Competitiveness

Key Success Factors of CCS in Thailand

Technology

- Need novel technology for breakthrough CCS and cost optimization

Business model

- Need suitable business model to optimize investment cost

Regulatory/ Incentives

- Regulatory unlock to advance the project
- Proper incentives for economic viability
- One-stop Governance Entity

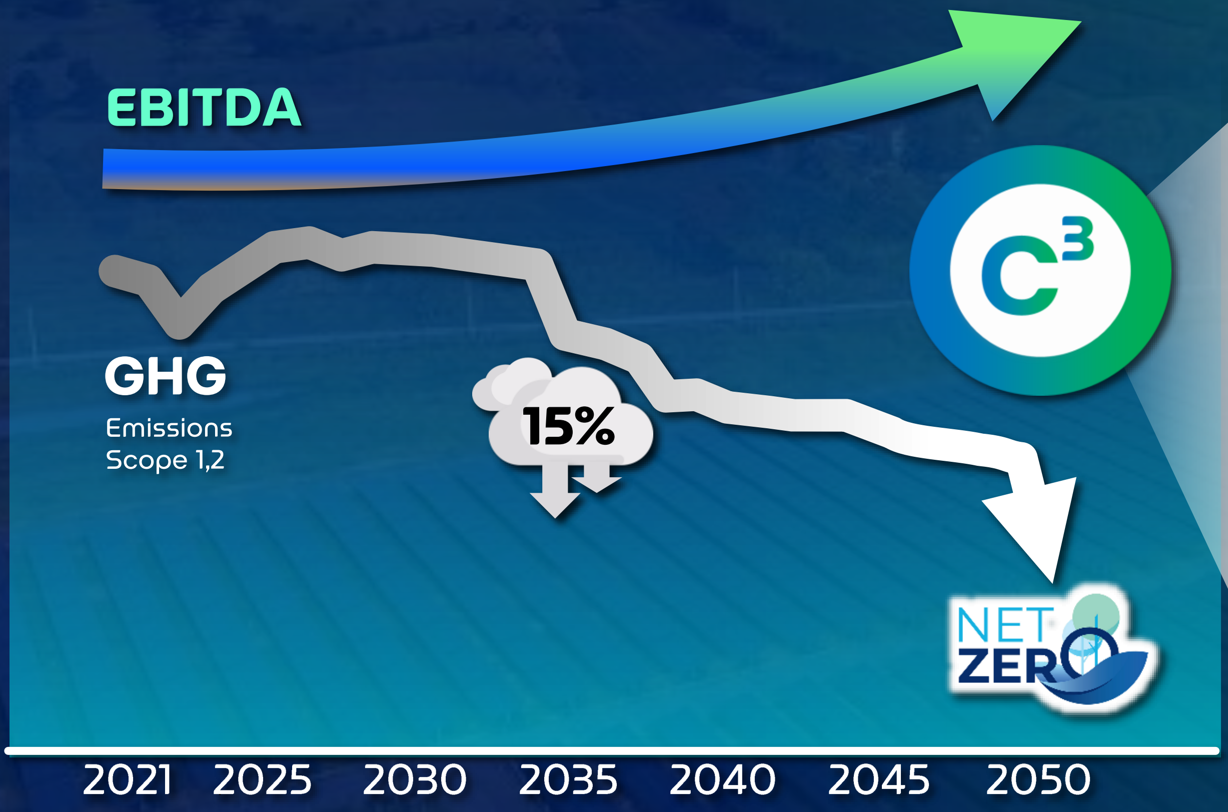
Nations are accelerating CCS through multi-stakeholder collaboration and regulatory unlocks

Key Lessons for Advancing Thailand's Energy Transition

Key Enabler		UK	Malaysia	Norway	USA	Implication to Thailand
		Established one-stop governance entity		Leveraging existing entity		
Unlock operational policies	Policy Maker	Department for Energy Security & Net Zero (DESNZ) <2 yrs to approve	Ministry of Economy My CCUS MyCCUS oversees, bill passed in 2025	Ministry of climate and environment Multi-layered approvals, could take up to 7 years	Environmental Protection Agency (EPA)	Seek to have **One Entity** to responsible as Champion
Establish incentive instruments	Government Incentive	• $30bn funding • **CfD** – emitter & **RAB** – T&S Co.[2]	• Developing **tax incentives**	• **Direct funding** to projects	• **IRA45Q** - Tax credits **$85/t** • Funding[3] for study/permit	Set up **Govt. funding and mechanism** with clarity for CCS developer
Capture rising domestic & cross-border demand	CO_2 Cross-border	Developing	Developing	Bilateral agreements existed	Developing	**Seek for bilateral/** multi-lateral to be competitive sink for cross-border CO_2
	Carbon Market	• UK ETS[4] of $40-50/t	Carbon tax[5] in 2026	EU ETS of $70-90/t	ETS only in selected state	**Carbon pricing** can be a driven **for emission target**

1. International Energy Agency, standard for CCS; 2. Contract for Difference and Regulated Asset Base; 3. US Executive Order in Jan called for pause of funds;
4. developing UK-EU ETS to create more stable carbon market, and avoid CBAM; 5. targeting the iron, steel and energy sectors

PTT Group strives to balance business growth with our Net Zero commitment, ensuring energy security and long-term sustainability for the nation



C3

Proactively Managing Risks

Capturing Full Upside

Driving Climate Adaptation

C1 – Climate-resilience business
- LNG
- RE Biz.
- Bioproducts (PLA, biojet, etc.)
- EV station

C2 – Carbon-conscious asset
- Efficiency improvement
- Clean energy adaptation
- Adv. tech (CCU, SMR, etc.)
- Digitalization

C3 – Coalition, co-creation, and collective efforts for all
- CCS
- Hydrogen
- Carbon credit project & mgmt.
- Forestation
- Water Mgmt.

*Also support offsetting

Execution with Clarity and Flexibility in response to Signposts