

# Carbon Capture and Storage – from Risk & Insurance Perspective

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# Agenda

- TMNF CCS Team
- Risks in CCS Value Chain
- Carbon Pricing Scheme
- Insurance
- Concluding Remarks

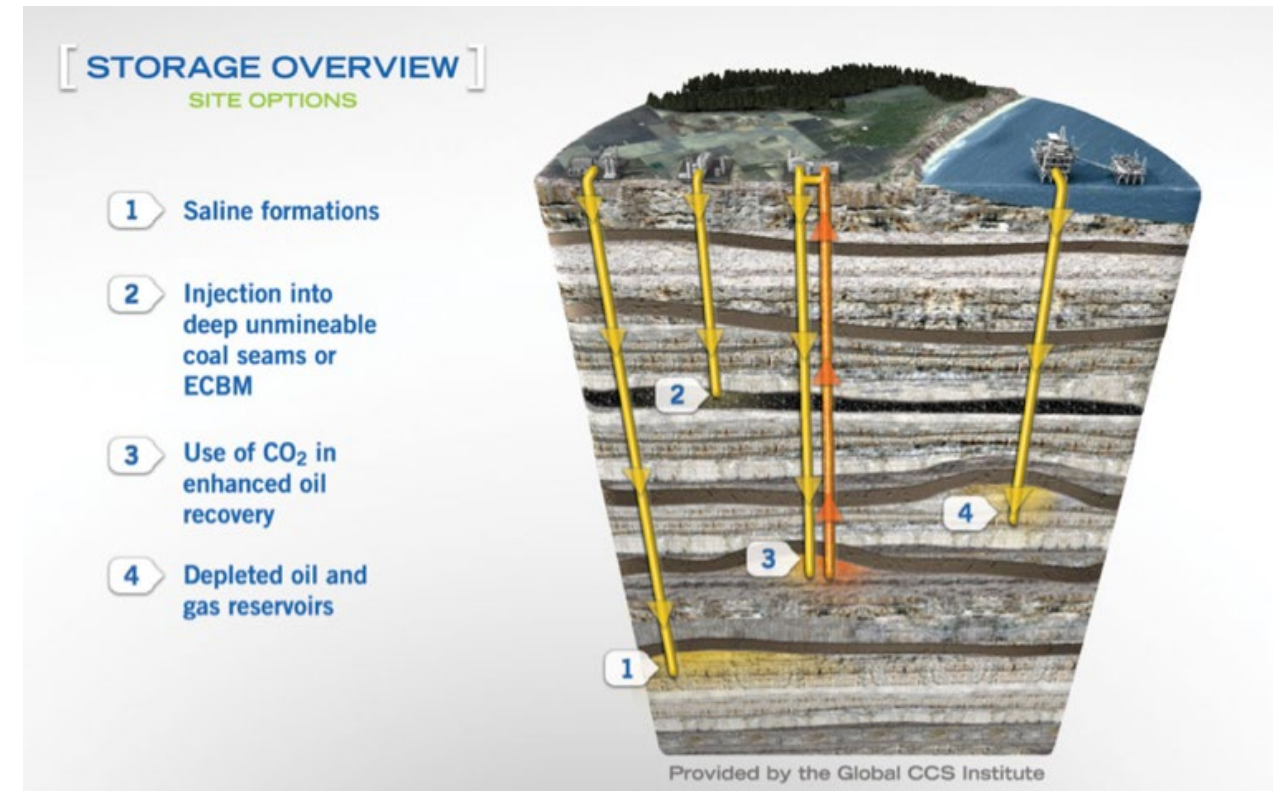
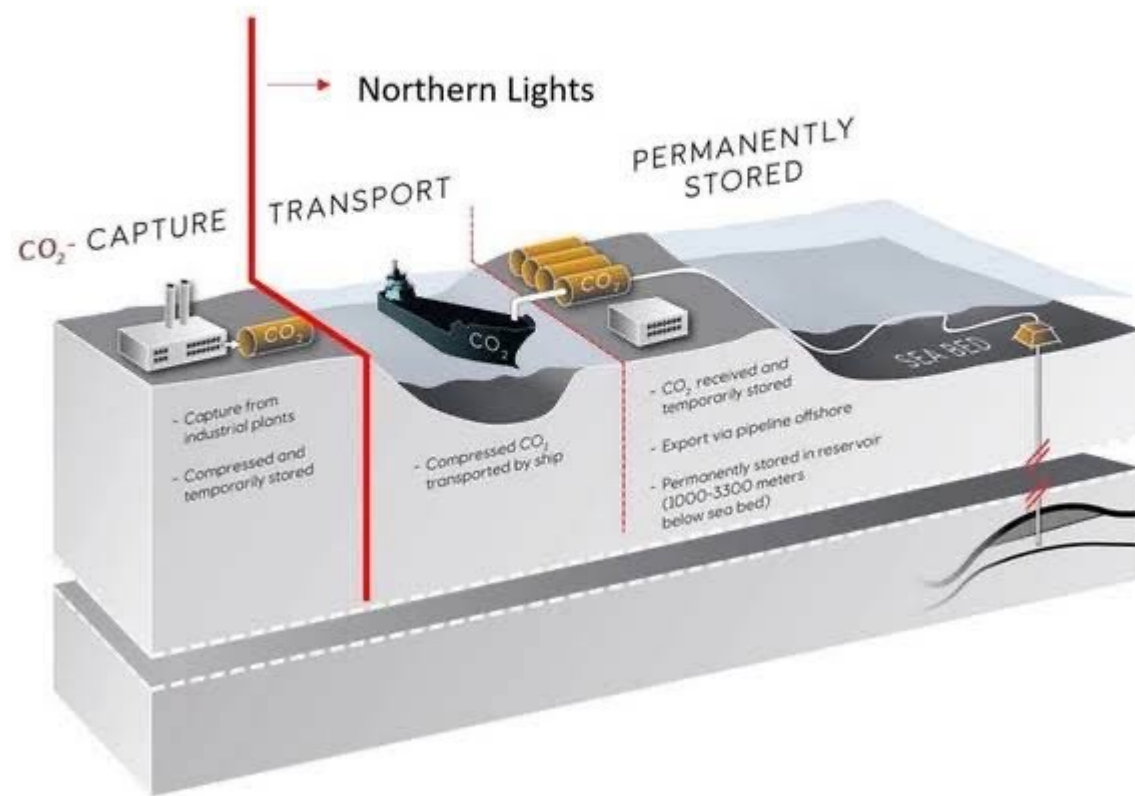
# TMNF CCS team

Dedicated team serving for offshore projects with experience and expertise

- Specialized team for CCS
- Deep insight of the industry with background of upstream/downstream energy
- Building global network to obtain the industry's cutting-edge knowledge
- To offer bespoke innovative risk transfer solution to clients
- A member of a governmental working group for CCS

# Overview - CCS Value Chain

## ■ Emission, Capture, Transport by Pipeline and/or Vessel, Injection and Geological Storage



# Major Risks Categories in Integrated CCS Projects

## Overview of general understanding of the risks surrounding the projects

### Capture

- ❑ Health and Safety
- ❑ Environmental Damage
- ❑ Technology Performance
- ❑ Technology Development
- ❑ Energy and Carbon Price
- ❑ Capital Cost

### Transport

- ❑ Health and Safety
- ❑ Pipeline Leakage
- ❑ Shipping Leakage
- ❑ Third Party Access

### Storage

- ❑ **CO2 Leakage**
- ❑ **Damage to Project facilities**
- ❑ Decommissioning Costs
- ❑ Measurement and Monitoring
- ❑ Alternative Storage Site
- ❑ **Health and Safety**
- ❑ **Environmental Damage**
- ❑ Financial Security
- ❑ Third Party Access

### Project Wide

- ❑ Value Chain Integration
- ❑ Technology Performance
- ❑ Change in Law
- ❑ Public Perception
- ❑ Cost of Financing

# CO2 – Properties and Behavior

What do we know about CO2?

■ Is CO2 dangerous?



# CO2 – Properties and Behavior

Potential threats are known and manageable but could be a cause major accidents.

- CO2 is well known substance and the industry know how to manage it.
- However, if you fail, it may cause or contribute to major accidents.

CO <sub>2</sub> % in Air	Exposure Time	Effect on Humans
3%	1 hour	Mild headache, sweating, difficult breathing
10%	< 5 mins	Dizziness, sweating, rapid breathing, unconsciousness
17%	< 2 mins	Unconsciousness, convulsions, coma, death

- **CO2 is a toxic substance..**
- **CO2 when inhaled above around 5% in air is a threat to life.**

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- ***Free water combined with the high CO2 pressure may cause severe internal corrosion in pipeline due to the formation of carbonic acid***



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- ***Carbon steel can get cold and brittle enough to crack in CO2 stream.***
- ***Small brittle fracture could grow to propagating cracks very fast driven by the initial pipeline pressure.***



# What happened if you fail to sequestrate and store CO2?

## Case Study | Large LNG project with CCS facility faced difficulties.

- *\$70 billion LNG Project with \$3 billion facilities associated with carbon capture.*
- *Planned to store **4 million t-CO2** per year **but only achieved half of that.***
- *The first CO2 injection was delayed and the project then encountered further difficulties after it commissioning, with sand clogging parts of the storage system and dramatically reducing the amount of CO2 it was able to inject underground.*
- *Associated CCS was one of the key conditions for state government approval.*
- *Failure to meet the approval resulted in **the Operator acquiring and surrendering 5.23 million greenhouse gas offsets from carbon markets to offset the emissions that they failed to store.***

# Carbon Pricing Scheme – Effects on CCS Industry

## Key driver to the industry

- Economic incentive to enhance decarbonization utilizing market forces.
- Emission Trading System / Carbon Credits / Tax Credit can play significant role for deployment of commercial CCS projects.

### Voluntary Carbon Market

- i.e. Offset
- Lack of transparency and regulation
- Many different schemes and ideas

### Regulated/Mandatory/Compliance

- i.e. Cap and Trade
- More stable trading environment but no overall rules and regulation
- It is estimated that the Compliance carbon trading market was worth in excess of USD 200bn in 2020.

### Carbon Tax / Tax Credit

- i.e. Petroleum Tax, Production Tax, 温対法
- A Tax levied on the carbon emissions required to produce goods and services
- Tax credit is also considered as an option to enhance introduction of carbon removal.

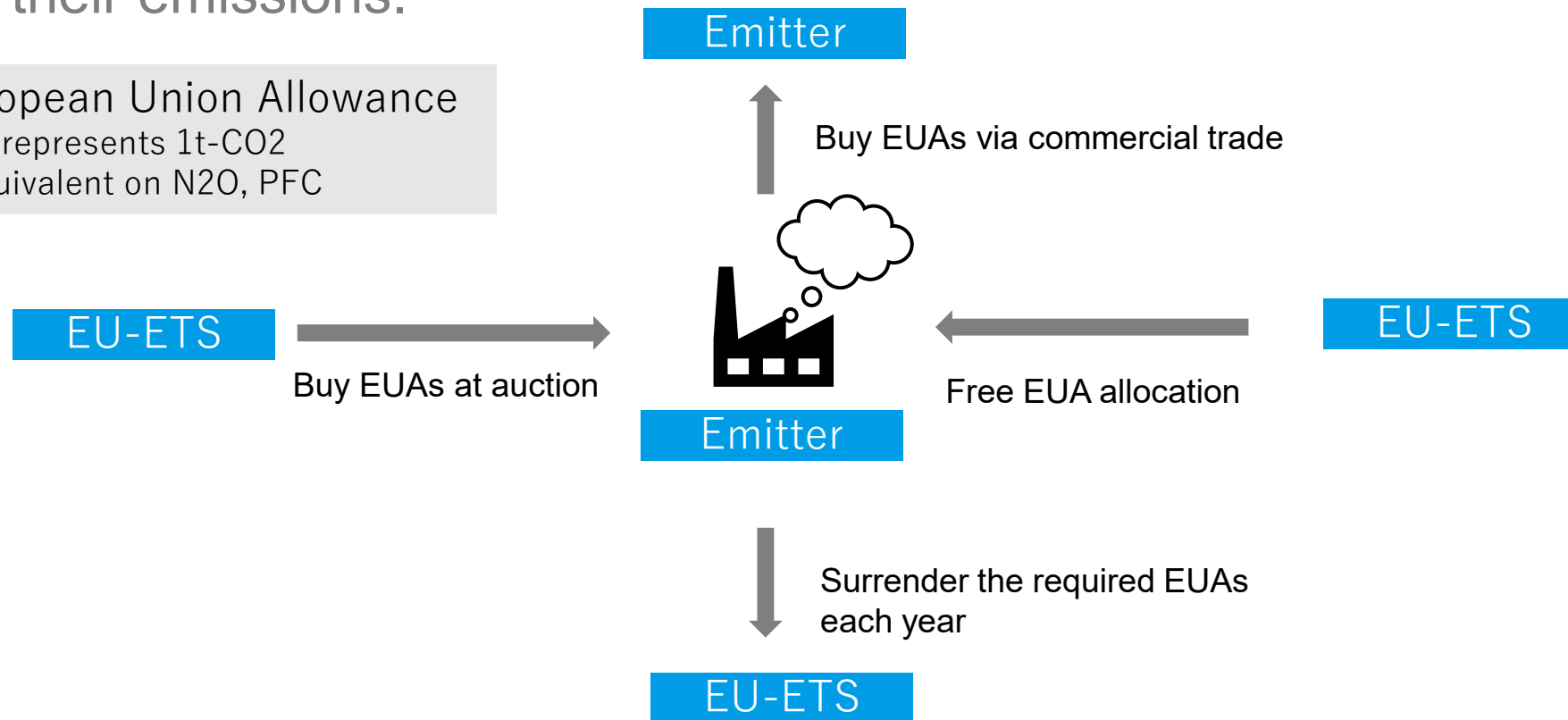
# Carbon Pricing Scheme – Influence on CCS Industry

## Example | EU/UK Emission Trading System (Compliance)

- A “cap and trade” scheme designed to meet EU/UK’s contribution to the Paris Agreement.
- Each year emitters of greenhouse gases must obtain & surrender “EUAs” to match their emissions.

EUA = European Union Allowance

- Each EUA represents 1t-CO<sub>2</sub>
- or CO<sub>2</sub> equivalent on N<sub>2</sub>O, PFC



# Carbon Pricing Scheme – Influence on CCS Industry

## Example | UK Emission Trading System (Compliance)

- UK government support for CCS projects will be underpinned by a legal and regulatory framework associated with ETS.
- Included in these will be specific requirements.

● *“..... will secure **appropriate insurance which is likely to include coverage for costs arising from CO2 Leakage Risk**, including in relation to: a) business interruption (including debt service); b) remediation (including damage to the environment); and c) **carbon allowances**”*

● *“..... shall ensure that insurances are placed and maintained with insurers or underwriters of reputable standing with a minimum rating specified”*

● *“The Regulator will check that ..... has sufficiently tested the insurance market and will satisfy itself that ..... insurance procurement obligation has been met and that adequate and suitable quantum and coverage has been sought effectively and obtained.”*

# Carbon Pricing Scheme – Influence on CCS Industry

## US Tax Credit for carbon sequestration (Section 45Q)

- The US Government is offering Tax Credits to companies engaged in Carbon Capture.
- Whilst the credit can be given, they can be taken away.

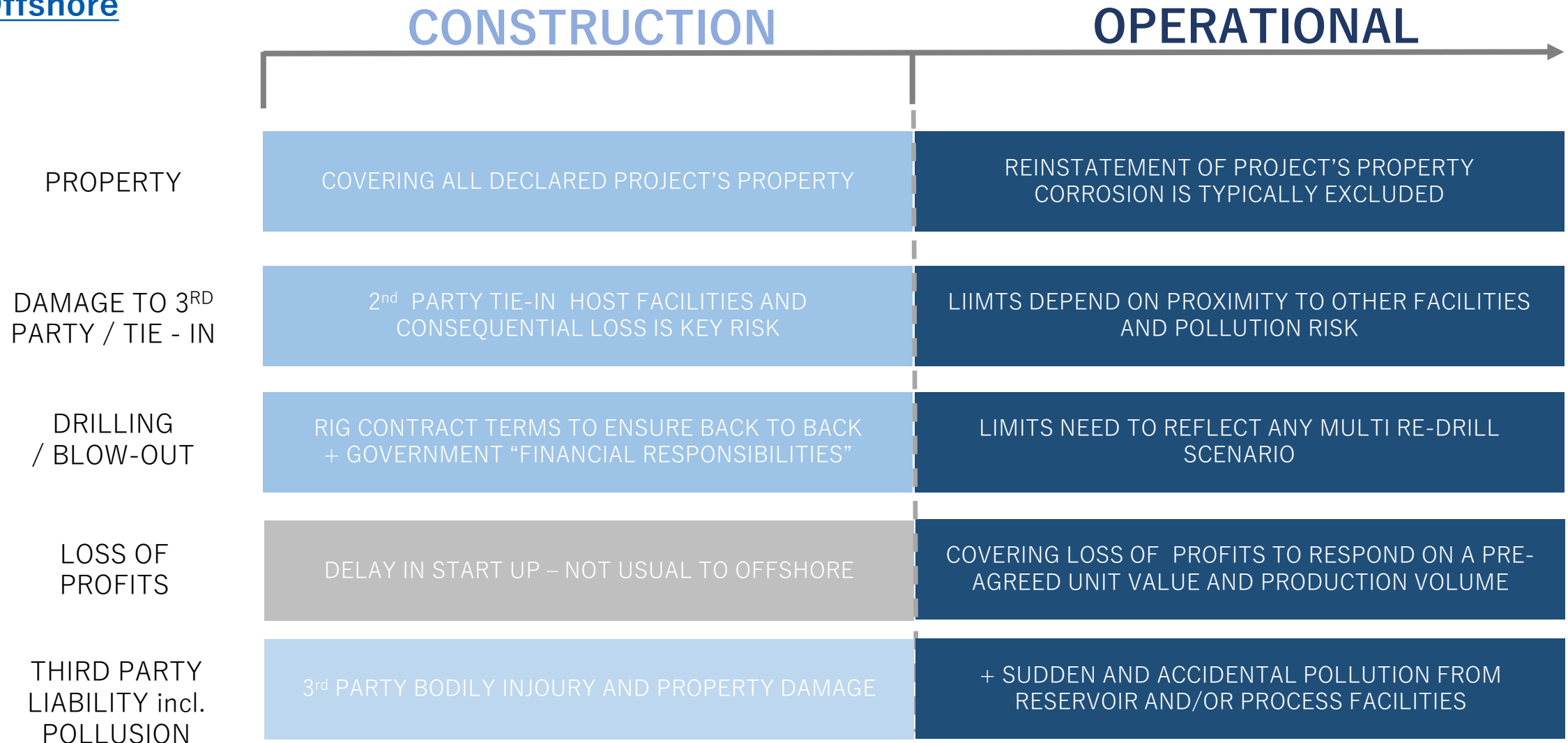
Carbon capture and sequestration (CCS) technologies are being proposed as an option to reduce greenhouse gas (GHG) emissions from coal- and natural-gas-fired power plants, as well as other large industrial sources. The tax credit for carbon oxide sequestration (Internal Revenue Code [IRC] Section 45Q) is intended to incentivize investment in carbon capture and sequestration.

includes “storage at deep saline formations, oil and gas reservoirs, and unminable coal seams.” The taxpayer has to repay the tax credit (credit recapture) to the Treasury if the carbon oxide ceases to be captured, disposed of, or used in a qualifying manner (i.e., if it escapes into the atmosphere).

# CCS - Risk and Insurance

Insurers have established solutions to existing exposures

## Offshore



# CCS - Risk and Insurance

Further consideration may be needed to emerging exposures

- In case of CO2 leakage, there must be a need to cover costs of offset.
- There remains challenges and uncertainty and products are still under development.

## New Exposure

- Indemnity for leakage of CO2 arising from CCS activity.
- Recovery based on voluntary credit / ETS / tax credit

## Challenges for Insurers

- Lack of historic data
- Reservoir risk assessment
- MMV programme
- Post-Closure phase
- Volatility of ETS / credit price when setting limits
- Regulatory changes



- Identifying the risks surrounding the project is a first step and important action.
- Properties of CO<sub>2</sub> can cause major accidents but manageable as long as equipped with appropriate measures.
- ETS/Carbon Credits/Tax Credit can play a significant role to spread commercial CCS projects but it can also be novel exposures to stakeholders.
- Insurance industry has established knowledge and solution for existing risks.
- Insurers are preparing for offering new solutions addressing emerging risks that CCS industry could face.
- We TMNF are always welcoming discussion how we can support CCS industry in Japan and across the world.

Thanks for listening!

*To Be a **Good Company***



**東京海上日動**