

MICEDD

DEEPWATER DEVELOPMENT

28 - 30 March 2023 | Millennium Gloucester Hotel | London, UK

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Quest Offshore

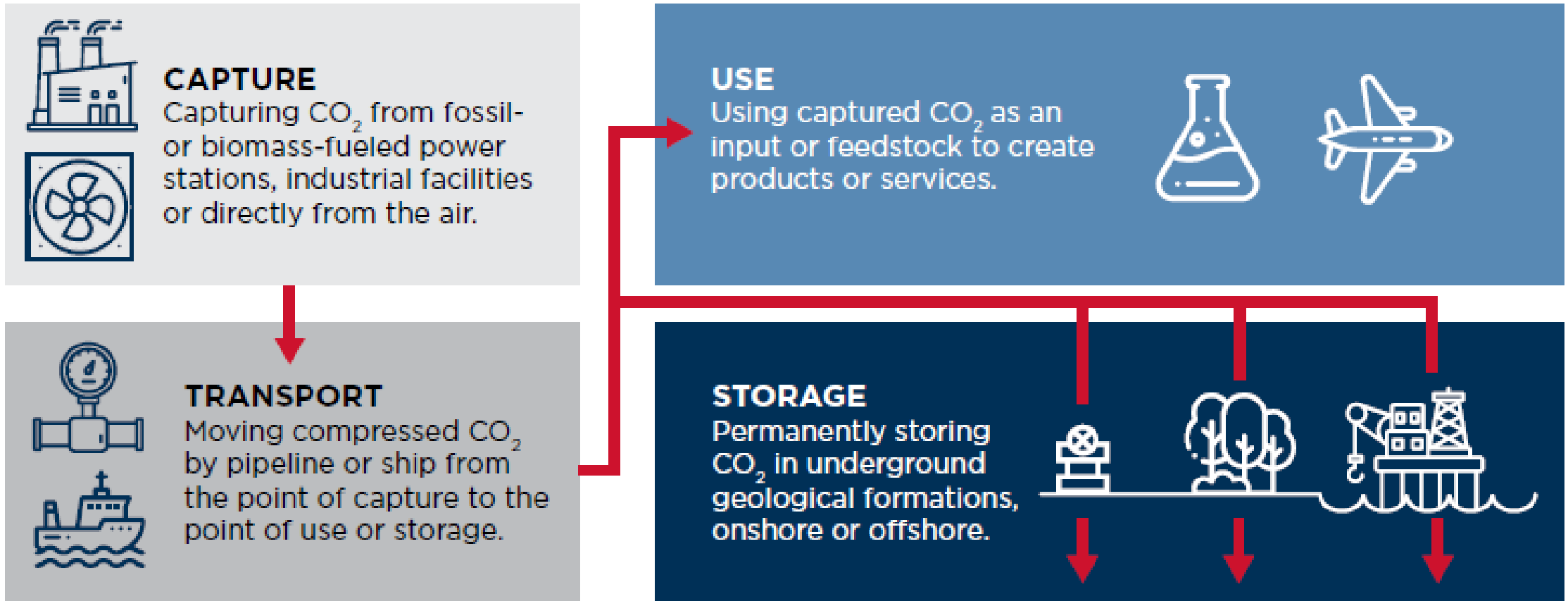
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Risk Management Considerations for Offshore Carbon Capture, Utilization and Storage (CCUS)

Luiz Feijo



Carbon Sectors



Sources and Destinations



From:

- Onshore industry – power plants etc.
- Marine and offshore vessels – onboard scrubbing systems
- Direct air capture



Goes to:

- Adjacent/nearby usage or sequestration
- Pipeline, ship or land transport to a usage or sequestration site
- Pipeline, ship or land transport to a hub for onward transport

Offshore Hub Characteristics

- Fixed or floating platform
 - Single source or multisource CO₂
- Import via pipeline and/or from ships
- Storage
 - Onboard tanks or separate floating storage unit
- Onboard processing
 - Metering, sampling, treating, preparing for injection

Offshore Hub - Citing Considerations

Location

- Number of CO2 sources
- Distance from sources
- Distance to use or sequestration destination
- Suitability of site – metocean and soils

Infrastructure

- Pipeline network
 - existing or new
- Ports and shipping routes
- Access to wells or aquifers

Interfaces with Offshore Hub

Pipelines

- Pressure design, materials, maintaining single-phase flow
- Are existing pipelines suitable for purposing to CO2?

Tankers and platform supply

- Approach procedures, safety zones etc.
- Normal operations and emergency response situations

Well Intervention

- As needed by drilling vessel

CO2 Property and Volumes

- Required specification for CO2
 - how to handle off-spec fluid?
- Metering for fees, carbon tax/credits, etc.

Materials and equipment for CO2 handling

- Specified limits for pressure and temperature
- Sufficient power and utility system capacity
- Consider non-metallic components also (seals, seats, etc.)

Onboard Constraints

- Size and location of equipment
- Impact on machinery arrangements, other shipboard systems, escape routes

Normal Operations

- Design and construction standards
- Procedures and training

Potential leakage or release of CO2

- Detection and alarms philosophy
- Design features such as minimizing non-welded connections
- Emergency procedures and training

Use, storage and handling of chemicals

- Procedures and training
- Disposal/recycling



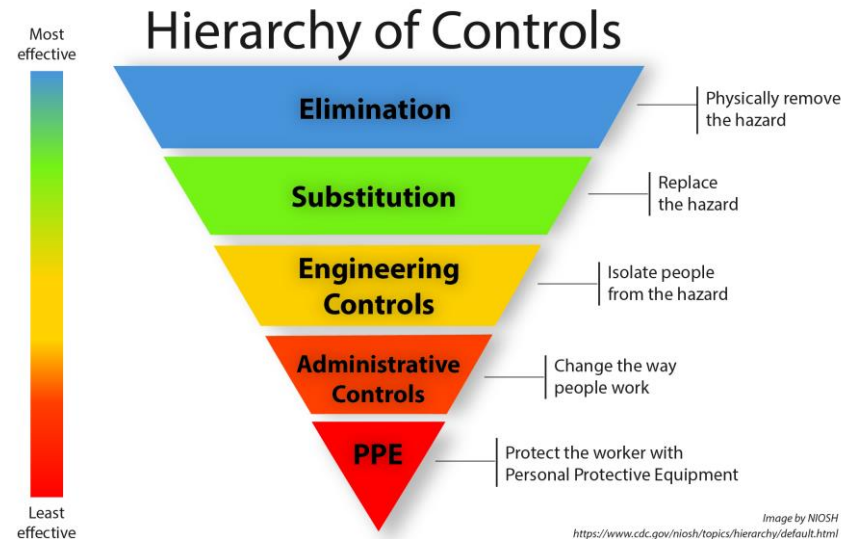
CO2 Properties

- Colorless, odorless
- Non-flammable
- Dispersion characteristics unlike lighter gases
- Corrosion from water and contaminants



Potential Mitigations

- Materials selection
- Minimize leak sources
- Detection and alarms
- Training
- Monitoring of CO2 properties



- Many similarities to existing technologies in marine and offshore
- Difference is the substance and its specific properties
- Lack of experience specific to CO₂ at this time
 - Technical and operational
- Apply systematic risk assessment principles and tools
 - Hazard identification e.g. HAZID
 - Process safety, e.g. HAZOP, bow tie
 - Develop barriers to prevent incidents and minimize consequences within project risk thresholds

Thank you

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