# Storing up a Problem?

The Security of Geological CO2 Storage and Implications for Business Commercialisation

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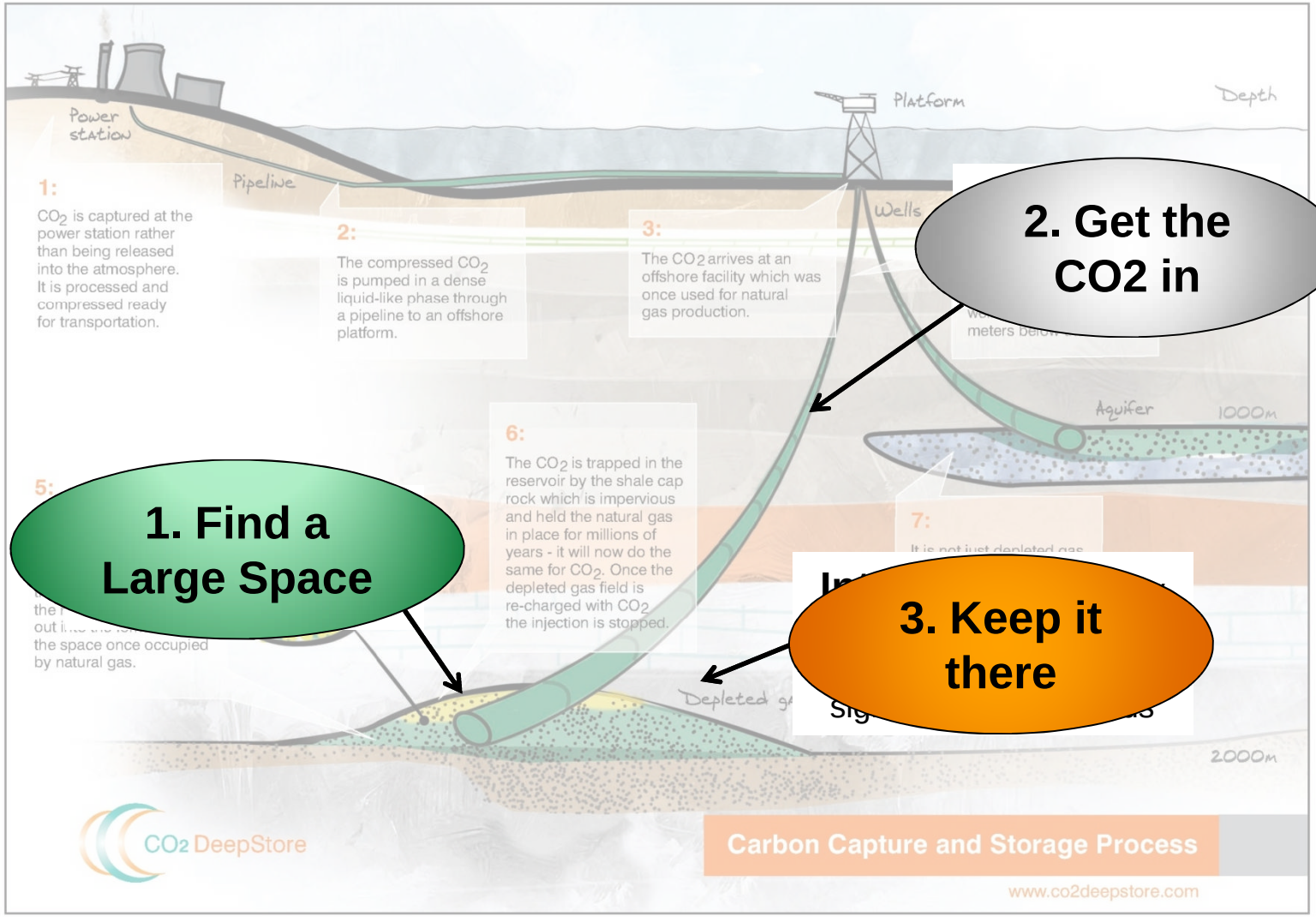
# The CO2DeepStore Business



# Does Storage Integrity Matter?

- Loss of integrity is a release CO2 from the containment lease which may
  - Reach the atmosphere and contribute to GHG inventory
    - Interfering with stabilisation targets
  - Reach the biosphere and potentially impact local ecosystems including human health
  - Interfere with other regulated use of the subsurface
    - Coal, Oil, Gas extraction, water supply
  - Require EUA purchase + various penalties

- Key Questions
  - What constitutes an important integrity loss?
  - Are there any acceptable leakage rates?
    - Climatic – Ecosystem – Economic views

# Nature of Storage Risks

**Geological storage risks**

## Geological Integrity

- Loss of integrity through natural formations, traps and seals

Containment Terminology

- **Migration** – Underground movement of CO2
- **Loss of Integrity** – Migration of CO2 outwith the licensed containment volume
- **Leak** – Loss of integrity leading to CO2 entry into the atmosphere, ocean or water supply

## Engineered Integrity

- Loss of integrity through new or existing (open or abandoned) well bore
- Considered to be the most likely cause of integrity loss, especially in areas with high density of old wells
- Mostly repairable with standard oilfield operations.

# Natural Analogues

- There are many natural underground accumulations of CO2
  - McElmo Dome, Bravo Dome
- Most have no discernable surface leakages
- Some – like Crystal Geyser in Utah are spectacular exceptions
  - Leakages are low level
- None of these endangers people
- Many are commercially exploited

Photo from:-
University of Cambridge –
Department of Earth Sciences –
Carbon Sequestration Group

# CO2 Containment Curves

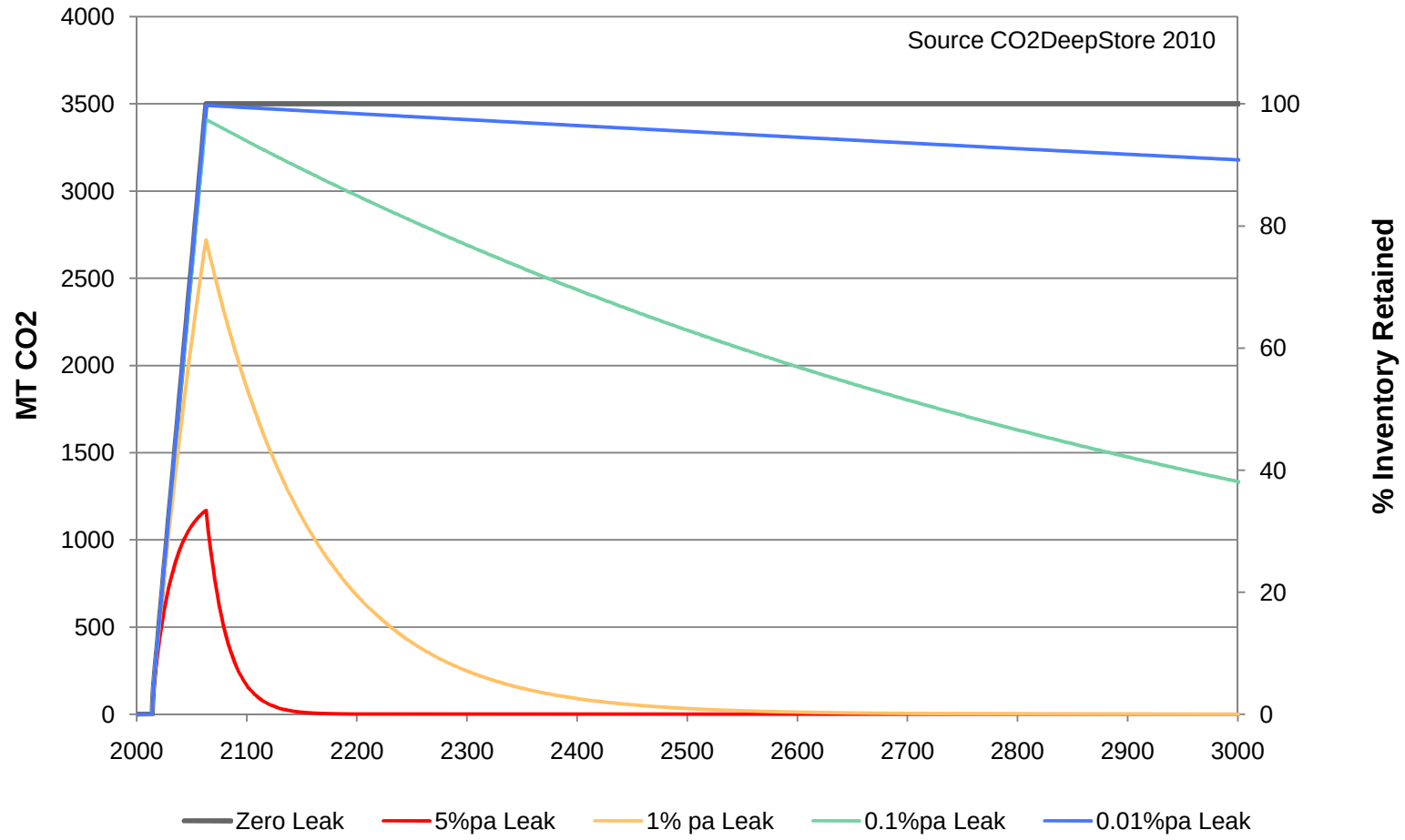
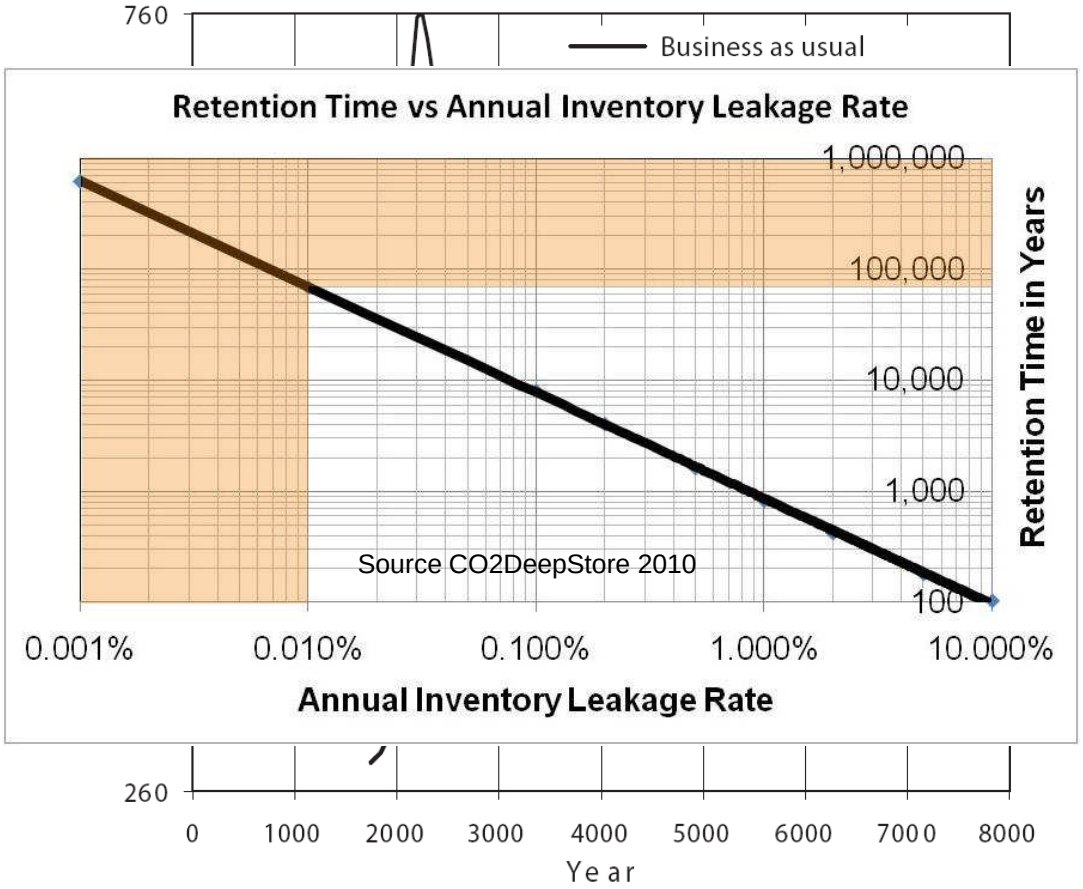



Illustration Assumes – 50% UK generator emissions are injected for 50 years from 2015 – 70MT/yr

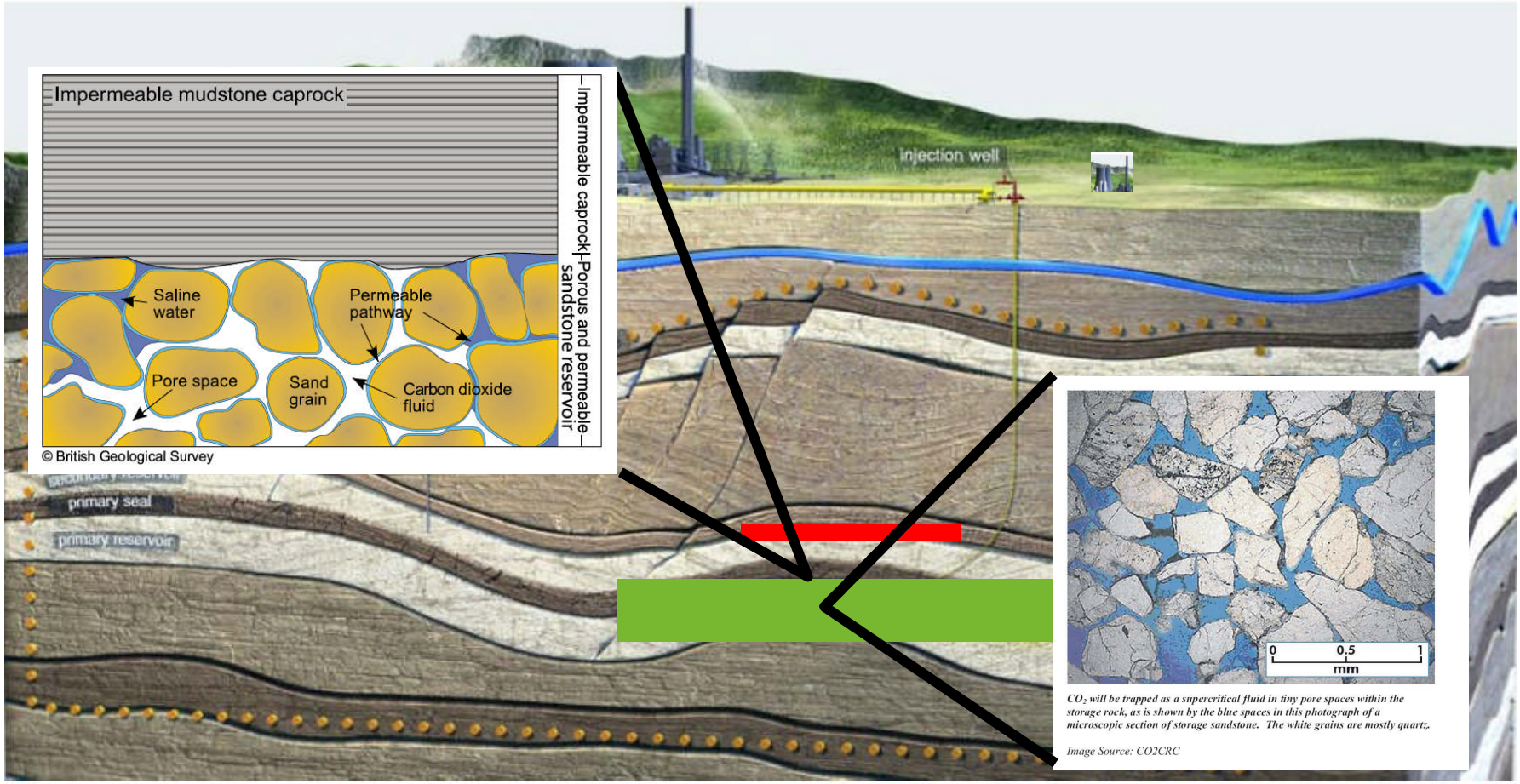
# IPCC

- IPCC Special Report on CO2 Capture and Storage (2005)
- “Observations from engineered and natural analogues as well as models suggest that the fraction retained in appropriately selected and managed geological reservoirs is very likely to exceed 99% over 100 years and is likely to exceed 99% over 1000 years.”

Kristoffersen et al 2008 – A Zero Report



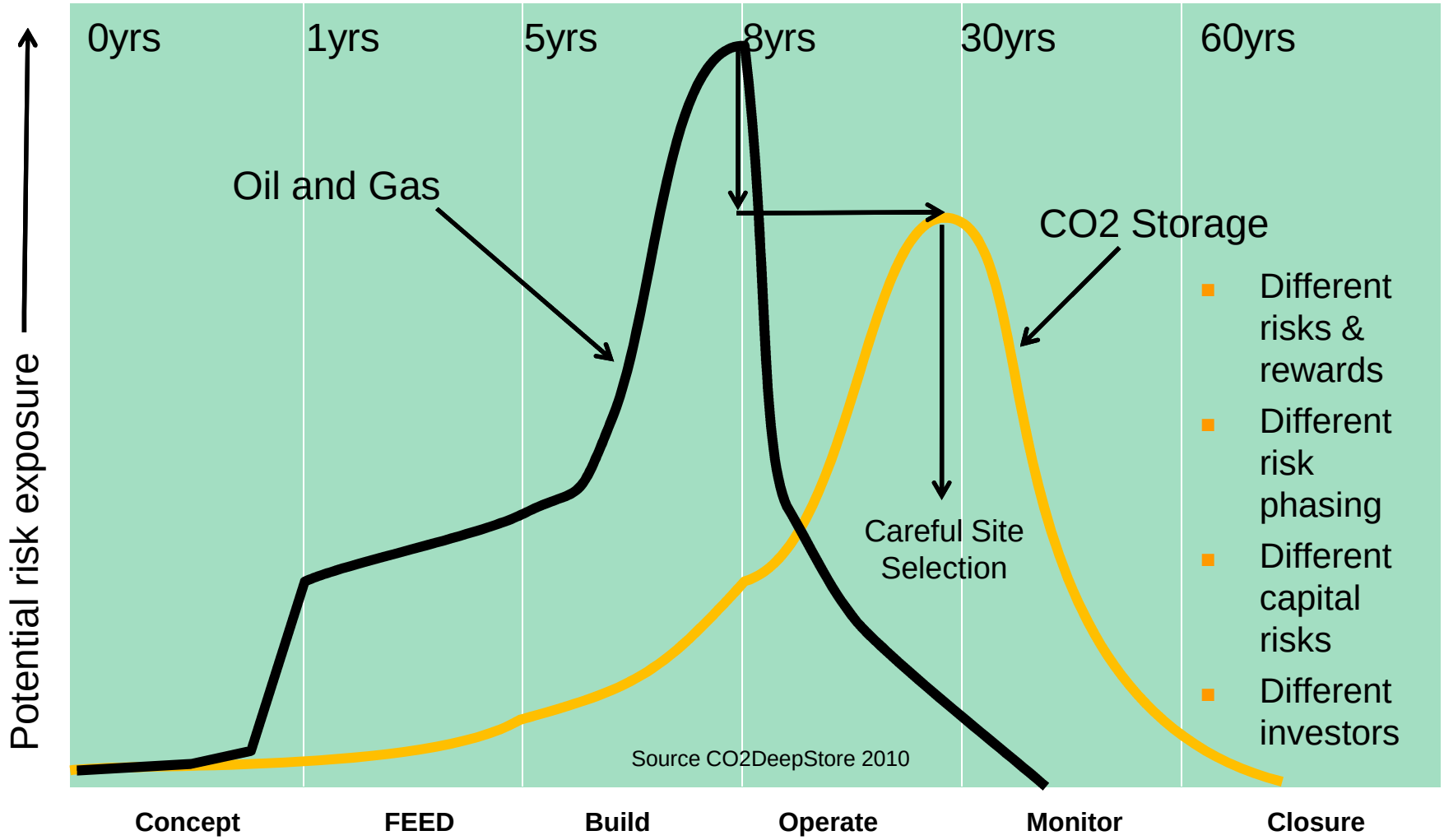
# Keeping it there.....




Schematic from CO2QUALSTORE guidelines – DNV Report 2009-1425

# Business Risks –

## CO2 Storage vs Oil & Gas



# Summary

- Natural geological CO2 stores occur in many places and have been exploited
  - Most have no discernable surface leakages
    - but there are exceptions
  - Continue to be studied in detail
- For engineered CO2 stores, injected CO2 must stay in place for many thousands of years for effective climate change mitigation
  - High degrees of geological integrity can be assured through careful site selection & monitoring – Target < 0.1% pa
  - Leaks associated with wells can be detected and repaired with oilfield technology
- Commercialisation requires effective containment
  - Business risks are lower and later in comparison to oil and gas
  - Resulting in different investors and requirement for new business models

# Thank you

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