



ERP Plenary

July 2015



CO₂ Enhanced Oil Recovery

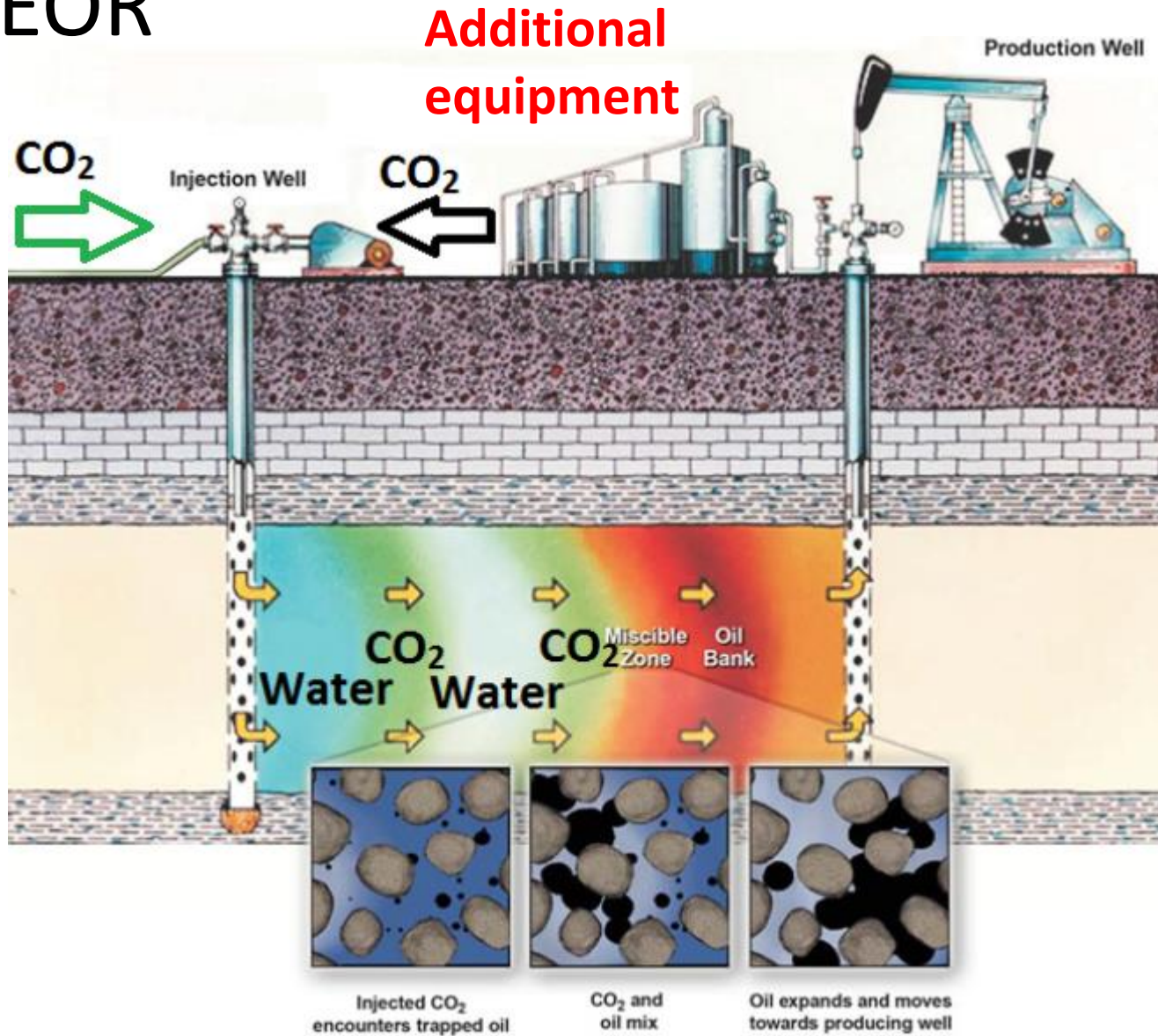
Richard Heap
July 2015



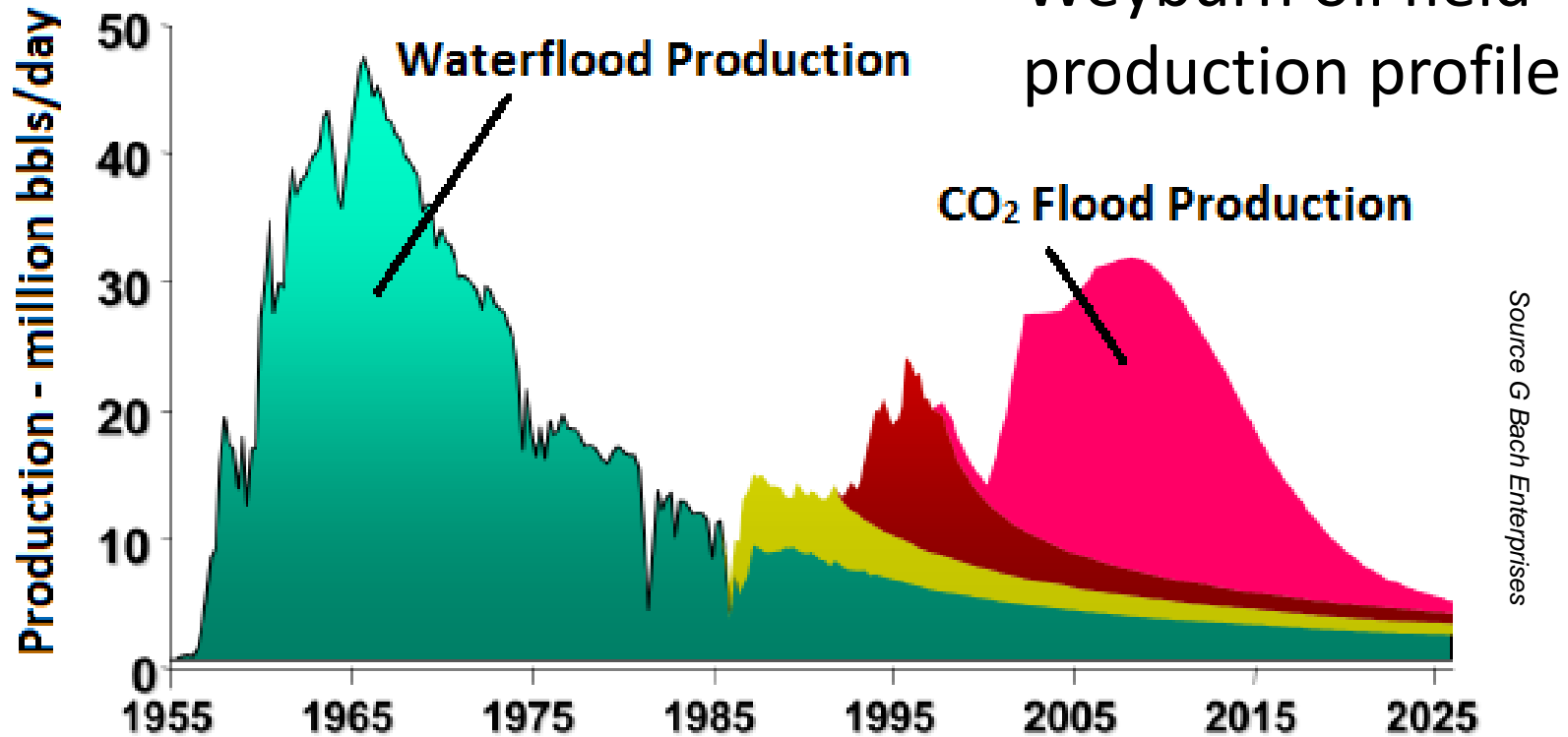
Outline

- Technical challenges
 - CO₂-EOR is not easy, and expensive
- Synchronisation issue
 - Timing of CO₂ supply
- Geographical disconnect
 - CO₂-EOR is in the North and emissions in South

CO₂-EOR



Successful in USA



US Oil Yields ~6% of total production >300,000 barrels/day

Injecting CO₂ >70 Mt/yr – mainly from natural sources

Benefits of CO₂-EOR in UK

Additional oil

- ~500 million barrels ~10% of remaining reserves
- increase revenue from North Sea
- revenue -> potential return on public investment

CO₂ storage

- additional storage space
- low cost

Accelerate CCS

- Transition to a low carbon energy system
- Transformation of the North Sea

Barriers in the UK

No CO₂ – but needed soon

Offshore challenge

- higher CAPEX and OPEX
- fewer wells – delay cost recovery
- uncertain oil recovery

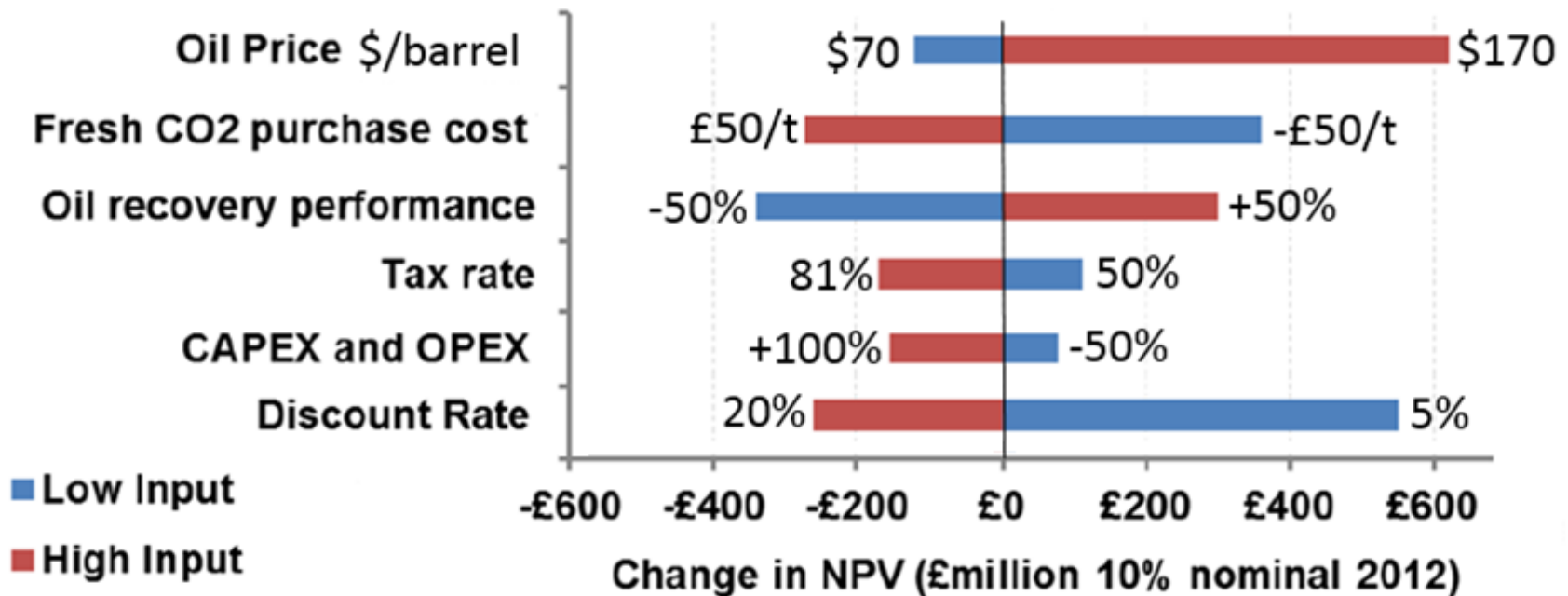
Economics

- oil price
- tax regime

Public acceptance

- Additional hydrocarbons and CO₂ emissions

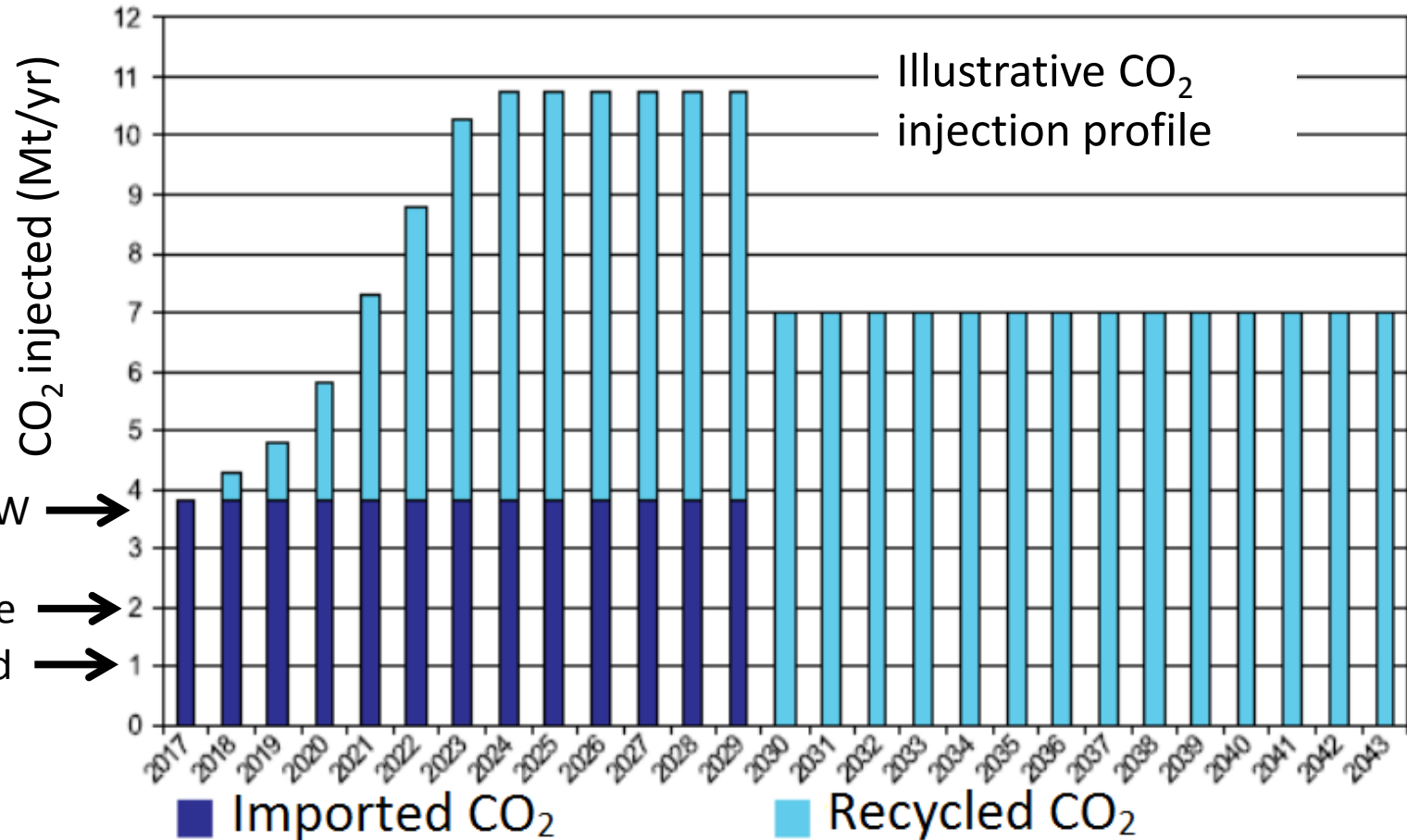
CO₂-EOR economic risks



Source Element Energy

Some risks are inherent – reservoir performance
 Others need negotiating – CO₂ price

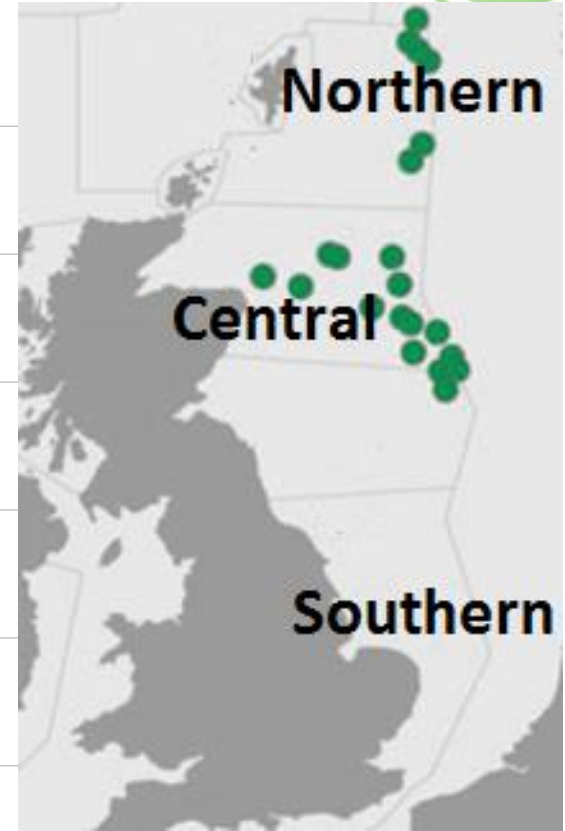
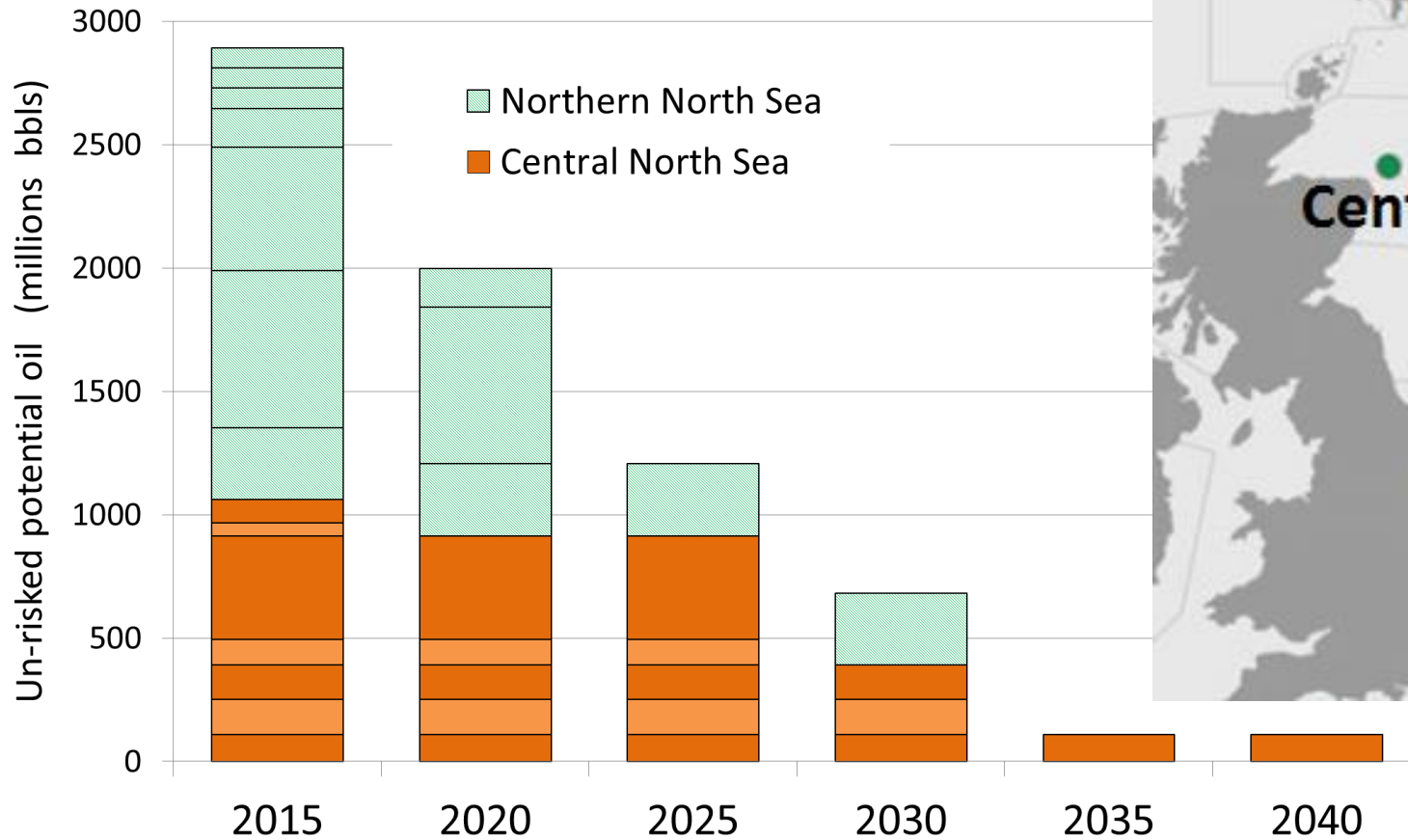
Demand for CO₂



CO₂ demand profile differs from emitter -> back-up storage needed

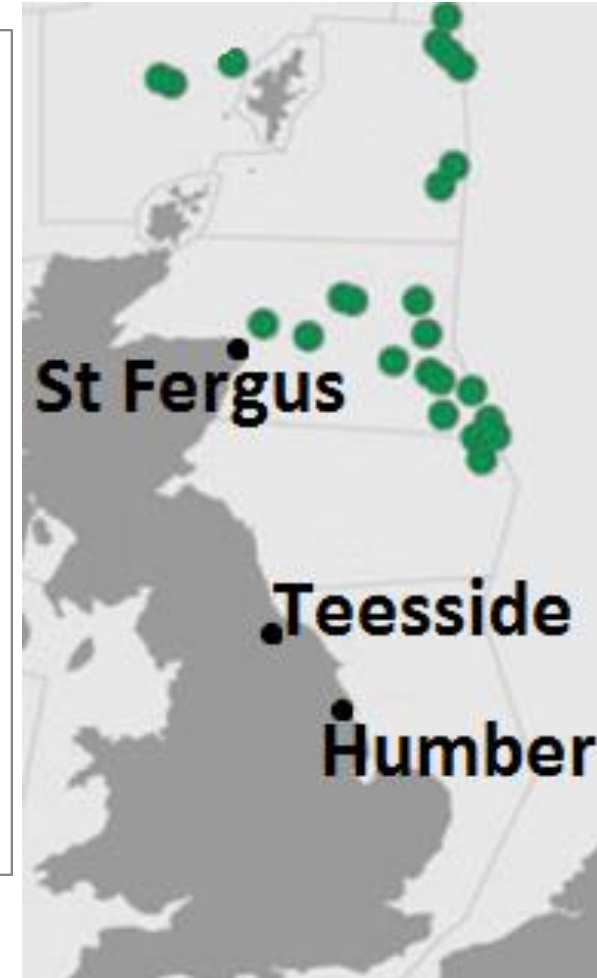
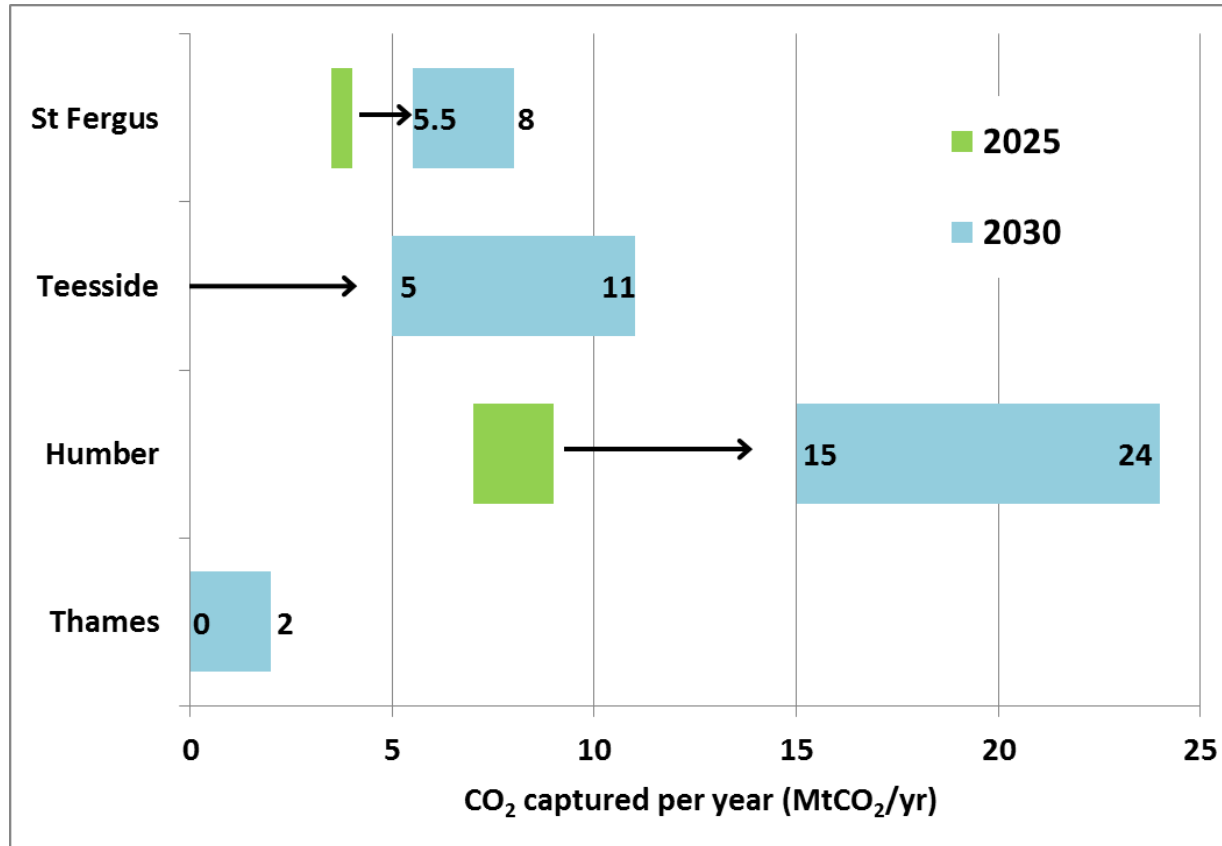
Central North Sea only real prospect

Potential additional oil & operational fields by date



CO₂ supply unlikely to reach critical mass until 2025
Supply won't reach Northern North Sea

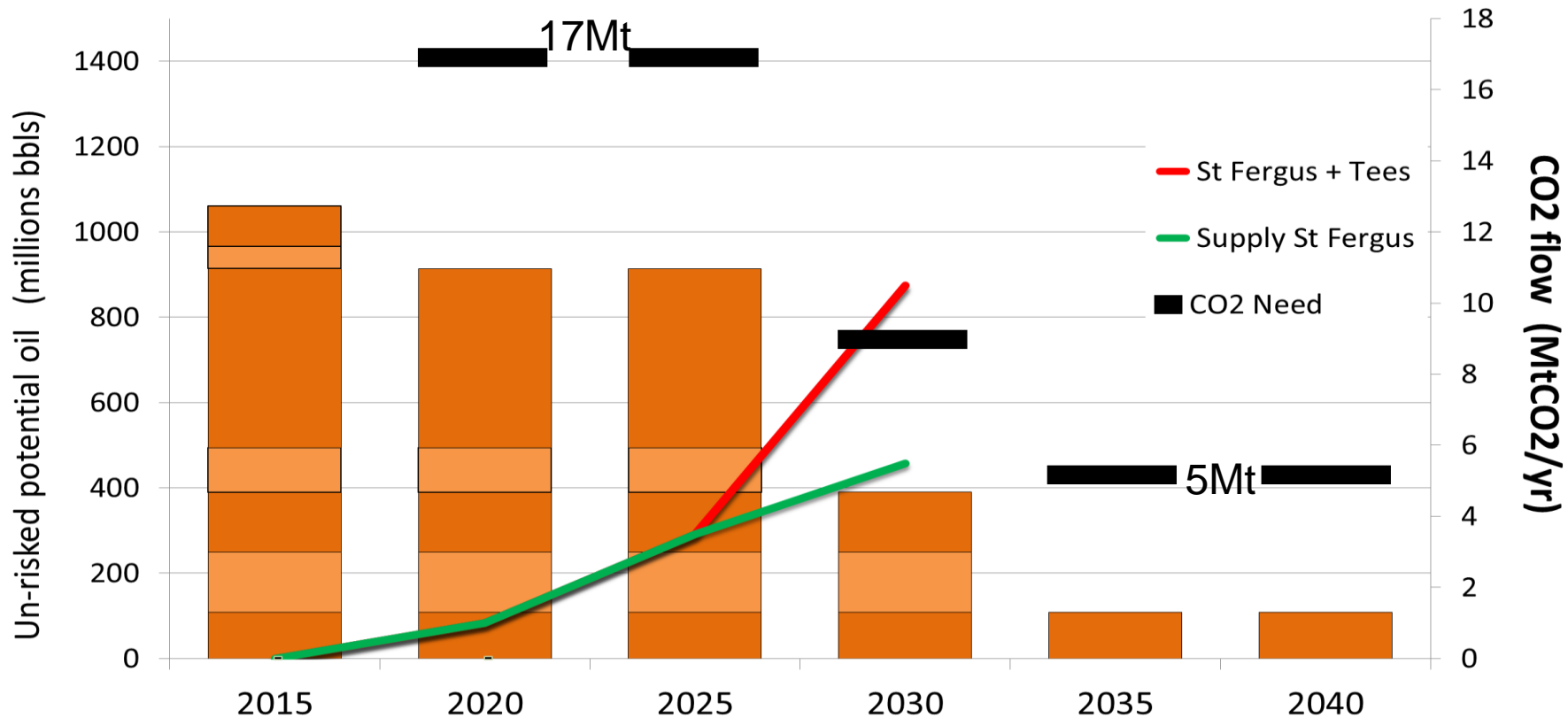
Geographical disconnect



Uncertainty about CO₂ from CCS to St Fergus
Teesside pipeline would secure CO₂ supply

Timing CCS is critical for CO₂-EOR

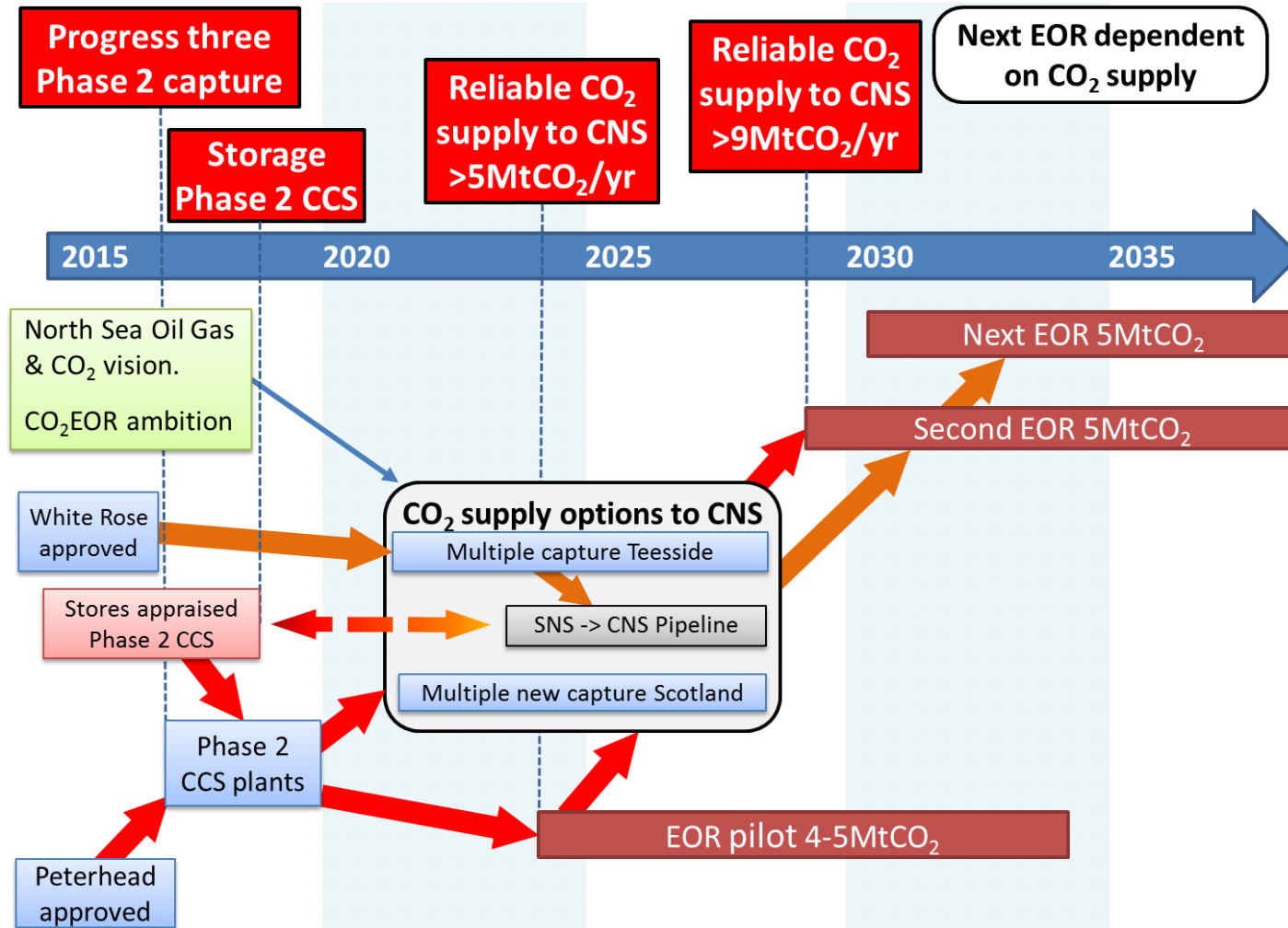
Potential additional oil and operational field by date in Central North Sea



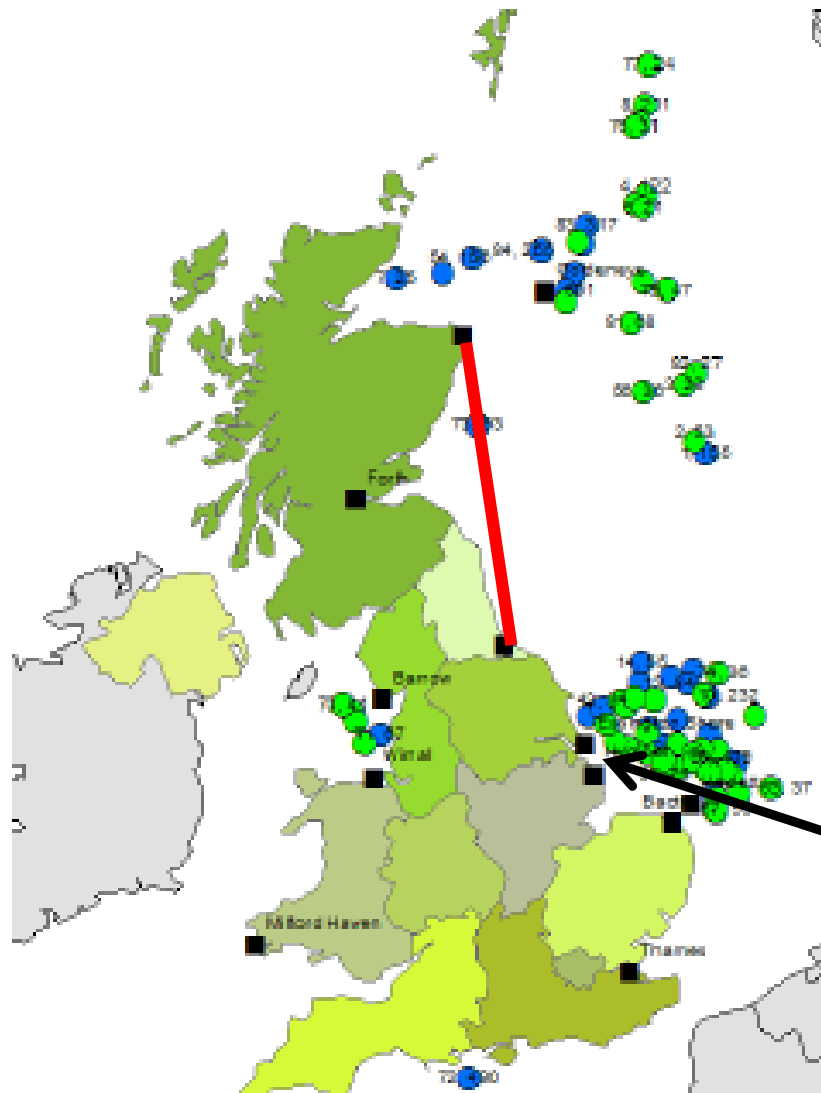
Multiple capture projects needed.

Pipeline from Teesside to CNS could reduce risks.

Critical timeline for CO₂-EOR



Mitigating transportation risks

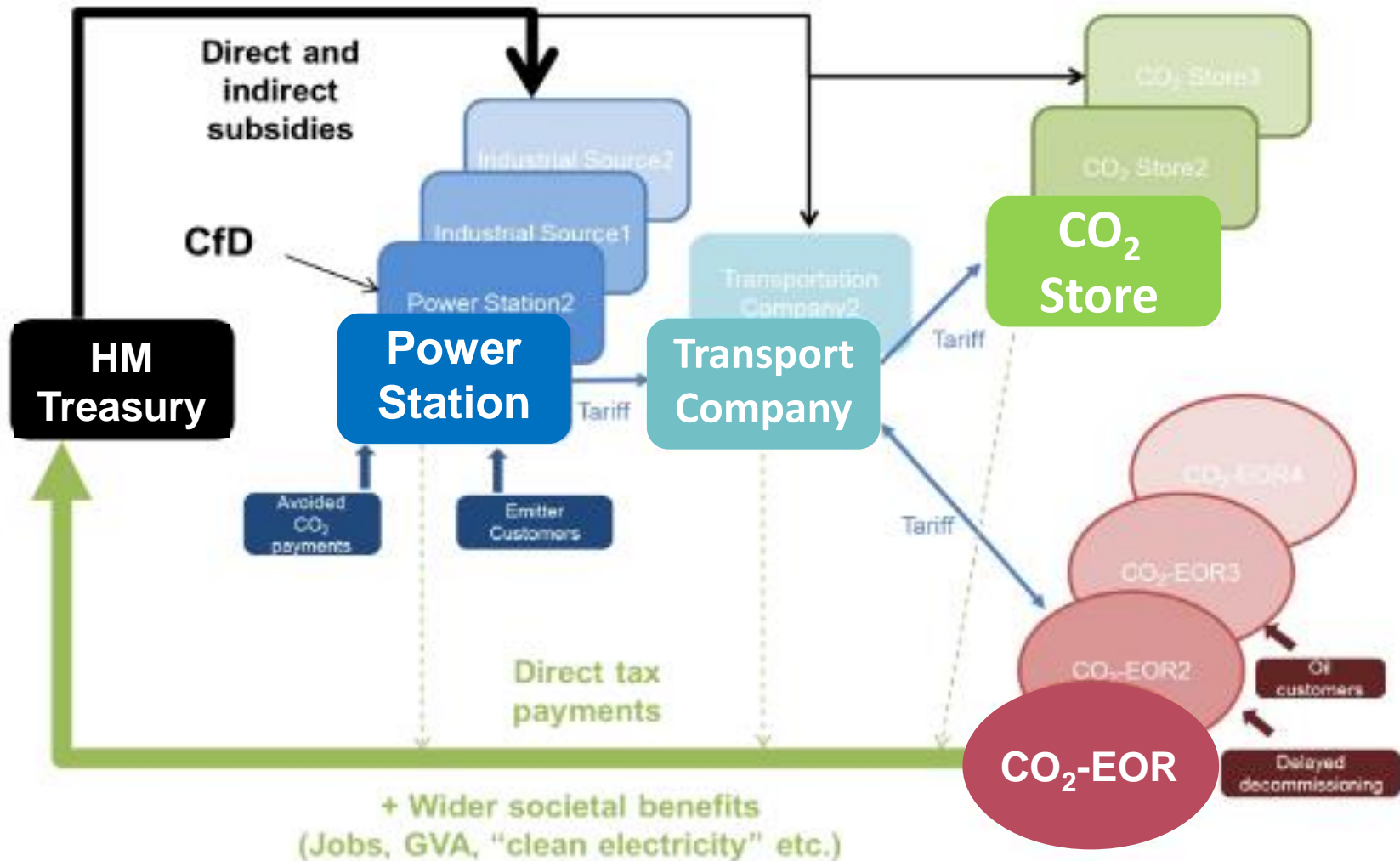


Pipeline Teesside to CNS
- additional cost

‘Market Maker’
- publicly supported CO₂
transport company
- de-risk interdependencies

Humber

Wider economic return on investment



Recommendations

North Sea plan to coordinate oil extraction, CCS and CO₂ network

CCS on its own will not deliver the full benefits of CO₂-EOR
A North Sea CO₂ network could open up a new offshore industry

Early policy decisions on CCS Phase 1 & 2 determine CO₂-EOR outcomes

Both CCS Commercialisation projects should be supported
Govt to create environment to progress Phase 2 CCS by 2017
De-risk storage in depleted oil fields and aquifers

Ensure offshore tax regime supports CO₂-EOR's high expense and risks

Additional support for early CO₂-EOR project – essential for learning

CO₂ network to reduce risks and cost for emitters, sinks and CO₂ users

A publicly supported 'Market Maker' network company would accelerate deployment of CCS and CO₂-EOR