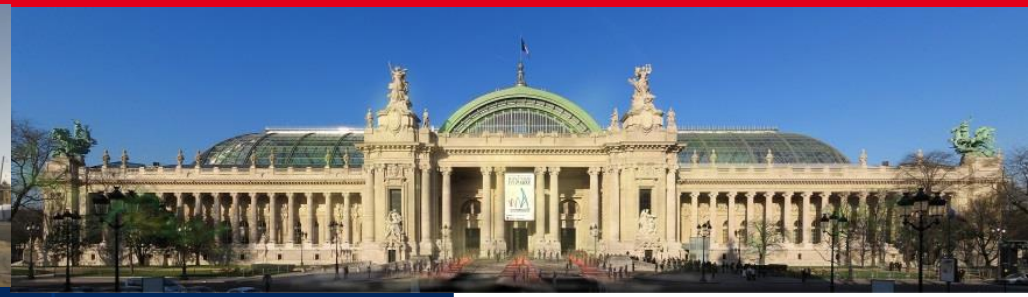
26th World Gas Conference

1 – 5 June 2015, Paris, France



PGCA1

THE PETERHEAD GAS CCS PROJECT DRIVERS AND DEVELOPMENT

Tim Bertels
CO_2 Implementation Manager / Head of CCS

IGU
WGCPARIS2015
WORLD GAS CONFERENCE

DEFINITIONS AND CAUTIONARY NOTE

Reserves: Our use of the term "reserves" in this presentation means SEC proved oil and gas reserves.

Resources: Our use of the term "resources" in this presentation includes quantities of oil and gas not yet classified as SEC proved oil and gas reserves. Resources are consistent with the Society of Petroleum Engineers 2P and 2C definitions.

Organic: Our use of the term Organic includes SEC proved oil and gas reserves excluding changes resulting from acquisitions, divestments and year-average pricing impact.

Resources plays: Our use of the term 'resources plays' refers to tight, shale and coal bed methane oil and gas acreage.

The companies in which Royal Dutch Shell plc directly and indirectly owns investments are separate entities. In this document "Shell", "Shell group" and "Royal Dutch Shell" are sometimes used for convenience where references are made to Royal Dutch Shell plc and its subsidiaries in general. Likewise, the words "we", "us" and "our" are also used to refer to subsidiaries in general or to those who work for them. These expressions are also used where no useful purpose is served by identifying the particular company or companies. ''Subsidiaries'', "Shell subsidiaries" and "Shell companies" as used in this document refer to companies over which Royal Dutch Shell plc either directly or indirectly has control. Companies over which Shell has joint control are generally referred to as "joint ventures" and companies over which Shell has significant influence but neither control nor joint control are referred to as "associates". The term "Shell interest" is used for convenience to indicate the direct and/or indirect ownership interest held by Shell in a venture, partnership or company, after exclusion of all third-party interest.

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THE CONTEXT

9 billion global population

Energy demand doubles

2 billion vehicles on road

75% of people living in cities

More societal scrutiny

THE NEED FOR CHANGE

9 billion global population

Energy demand doubles

2 billion vehicles on road

75% of people living in cities

More societal scrutiny

Decarbonise fossil fuels

Address climate change

CCS – KEY TO A LOW CARBON FUTURE

17%

CCS has the potential to deliver 17% of the required mitigation by 2050

(International Energy Agency)

40%

Without CCS the cost of tackling climate change could be 40% higher

(International Energy Agency)

138%

Without CCS, the cost of limiting global CO_2 emissions to 450ppm could increase by 138%

IPPC Fifth Assessment Report

£32

Billion per annum

Without CCS, the additional costs to run a decarbonised UK economy in 2050 will be £32 billion

UK Energies Technology Institute

SHELL INVOLVEMENT IN CCS DEMONSTRATION GLOBALLY

Quest

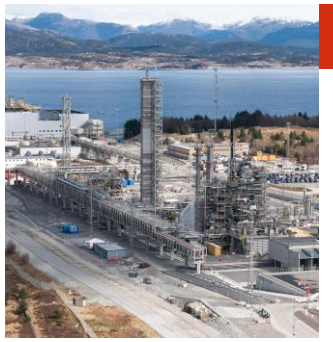
Feed: syngas
Start up: expected 2015
1 mtpa
Capture: amine

Boundary Dam*

Feed: coal power flue gas
Status: operating since 2014
1 mtpa
Capture: amine

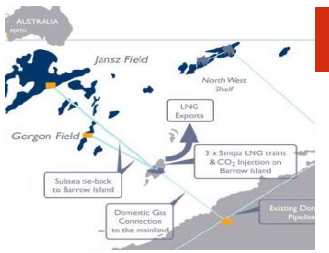
Peterhead

Feed: gas power flue gas
Status: FID to be taken
1 mtpa
Capture: amine



TCM

Feed: dual streams (gas and coal flue gas specs)
Status: operating since 2012
Up to 200 ktpa
Capture: various technologies for testing

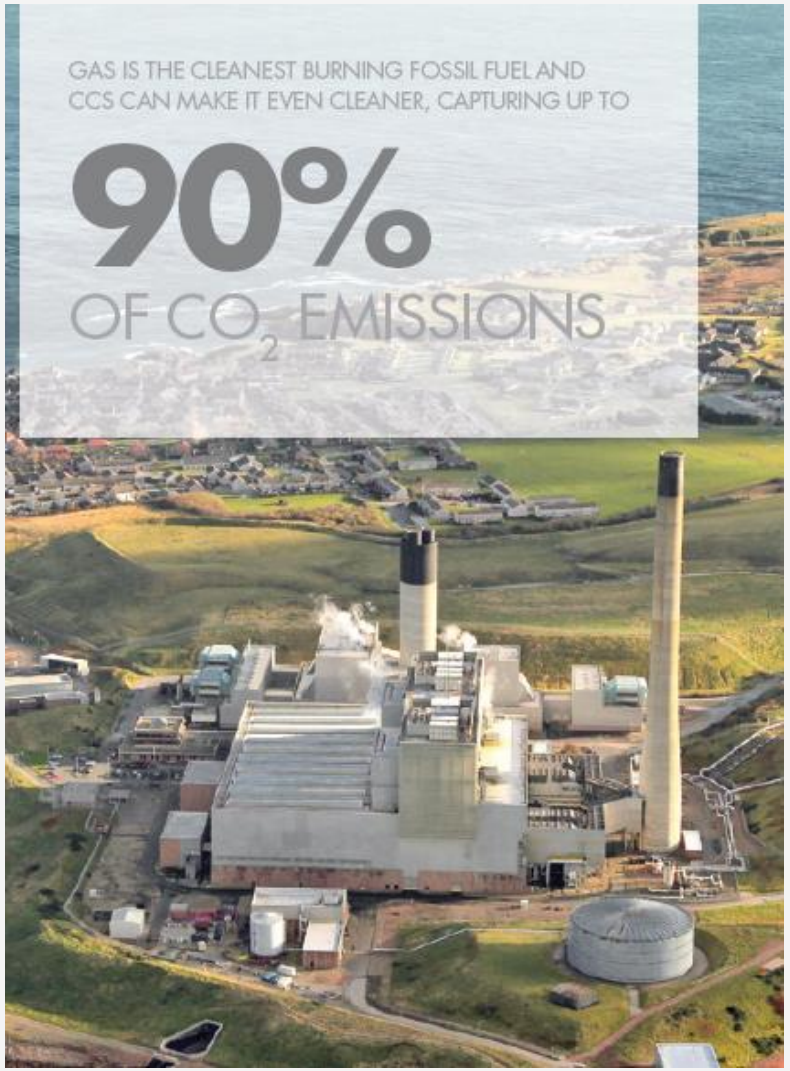


Gorgon

Feed: natural gas
Status: under construction
Between 3-4 mtpa
Capture: amine

* no equity position; involvement through Shell Cansolv

PETERHEAD CCS FOR GAS DEMONSTRATION PROJECT SCOPE



WORLD FIRST

First full-scale CCS project on a gas-based power station

WHERE?

Capture at Peterhead Power Station; offshore storage in depleted Goldeneye gas reservoir

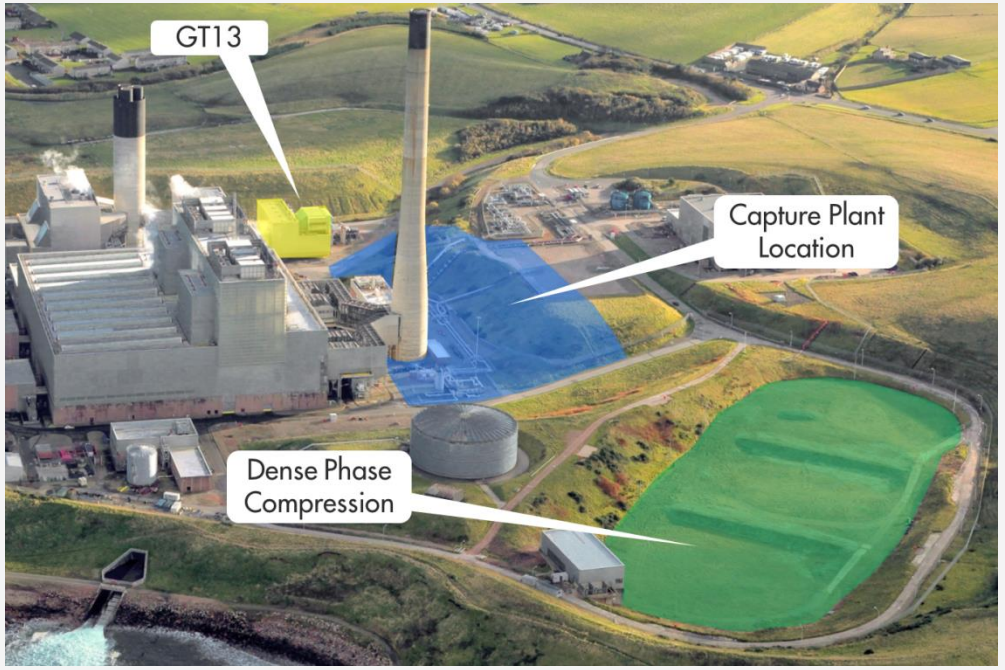
IMPACT

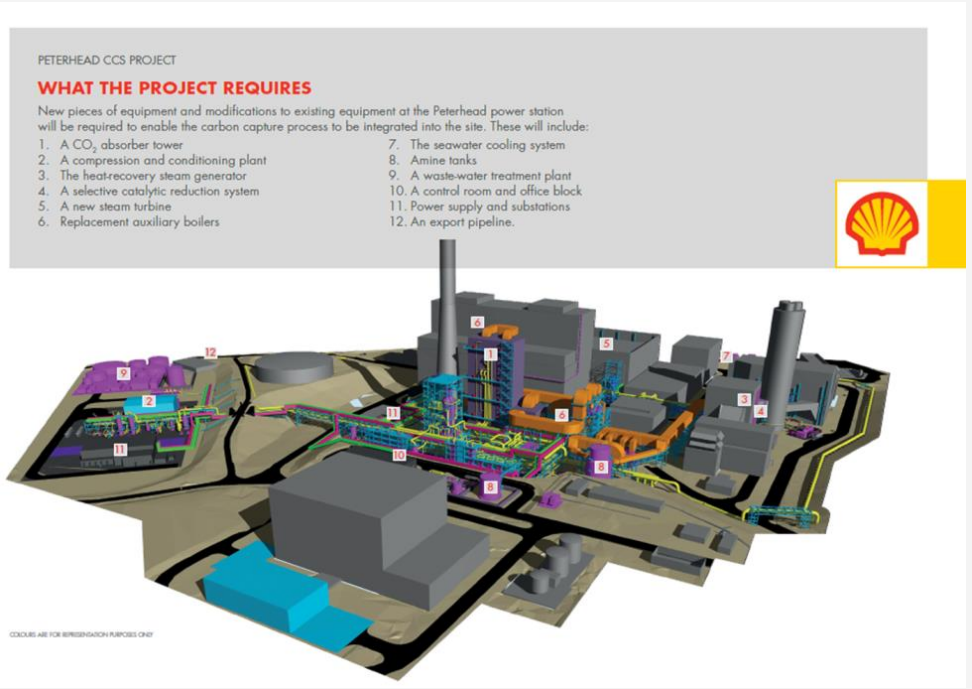
10-15 million tonnes of CO_2 captured over project lifetime (90% CO_2 capture from one turbine)

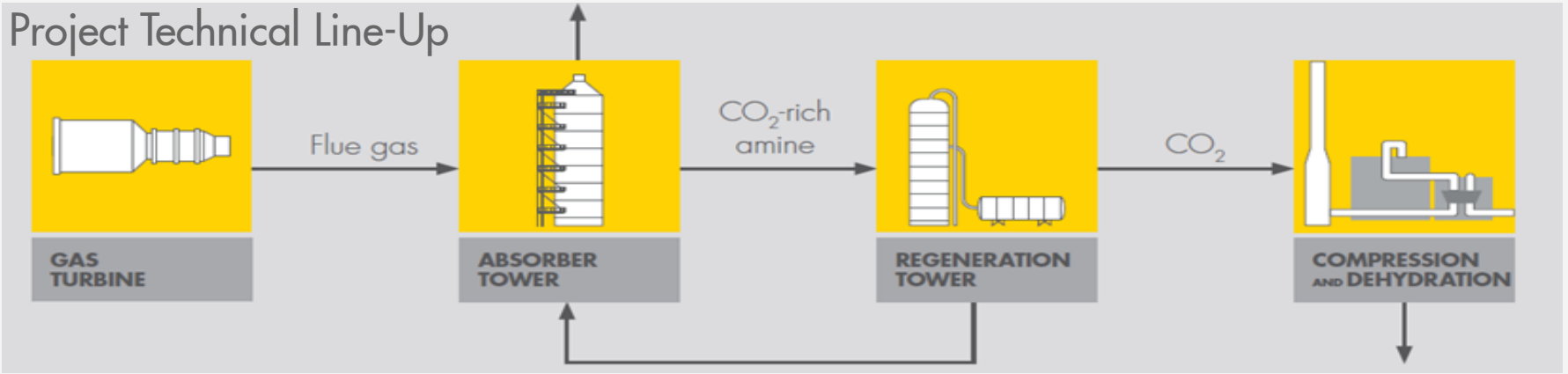
CONTEXT

UK Government CCS commercialisation competition

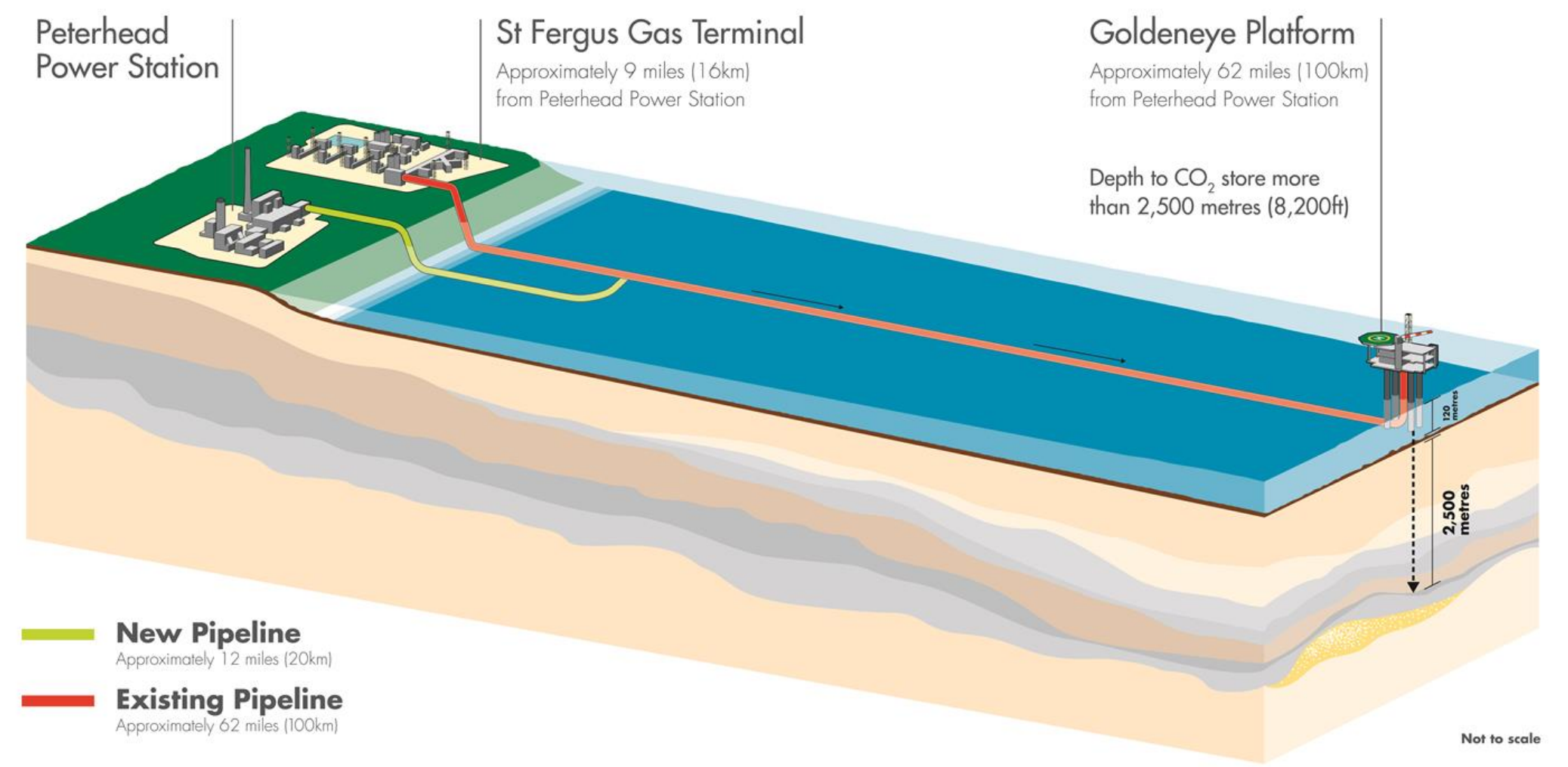
CO_2 CAPTURE – CANSOLV AMINE CAPTURE TECHNOLOGY







CO_2 TRANSPORT – DENSE PHASE, 100 KM PIPELINE

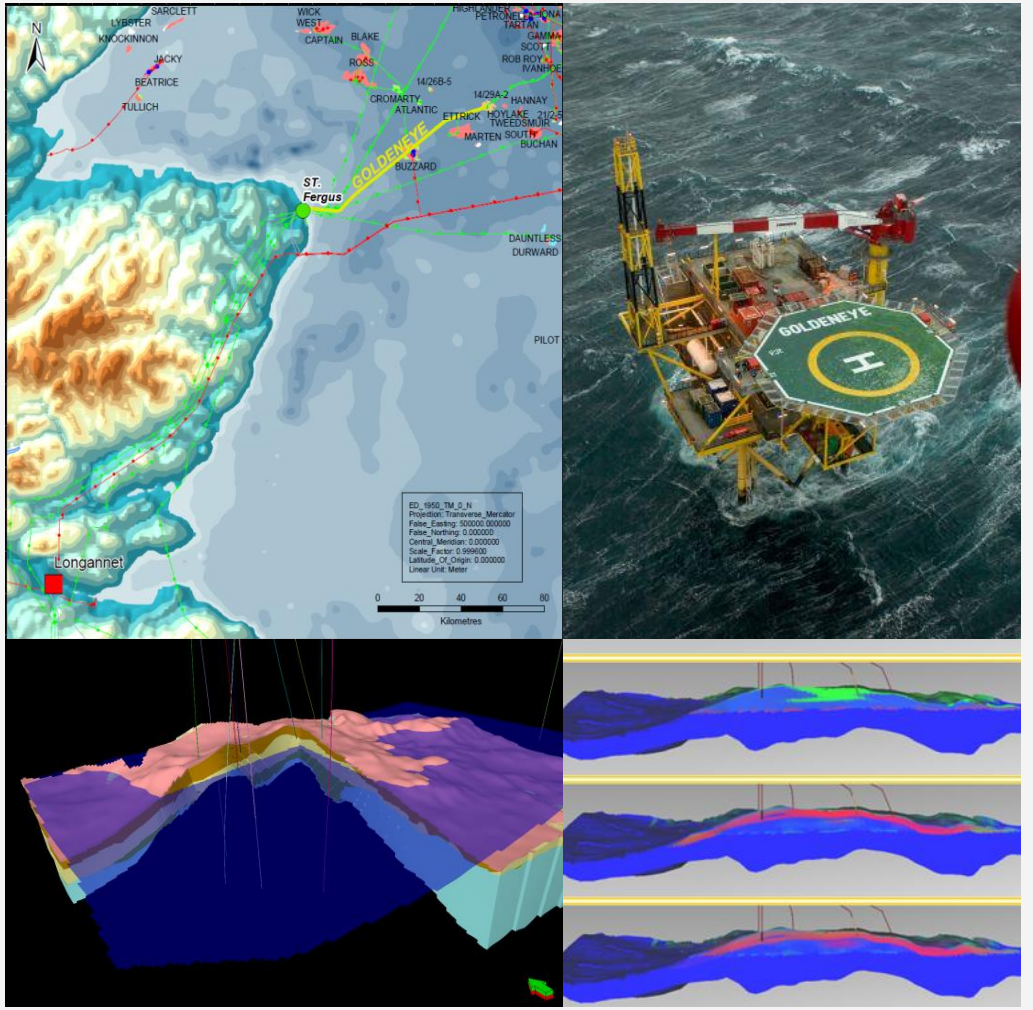


CO_2 STORAGE – OFFSHORE, USING EXISTING FACILITIES

- Storage in a depleted gas field (Goldeneye), over 100km offshore, using young facilities

- Advantages of a depleted gas field:
  - Exploration, appraisal and development data
  - Long term production history
  - Proven seal over millions of years

- CO_2 hub with potential for future storage in aquifer

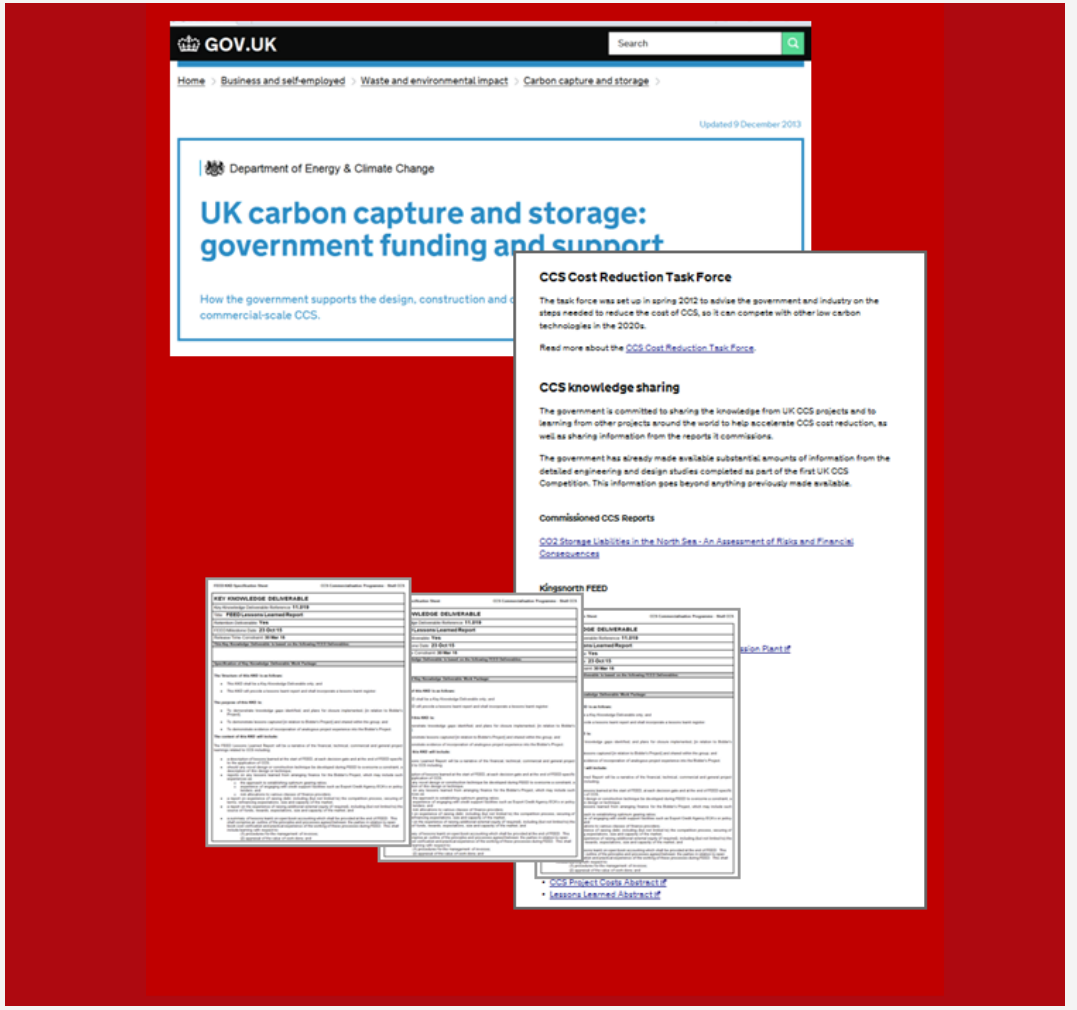


KNOWLEDGE SHARING TO DRIVE CCS COSTS DOWN

- 45 key knowledge deliverables to be shared via a public DECC website

Topics include:

- Engineering
- Subsurface
- Commercial
- HSE



SUMMARY

- Climate change is real and there is a need to decarbonise fossil fuels
- CCS is critical:
  - essential and significant contribution to emissions reduction in power and industry
  - without CCS, decarbonisation costs are substantially higher (IPCC, IEA)
  - only solution to achieve net zero emissions
- Delivering CCS requires demonstration, policy to drive more investment, and global stakeholder collaboration


IMAGINE CAPTURING THIS MUCH CO_2 EVERY HOUR
Find out how Shell plans to capture CO_2 at shell.co.uk/peterheadccs
LET'S GO
Illustration is an estimate based on the current Peterhead technical design that aims to capture 1 million tonnes of CO_2 per year.