ARB CCS QUANTIFICATION WORKSHOP

Shell presentation

Dr. Owain Tucker
Global Deployment Lead CCS

DEFINITIONS & 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.

Shales: Our use of the term 'shales' 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.

This presentation contains forward-looking statements concerning the financial condition, results of operations and businesses of Royal Dutch Shell. All statements other than statements of historical fact are, or may be deemed to be, forward-looking statements. Forward-looking statements are statements of future expectations that are based on management's current expectations and assumptions and involve known and unknown risks and uncertainties that could cause actual results, performance or events to differ materially from those expressed or implied in these statements. Forward-looking statements include, among other things, statements concerning the potential exposure of Royal Dutch Shell to market risks and statements expressing management's expectations, beliefs, estimates, forecasts, projections and assumptions. These forward-looking statements are identified by their use of terms and phrases such as ''anticipate'', ''believe'', ''could'', ''estimate'', ''expect'', ''intend'', ''may'', ''plan'', ''objectives'', ''outlook'', ''probably'', ''project'', ''will'', ''seek'', ''target'', ''risks'', ''goals'', ''should'' and similar terms and phrases. There are a number of factors that could affect the future operations of Royal Dutch Shell and could cause those results to differ materially from those expressed in the forward-looking statements included in this presentation, including (without limitation): (a) price fluctuations in crude oil and natural gas; (b) changes in demand for Shell's products; (c) currency fluctuations; (d) drilling and production results; (e) reserves estimates; (f) loss of market share and industry competition; (g) environmental and physical risks; (h) risks associated with the identification of suitable potential acquisition properties and targets, and successful negotiation and completion of such transactions; (i) the risk of doing business in developing countries and countries subject to international sanctions; (j) legislative, fiscal and regulatory developments including potential litigation and regulatory measures as a result of climate changes; (k) economic and financial market conditions in various countries and regions; (l) political risks, including the risks of expropriation and renegotiation of the terms of contracts with governmental entities, delays or advancements in the approval of projects and delays in the reimbursement for shared costs; and (m) changes in trading conditions. All forward-looking statements contained in this presentation are expressly qualified in their entirety by the cautionary statements contained or referred to in this section. Readers should not place undue reliance on forward-looking statements. Additional factors that may affect future results are contained in Royal Dutch Shell's 20-F for the year ended 31 December, 2015 (available at www.shell.com/ investor and www.sec.gov). These factors also should be considered by the reader. Each forward-looking statement speaks only as of the date of this presentation, 5 April, 2016. Neither Royal Dutch Shell nor any of its subsidiaries undertake any obligation to publicly update or revise any forward-looking statement as a result of new information, future events or other information. In light of these risks, results could differ materially from those stated, implied or inferred from the forward-looking statements contained in this presentation. There can be no assurance that dividend payments will match or exceed those set out in this presentation in the future, or that they will be made at all.

We use certain terms in this presentation, such as discovery potential, that the United States Securities and Exchange Commission (SEC) guidelines strictly prohibit us from including in filings with the SEC. U.S. Investors are urged to consider closely the disclosure in our Form 20-F, File No 1-32575, available on the SEC website www.sec.gov. You can also obtain this form from the SEC by calling 1-800-SEC-0330.

1.0

SHELL'S GLOBAL EXPERIENCE IN CCS

WORKING ON CCS IN MULTIPLE COUNTRIES

OCAP

- Netherlands, CO_2 from refinery to greenhouses
- Operating since Summer 2005

Quest

- Alberta, Canada, Onshore saline
- CO_2 from hydrogen manufacturing unit
- Injecting since August 2015

Peterhead

- Scotland, UK, Offshore depleted field
- CO_2 from gas turbines
- Permits about to be finalized when support withdrawn

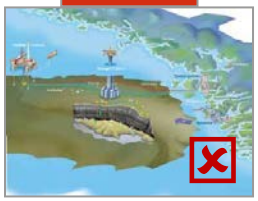
Barendrecht

ZeroGen

TCM

Longannet

Draugen



Gorgon

Observation: in all countries with mature regulation, the regulations have the same key components around characterization, MMV and closure

- Significant global experience
  - Europe, Australasia, North America

CCS ELEMENTS ARE MATURE AND PROVEN

CAPTURE

- Capture-related technology has been utilised in industry for decades for product decontamination.
- Most mature technology uses amine solvents.
- Emerging capture technologies build on industrial processes e.g. gas/ solid fluidised beds & membranes.

TRANSPORT

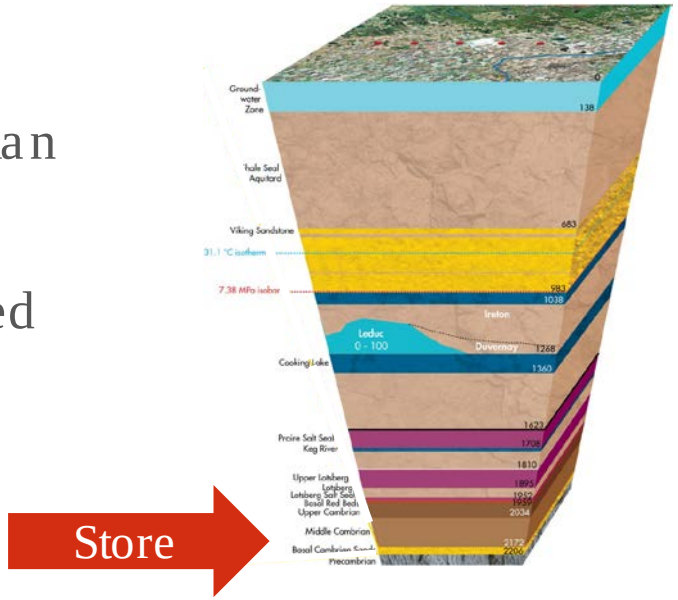
- Decades of CO_2- enhanced oil recovery (EOR) experience in the US.
- Established pipelines across the US and Europe

STORAGE

- Dedicated CO_2 storage has been in operation in Norway for nearly 20 years.
- CO_2 EOR with incidental storage started in the 1980s.
- Many accumulations of natural CO_2

SPOTLIGHT ON QUEST

- Delivering large scale emissions reductions, from upgrading at Scotford
- 1 million tonnes of CO_2/ year – already stored over 0.5 million tonnes since startup
- Equivalent to removing 250,000 cars (EU) from the road every year
- Deep secure saline storage
- Site specific risk assessment, monitoring plan and response plan
- DNV – Storage & monitoring plans certified
- Licensed by Albertan regulators



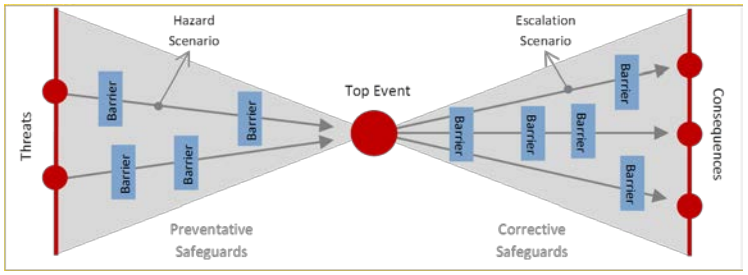
2.0

ACCOUNTING AND MONITORING

PRINCIPLES FOR CONSIDERATION

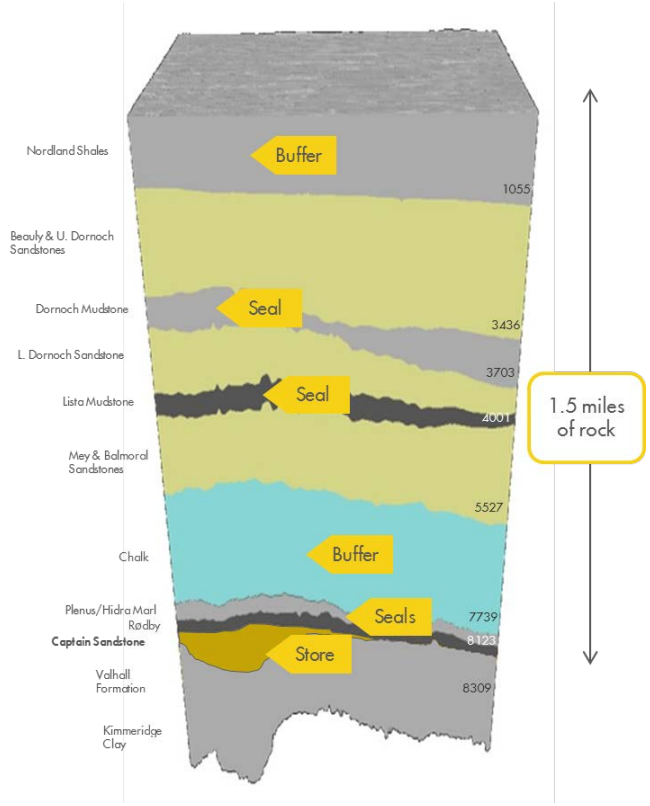
1) Simple, stimulate CCS deployment
2) Reasonable Equivalence for CCS in out-of-state jurisdictions (LCFS)
3) Difference between CO_2 avoided and CO_2 stored;
   Avoid double counting in jurisdictions with comprehensive GHG regulation
   - Options: (a) Credit for double counted CO_2, (b) Credit for gross storage for first X years, then shift to CO_2 avoided
4) CO_2 avoided should include indirect emissions factor for absorbants
5) CO_2 avoided should not include system construction or materials used
6) Leakage defined as release to atmosphere
7) Start date = first injection; End date = 2-5 years after last injection (or date of liability transfer to state).
8) Review quantification protocol performance after X years

PRINCIPLES FOR CONSIDERATION



1) Presumption is zero leakage to atmosphere post-injection
   - Good site selection is key
   - Risk-based MRV (third party review for early projects?)
   - Revisit operational plans if migration is detected outside of primary store
   - Best engineering estimate to quantify leakage to atmosphere
   - Surface CO_2 flux can be highly variable (many factors influence) – assurance monitoring

2) Fugitives in dense phase system would be readily visible. Dense phase systems do not suffer from persistent undetected fugitives.

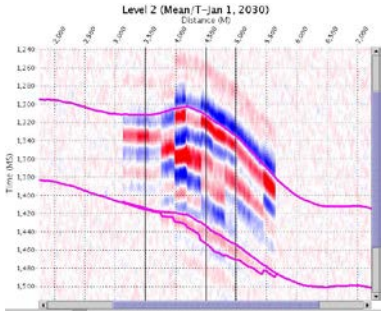


MONITORING: SURFACE VS. DEEP, NOISE VS. SIGNAL

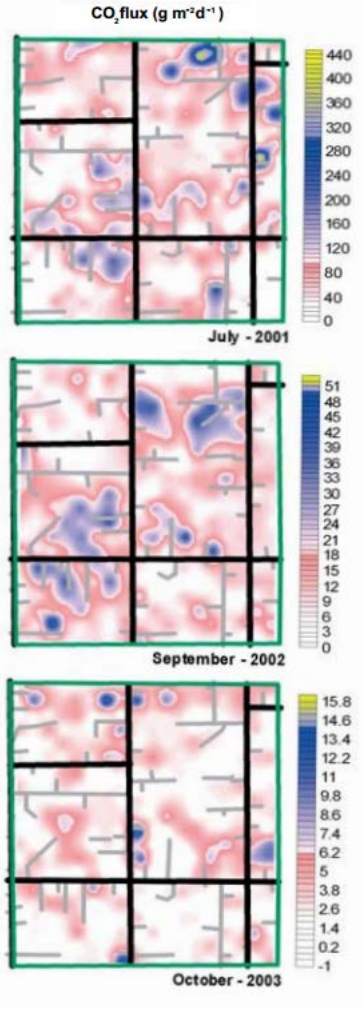
- Above ground and soil monitoring is best suited to assurance
  - Natural variability in CO_2 flux measurements means that surface measurements are not diagnostic of subsurface migration.

- Deep geophysical monitoring is best suited for detection of migration
  - Conformance
  - Containment

Simulated seismic signal from CO_2 migration above the store (Peterhead, UK)



Measurements of Natural CO_2 flux at Weyburn showing seasonal variations.



METERING COMMENTS

Treat in a similar manner to natural gas metering

1) Meter CO_2 post compression (quality)
2) Meter CO_2 at distribution manifold in field (fiscal quality)
3) Meter CO_2 at individual injection wellheads
4) Calibrate meters to manufacturer specifications on frequency defined by common standards body
5) Expect meters for purchased energy inputs (electricity, natural gas)