CLEAN HYDROCARBON POWER
THE NEED FOR GAS AND CCS

UNECE workshop on Cleaner Electricity Production from Fossil Fuels
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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.

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• The challenge facing policy makers/leaders and the global energy industry is to cooperate in the development of energy systems that meet anticipated demand growth in an economically efficient way and balance concerns about climate change and local environmental conditions.

• Portfolios of energy solutions will be determined based on a number of factors and decisions and “decision lenses”, including energy security, energy reliability, diverse and flexible supplies; environment and health; cost and competitiveness; energy access, and resource base. Choices will differ for countries, states and regions.

• There is no single (‘silver bullet’) solution. The answer lies in an “and and or “all of the above” world’. Energy mixes reflecting above lenses will require cleaner fossil fuels alongside non-fossil fuels and we need options to decarbonise fossil fuels to deliver both “clean and green”
EXAMPLE OF COAL BY GAS REPLACEMENT (US)

Source: EIA, U.S. Energy Information Administration
IN EU GAS IS REPLACED BY COAL

- LOW CO$_2$ PRICE
- CHEAP COAL
- DECLINING POWER DEMAND
- GROWTH IN RENEWABLES
- OVERCAPACITY IN POWER GENERATION

LESS GAS IN EU POWER

COAL DISPLACES GAS IN POWER MIX

Increase in CO$_2$ emissions in some countries

2013 v 2010

Source: WoodMackenzie
CCS WILL BE REQUIRED IN ANY CASE

- CCS provides an **essential and significant contribution** to emissions reduction in power & industry

- CCS on fossil fuels will be **cost competitive** with low carbon alternatives, maintaining diversity of energy supply and volume

- Without CCS, decarbonisation costs are substantially higher (IPCC, IEA)

- CCS works; all CCS **technology components** have been **proven** in Oil & Gas and EOR industry
**Boundary Dam**
*Feed: coal power flue gas*
*Operating since October 2014*
*1 mtpa*
*Capture: amine*
*Shell has no equity in this project*

**Quest**
*Feed: syngas*
*Start up 2015*
*1 mtpa*
*Capture: amine*

**Peterhead**
*Feed: gas power flue gas*
*Working towards FID Q1 ‘16, Start-up potentially 2019*
*1 mtpa*
*Capture: amine*

**TCM**
*Feed: dual streams (gas and coal flue gas specs)*
*Operating since May 2012*
*Up to 200 ktpa*
*Capture: various technologies for testing*

**Gorgon**
*Feed: natural gas*
*LNG start-up: 2016*
*CO₂ injection start-up: 2017*
*Capture: amine*
NG Power Plants are an excellent partner for integrating intermittent Renewables in low carbon power systems.
PROPOSED PETERHEAD CCS FOR GAS PROJECT

- **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 CO₂ captured over project lifetime (90% CO₂ capture from one turbine)

- **CONTEXT** – UK Government CCS demonstration competition

- **TIMELINE** – could be operational by the end of the decade
**CONTEXT**

- UK follows a ‘**lowest cost pathway**’ to decarbonisation. This involves a wide spectrum of energies with CCS the single most cost effective lever.

- UK has launched the ‘**Contract for Difference**’, a clean electricity premium which for the first time lumps together nuclear, renewables and CCS into the same mechanism.

- In the UK there is a competition for a capital grant of up to £1Bln to give a kick-start to CCS demonstration.

- If we are successful in our bid we earn a ‘**prize**’ (CfD) for delivering clean electricity rather than a penalty (CO₂ Price) for CO₂ emissions.

- The UK has a policy framework enabling CCS demonstration and deployment and signals a longer term need for CCS.
CCS will require

- **Long term signal** of support/need for CCS
- **Policy parity**; a level playing field with other low carbon technologies
- **Short term support** to build and operate CCS demonstration plants

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**Clean energy investment between 2004-2013**

USD billion

- **20**
- **1929**

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PROGRESSING CCS IN EUROPE

• Embed CCS in Energy Transition portfolio mix, where applicable

• Achieve policy parity for CCS; reward capture & storage of \( \text{CO}_2 \)

• Deploy EU Innovation Fund for CCS projects and T&S infrastructure development and Horizon 2020 funds for continued CCS RD&D

• Collaborate across industry and Member States; plan for CCS hub/cluster developments
We have a challenge to deliver more energy with less CO$_2$; energy solution portfolios will be decided on multiple factors and will likely differ from country to country but FF power will remain in the global mix.

More power from natural gas would make the biggest contribution, at the lowest cost, to CO$_2$ emission targets this decade; a modern gas plant emits 50% less CO$_2$ than a modern coal plant.

CCS will be required to further decarbonise fossil fuel power; delivering clean energy, next to green.

CCS for gas power generation is technically feasible, with Peterhead in the UK Shell is progressing the first large-scale CCS demonstration project on gas fired power in the world.

CCS demonstration on both coal and gas will be required to reduce unit costs of CCS over time through learning.