

The energy mix: the good, the bad & the ugly

**EPRG & CEEPR International
Energy Policy Conference**
“The Good Fight Against GHG Emissions”

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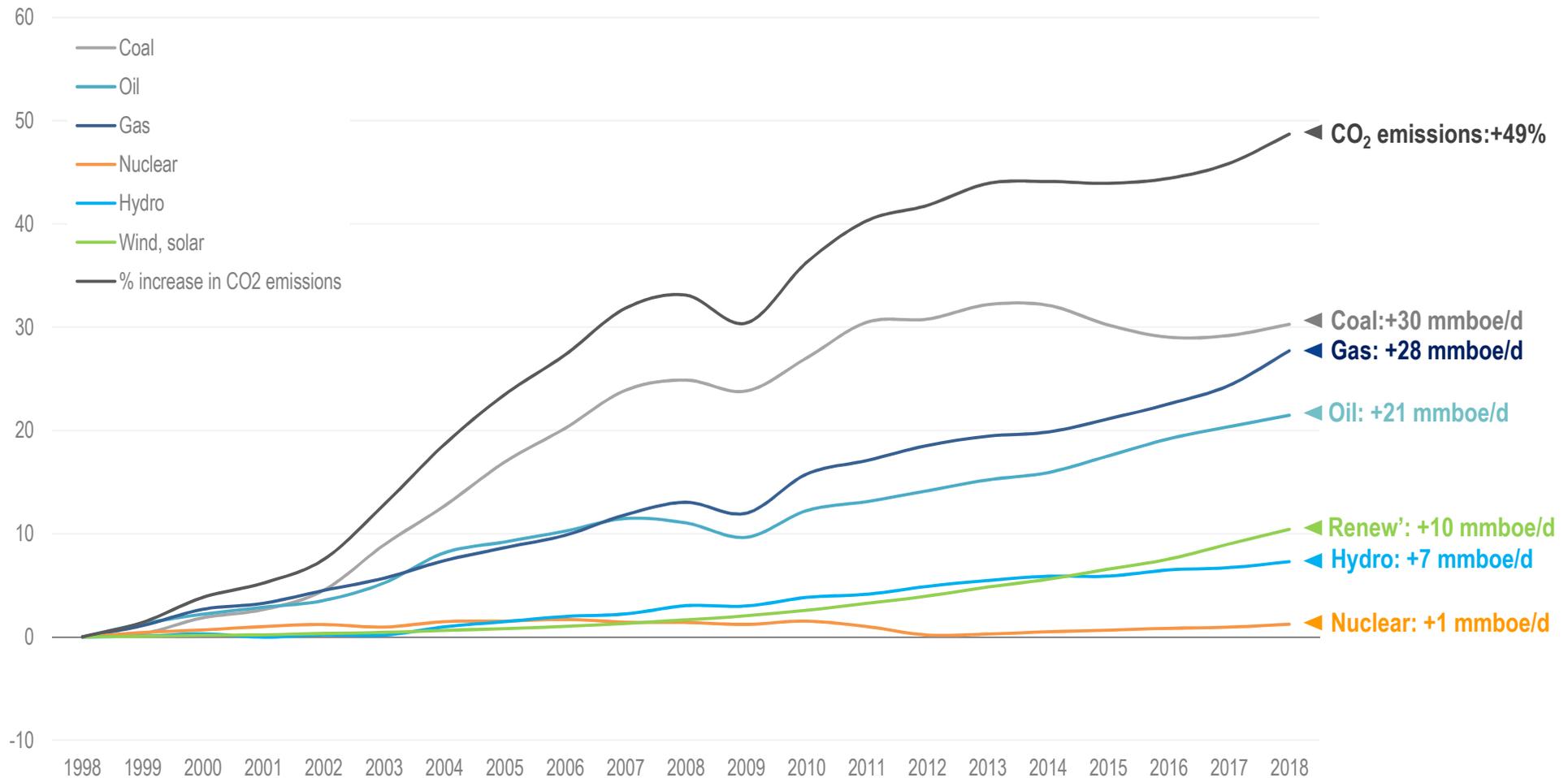


Dr Patrick Allman-Ward
Chief Executive Officer
Dana Gas PJSC

Since the Kyoto conference in 1997, the global energy mix has worsened from an emissions perspective

Since the Kyoto Protocol in late 1997, global coal use has grown by 50%

Growth in global PED by fuel (mmboe/d) and increase in global CO2 emissions (%), 1998-2018

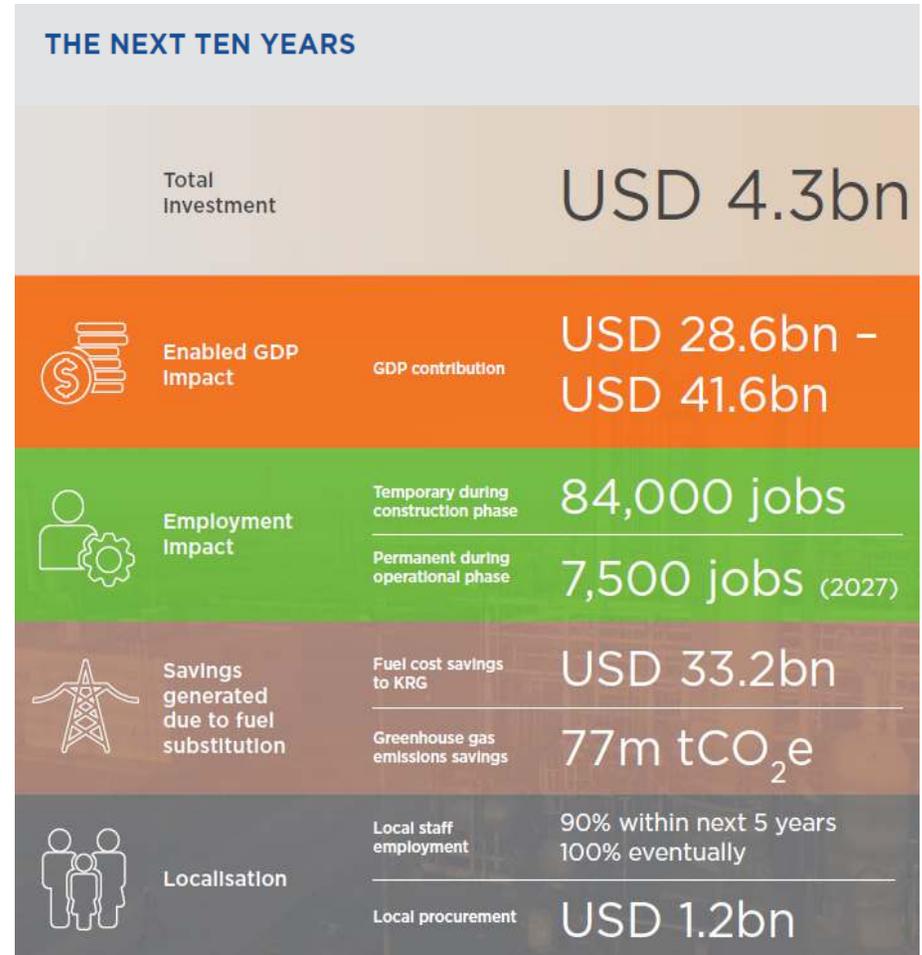


Diesel to gas switch at heart of KRI's growth



Pearl Petroleum led diesel to gas switch a huge boost for KRI

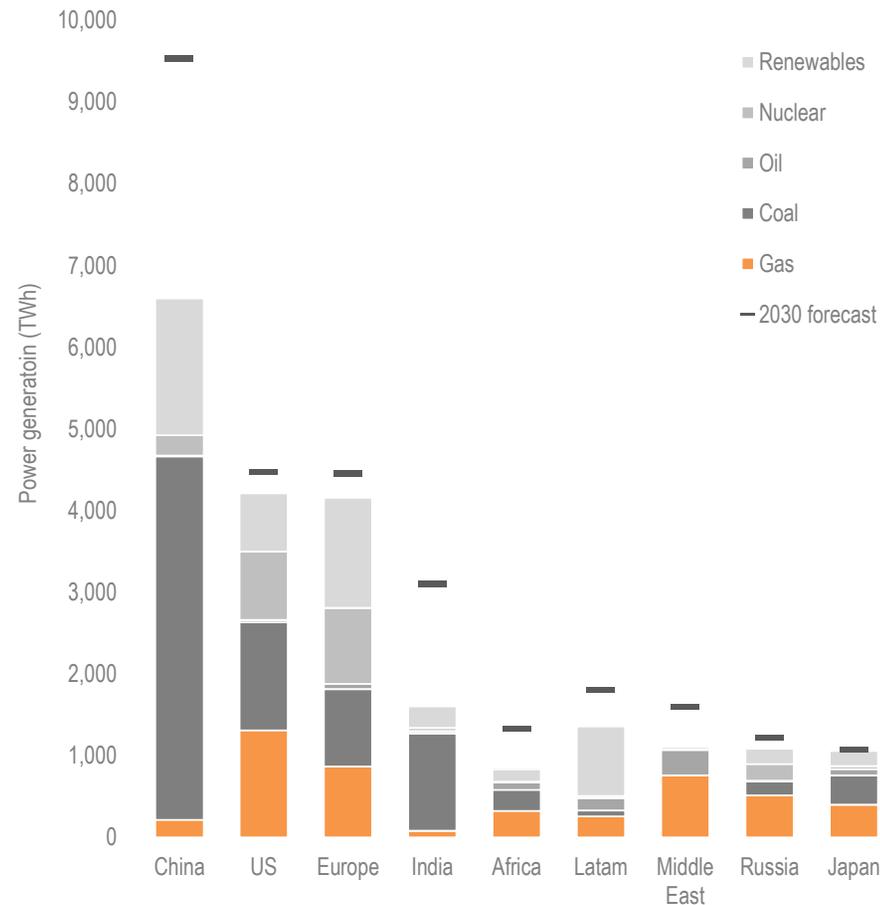
Switch accelerated by Pearl Petroleum expansion plan



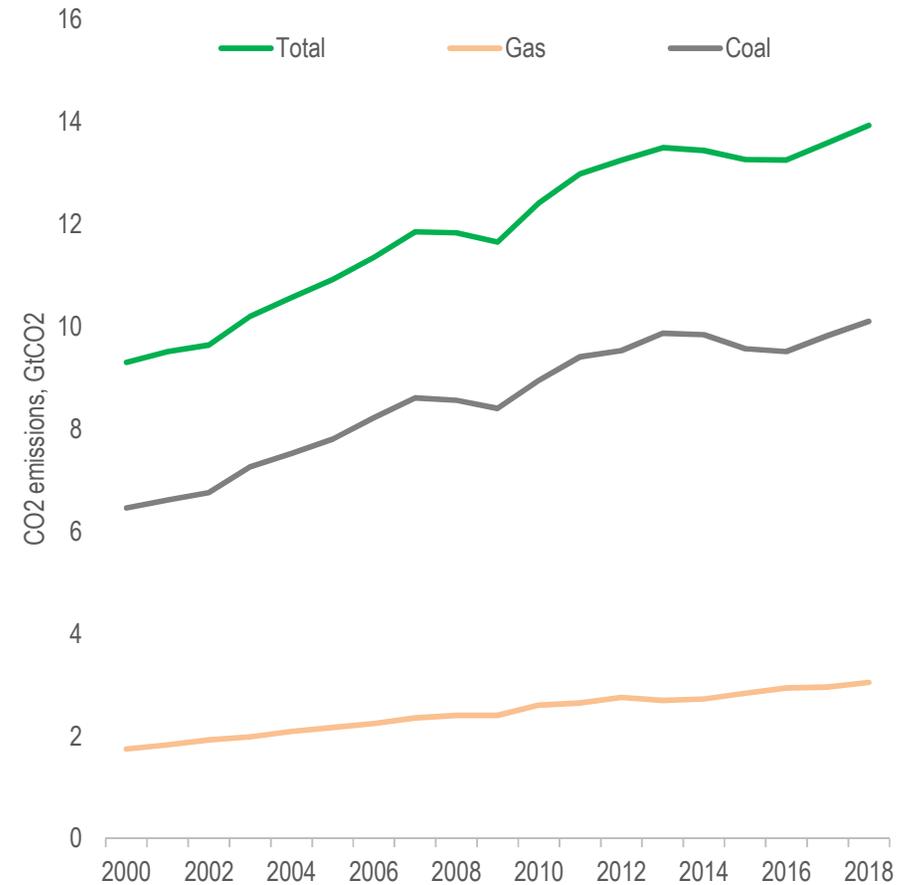
The power sector has failed to reduce CO2 emissions, until it succeeds mass electrification is irrelevant to climate goals



Power demand is expected to grow across the world
Power generation by fuel in selected regions (2017, TWh)



Coal generates 38% of total power but 72% of power sector CO2 emissions. It is also a large emitter of other pollutants
Power sector CO2 emissions since 2000

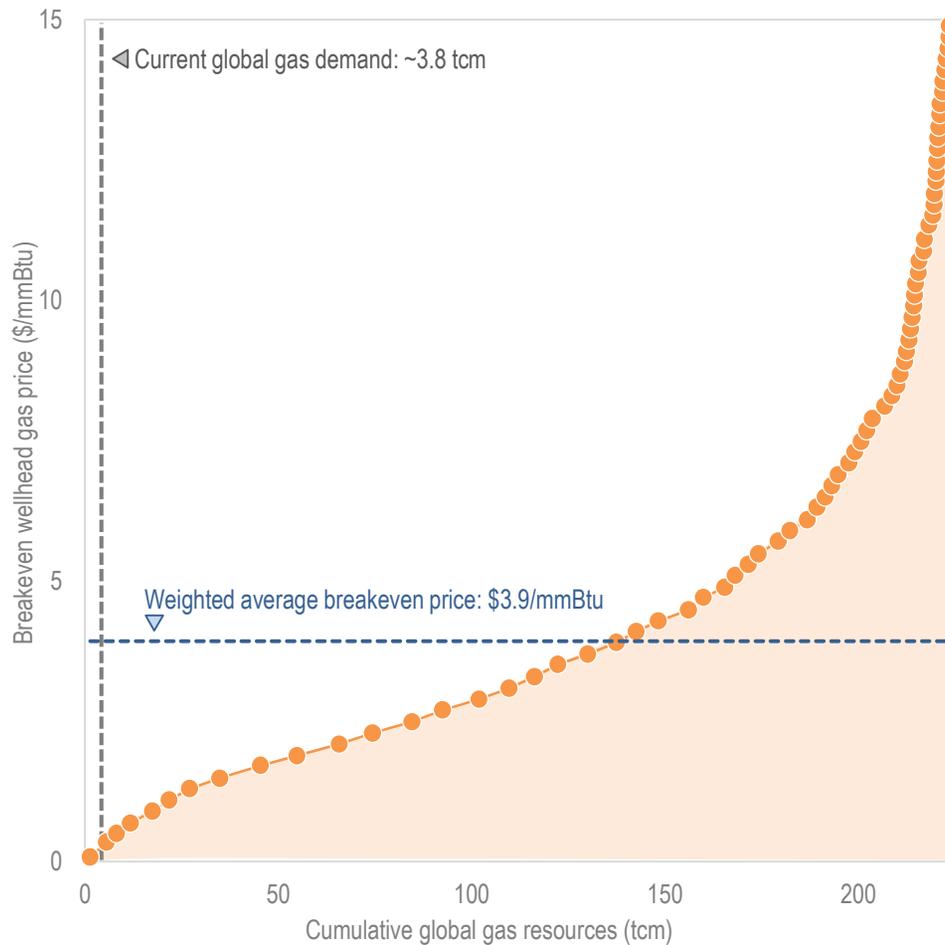


Fortunately, global gas resources are abundant, pervasive and can be extracted at low cost



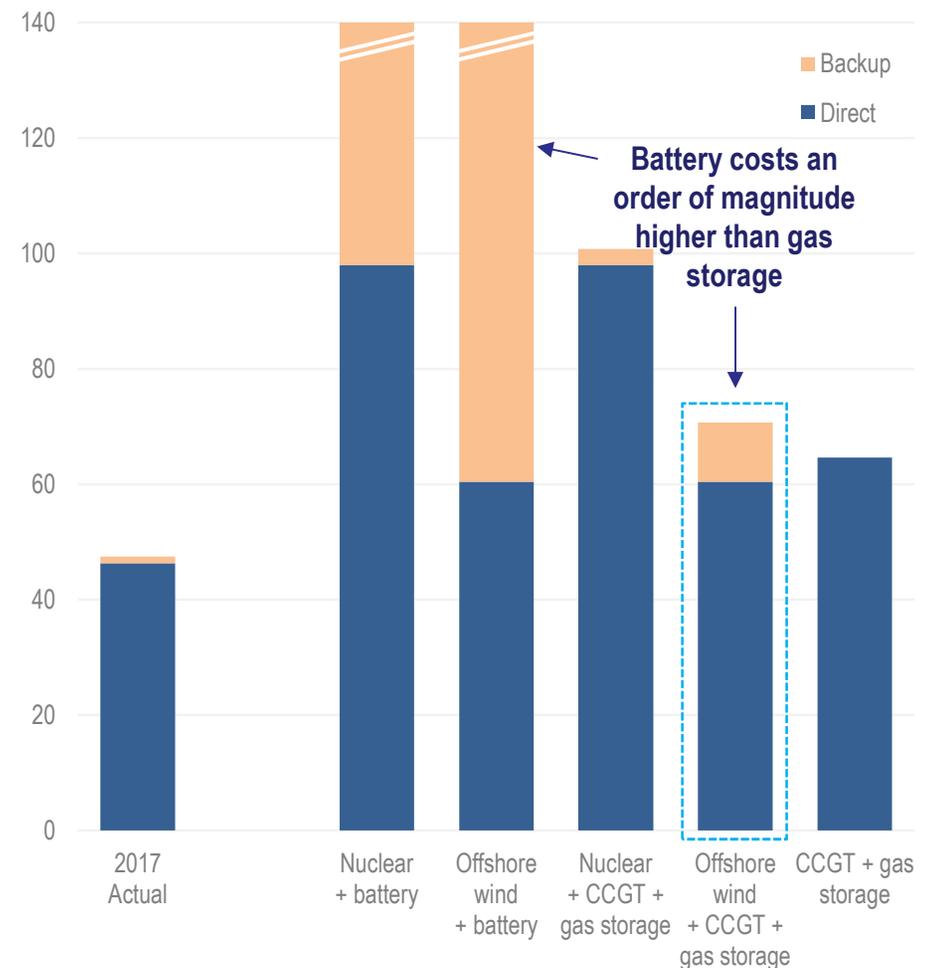
Significant gas volumes can be produced at low cost

Global gas resources breakeven cost curve



Levelised costs for different UK firm power options

GBP per MWh

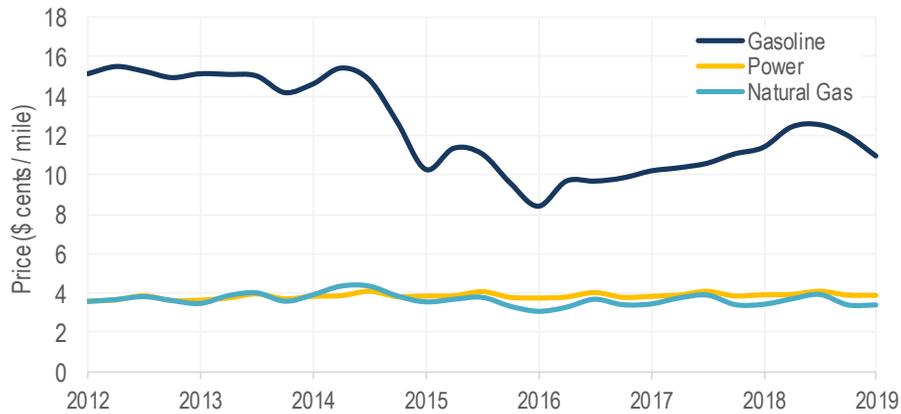


Transport sector emits c.25% of global CO2 emissions. Gas can play a role in heavy road haulage and marine bunkering



NGVs compete with EVs on cost as alternative to ICEs

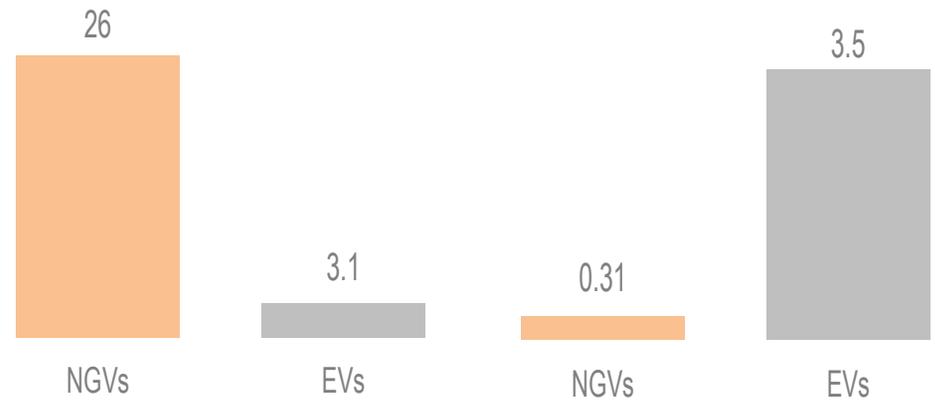
Fuel cost per mile of passenger car fuels (US, \$ cents / mile)



But NGVs currently lack the necessary infrastructure

Global fleet size (mln)

Global charging / refuelling points (mln)



Heavier transport is difficult to electrify, but gas is demonstrating potential in shipping and trucking



Increasing use of LNG as a bunker fuel in maritime transport.

New regulation coming into effect in 2020 that limits the sulphur content in marine fuels may present opportunities for other fuels but electricity unlikely to make inroads



Attempts at electrification of passenger planes are underway but, given current technology, only very small electric passenger planes are viable. The weight and size of a battery required to power a large plane are likely to prevent any meaningful electrification of the sector



Weight and range concerns may limit the extent of electrification of the freight industry.

Gasification of the freight sector (LNG and CNG) is developing in Europe and the US, and could pose a larger threat to oil demand than power

Ultimately we have to put CO2 in the ground where it came from. Carbon Capture, Utilization and Storage is essential

1

Aggressive substitution of coal with gas & renewables



- ❖ Gas and renewables partnership in firm power generation
- ❖ Displace existing coal capacity and prevent new-builds
- ❖ O&G companies build sensible renewables expertise

2

Stringent methane emission and flaring reduction efforts



- ❖ Protect gas' environmental credentials by minimising fugitive emissions
- ❖ Reducing methane emissions is needed to secure public approval of gas

3

Investment drive into CCUS supported by carbon price



- ❖ Investment drive into the technology and research needed to drive down costs of CCUS just as the renewable sector benefitted in the past.
- ❖ Global carbon price to generate a level playing field to incentivize innovation for most cost effective solutions

4

Investment into biological CCS i.e. forestry

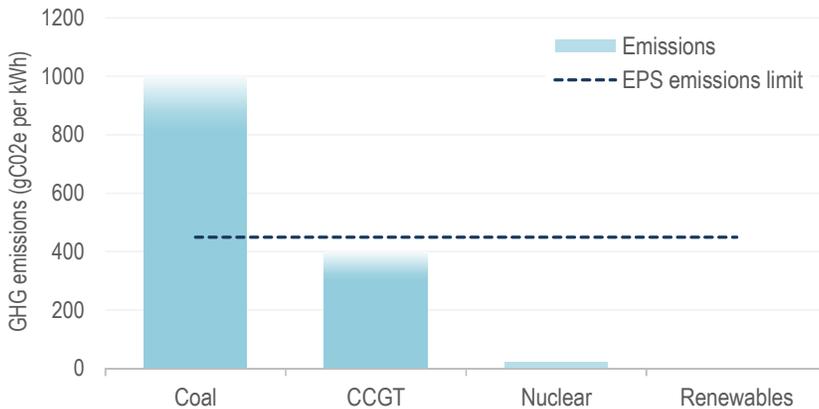


- ❖ Protect and enhance a powerful natural carbon sink and habitat
- ❖ Tackling deforestation and land degradation caused by logging, agriculture, primary bioenergy etc

Continued investment into R&D and advocacy of the key contributions of the oil & gas industry

Getting policy right is really important, the UK's efforts in 2013 are worth emulating elsewhere

UK introduced an Emissions Performance Standard in to discourage new-build coal

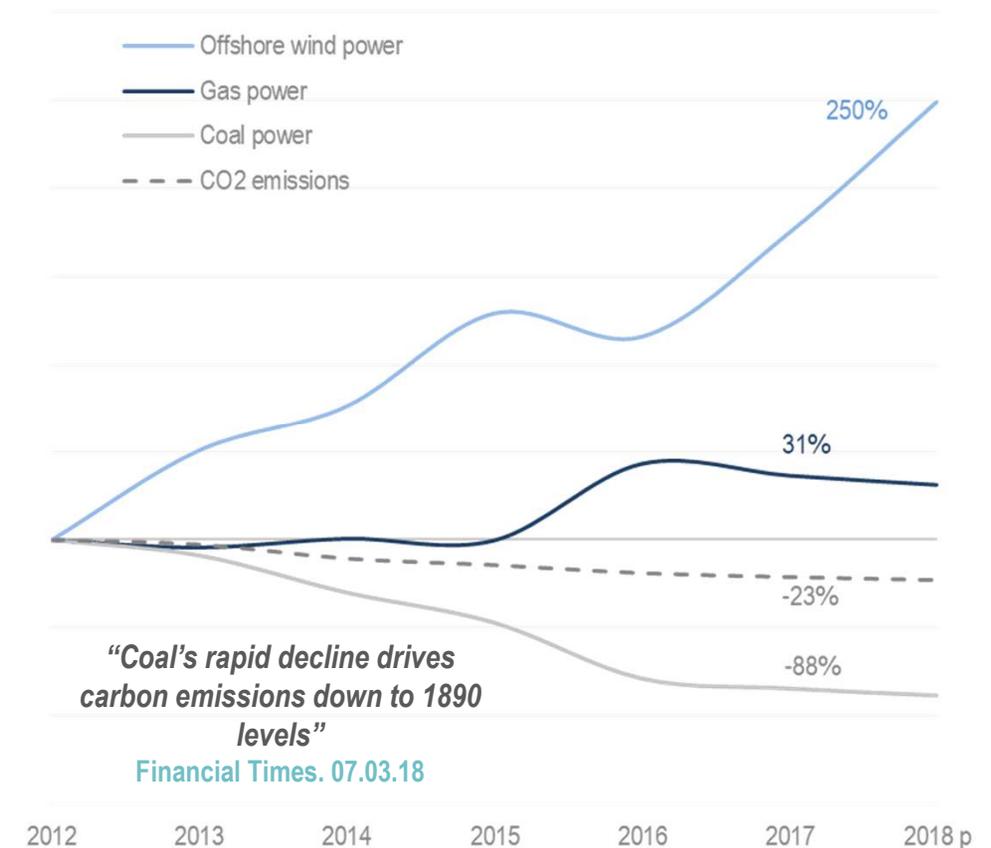


UK Carbon Price support added in April 2013 to supplement EU ETS

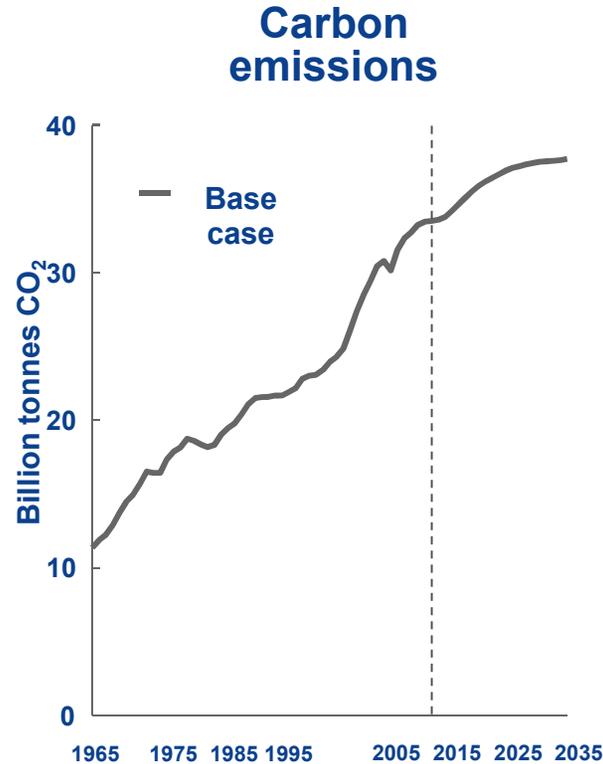
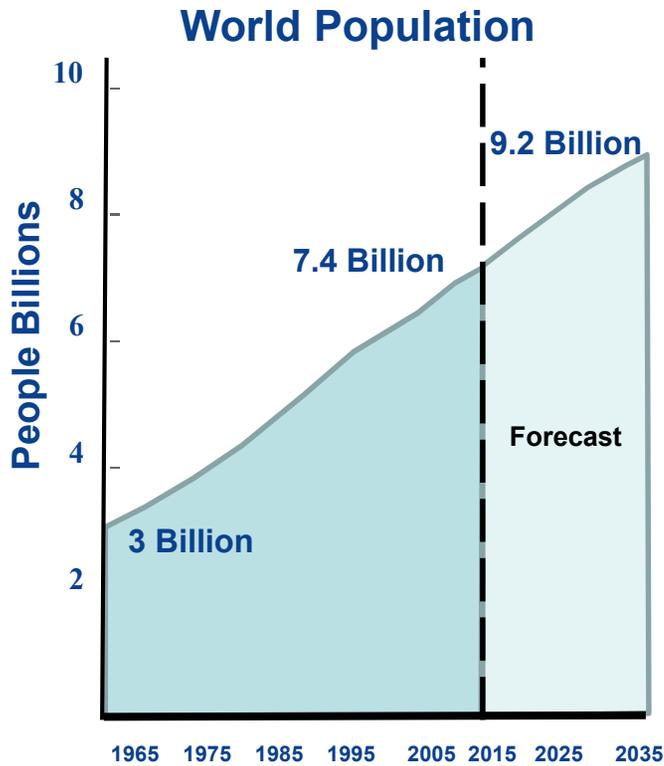


Replacing coal with gas and suitable renewables in power has had an unequivocal impact on CO2 emissions

Relative change in power generation and CO₂ emissions in the UK



Some final reflections – the challenge is also political



The Brazilian president has said NGOs could be burning down the Amazon rainforest to embarrass his government after he cut their funding. Bolsonaro had no evidence but said 'everything indicates' that NGOs are going to the Amazon to set fire to the forest



Pope Francis has urged oil executives and energy leaders to rapidly transition to clean fuels in order to avert climate disaster.

The concept of global warming was created by and for the Chinese in order to make U.S. manufacturing non-competitive.



THANK YOU

Dana Gas PJSC
P. O. Box 2011, Sharjah, UAE
www.danagas.com