

Coal Bed Methane in the UK

SPE 30th March 2010



(1) Overview of UK Coal Bed Methane

Graham Dean, Reach Coal Seam Gas Limited

(2) The use of the SPE/AAPG/WPC/SPEE PRMS reserve and resource reporting standard for unconventional plays: assessing the CBM potential of the UK

Jeffrey B. Aldrich, Greenpark Energy, Ltd

(3) Backyard politics - How excellent Surface Management helps unlock Subsurface Resource

Tom Pickering, Managing Director, Geometric Drilling Ltd

(4) The exploration of CBM resources in the UK and comparisons with practice in North West Canada

Andrew Gunning, Operations Manager CBM, Centrica

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Dawn breaks on an Igas drill site

UK CBM activity

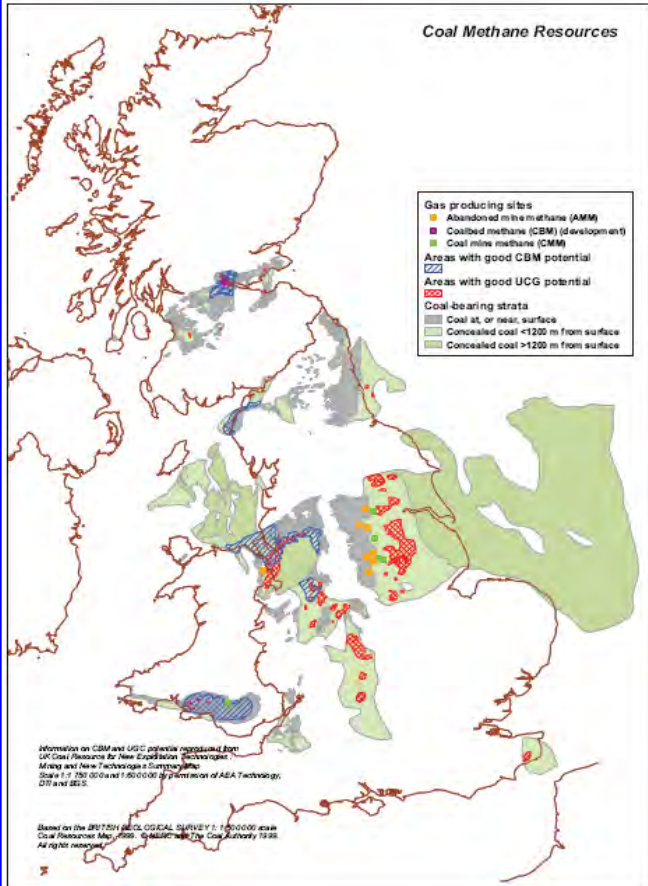
What is Coal Bed Methane

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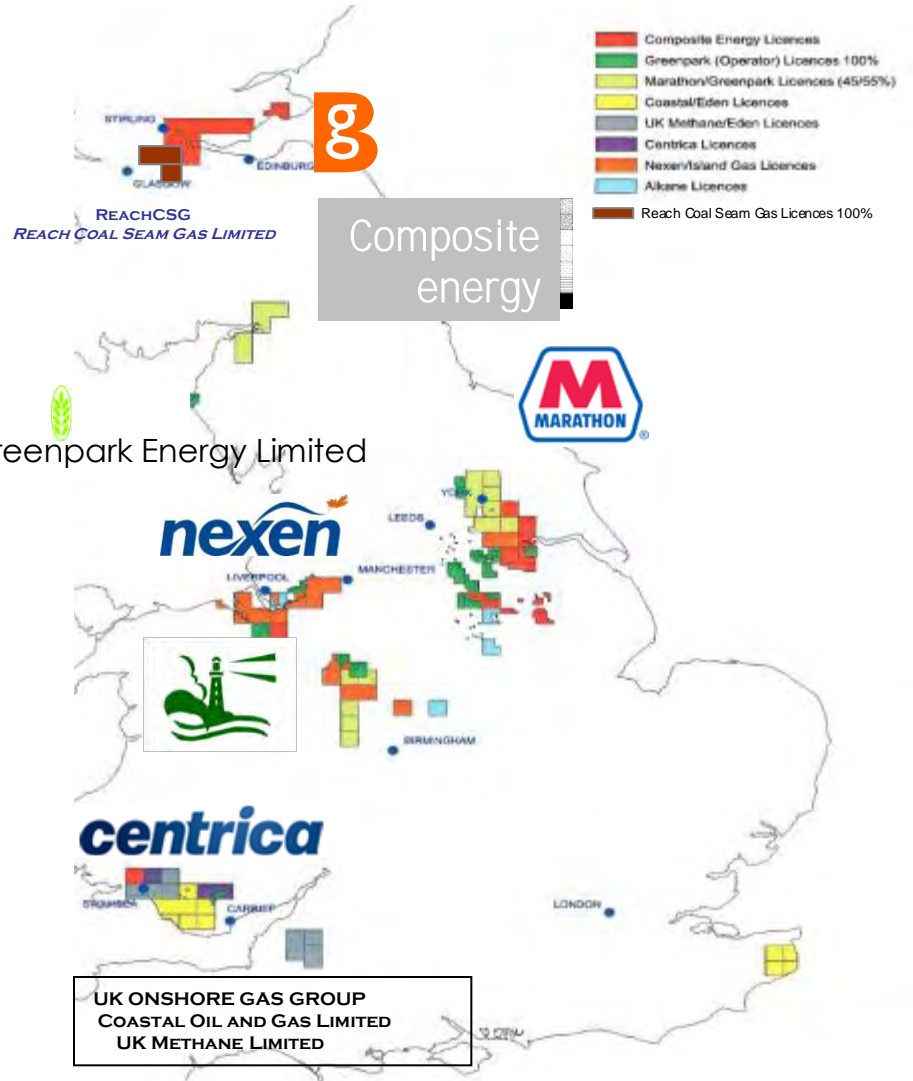
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CBM in the UK

Coal Bed Methane, CBM, is also called Coal Seam Gas, CSG.



9 companies have the bulk of the prospective acreage

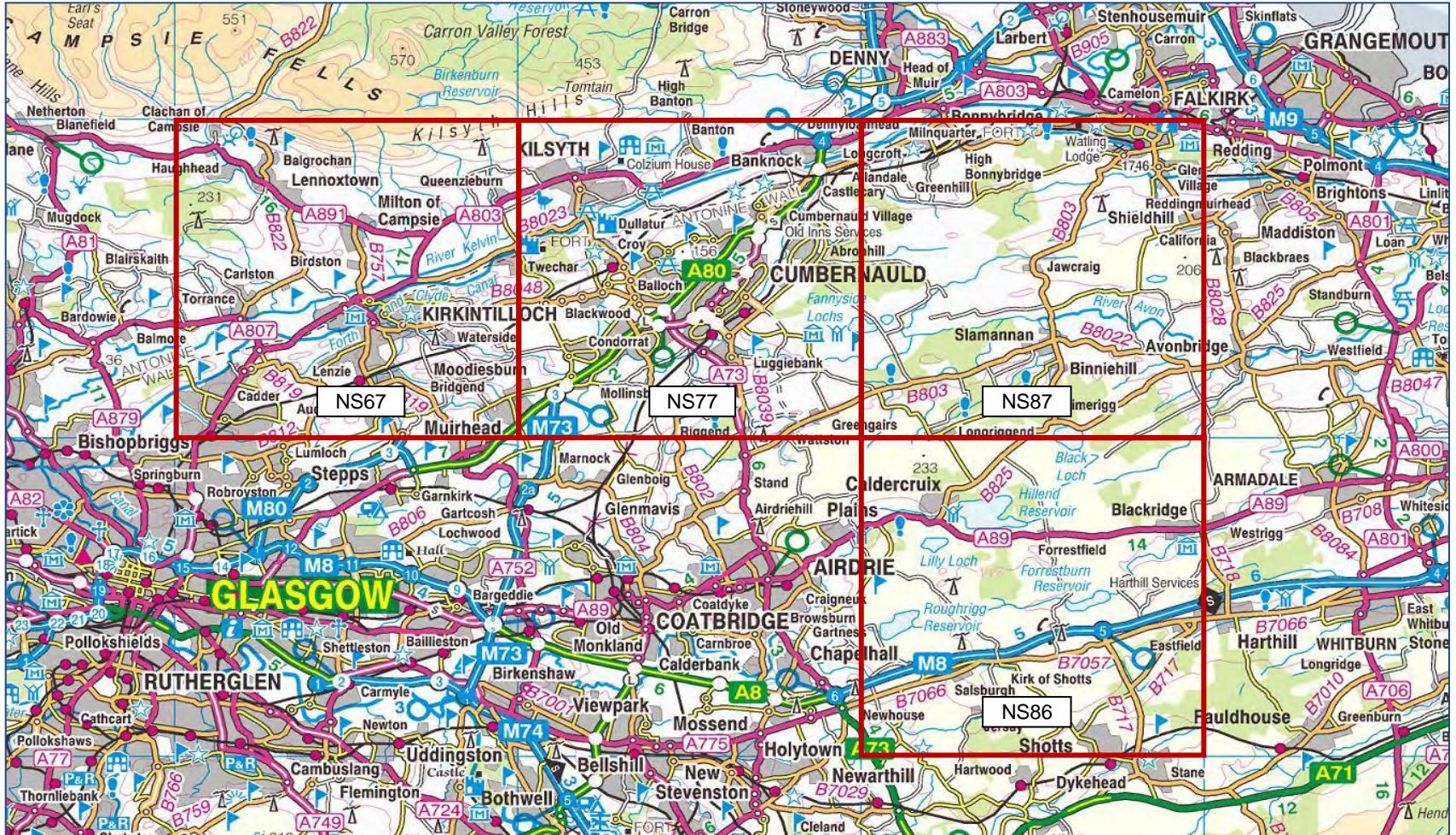


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Overview of UK Coal Bed Methane

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In 2008, ReachCSG was awarded the hydrocarbon licence PEDL162 400 km²

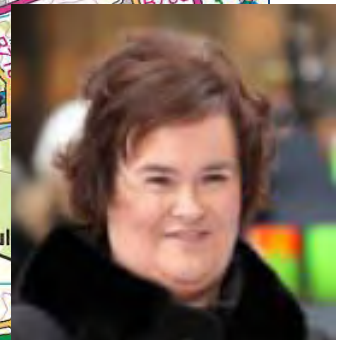
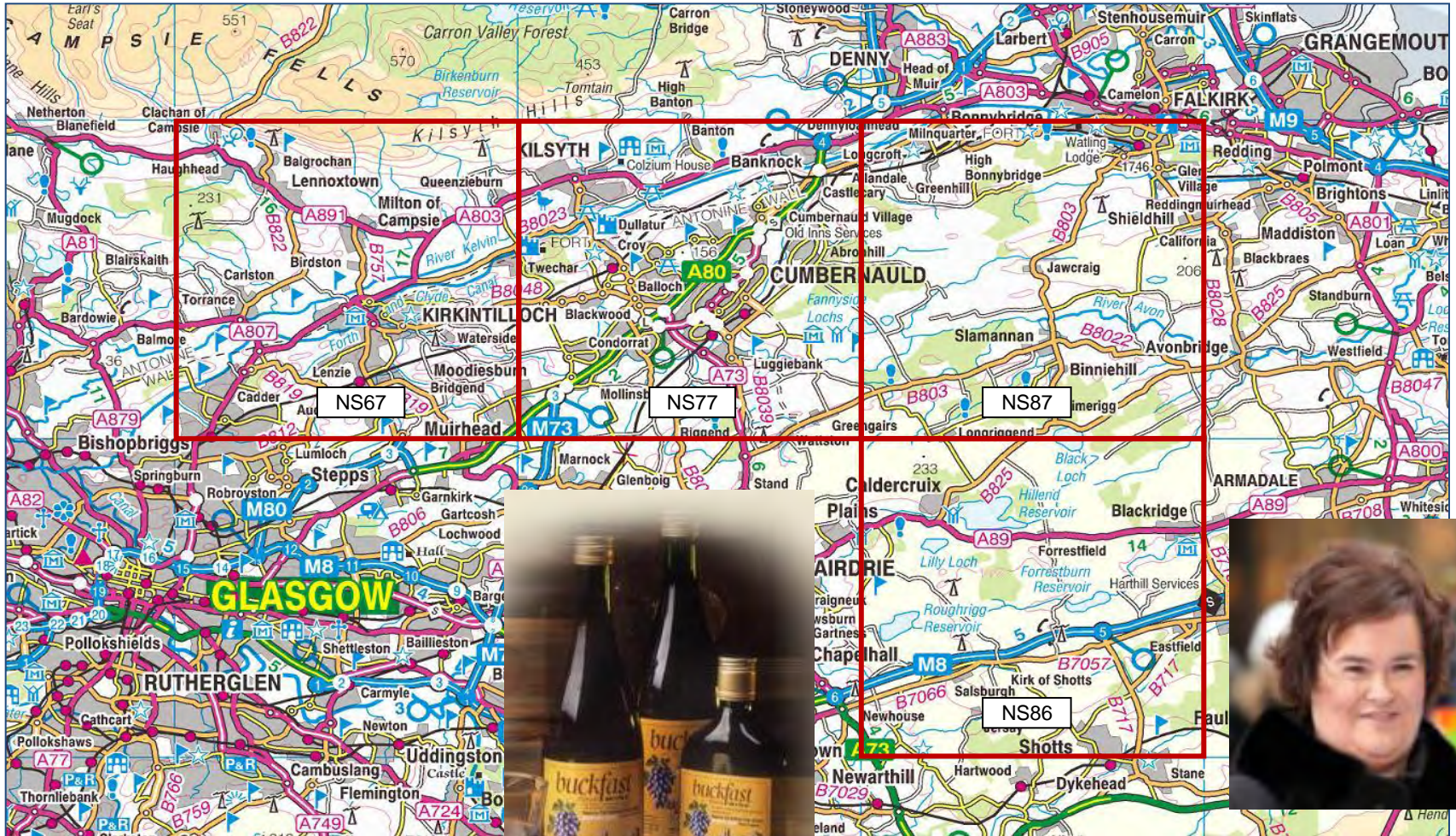


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Overview of UK Coal Bed Methane Reach Coal Seam Gas

In 2008, ReachCSG was awarded the hydrocarbon licence PEDL162 400 km²



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Overview of UK Coal Bed Methane

- In last 4 years the CBM companies have drilled over 20 core wells & 9 pilot production wells
- Invested ~£100 million to date
- Large acreage has been licensed (>7000sq km)
- First commercial production started in June 2009 at Doe Green near Warrington by IGAS/Nexen.

Igas/Nexen gas production pilot at Doe Green

- Doe Green Pilot (PEDL 145): on-site electricity generation
- 3 laterals and 1 vertical well
- One lateral producing 45,000 scf/day and used to generate electricity
- Two additional pilot schemes, one at Keele University.

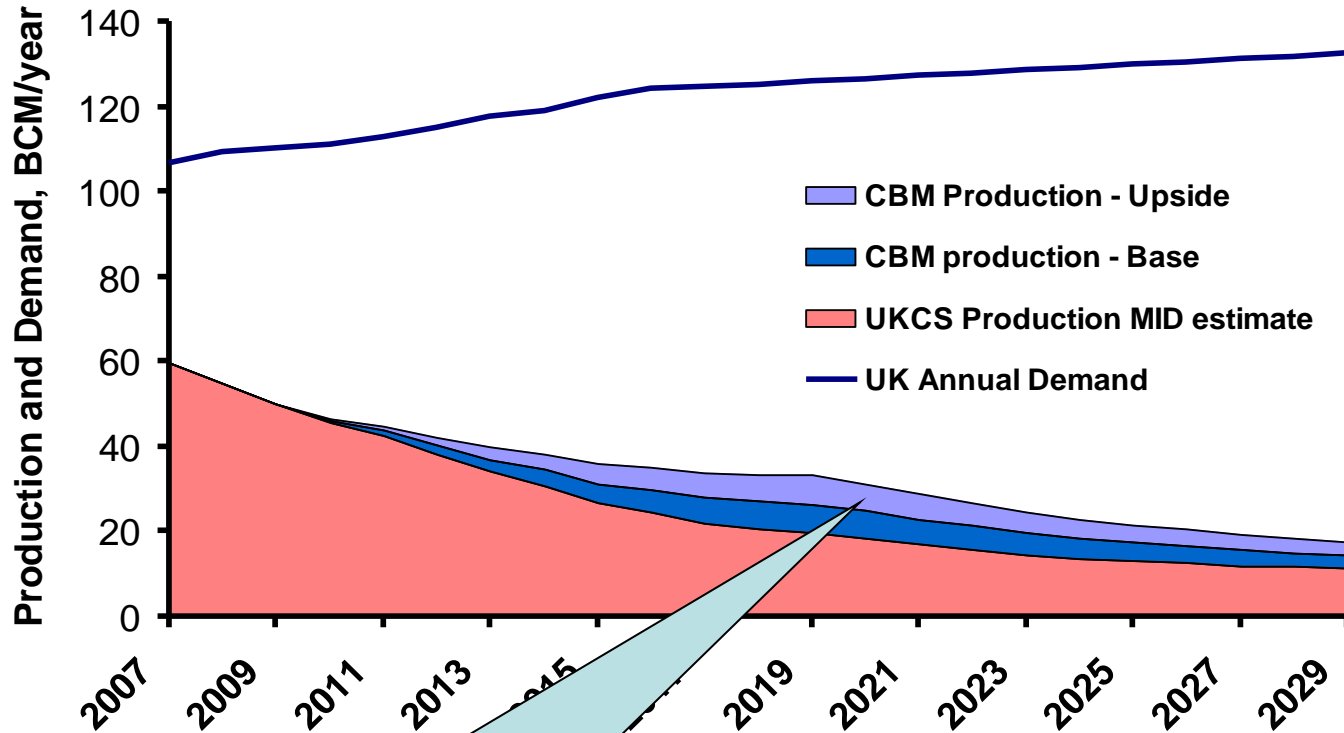


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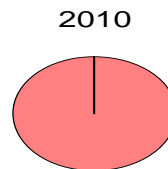
Overview of UK Coal Bed Methane UK Gas Demand & Production

CBM Increasing Contribution to Gas Supply

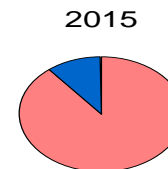


5 – 10 TCF reserves developed by 2020.

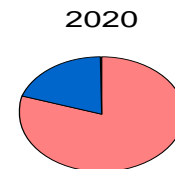
The 2002 report - COAL R271 DTI/Pub URN 04/1879 estimated UK CBM Resource at 102 TCF



<1%
20%



10%



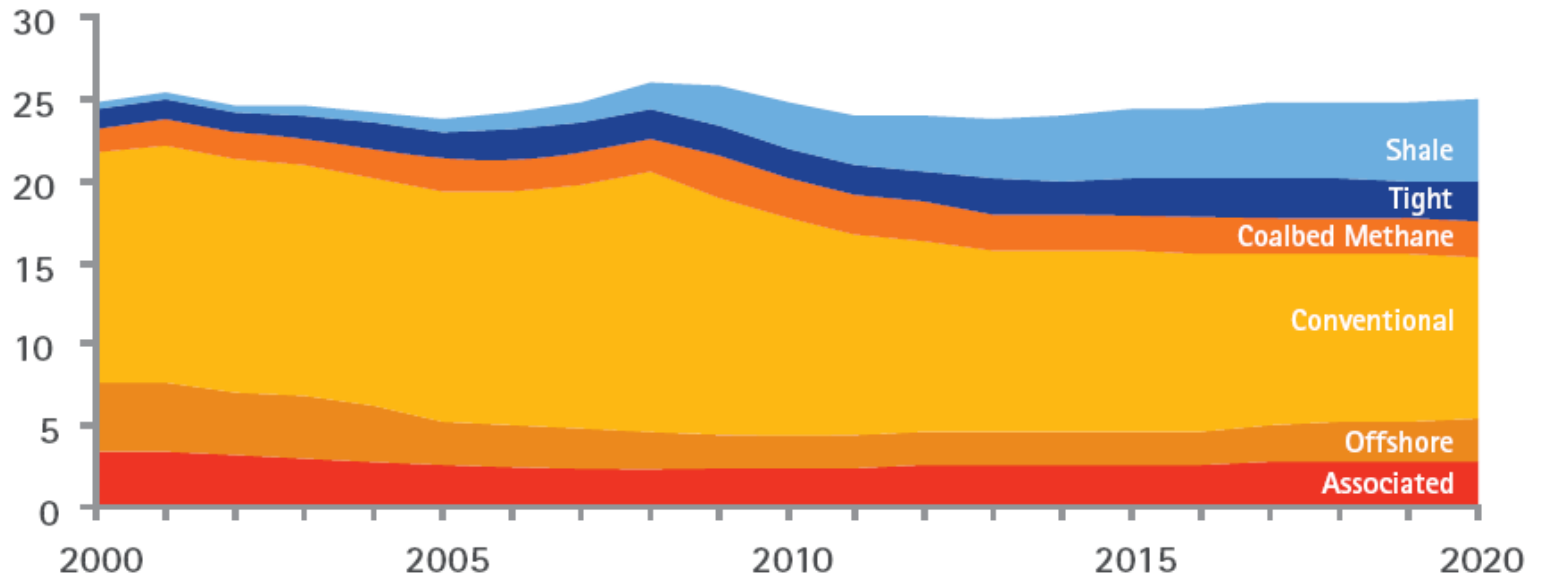
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Overview of UK Coal Bed Methane

North American Gas Production

Gas production (tcf)



CBM production in North America is larger than the UK North Sea gas production

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Overview of UK Coal Bed Methane

Courtesy of Wood Mackenzie

West Virginia Pennsylvania (Carboniferous)

Inputs		Outputs - Development (Well)	
EUR (bcf)	0.55	Capex/mcfe (Well)	2.63
IP (mmcfed)	0.36	Opex/mcfe (Well)	1.50
Well Cost (US\$mm)	0.90	P/I	1.00
Other Capex per well (US\$mm)	0.42	Fiscal Take (%)	68%
Fiscal Regime	Concession	IRR (%)	10%
Pre-development Capex (US\$mm) (Project)	51.75	US\$NPV/mcfe	-0.01
		Gas Breakeven	5.86
		Outputs - Full-cycle (Project)	
		IRR (%)	12%
		US\$ NPV/mcfe	0.08
		Gas Breakeven	6.27

Horseshoe Canyon

Inputs		Outputs - Development (Well)	
EUR (bcfe)	0.35	Capex/mcfe	2.71
IP (mmcfed)	0.22	Opex/mcfe	1.09
Well Cost (US\$mm)	0.40	P/I	1.20
Other Capex per well (US\$mm)	0.11	Fiscal Take	47%
Fiscal Regime	Concession	IRR	22%
Pre-development Capex (US\$mm) (Project)	4.80	US\$NPV/mcfe	0.35
		Gas Breakeven	4.26
		Outputs - Full-cycle (Project)	
		IRR	
		US\$NPV/mcfe	0.07
		Gas Breakeven	5.38

UK

Inputs		Outputs - Development (Well)	
EUR (bcf)	1.1	Capex/mcfe (Well)	2.31
IP (mmcfed)	0.1	Opex/mcfe (Well)	1.18
Well Cost (US\$mm)	1.9	P/I	1.32
Other Capex per well (US\$mm)	0.7	Fiscal Take (%)	50%
Fiscal Regime	Concession	IRR (%)	21%
Pre-development Capex (US\$mm) (Project)	28.4	US\$NPV/mcfe	0.71
		Gas Breakeven	4.92
		Outputs - Full-cycle (Project)	
		IRR (%)	21%
		US\$ NPV/mcfe	0.5
		Gas Breakeven	5.16

Unlike North America the UK does not have a large onshore service sector

However the "netback" gas price is often higher

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Overview of UK Coal Bed Methane

- ***The UKCBM Association estimates that if CBM is successful in the UK then in a few years time an estimated 8000 - 16000 long-term jobs will be created. Direct, indirect and induced. (2,000 – 4,000 direct)***
- For comparison the UK coal industry sustains about 12,000 direct, indirect and induced jobs. 6,039 were directly employed in March 2009 down from about 10,000 directly employed in 2005.
- OGUK say there are 34,000 employed by oil companies and their direct contractors; 230,000 employed in the supply chain; and 89,000 spending-induced jobs, giving a total of 353,000 jobs. OGUK says 100,000 jobs sustained by the export market. But the level of investment and revenues are falling which will result in fewer jobs.

Overview of UK Coal Bed Methane

What is Coal Bed Methane, CBM, Coal Seam Gas?

- The gas produced from coal is the same as the gas in gasfields in the Southern North Sea. It is 80 – 98% methane.
- Unlike North Sea gasfields, the methane is adsorbed on the surfaces of cleats, microfractures and pores as a monomolecular layer.
- **Not renewable energy but more friendly to the environment than most other energy sources**



- Wells are drilled into the coal seams at depths of 200 – 1200 m.
- Water is pumped out of the coal to lower the pressure. This process enables the gas to desorb from the coal.
- Gas is produced by maintaining a low pressure at the well-head.

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Coal Bed Methane is not ..

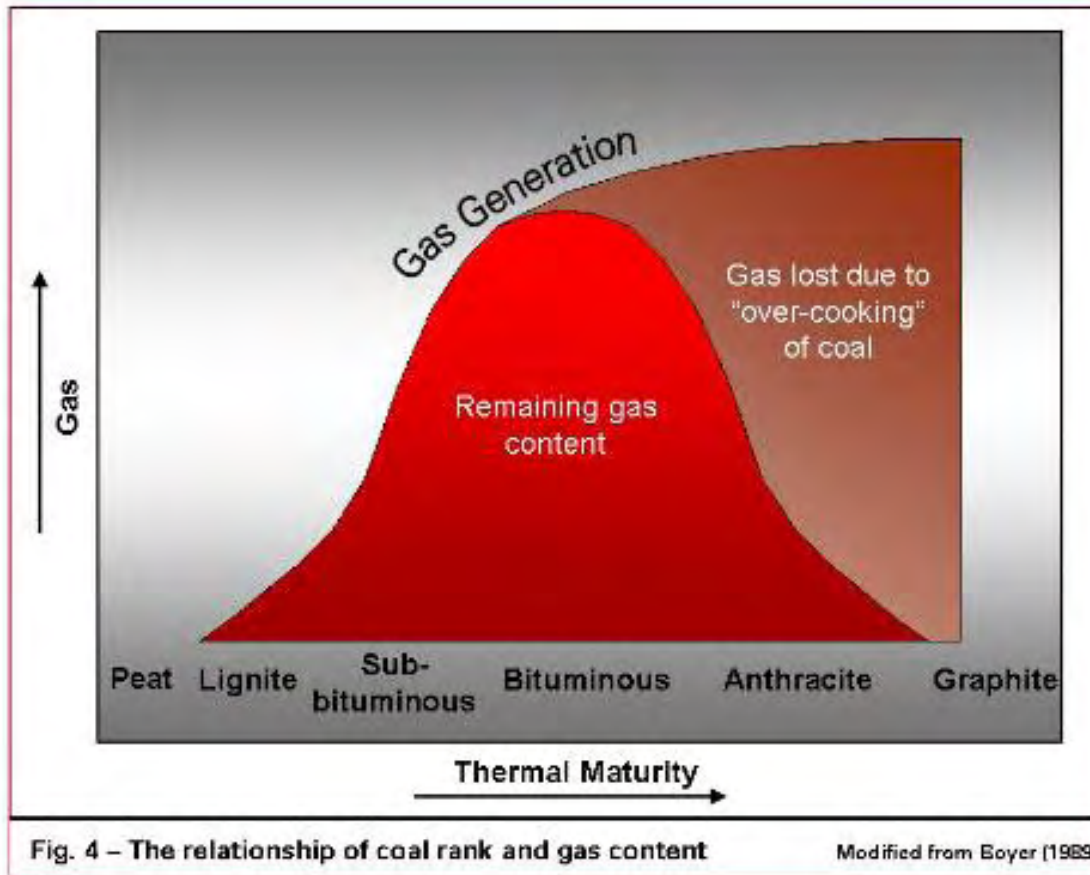
- » Abandoned Mine Methane, AMM
- » Ventilation air methane, VAM



Chryston – a street with false “lampposts” to vent abandoned mine methane

- The UK produces about a quarter of the coal it uses and imports the rest mostly from Russia
- The UK mining operations release approx 3.5 bcf/year methane into the atmosphere

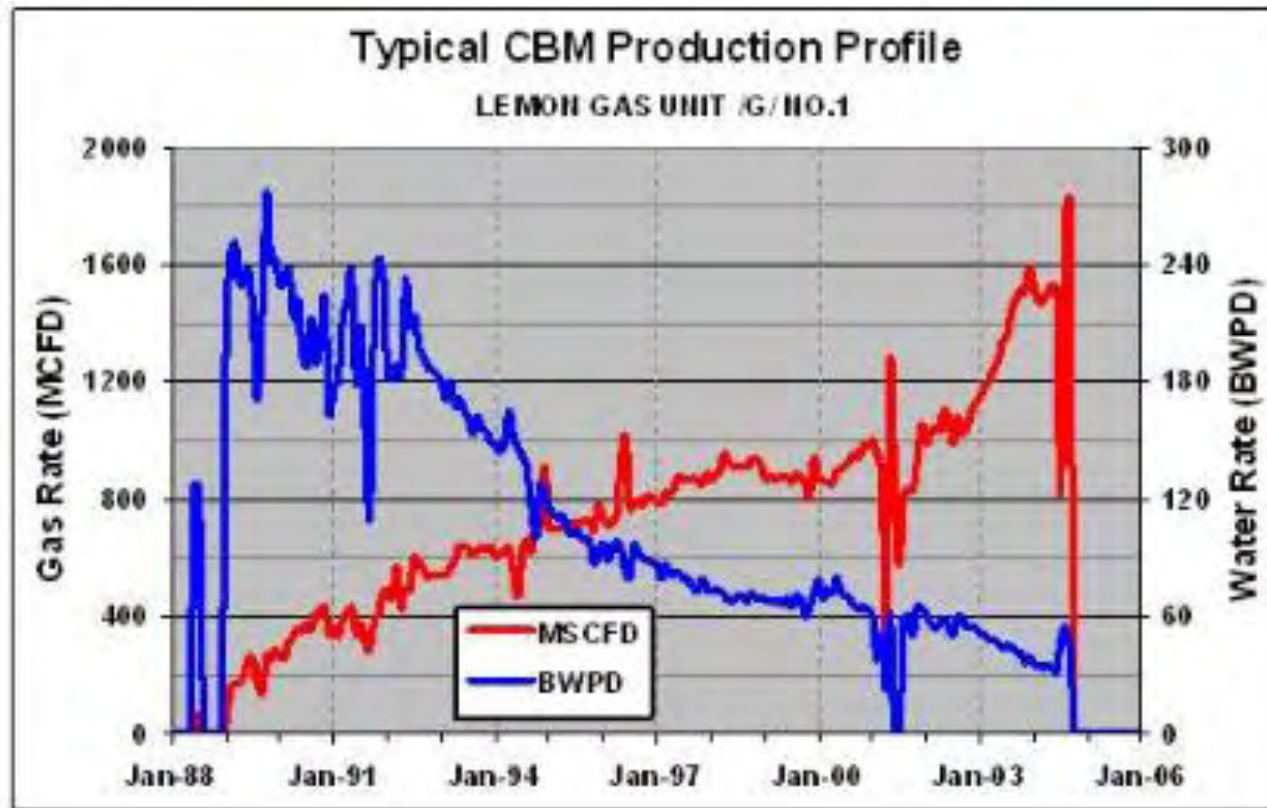
Overview of UK Coal Bed Methane



From paper by Philip Loftin, BP America

- Coal rank represents the thermal maturity of the coal

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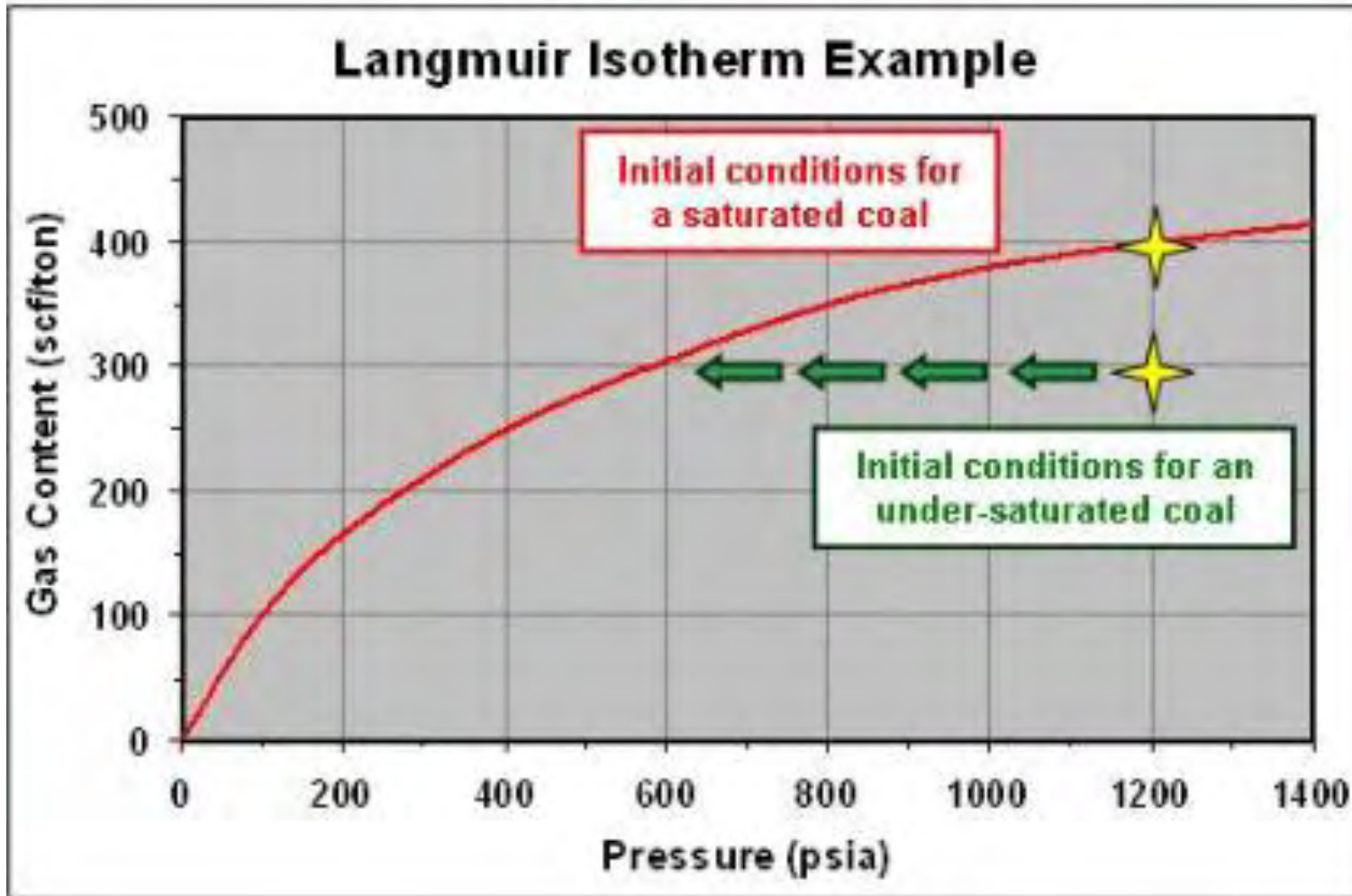
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- **De-watering** The cleat system is almost always filled with water. The hydrostatic head of this water provides the pressure that keeps the methane adsorbed to the coal. For gas production to take place this pressure must be reduced, by pumping out the water, allowing the methane to de-sorb from the surface of the coal, diffuse through the matrix and ultimately find its way into the cleat system.

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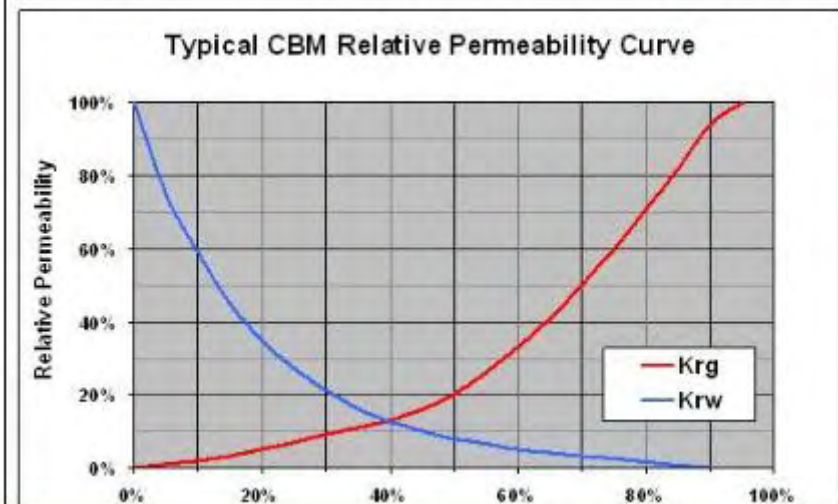
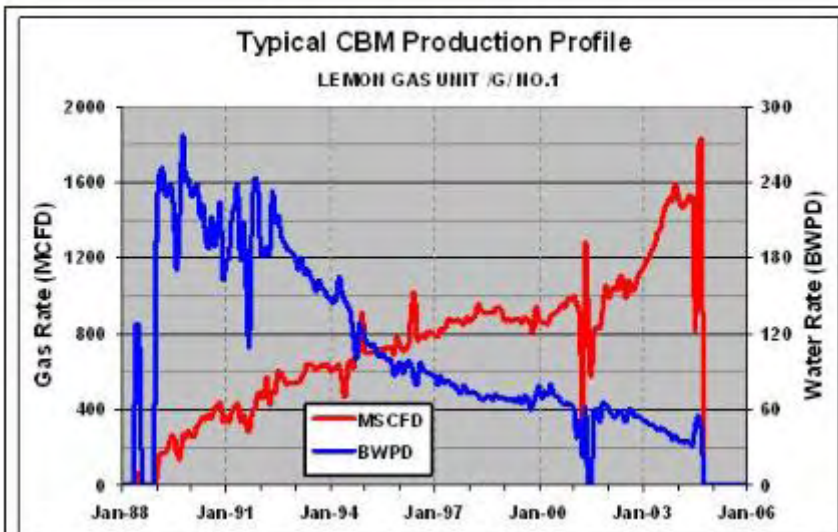
Overview of UK Coal Bed Methane



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Overview of UK Coal Bed Methane



- **Pilot production** can be a “five-spot” of closely spaced wells that are dewatered to increase the gas relative permeability and to lower the pressure

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graham.dean@reachcsg.co.uk

Summary

The UK CBM industry has many challenges ahead but if successful it will become a major industry as it is in North America and elsewhere

