



UK Shale Gas Potential

Shale Gas Resource and Reserve Estimates

Estimates of UK shale gas potential are at an early stage of development. Variations in shale thickness and gas content are known to occur across the UK, so reliable estimates require significant geographical coverage of data, from rock layer imaging and drilled wells. However, currently only a few exploration wells have been drilled into UK shales and properties from individual wells are extrapolated across large regions, leading to uncertainty in resource estimates. There are no official reserve estimates, which are needed to forecast the commercial scale of shale gas extraction.

Resource and Reserve Terminology

Several terms are used to describe the volume of gas available.

- **Total Resources:** the estimated total volume of gas.
- **Potentially (or Technically) Recoverable Resources:** the estimated volume of gas that it is possible to extract from the total resource. The proportion of the total resource that is potentially recoverable is known as the **Recovery Factor**.
- **Reserves:** the fraction of the potentially recoverable resources that are deemed to be commercially recoverable.

Estimation Methodologies

Total resource is estimated by multiplying three factors:

- geographical extent of shale layers
- thickness of shale layers
- gas content per unit volume of shale.

These will vary depending upon many factors including the local geology. At this early stage of development a number of pieces of work could be undertaken to refine resource estimates. Seismic imaging of the subsurface may be undertaken or more legacy imaging data analysed to improve thickness data.¹ More wells could be drilled to allow direct measurement of the subsurface gas content. As no data have been available in the UK, these wells could be used to test the production of shale gas to help estimate recovery factors. Currently estimates are based on limited data and international comparisons. US experience indicates that recovery factors are less transferable for shale gas than conventional gas and as the UK has a different geology to the US, comparisons are speculative.

UK Resource Estimates

The potentially recoverable resources of shale gas in the UK are uncertain. In 2010, the British Geological Survey (BGS) published an indication of the potential of some 150 billion cubic metres (bcm).² A study for the US Energy Information Administration (EIA) puts it at 740 bcm.³

These estimates used analogies for the shale thickness, gas content and recovery factor. The BGS estimate assumed the

same shale gas production per square kilometre as the US Barnett Shale gas basin. The EIA estimated a shale gas production based on the UK geology. These productivities were applied to UK shale areas to provide speculative early estimates.

In 2011, the company Cuadrilla estimated a total resource of 6,000 bcm in their licensed portion of the Bowland Shale, a layer of shale located under northern England that is considered to have the UK's best shale gas potential.⁴ Assuming a North American recovery factor of around 8-20%⁵ would indicate potentially recoverable resources of 500-1,100 bcm. The thickness and gas content used for the estimates were informed by data from three wells drilled by Cuadrilla in 2011 along with three wells drilled in the 1980s. Estimates of shale thickness were also supported by subsurface imaging; however, the accuracy of both recovery factors and extrapolating gas content across the Bowland shale based on well information remains uncertain.

In 2013 the BGS released an estimate of the total resources of the entire Bowland Shale layer of **23,000-65,000bcm**⁶. The approach involved mapping the layer to provide information on its thickness. Assuming a North American recovery factor of around 8-20%⁵ would indicate potentially recoverable resources of **1,800-13,000bcm**.

To put these estimates in context, the UK's remaining potentially recoverable conventional gas resources are 1,466 bcm (of which 493 bcm are reserves)⁷ and annual UK gas consumption is 77 bcm.⁸

UK Reserve Estimates

There are currently no official reserve estimates. The UK reserves could be anywhere from zero to substantial. To determine reliable estimates of shale gas reserves, flow rates must be analysed for a number of shale gas wells over a couple of years. Further, estimates will be determined by many non-geological factors including costs, engineering, supply chain and access restrictions due to environmental and planning issues. Without reserve estimates the commercial scale of shale gas extraction cannot be forecast.

Endnotes

- 1 HC 785-I ECC Committee, Session 2012-13, Corrected oral evidence, Q12
- 2 DECC, 2010, The Unconventional Hydrocarbon Resources of Britain's Onshore Basins – Shale Gas
- 3 EIA, 2013, <http://www.eia.gov/analysis/studies/worldshalegas/>
- 4 Cuadrilla 2011, <http://www.cuadrillaresources.com/what-we-do/about-natural-gas/>
- 5 Curtis, 2002, Non-conventional gas, volume 3, Encyclopaedia of Hydrocarbons.
- 6 DECC, 2013 <https://www.gov.uk/government/publications/bowland-shale-gas-study>
- 7 DECC UK oil and gas reserves (www.gov.uk/oil-and-gas-uk-oil-portal)
- 8 DECC Digest of UK Energy Statistics and website (www.gov.uk/decc)