

Meeting:	NuLeAF Steering Group, 23 October, 2013
Agenda Item:	7
Subject:	Fracking and radioactive waste management
Author:	Catherine Draper
Purpose:	To provide background information on the implications for radioactive waste management of the development of fracking in the UK

Introduction

This report covers:

- What is fracking?
- How does it generate radioactive waste?
- Where could fracking take place?
- Government policy and strategy on fracking
- Government strategy on the management of low level radioactive waste
- Regulation
- Disposal
- Implications for Waste Planning Authorities

Recommendation

1. That NuLeAF continues to monitor developments in NORM strategy.
2. That, subject to any comments from the Steering Group, this paper be published as a Briefing Paper and circulated to the full membership.

Contribution to Key Tasks:

"Engage with NDA, LLWR and Government on the development of a revised LLW Strategy for the nuclear industry, and also on the preparation of a non-nuclear LLW strategy for LLW and a NORM Strategy."

1. What is fracking?

According to DECC, "Hydraulic fracturing or 'fracking' is a technique that uses fluid, usually water, pumped at high pressure into the rock to create narrow fractures that create paths for gas to flow into the well bore and to the surface. The water normally contains small quantities of other substances to improve the efficiency of the process, e.g. to reduce friction. Once the fractures have been created, small particles, usually of sand, are pumped into them to keep the fractures open."ⁱ Fracking is one of a number of alternative oil and gas production techniques now being used across the world.

2. How does it generate radioactive waste?

"Radioactive materials such as uranium and thorium were incorporated in the Earth's crust when it was formed; these normally exist at trace (parts per million – ppm) concentrations in rock formations. Decay of these unstable radioactive elements produces other radionuclides that, under certain conditions (dependent upon pressure, temperature, acidity *etc*) in the subsurface environment are mobile and can be transported from the reservoir to the surface with the oil & gas products being recovered.

During the production process, Naturally Occurring Radioactive Material (NORM) flows with the oil, gas and water mixture and accumulates in scale, sludge and scrapings. It can also form a thin film on the interior surfaces of gas processing equipment and vessels. The level of NORM accumulation can vary substantially from one facility to another depending on geological formation, operational and other factors."ⁱⁱ

3. Where could fracking take place?

Potentially geologically suitable rock formations are located across the UK (see map on page 4). On behalf of DECC, the British Geological Survey has undertaken a survey of the Bowland-Hodder shale formation in northern Englandⁱⁱⁱ. The study provides maps and data which will enable investors, operators and regulators to identify suitable drilling exploratory drilling locations.

4. Government policy and strategy on fracking

Government policy on the production of shale gas is set out in 'Maintaining UK energy security'^{iv} in which it states that it intends to "provide reliable energy supplies that are not exposed to international energy supply risks". To support this intention the government issues licenses for gas exploration in the UK both on and off shore and encourages the development of the domestic gas and oil industries.

Government strategy for the development of shale gas production in the UK is set out in the Energy Security Strategy^v, which states:

Exploration for shale gas in the UK remains at a very early stage and the production potential is not yet known. DECC will support new ways of tapping our indigenous resources, where this proves economic and can be carried out safely and with full regard for protection of the environment. DECC is also supporting new work by the British Geological Survey to better delineate the extent of the resource.

5. Government strategy on the management of low level radioactive waste

Government published the *UK strategy for the management of solid low level radioactive waste from the nuclear industry*^{vi} in August 2010 and the *Strategy for the management on solid low level radioactive waste from the non-nuclear industry: part 1 anthropogenic radionuclides*^{vii} in March 2012.

Due to the difficulty in collecting data on the amount of NORM waste it was not possible to address this waste stream in the latter strategy. The Scottish Government has been tasked by DECC with leading on the development of NORM strategy and the Scottish Environmental Protection Agency (SEPA) and the Environment Agency (EA) are currently collecting data^{viii}. SEPA has established a webpage on the NORM Strategy. A key challenge will be to establish a reasonable estimate of the amount of NORM likely to arise from different operations over the coming decade. This is a challenging task as the likely scale of fracking and other unconventional oil and gas production is hard to quantify.

DECC hope to publish a consultation document on the NORM strategy in December 2013. The consultation will run for 3 months and the aim is to produce the final strategy in summer 2014.

6. Regulation

Shale gas production is regulated by the Environment Agency including ‘suitable treatment of any naturally occurring radioactive materials’. Any operator undertaking fracking would need to consult EA and obtain the appropriate environmental permit.

The Scottish Environment Protection Agency is currently consulting on proposed technical guidance for onshore oil and gas exploration for the whole of the UK. The consultation document includes a section on Radioactive Substances and the Waste Management Plan.^{ix}

7. Disposal of the waste

Disposal of solid NORM waste in England and Wales will be to sites which have appropriate permits from EA to accept radioactive waste. At present these are: the Low Level Waste Repository near Drigg and Lillyhall in Cumbria; Clifton Marsh in Lancashire; and King’s Cliffe in Northamptonshire. The application for disposal of LLW to the landfill site at Keekle Head was refused by the local authority. The site operator appealed the decision and a public inquiry was held. The Secretary of State’s decision on the Planning Inspector’s report is expected in December 2013.

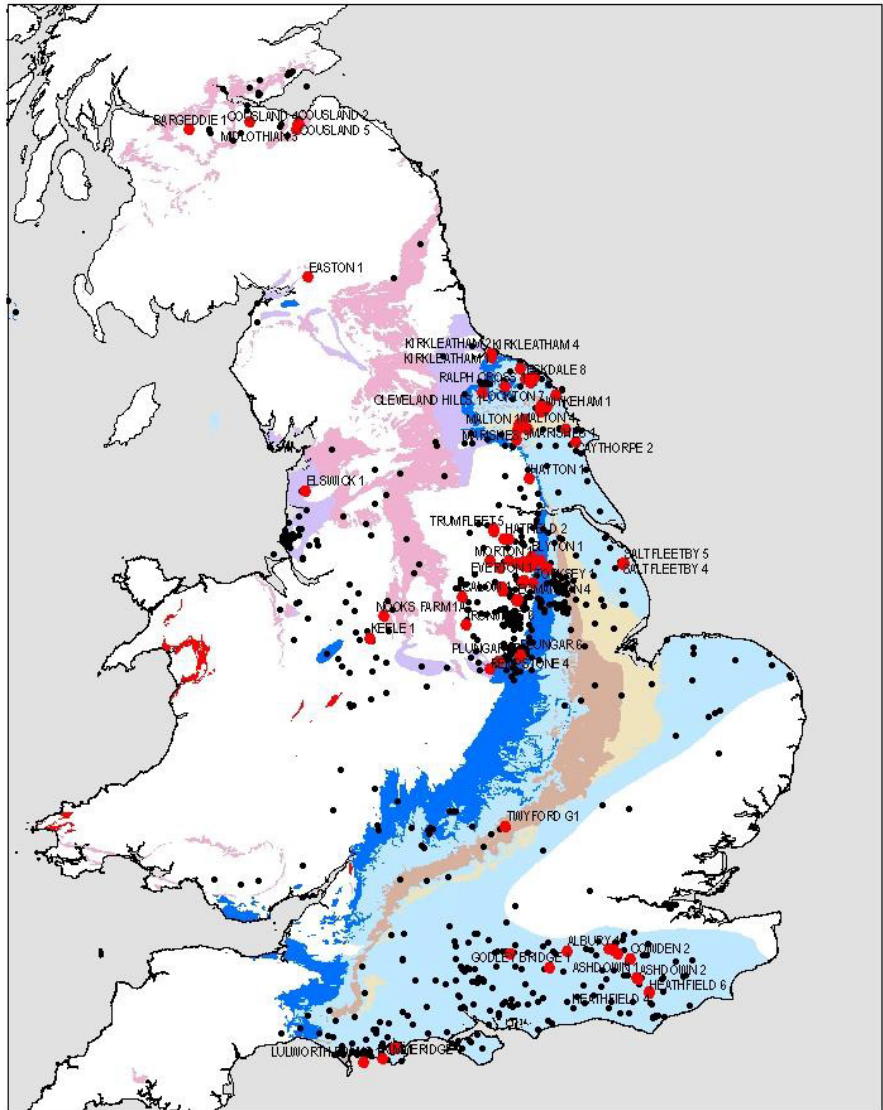
The Environment Agency has said that they ‘will be advocating treatment and re-use of [the] flowback waters, but in the exploration stage this is unlikely to be practicable, so disposal is necessary. For these flowback waters, the waste management will be by road tanker to a permitted effluent treatment plant (ETP), at the moment there are very few such commercial ETPs with the appropriate NORM waste permit. In the future sewage treatment works may be an option.’

8. Implications for Waste Planning Authorities

NORM waste will be sent to those facilities currently taking Low Level Waste (LLW) from the nuclear industry. This has the potential to affect the capacity of those sites. The *Low Activity Low Level Waste (LALLW) Capacity Assessment*^x produced by Low Level Radioactive Waste Repository in March 2013 takes the view that there is sufficient capacity in those sites currently permitted (assuming planning extensions are granted) to take LALLW generated by the nuclear industry until 2030. However, NORM wastes were not accounted for in this forecast as arisings are currently unknown. This raises the prospect that further applications for disposal sites may be made in order to cope with the increased volume of waste.

At present, it is incumbent upon the supply chain to identify the market potential for sites to take LLW and make the appropriate planning and permitting applications. NuLeAF’s advice is that all WPAs should include appropriate policies within their Waste Local Plan to address the potential for such applications^{xi}.

Local Authorities wishing to be kept up to date with developments in fracking and its implications for radioactive waste management may wish to join the Shale Gas Forum^{xii} on the LGA Knowledge Hub and the NuLeAF group on LinkedIn^{xiii}. Elected members interested in learning more about fracking may wish to attend the workshop being run by the Planning Advisory Service in Sheffield on 14 November^{xiv}.



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|---|---|
| Kimmeridge Clay outcrop | Conventional wells which flowed gas |
| Oxford Clay outcrop | Conventional well drilled |
| Lias outcrop | Jurassic Lias Subcrop |
| Namurian (Millstone Grit) outcrop | Namurian Subcrop |
| Cambrian including Tremadoc outcrop | |

Main areas of prospective UK shale formations^{xv}. Copyright DECC

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- ⁱ [About Shale Gas and Hydraulic Fracturing \(Fracking\)](#), DECC, 30 July 2013
- ⁱⁱ [Guideline for the management of NORM in the oil and gas industry](#), Report 412, International Association of Oil and Gas Producers, September 2008
- ⁱⁱⁱ [Bowland Shale Gas Study](#), British Geological Survey, July 2013
- ^{iv} [Maintaining UK energy security](#), DECC, January 2013 plus ongoing updates
- ^v [Energy Security Strategy](#), DECC, November 2012
- ^{vi} [UK strategy for the management of solid low level radioactive waste from the nuclear industry](#), DECC, August 2010
- ^{vii} [Strategy for the management on solid low level radioactive waste from the non-nuclear industry: part 1 anthropogenic radionuclides](#), DECC, March 2012
- ^{viii} [NORM strategy data collection](#), SEPA
- ^{ix} [Onshore oil and gas exploratory operations: technical guidance](#), consultation document, Environment Agency, August 2013
- ^x [Low Activity Low Level Waste Capacity Assessment](#), LLWR Ltd, March 2013
- ^{xi} [Briefing Paper 23: Interim advice on radioactive waste management in Local Plan](#), NuLeAF, June 2013
- ^{xii} [LGA Shale Gas Forum](#)
- ^{xiii} [NuLeAF group on LinkedIn](#)
- ^{xiv} [PAS workshop webpage](#)
- ^{xv} [The Unconventional Hydrocarbon Resources of Britain's Onshore Basins – Shale Gas](#), DECC, 2011