



Radioactive Dangers of Fracking



Radioactivity from Fracking

The process brings up radioactive liquids and solids from the earth in waters, sludges and pipeline scales. The methane gas produced is contaminated with radon gas which can not be separated out.

Cuadrilla in Lancashire

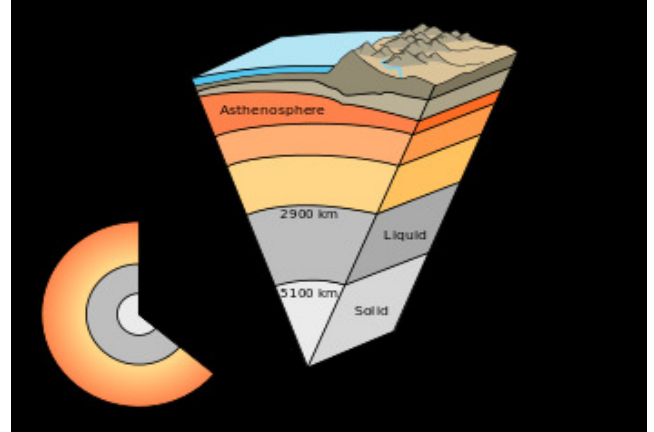
The Independent (January 29 2014) : Cuadrilla recently announced that it stopped its fracking operations in Lancashire in order to apply for Authorisations under the Radioactive Substances Act 1993 to dump radioactive wastewater.

Radionuclides in Fracking Wastewater:

Managing a Toxic Blend <http://ehp.niehs.nih.gov/122-a50/>



Where does this radioactivity come from?



Radioactivity in Earth's Crust

The becquerel (Bq) is the unit of radioactivity which indicates how radioactive the material in question is. One Bq is defined as one nuclear decay per second. The earth's crust is radioactive with an average concentration of about 1,400 Bq per kg. It contains radioactive elements such as uranium-238 (U-238), thorium-232 (Th-232) and potassium-40 (K-40) which have extremely long half-lives near to, or exceeding, the age of the Earth.

<http://www.world-nuclear.org/info/Safety-and-Security/Radiation-and-Health/Naturally-Occurring-Radioactive-Materials-NORM/>

Radioactivity in deep Earth

"The decay of uranium, thorium, and potassium-40 in the Earth's mantle is thought to be the main source of heat that keeps the outer core liquid and drives mantle convection, which in turn drives plate tectonics."

Biever, Celeste (27/07/05). *First measurements of Earth's core radioactivity*. New Scientist. "Potassium-40 heats up Earth's core". physicsweb (07/05/03).

http://en.wikipedia.org/wiki/Uranium#Prehistoric_naturally_occurring_fission

Radionuclides in Earth's Crust

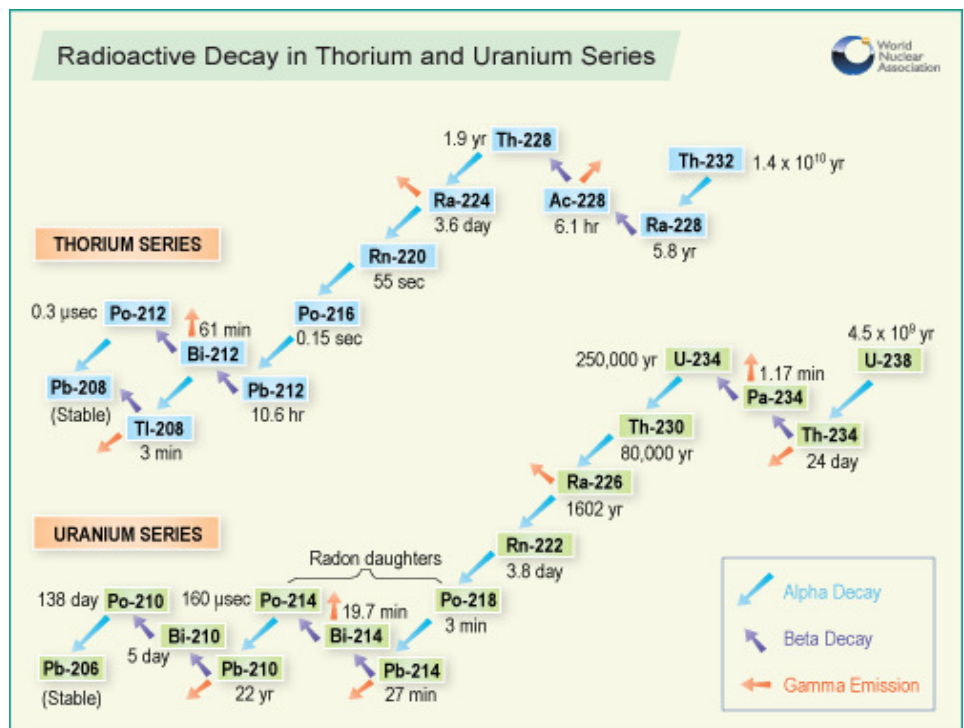
Naturally Occurring Radioactive Materials (NORM) such as Thorium-232 and Uranium-238 decay to various Radon (Rn), Radium (Ra), and Polonium (Po) isotopes.

Radon and Radium

"Since Rn and Ra are among the most radio-toxic substances existing, causing lung and bone cancer at relatively low concentrations

...special attention must be devoted to their appearance in nature."

Choppin GR et al. Radiochemistry and Nuclear Chemistry. Butterworth-Heinemann Ltd. Oxford 1995. page 108 (basic college textbook)



Polonium-210

The Po-210 that was used in the murder of dissident Alexander Litvinenko in London, 2006 did not come from NORM. It very likely came from reprocessed spent nuclear fuel however it was chosen by the perpetrators for its supremely lethal properties. <http://www.theguardian.com/world/2013/nov/06/polonium-210-poison-alexander-litvinenko>



The Times - Fracking claim on baby health

“Opening Britain up to fracking risks increasing the number of birth defects in children of mothers who live near exploration sites, a group of doctors has said. The scientists, from Cornell University and the University of California, Berkeley, are affiliated to the anti-fracking group Physicians Scientists & Engineers for Healthy Energy. In an editorial published in the *BMJ*, they criticised a report in October by Public Health England that said there were minimal safety implications to shale gas exploration. A study in Colorado found a 30 per cent increase in congenital heart defects in children born to mothers who lived close to fracking operations.”

www.thetimes.co.uk/tto/health/news/article4066423.ece

Uses of Unnatural Uranium in the Fracking Industry

The radially distributed set of channels that are created along the length of the drill tube during the fracking process are generated using “shaped charges”. These are cone-shaped dense metal explosive devices that send a powerful directed jet of metal atoms that act as a drill and melt the rock or shale along the length of the jet. There are two US patents using Depleted Uranium (DU) for this process. “Conical Shaped Charge Liner of Depleted Uranium.” by Thomas Wilson [US patent \(US 4441428\)](#), and “Perforating gun assembly and method for controlling wellbore pressure during perforating” by Halliburton [\(US Patent 20110000669\)](#).

<http://rt.com/op-edge/fracking-radioactive-uranium-danger-ecology-057/>

Radioactive levels in oil/gas wells

*IAEA 2003, Safety Report Series 34. International Atomic Energy Agency, 2003, Radiation Protection and the Management of Radioactive Waste in the Oil and Gas

http://www-pub.iaea.org/MTCD/publications/PDF/TRS419_web.pdf

Radio nuclide	Natural gas Bq/m ³	Produced water Bq/L	Hard scale in pipes Bq/kg	Sludge Bq/kg
U-238		trace	1 - 500	5 - 10
Ra-226		0.002 - 1200	100 - 15 million	50 - 800,000
Po-210	0.002 - 0.08		20 - 1,500	4 - 160,000
Pb-210	0.005 - 0.02	0.05 - 190	20 - 75,000	10 - 1.3 million
Rn-222	5 - 200,000			
Th-232		trace	1 - 2	2 - 10
Ra-228		0.3 - 180	50 - 2.8 million	500 - 50,000
Ra-224		0.05 - 40		

Radon Levels - Bq/m³

UK air	UK indoor levels (average)	UK indoor Action Level	US Marcellus shale gas wellheads	US average shale gas well-heads	IAEA* report natural gas	UK gas well-heads
~3	~50	200	~50,000 max 100,000	~1,300 max 50,000	5 - 200,000	?

*IAEA 2003, Safety Report Series 34. International Atomic Energy Agency, 2003, Radiation Protection and the Management of Radioactive Waste in the Oil and Gas http://www-pub.iaea.org/MTCD/publications/PDF/TRS419_web.pdf

Radium levels in water (The levels of radium in fracking discharge are approx 100 to 300 times higher than in drinking water)

FRACKING SITES	Ra-226 Bq/Litre	DRINKING WATER	Ra-226 Bq/Litre
Marcellus shale (US) discharge water	90 (median)	US EPA maximum limit in drinking water	0.185 (Ra-226 plus Ra-228)
Other US sites discharge water	30 (median)	German maximum limit for water in baby foods	0.125
Cuadrilla operations in Lancashire flowback water	14-90	California State public health goal for drinking water	0.0019



www.dailymail.co.uk/news/article-2562431/Chevron-apologizes-residents-small-town-fracking-exploded-burned-five-days-leaving-one-dead-coupon-free-PIZZA.html



Fracking in Your Area? Demand data on:



radium levels in discharge waters, in sludges and in pipework



radon gas concentrations in methane, and produced water



baseline studies before any drilling starts



Produced from a slide presentation prepared by
Dr Ian Fairlie
Consultant on Radiation in the Environment

