



# Nuclear Power: Waste

Nuclear Power produces small amounts of radioactive wastes which are safely confined. These wastes can be directly disposed of (as in the US), or reprocessed and partially recycled. The UK has adopted reprocessing, and deep geological storage as its preferred method of disposal. In the future we may be able to use what is currently considered to be waste as fuel (see *fast reactor* sheet).

## Comparison With Fossil Fuels

A nuclear power station produces very little pollution into the environment - unlike the unrestricted burning of fossil fuels, which release much pollution into the atmosphere:

FUEL CONSUMPTION	FUEL OIL	1.52 million metric tons
	COAL	2.3 million metric tons
	NUCLEAR	= 27 metric tons
OXYGEN BURNED	FUEL OIL	3.4 billion m <sup>3</sup>
	COAL	4.2 billion m <sup>3</sup>
	NUCLEAR	= 0
THERMAL HEAT REJECTED IN THE ENVIRONMENT	FUEL OIL (cooling water →)	0.4 billion kWh chimney 2.4
	COAL (cooling water →)	0.9 billion kWh chimney 2.5
	NUCLEAR (cooling water →)	12.4 billion kWh
RADIOACTIVITY REJECTED	FUEL OIL	4.10 <sup>7</sup> Bq
	COAL	4.10 <sup>8</sup> Bq
	NUCLEAR (note: this U was initially taken in naturally)	4.10 <sup>12</sup> Bq
SOLID WASTE	FUEL OIL	negligible
	COAL	250,000 metric tons
	NUCLEAR	= 27 metric tons (recycled 97%, confined 3%, rejected 0%)
CARBON DIOXIDE (CO <sub>2</sub> )	FUEL OIL	2.4 billion m <sup>3</sup>
	COAL	3 billion m <sup>3</sup>
	NUCLEAR	= 0
SULFUR (SO <sub>2</sub> )	FUEL OIL	51,000 metric tons
	COAL	41,000 metric tons
	NUCLEAR	= 0
NITROGEN OXIDE (NO <sub>2</sub> )	FUEL OIL	3.1 million m <sup>3</sup>
	COAL	9.6 million m <sup>3</sup>
	NUCLEAR	= 0
DUST	FUEL OIL	1,650 metric tons
	COAL	1,200 metric tons
	NUCLEAR	= 0

Pollution from oil and coal and nuclear power [1]

**Globally**, every year we pollute the atmosphere with 27 billion tons of Carbon Dioxide from burning fossil fuels.

To get the same quantities of energy from nuclear would generate 16 x 16 x 16m ~4,000m<sup>3</sup> of high-level waste (HLW), per year the size of a small building [2]. One golf-ball is the amount of waste produced to power an individual for life [1].



Nuclear Waste Canisters [5]

Each power station (1GW) produces [1]:

- ~20 tonnes used fuel:
- ~19 tonnes recyclable Uranium
- 750 kg fission products (strontium and cesium)
- 250 kg plutonium
- 21 kg of actinides

Vitrified high-level wastes from 58 nuclear power plants (France) has generated on 3,000m<sup>3</sup> of vitrified waste over the entire history of the nuclear programme.

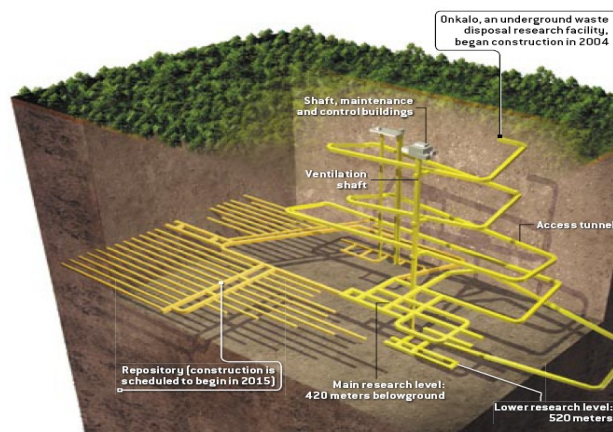
**Total UK Stocks [3]**

Intermediate level Waste: 237,000m<sup>3</sup> = 24 x 100 x 100m

High Level Waste (HLW): 1,510m<sup>3</sup> = 15 x 10 x 10m

**Attitude to Nuclear Waste**

Most of radioactivity is due to short-lived isotopes; drops to a few percentage of initial value when left to sit for a few years. In the short term, spent fuel is stored underwater so it cools down and becomes less highly radioactive. In the UK, geological depository has been adopted as the method of long-term storage [4], as is being constructed in Finland [5].



Disposal of Waste: repository in Finland [4]

[1] B. Comby, 'The solutions for nuclear waste', *International Journal of Environmental Studies* Vol. 62, No. 6, December 2005, 725-736

[2] J. Lovelock, "The Revenge of Gaia" (2006);

[3] W.J. Nuttall *Nuclear Renaissance* (2005);

[4] *New Scientist* "Much of UK suitable for nuclear waste burial" (7 February 2007)

<http://environment.newscientist.com/article/dn11119-much-of-uk-suitable-for-nuclear-waste-burial.html>

[5] *Scientific American*, (September 2006)