West Cumbria Sites
Stakeholder Group

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To: All members
West Cumbria Sites Stakeholder Group

Dear Member

Carbon Emissions from the Nuclear Cycle

At the West Cumbria Sites Stakeholder Group in April, the Environmental Health sub committee reported that it had been asked to provide information on the carbon dioxide balance of the whole nuclear cycle, ie: mining, conversion etc.

The EHSC felt that the request was outside of its remit and requested British Nuclear Group to try and source the information.

Please see attached an extract from a report which contains the relevant information. If required, the full report can be found on the BNFL website, www.bnfl.com

Regards

Rosina Robinson
Secretariat, WCSSG
For
David Moore,
Chairman, WCSSG

Carbon Emissions from the Nuclear Cycle

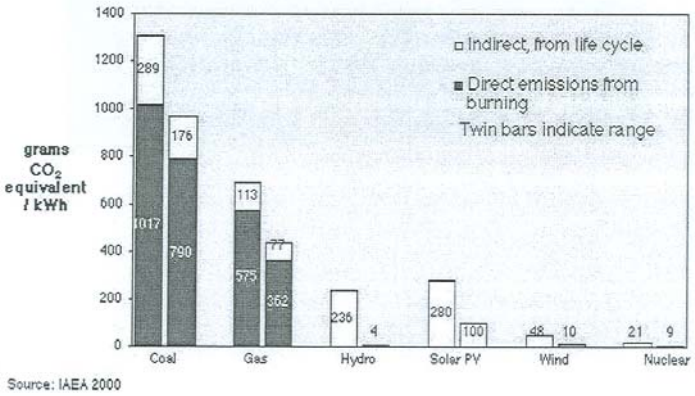
Nuclear power stations do not produce any greenhouse gases emissions directly during electricity generation.

All forms of electricity generation have some greenhouse gas emissions associated with the construction and operation of plant. Nuclear also has emissions associated with energy use during uranium mining, manufacture of fuel, management of spent fuel, waste management and decommissioning. However, when considered over the lifetime operation of the power station, these emissions are very low in terms of emissions per kilowatt-hour.

The results of four studies into the lifecycle emissions of different forms of generation are summarised below. These results consistently show that emissions for nuclear, wind and hydropower are much lower than those of fossil fuels.

	Lifecycle Emissions gCO_2/kWh				
	Nuclear	**Wind**	**Hydro**	**Gas**	**Coal**
IAEA[9]	9-21	10-48	4-236	439-688	866-1306
International Journal of Risk Assessment & Management[10]	8.9	15	16	Fossil fuels: 500-1200	
Central Research Institute of Electric Power Industry, Japan[11]	22	29	11	519-608	975
Vattenfall[12]	3	10	5	409	696

The IAEA data are shown graphically below:



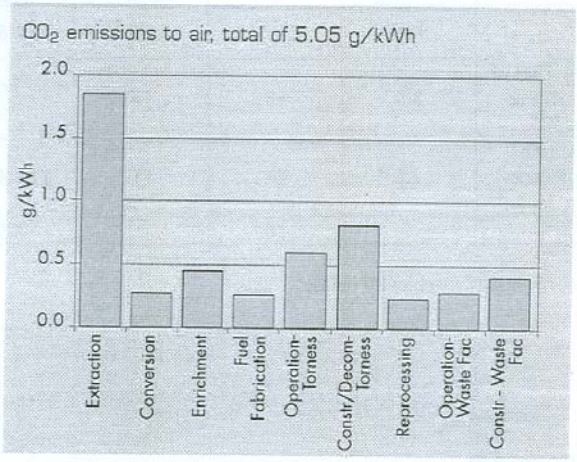
Source: IAEA 2000

[9] IAEA Bulletin 42 (2) 2000
[10] Joop F. van de Vate, International Journal of Risk Assessment and Management 2002 - Vol. 3, No.1 pp. 59-74
[11] Data Presented by T Fujie, JAPC; Topnux 2006; London; March 2006
[12] Life-Cycle Assessment Vattenfall's Electricity In Sweden, Eng 30966_Lca_Divk, 2005

The Vattenfall study includes a breakdown of emissions for the different stages of the nuclear fuel cycle, shown below.

Stage of Nuclear Fuel Cycle	Emissions gCO_2/kWh
Extraction/leaching (mining)	1.1
Conversion	0.2
Enrichment	0.1
Fuel Fabrication	0.2
Operation of Nuclear Power Plant (NPP)	0.2
Building & Decommissioning of NPP	0.6
Waste Facility Operation	0.4
Build/Decommissioning of Waste Plant	0.1

A recent UK-specific study has been made of the Torness AGR nuclear power plant,and produced results comparable to the Vattenfall study.[13]



[13] http://www.british-energy.com/documents/EPD_Exec_Summary.pdf