

## URANIUM: THE PRODUCERS AND THE USERS

### Natural Uranium, U-238, U-235, U<sub>3</sub>O<sub>8</sub> und UF<sub>6</sub>

Natural uranium is extracted from uranium ore and is the basis for the production of nuclear reactor fuel and weapons-grade highly-enriched uranium (HEU).

About 99.27% of natural uranium is made up of the isotope U-238 with a half-life of 4.47 billion years. 0,72% of natural uranium is made up of U-235. The half-life of U-235 is 704 million years. A tiny bit of U-234, 0.0055%, with a half-life of 245,500 years, can also be found in natural uranium,.

To operate a nuclear power plant the uranium needs to have a concentration of 3-5% U-235. This means that the natural uranium has to be enriched.

After it is extracted, the natural uranium is ground in a mill, that is usually attached to the mine, to make a yellow-brownish powder called „yellowcake“. The chemical term is Triuranium octoxide (U<sub>3</sub>O<sub>8</sub>)

In order to enrich the uranium, the „yellowcake“ is converted into uranium hexafluoride (UF<sub>6</sub>) in a subsequent process stage that takes place elsewhere.

Uranium's decay elements are no less dangerous than the original material. U-238 decays into the isotopes thorium, proactinium, radium, radon, polonium and wismut. Lead, a stable element, is to be found at the very end of the decay chain.

### Where is uranium mined?

The biggest producer of natural uranium worldwide is Kazakhstan, producing 13,820 tonnes of natural uranium and accounting for 27.36% of global production. Then comes Canada with 20.14% and Australia with 15.69% of the market. Namibia and South Africa are counted together and are to be found in fourth place, followed by Russia in fifth place with about 7% of the global market. Niger, Usbekistar und die USA make up the other large producers.



In 2009, as compared to 2008, exactly 6666 tonnes more uranium was produced worldwide. World production reached 50,519 tonnes.<sup>1</sup>

Global production of natural uranium grew by 33% between 1995 and 2008. The price for a US pound (0,45 Kilo) of U<sub>3</sub>O<sub>8</sub> („yellowcake“) was US\$ 46 (Spot Ux U3O8 Price) at the beginning of August 2010.<sup>2</sup>

One reason for the growth in demand for uranium is the annual deficit between the uranium needed by nuclear power plants and the amount being produced (every year the demand is greater than the supply from extraction can meet). Moreover, less uranium is available from the disarmament of nuclear weapons as originally projected and extraction problems have increased the demand for more and more deposits.

### Who are the biggest users of uranium in the world?

According to the German Federal Government, there were 436 nuclear power plants (NPP) in operation with a total capacity of 371,927 megawatts at the end of May 2009. 43 NPP (37,668 MW) were in the process of being constructed and 106 (118,095 MW) were in the planning stages at that time. Another 266 NPP (262,075 MW) were „envisioned“.<sup>3</sup> The demand for nuclear fuel could, therefore, double within the foreseeable future.

The five biggest users of uranium are the USA, France, Japan, Russia and Germany. Die USA have their own – albeit minimal in comparison to their demand – uranium resource, whereas Russias's demand and resource is about the same. Japan and Germany do not have any uranium reserves. According to the Nuclear Energy Agency and the International Atomic Energy Agency (IAEA) only seven countries in the world have a capacity to export uranium worth speaking of.<sup>4</sup>

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<sup>1</sup> EURATOM Supply Agency, Annual Report 2009

<sup>2</sup> Ux Consulting Company,

<sup>3</sup> Antwort der Bundesregierung auf eine Große Anfrage der Fraktion Bündnis 90/Die Grünen im Deutschen Bundestag, Drucksache 16/13276 vom 28.5.2009

<sup>4</sup> NEA / IAEA: Uranium 2007 (2008).  
Greenpeace: Reichweite der Uran-Vorräte (2006)