

# Uranium fuel sparks German-US controversy

**Munich.** More than 20 of Germany's top physicists have sent a letter to ministries, politicians and licensing authorities in Germany expressing concern over the proposed use of highly enriched uranium (HEU) in a new research reactor planned for construction in Garching near Munich.

Their main complaint is that the so-called *Forschungsreaktor München II* (FRM-II) would as currently planned undermine attempts led by the United States to eliminate the world-wide use of HEU in research reactors, and to substitute it with the less energy efficient but safer low enriched uranium (LEU).

The United States, at present the west's only supplier of HEU, has introduced strict controls on the distribution and use of this fuel, quoting its commitments under the terms of the Nuclear Non-Proliferation Treaty (NPT), which came into effect in 1970. In addition, over 50,000 individuals in Germany, including many scientists, have backed a demand that the FRM-II be redesigned to use LEU fuel.

But the scientists at Munich's Technical University who have designed the FRM-II argue that converting it from HEU to LEU would be extremely costly. They also claim that such a move is unnecessary, as Germany is a signatory of the NPT, and thus has strict controls on the use of nuclear fuels.

Last week saw the opening of an inquiry into the planned reactor, which will provide high energy neutrons for researchers in materials and medical sciences. German physicists have been trying to establish a new national neutron source since the late 1970s, as the country's four working research reactors are ageing, and have neutron fluxes too low to meet all current research needs.

Planned for construction next to Munich university's existing research reactor, known as the Atom-Ei (atomic egg) because of its shape, the new reactor would have a high neutron flux ( $800 \times 10^{12}$  per second per  $\text{cm}^2$ ) and would cost DM525 million, two thirds paid by the federal government, and the rest by the state of Bavaria.

Wolfgang Gläser, professor of experimental physics in Munich and former director of Europe's most powerful research reactor at the Institut Laue-Langevin in Grenoble, France, says that the use of HEU, made up of 93 per cent  $^{235}\text{U}$  and 7 per cent  $^{238}\text{U}$ , is needed to achieve the required neutron flux at a power of 20 megawatts.

If the new reactor is required to use a mixture of only 20 per cent  $^{235}\text{U}$  (and 80 per cent  $^{238}\text{U}$ ), he says, it would have to operate at twice this power, raising annual running costs from DM20 million to DM30 million. In addition, conversion is likely to cost an estimated DM200 million.

Gläser also argues that LEU provides a

similar security risk to HEU, as  $^{238}\text{U}$  in the fuel is converted to plutonium. But Werner Buckel, former president of the German Physics Society, says that sophisticated re-processing technology is required to extract this plutonium, which is already at low levels, and that the risks are therefore not comparable.

The United States has established a programme to develop alternative high density LEU fuels. Its overall policy, intended to reduce the risks of nuclear proliferation, was reinforced by the Schumer amendment to the 1992 Energy Policy Act, which specifies three conditions for the supply of HEU



**Gläser: claims fuel would be safe.**

to research reactors.

First, the reactor must be technically incapable of using any of the LEU fuels currently available. Second, the relevant national government must agree to use an alternative, compatible LEU fuel type, if one becomes available. Finally, the United States must become involved in developing an LEU fuel type that would be compatible with the specified reactor.

Despite the extra costs incurred by reactors using LEU fuel, the policy has so far been highly successful. Thirty eight of the 42 research reactors outside the US which depend on imported US fuel have already switched, or are preparing to switch, to LEU. These include Germany's four current research reactors in Berlin, Hamburg, Jülich, and the Atom-Ei in Garching. One of the remaining four is now considering switching, and the other three are not technically capable of conversion.

Given this virtually universal compliance with the policy, as well as Germany's ultra-sensitivity to 'green' issues, the country's insistence on using HEU at Garching has generated widespread surprise.

Government officials deny that the use of HEU will increase the risk of nuclear proliferation. They point out that strong security measures have been incorporated into the FRM-II plans to meet the demands of both the European Atomic Energy Community (Euratom) and the International Atomic Energy Agency.

But Robin Delabarre from the US State Department's section on nuclear affairs says that this is not the point. "The German safeguards are fine," he says. "But it is not a problem specific to Germany; there is a general concern about the risks of international transport and use of weapons-grade materials."

The US is particularly worried that, by breaking ranks, Germany could encourage those responsible for research reactors in other countries to reconvert their reactors to use the cheaper HEU fuel. If that happened, however, a new question would arise concerning the origins of the fuel.

Gläser says he is confident that the US will agree to supply FRM-II with HEU, accepting the reactor as an exception to its general rules on the grounds that a redesign to use LEU would be uneconomic. But Delabarre says that economic reasons are not sufficient to allow an exception, and that a request for HEU from Garching would "most likely not be approved".

The State Department has been urging the Garching team — so far unsuccessfully — to work with US scientists at the Argonne National Laboratory near Chicago on low enriched fuel that would be both technically and economically acceptable.

If the US refuses to supply the HEU (no such fuel has been exported from the US since 1992) and the reactor is not converted to use LEU, its fuel will have to be sought elsewhere. It will have to be ordered through Euratom, as nuclear installations in Germany, as in all other countries of the European Union, are obliged to do.

A spokesperson for Euratom admits that US policy has put its HEU supplies "in grave doubt in the near future". The organization is considering new sources — possibilities include the United Kingdom, France, and Russia — but will not discuss the options it is considering.

The public hearing, which is part of the nuclear licence procedure for FRM-II, is likely to continue for several weeks. Bavaria's prime minister Edmund Stoiber says he would like to see a (positive) licensing decision taken before the state elections in September. But few expect a decision much before Christmas.

**Alison Abbott**

## Business booms for China's universities

**Beijing.** Entrepreneurialism seems to be thriving in China's universities. According to a report from the Xinhua news agency in Beijing, the output of university-run enterprises in Beijing reached a value of 2.6bn yuan (US\$330 million) in 1993, more than twice the figure for 1992. Total profits also doubled, to a total of 400m yuan.

Of Beijing's 67 colleges and universities, Beijing University, Qinghua University, the Beijing Polytechnic University and the Beijing University of Science and Engineering, each reported an annual output of more than 100m yuan from their campus-run hi-tech enterprises. □