

would need to earn an extra 2 or 3 million rand a year by doing contract work for medical and other industries, and the government's contribution would also decrease over time. Break-even is projected after ten years of operation, von Bergmann says. Wicus Olivier, who heads the company Hitech Lasers/SDI and is involved in planning the NLF, believes industry will make use of the facility. "South Africa cannot compete with the rest of the industrial world if laser technology is not kept alive," he says. But for the facility to be successful, he warns, "one proviso is that it not directly compete with the private sector."

The emphasis on industrial links

has some academics worried that education may get short shrift. Says Michaelis, "I regard education as purpose number one. Most young South Africans have never seen a helium-neon or diode laser." Poorer universities—"like mine"—Michaelis continues, are at a disadvantage because "there is no point in having a beautiful laser if I haven't got students to run the thing." But, notes Botha, the lab's ability to redress past inequities under apartheid is one of the things on which the proposal will be judged. And so, he adds, "One of the NLF's first objectives would be to proactively involve black researchers, giving them preferential bursaries."

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Germany Weighs Barring Bomb-Grade Uranium at Research Reactor

Should the research reactor being built by the Technical University of Munich at Garching, Germany, be converted to use low enriched, instead of highly enriched, uranium? The country's new Social Democrat-Green coalition government has charged a panel of six scientists to tackle this question.

The move is part of a broader overhaul of the country's nuclear laws, including plans to phase out nuclear energy. But by January, less than three

The FRM2, intended for neutron scattering experiments, has been controversial among both scientists and the general population from the outset because it was designed to burn weapons-grade, highly enriched uranium fuel, or HEU. The critics' main concern, explains Alan Kuperman, a senior policy analyst for the Washington, DC-based Nuclear Control Institute, "is the domino effect. It would send a message to industrializing countries that state-of-the-art research reactors require HEU, undermining the RERTR program"—that is, the international Reduced Enrichment for Research and Test Reactors program initiated by the US in 1978.

What's more, low enriched uranium (LEU) could have done the job, according to Armando Travelli, who says that, with increased thermal power, fuel developed by his group at Argonne National Laboratory could have safely provided the same neutron flux that the FRM2 is designed to deliver using HEU.

But now that construction of the FRM2 is so far along, switching to LEU would be a big deal technically, financially and politically. With the reactor slated to start up in 2001, more than half of its roughly DM 800 million (\$465 million) price tag has been spent or committed, says spokesman Gert von Hassel. And the reactor design team—which has all along sworn by HEU—maintains that

switching to LEU would mean starting from scratch, and building "FRM3." With FRM2 officials keen to make such a switch ever more prohibitive, von Hassel adds, "We are pushing construction ahead full speed."

The government-appointed panel will look at the options for switching to LEU. To get the desired neutron flux of $8 \times 10^{14} \text{ cm}^{-2}\text{s}^{-1}$, the reactor core would have to be modified, and the power upped. Says University of Dortmund physicist Franz Fujara, a longtime neutron user, "Some optimum has to be found by playing with the three parameters—time, money and neutron flux. What is really important, however, is that the fuel enrichment not exceed 20% uranium-235." (The HEU fuel is enriched to 93%.)

The panel members are neutron users Peter Armbruster, of the Heavy Ion Research Center in Darmstadt, and Richard Wagner, of the Jülich Research Center; reactor operators Wilfried Krull, who oversaw the HEU-to-LEU conversion of a reactor at the Geesthacht Research Center near Hamburg in the 1980s, and Ekkehardt Bauer, who heads the reactor at the Institut Laue-Langevin in Grenoble, France; and nonproliferation specialists Annette Schaper, of the Peace Research Institute in Frankfurt, and Wolfgang Liebert, of IANUS (Interdisciplinary Research Group in Science, Technology and Security) at the Technical University of Darmstadt. The panel is being overseen by the deputy minister of research, Wolf-Michael Catenhusen, and observers from other ministries and from the host state of Bavaria are being invited.

The panel has until June to weigh such factors as scientific value, technical feasibility, cost, time delays, licensing procedures and nuclear proliferation risk, and to make recommendations as to whether, and how, the FRM2 should be converted to burn LEU.

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THE CONTROVERSIAL RESEARCH REACTOR FRM2 (for Forschungsreaktor München 2) is being built next to its predecessor, the Atomei (atom egg) in Garching, north of Munich. This photo was taken last July.

months into the new government's term, some of the proposals of the environment minister, Jürgen Trittin, had already been set back: Attempts to cancel nuclear waste reprocessing contracts with France and the UK had faltered, and research reactors had been excluded from draft legislation to stop licensing new reactors—a victory for the FRM2, as the Garching reactor is known.

IN BRIEF

Three new centers have been established by the International Centre for Scientific Culture-World Laboratory—two in Egypt and one in Texas. They are a center for the study of extreme weather events, at Cairo's Meteorological Authority; a center for coastal marine modeling, at the University of Alexandria; and a center for Pan-American collaboration in science and technology, at the University of Houston. The brainchild of physicists Paul Dirac, Piotr Kapitza and Antonino Zichichi (the organization's current