AGA 8: Nonproliferation and Research Reactor Conversion

Time: Friday 10:30–11:30 Location: B 0.014

AGA 8.1 Fri 10:30 B 0.014

The German Research Reactor FRM-II and the Use of High Enriched Uranium (HEU) Fuel — •Friederike Friess — Institut für Sicherheits- und Risikowissenschaften, BOKU Wien

The design of the research reactor FRM-II in Munich took place when the norm against using highly enriched uranium (HEU) as fuel for research reactors was already widely accepted. Yet, the FRM-II went critical in 2004 using HEU. The operating license, however, included the requirement to convert the FRM-II to low enriched uranium (LEU) fuel until the end of 2010. This deadline has been extended to 2018. This conversion deadline will not be met either. The operation of a research reactor using HEU does not only undermine international non-proliferation policy, it also bears several problems such as the fuel supply and the spent fuel management.

The FRM-II influenced several recent developments such as Russia's renewed efforts to enrich to HEU and the change in German nuclear legislation in 2017.

AGA 8.2 Fri 11:00 B 0.014

Conversion Options for the FRM-II - an overview of results of neutronic calculations — Christoph Pistner and •Matthias Englert — Institute for Applied Ecology - Öko-Institut e.V., Rheinstr. 95, 64295 Darmstadt

Minimization of the civil use of highly enriched uranium (HEU) is one of the cornerstones of international nonproliferation efforts to prevent access to fissile material suitable to build nuclear weapons. The conversion of the fuel of research reactors from the use of HEU to the use of low-enriched uranium is at the heart of this effort, as the annual demand for HEU for research reactors is highest compared to other civilian applications. Since the 1980s, a norm existed not to commission any new research reactors with a design based on HEU fuel. The only exception is the research reactor Munich II (FRM-II) which went critical in 2004, and today is one of the seven HEU reactors worldwide, which account for about 80% of the civilian HEU demand worldwide. To convert existing reactors, programs for the development of high-density uranium silicide fuels were set up in the 1980s and were qualified for use in reactors up to a density of 4.8 g/cm3. In the following decades, all German research reactors were converted with this new fuel or shut down. For the reactor core design of the FRM-II, however, instead of using it at a 20% LEU enrichment, these new uranium-silicide fuels developed for the HEU-LEU conversion have been highly enriched again for the FRM-II core. The extremely compact design of the fuel element, made possible by the new uranium silicide fuel, has made the conversion of the reactor into a demanding task ever since. However, the proliferation risks were finally acknowledged and while the reactor initially started operation with HEU, a legal obligation exists to convert the reactor to lower enrichment. The new hope for conversion is on the development of new uranium-molybdenum (UMo) alloys with which fuels of even higher density could be obtained. We present an overview of the current status of the conversion possibilities for the FRM-II, especially with regard to neutron-physical simulations and possible changes in the core geometry.