AGA 5: Nuclear Archeology and Fissile Materials

Time: Friday 10:30–11:30 Location: U HS 3 Parkstr. 6

AGA 5.1 Fri 10:30 U HS 3 Parkstr. 6

Nuclear Archaeology: Reconstructing Reactor Histories From Reprocessing Waste — •Antonio Figueroa and Malte Göttsche — Nuclear Disarmament and Verification Group, RWTH Aachen - Aachen Institute for Advanced Study in Computational Engineering Science (AICES) , Aachen, Germany

Nuclear Archaeology is a field dedicated to the reconstruction and quantification of the past production of weapons-usable fissile materials. As part of related research efforts, we examine the possibilities and limitations of exploiting measurements of high level waste to deduce parameters related to the operational history of reactors such as burnup. For the first stage of this project, we use high fidelity forward calculations to estimate spent fuel compositions, and develop a surrogate model which can be used as a computationally less expensive way to map combinations of input parameters to fuel compositions. This model will help better understand the challenges when solving the inverse problem of deducing the reactor history from waste. A promising method to solve the inverse problem may be Bayesian Inference, where prior existing information (e.g. a declaration by a state) can be taken into account, and waste measurements would be used to update this knowledge. This way, measurements may confirm the existing information, make it more accurate, or identifiy inconsistencies which may indicate cheating.

AGA 5.2 Fri 11:00 U HS 3 Parkstr. 6

Highly Enriched Uranium Status Update - All quiet since the Iran negotiatons? — •Matthias Englert — Öko-Institut e.V. Rheinstr. 95, 64283 Darmstadt

Highly Enriched Uranium - HEU is a nuclear material that can be used to fuel nuclear weapons. This talk presents an overview on the current status of HEU stockpiles and usage as well as HEU production technologies and newer developments over the last years. HEU is used in nuclear weapons worldwide, but also for other purposes such as to fuel research and power reactors, naval propulsion and to produce isotopes for medical purposes. Today HEU is produced with gas centrifuge technology, a technology which is in the reach of the technical capabilities of most countries worldwide. Problematic developments in nuclear proliferation in the last two decades involved the spread and covert acquisition of centrifuge enrichment capabilities by countries such as Iran and North Korea. Not know much is known about the North Korean enrichment program. In Iran the program is mostly frozen since the Iran Nuclear Deal (JCPOA), but more informatian about the program became available especially since the presentation of secret documents from Iran by Israeli Prime Minister Netanyahu. Not often talked about: other countries also enhance and expand their centrifuge capabilities such as Pakistan or Brazil. Also new technologies such as laser enrichment are on the verge of becoming industrialized. HEU minimization programs to minimize the civil use of HEU are also not progressing quickly especially in the area of research reactor conversion to the use of low enriched uranium. This is mostly due to the complexity to qualify suitable high density Uranium-Molybdenum (UMo) fuels to convert the reactors from HEU to LEU. But for HEU minimization there were also significant accomplishments in recent years e.g. in repatriating spent fuel from research reactors in other countries to the US and Russia. In nuclear weapons states such as Russia, HEU still plays a major role either as a commodity or for the domestic energy programs, e.g. the recent use of HEU to fuel the Russian fast reactor program and the reopening of a HEU production line in Russia.