Science & Global Security, 19:iii–iv, 2011

ISSN: 0892-9882 print / 1547-7800 online
DOI: 10.1080/08929882.2011.589220

Routledge
Taylor & Francis Group

Editors' Note

A recurring lesson of the nuclear weapons age is that uncertainty has often bred insecurity and that this dynamic can be addressed by diplomacy and cooperation rather than arms racing. This was recognized recently, for example, in the United States' 2010 Nuclear Posture Review call for "high-level, bilateral dialogues on strategic stability with both Russia and China which are aimed at fostering more stable, resilient, and transparent strategic relationships . . . The goal of such a dialogue is to enhance confidence, improve transparency, and reduce mistrust."

A good agenda item for a U.S.–China strategic dialogue is offered by Wu Riqiang in his article assessing the survivability of China's ballistic missile submarines (SSBN) in coastal waters against U.S. anti-submarine warfare and the vulnerability of their ballistic missiles to interception by planned U.S. sea-based missile defenses. He shows why China may be concerned about the possible noisiness of its new Type 094 submarine and may want to improve the quietness of the planned fleet of perhaps six SSBNs to ensure their survivability. Further, he finds that U.S. plans to develop missile interceptors much faster than those available today and deploy them by 2018 on Aegis destroyers close to Chinese SSBN coastal patrol areas could enable the United States to intercept most if not all the SLBMs launched from China's coastal waters towards the U.S. mainland. To counter these perceived vulnerabilities, China could seek to move its submarines from coastal waters to patrol areas in the deep oceans and closer to the United States and to develop longer range sea-launched ballistic missiles and add more and better decoys to assure some of its nuclear warheads will reach the United States.

Uncertainty about fissile material production for weapons has long been a source of concern and will likely be a central issue in the move towards nuclear disarmament. Jungmin Kang simulates a verification exercise to determine the accuracy of reconstructing the total amount of plutonium produced in North Korea's 5 MWe Yongbyon reactor using the Graphite Isotope Ratio Method (GIRM). GIRM is an example of an approach for determining the total plutonium production by a reactor first proposed by Steve Fetter in 1993 in this journal. It relies on measuring the changes in trace element isotope ratios at sites in reactor structural material to determine the total neutron fluence experienced at these locations. For low-power graphite-moderated reactors like the one at Yongbyon, the local boron isotope ratio (B^{10}/B^{11}) in the graphite has proved to be a useful indicator.

Since graphite samples from the Yongbyon reactor are not available for analysis, however, Kang hits on the novel approach of using as mock-GIRM data the B^{10}/B^{11} ratios at 200 sites in the Yongbyon graphite generated by a simulation of the reactor core by researchers at Seoul National University and the Korea Atomic Energy Research Institute (KAERI). Kang uses these simulated B^{10}/B^{11} values to independently calculate plutonium production in the respective reactor fuel channels. His estimate of the cumulative plutonium production by the reactor differs by about 1% from the value determined in the original core simulation.

Emerging and future technologies carry their own uncertainties, which if understood early can inform the debate on whether the costs of pursuing them may outweigh any benefit. Nowhere is this perhaps more important than the issue of what energy production choices can best help limit carbon emissions so as to reduce the temperature increases and other effects associated with climate change. Robert J. Goldston seeks to inform this question by comparing the proliferation risks from the fuel and waste cycles that would be associated with a 12-fold expansion of nuclear energy worldwide by the year 2100 if it were achieved by the light-water reactors in use today, by plutonium-fueled fast reactors, or by fusion energy. He finds the proliferation risks associated with fast reactors appear significantly greater than those associated with light water reactors, while fusion systems still under development constitute an even lower proliferation risk in terms of the diversion of fissile material or breakout production of fissile material from such facilities.