Argonne NATIONAL LABORATORY

ARGONNE-LED EFFORT **SHRINKS GLOBAL NUCLEAR WEAPONS RISK**

In Almaty, Kazakhstan, Argonne engineers worked with the Kazakh Institute of Nuclear Physics on a decade-long conversion of the reactor above, called VVR-K. Image of VVR-K courtesy Kazakh Institute of Nuclear Physics.

THE CHALLENGE

In December of 1953, President Eisenhower told the United Nations that the United States — in a reversal from the absolute secrecy it had enforced around nuclear technology following the Manhattan Project — would share its research with scientists around the world who wished to use it for peaceful purposes.

From this "Atoms for Peace" speech sprang hundreds of research reactors, designed and built with uranium and expertise from the United States, and later Russia and China, and scattered around the world's universities and scientific institutions. These reactors run on a uranium fuel that is processed to contain a lot of one particular uranium isotope (U-235) that is very easy to split. This processing makes the fuel a powerful tool for scientific research — it also makes it easier to use to make nuclear weapons. Such reactors are located in more than three dozen countries-— from Kazakhstan to Brazil, Jamaica, Ghana, Denmark, and Vietnam — and most are still running.

THE INNOVATION

Nearly four decades ago, the U.S. Department of Energy (DOE) embarked on a program called Material Management and Minimization (M3), which was aimed at converting research reactors for safe use. As part of the M3 program, a research team from DOE's Argonne National Laboratory designed a replacement fuel made of low-enriched uranium, which is much harder to make into weapons. That fuel is now the international standard for many such reactors. The first two reactors they converted, as demonstrations, were at the University of Michigan in 1981 and at Oak Ridge National Laboratory in 1986. The team then converted reactors in Argentina, Austria, and Denmark, soon moving on to reactors around the world.

> "**Our goal is to be ready on the technical side when the political moment comes.**"
>
> — John Stevens, nuclear engineer and M3 program manager at Argonne

Like converting a car engine to run on diesel instead of gasoline, the conversion takes a great deal of careful engineering— as well as diplomacy, knowledge, experience, and a little bit of luck. They must redesign the core so that it fits in the same space while offering the same range of scientific capabilities, but using a lower proportion of U-235.

THE IMPACT

Since the program's inception, Argonne engineers have helped convert 69 research reactors and one isotope production facility in 34 nations and areas. Many more are planned; the schedule stretches out to 2035. Thus far, 30 countries and Taiwan have been cleared of highly enriched uranium.

In 2004, new agreements opened up pathways to several reactors the group had been eyeing for decades. The Argonne team completed 12 conversions in eight countries over the next four years and has completed 18 conversions in 13 countries since then.

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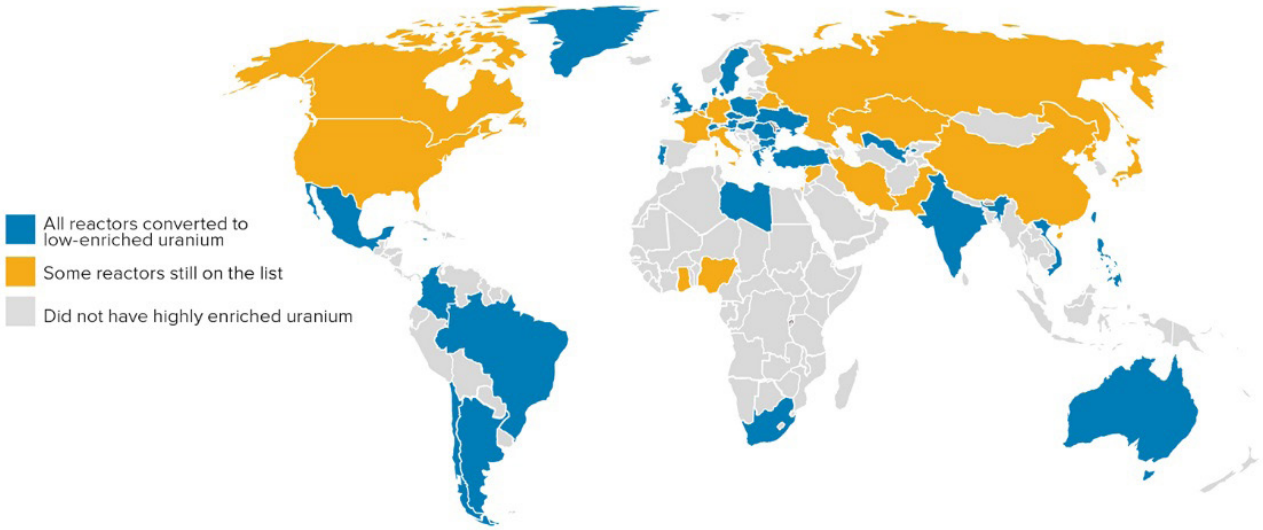

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