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Commentary: The looming crisis for US tritium production

By: Franklin C. Miller ([/author/franklin-c-miller](#)) and John R. Harvey ([/author/john-r-harvey](#)) 📅 March 6, 2017

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Tritium, an isotope of hydrogen, is an essential component in all U.S. nuclear weapons and bombs. It is radioactive with a decay half-life of 12 years and, thus, must be replenished in U.S. warheads every few years. Absent timely replenishment, our warheads become duds.

The United States, however, will be unable to produce enough tritium in coming years to support the nuclear stockpile. How did this dire prospect come about?

Today, the U.S. produces tritium by irradiating special rods in a single light water reactor run by the Tennessee Valley Authority (TVA). This reactor burns low-enriched uranium (LEU) fuel and also produces electricity to power homes in the Southeast. To meet demand, a second TVA reactor will begin producing tritium early next decade.

U.S. nonproliferation policy generally seeks to separate atomic energy defense activities, including past production of "special nuclear materials" -- plutonium and highly enriched uranium (HEU) for nuclear weapons -- from peaceful activities enabling domestic nuclear power.

The U.S., however, determined in 1998 that production of tritium in government-owned TVA reactors would be cost effective and consistent with nonproliferation interests so long as the reactors burned U.S.-origin LEU fuel.

Unfortunately, the U.S. does not now have a domestic source to produce that fuel. In 2013, its one remaining uranium enrichment plant, the aging and costly-to-operate gaseous diffusion plant in Paducah, Kentucky, was shutdown. Moreover, funding to support a U.S. company seeking to build a centrifuge enrichment plant in Piketon, Ohio, was terminated.

Existing U.S.-origin LEU will run out by mid next decade given the two-reactor production strategy. Reasonably low-cost options are available to extend stocks until 2030 or so. Beyond that, it would force down-blend of HEU now reserved for the nuclear stockpile and naval ship propulsion. This is imprudent from a national security perspective, and wasteful given the initial large cost to highly enrich this material.

By the early 2030s, the viability of the entire U.S. nuclear deterrent is at risk from an inability to produce tritium for nuclear warheads. The Trump administration will need to take action soon to manage this long-term problem.

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Cheap oil and gas today make new enrichment plants uneconomical. There is thus a national security imperative for the U.S. government to either renew subsidies to U.S. firms willing to take on this mission, or do this itself.

The Department of Energy estimates many billions of dollars and a decade or more to design and build a U.S.-origin centrifuge plant. Given DOE's sorry experience in failing to field critical nuclear infrastructure on time and cost -- for example, facilities to produce plutonium and HEU parts for nuclear warheads, and for mixed oxide (MOX) fuel -- we anticipate these estimates are overly optimistic. Therefore, it is not too soon to start now.

Failure to restore domestic enrichment by the early 2030s leaves only one alternative: use of foreign-origin LEU. But there are many drawbacks. Some exporting countries will not sell LEU for tritium production because agreements in place limit use solely for peaceful purposes. Earlier, an international consortium (URENCO) agreed to provide LEU for TVA reactors, whether tritium producing or not, but previous administrations rejected this on the grounds that it further weakened separation of national defense-related and commercial nuclear activities. And, to be clear, because nuclear weapons play such a critical role in U.S. security, and the security extended to allies, our nation cannot rely on global markets, or other countries' decisions, to provide means to ensure that security.

Restoring domestic enrichment capacity offers security benefits beyond a viable nuclear deterrent. HEU reserves to fuel nuclear-powered ships will run out in about 40 years; capability for high enrichment assures the long-term viability of the nuclear Navy. While it may not, in itself, restore U.S. global leadership in shaping the future of nuclear power, building and operating a modern enrichment plant would help reverse declining U.S. technical capabilities in the commercial nuclear arena.

Harvey and Miller have among them several decades of experience serving in senior posts in the U.S. government overseeing nuclear weapons policies and programs, Harvey in the Departments of Energy and Defense and Miller in the Department of Defense and the NSC Staff.

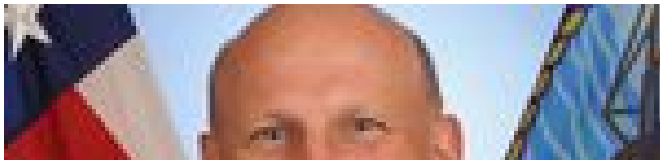
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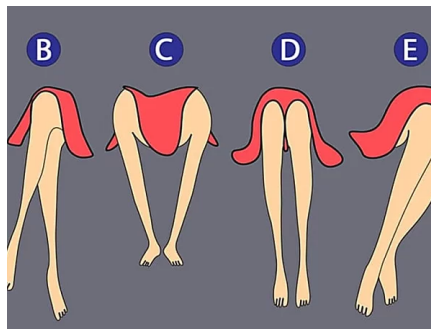
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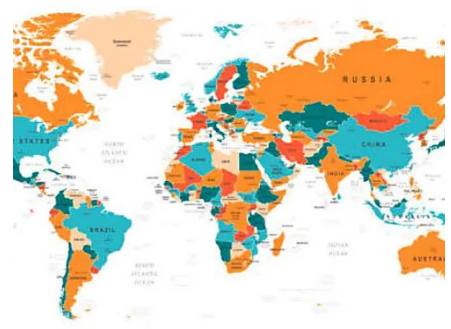
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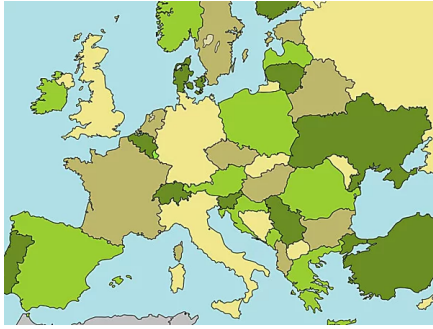
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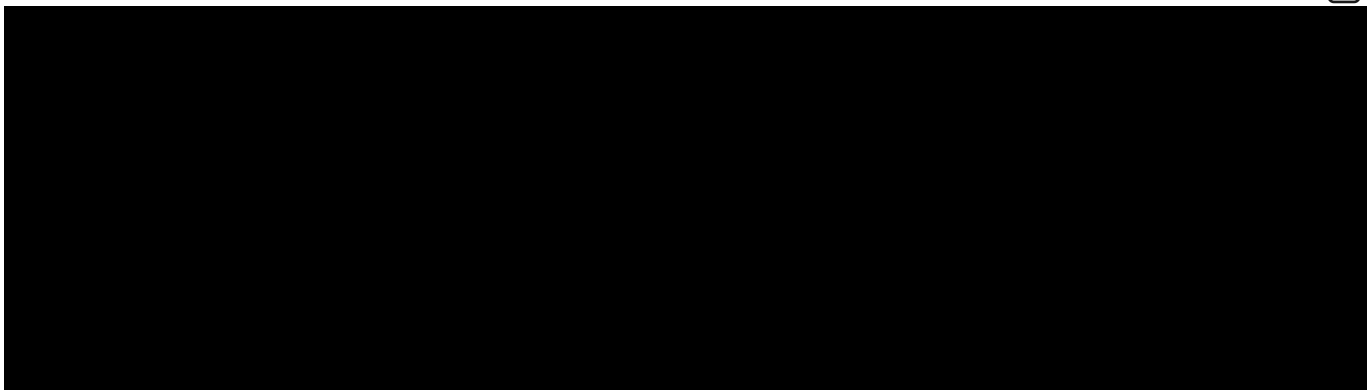
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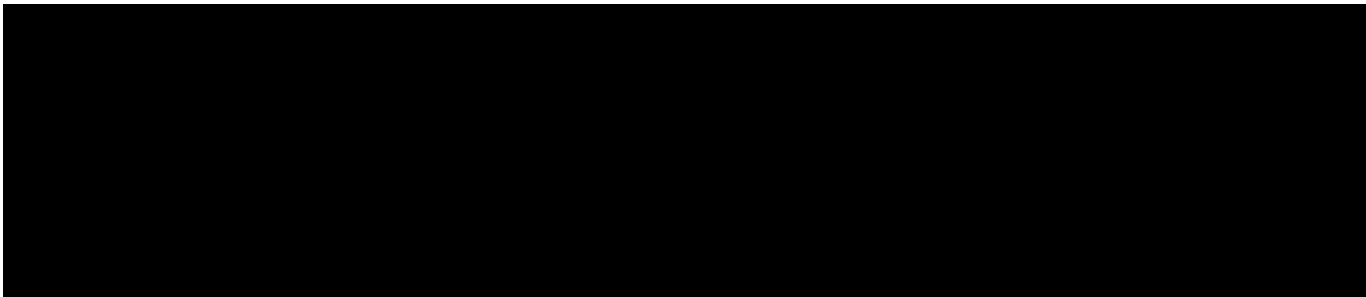
The vast majority of US military tritium comes from Ontario Hydro, the TVA has long been unable to supply the demand.

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