

Low-Enriched Uranium for Naval Reactors

Congress is considering whether to continue research that started in 2016 into using low-enriched uranium (LEU) to replace weapon-grade highly-enriched uranium (HEU) to fuel naval nuclear propulsion reactors. Such a switch would reduce risks of nuclear proliferation and avoid the need to restart production of weapons-grade uranium for the first time since 1992.

Rapidly Closing Window for LEU R&D

The United States halted HEU production for all purposes in 1992, and the stock of HEU from excess Cold War warheads is [projected](#) to satisfy the U.S. Navy's needs until only 2060. The National Nuclear Security Administration (NNSA) is already [arguing](#) that a new HEU enrichment facility is needed before the current HEU stockpile runs out. There will be a high price tag in any event. The question will be whether it pays for a HEU or LEU fabrication facility.

The question of the next generation fuel is becoming acute because Congress already has begun authorizing funding for the design of the next generation of U.S. attack submarines. In order to design those submarines to accommodate an LEU life-of-ship reactor, which may well be larger than an HEU reactor, several years of research and development must first be completed. In a 2014 [report to Congress](#), the U.S. office of Naval Reactors estimated the R&D of Navy LEU fuel would require "10 to 15 years," a schedule fleshed out in a 2016 [report to Congress](#). Congress has funded such research on a bipartisan basis every year [since 2016](#).

An Effective Fuel Source for Naval Propulsion

In its 2016 [report to Congress](#), the U.S. Office of Naval Reactors made it clear that LEU fuel could meet the rigorous performance requirements for naval reactors. Other countries already have made the transition to LEU-fueled submarines. France made the conversion quietly around 1996 with no reported effect on their submarine forces. China is also believed to use LEU fuel for naval propulsion. The ongoing U.S. research program could determine if the life-of-ship core requirements for U.S. submarines could be met with LEU fuel.

A Better Option than HEU

Using HEU fuel for naval reactors increases the dangers of nuclear-weapon proliferation and nuclear terrorism. Since the 1970s, the United States has led a global transition from HEU to LEU fuels in many types of reactors. A transition of Navy nuclear fuel to LEU would support the United States' goal of minimizing the production and availability of HEU, which is the easiest path to a nuclear weapon. The naval propulsion "loophole" allows states to exempt naval fuel from international monitoring, which could drastically limit the IAEA's ability to catch diversion of naval HEU to a nuclear weapons program.

The new trilateral AUKUS pact, under which the U.S. and UK would provide Australia with nuclear submarines fueled with weapon-grade uranium, adds a new element to the debate. The promised eight submarines would require export of about four tons of HEU, sufficient for at least 160 nuclear weapons, unless the U.S. develops Navy LEU fuel. Such export of HEU submarines would undoubtedly embolden other countries to go down the same path, magnifying proliferation risks. [Iran](#) already has used this example to justify its own production of HEU.

Official Reports to Congress on HEU Fuel Alternatives

In a [July 2016 report to Congress](#), the Office of Naval Reactors stated that, "Having the option to use an LEU fuel system could have positive implications from a national security standpoint by creating a practical

alternative to HEU reactors...The advanced LEU fuel system concept has the potential to satisfy the energy requirements of an aircraft carrier without affecting the number of refuelings.”

In a [November 2016 report](#), the JASON science advisory panel added that it might be possible to use LEU fuel also in future attack and ballistic missile submarines, stating that, “This scenario achieves the nonproliferation goal of eliminating use of HEU, and it could do so in the 2040 time frame.”