NUCLEAR PROLIFERATION
PREVENTION PROJECT

April 13, 2023

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1955 Fremont Ave.
MS 1235, 83415-1222
Via email: MCRE@id.doe.gov

Re: Proposed Idaho Reactor (MCRE) Violates U.S. Nonproliferation Policy of HEU Minimization

Dear Ms. Amos,

This submission responds to the March 16, 2023, announcement by the Department of Energy (DOE) of the public comment period for the "Draft Environmental Assessment (EA) for the Molten Chloride Reactor Experiment (MCRE) Project at the Idaho National Laboratory" (DOE/EA-2209, Revision 0). This submission is filed in a timely manner, prior to the deadline of April 14, 2023.

The EA is deficient in ignoring the significant environmental consequences that could result from a central aspect of the proposed action – the use in this new research facility of fuel containing more than 600 kilograms (kg) of nuclear weapons-grade, 93%-enriched, highly enriched uranium (HEU) – which would violate 45 years of U.S. government nonproliferation policy and practice, thereby increasing risks of nuclear proliferation and nuclear terrorism that could have catastrophic environmental consequences.

Since 1978, the U.S. government has avoided building new research reactors using HEU fuel, has opposed other countries doing so, and has refused to export HEU fuel for any such new reactors – on grounds that the resulting HEU commerce would increase risks of nuclear proliferation and nuclear terrorism that could threaten U.S. national security.[1] A guiding principle of this U.S. HEU minimization policy has been to avoid exceptions, on grounds that if any country were granted an exception for a facility, then other countries would demand exceptions too, potentially unravelling the policy. That is why, even though the U.S. government's original goal was to reduce foreign use of HEU, the policy was first implemented by converting two U.S. research reactors from HEU fuel to low-enriched uranium (LEU) fuel that is unsuitable for nuclear weapons. In the 1990s, the U.S. government did consider building one new research reactor with HEU fuel, the Advanced Neutron Source at Oak Ridge National Laboratory, but as reported in 1995, "opposition to the use of highly-enriched uranium in the reactor's core led to its cancellation."[2]

[1] Alan J. Kuperman, "Nuclear Nonproliferation via Coercion and Consensus: The Success and Limits of the RERTR Program (1978–2004)," in *International Cooperation on WMD Nonproliferation*, ed. Jeffrey W. Knopf (Athens, GA: University of Georgia Press, 2016): 46-71.

[2] Peter Rodgers, "US cancels another megaproject," *Physics World* 8, 3 (March 1995), p. 5.

The U.S. government has since expanded the ban on HEU fuel to nearly all new nuclear facilities. In 2012, the DOE announced that new medical-isotope production facilities must avoid HEU.[3] Similarly, in 2019, the U.S. Army announced that its future mobile nuclear power reactors must avoid HEU fuel.[4] Indeed, in recent decades, the U.S. government has permitted only two exceptions to the ban on new reactors using HEU fuel. One occurred in 2018, when NASA tested a microreactor fueled by 30 kg of 93%-enriched HEU for barely one day (28 hours),[5] which triggered so much concern that the White House later issued a Presidential Memorandum declaring that future space reactors should avoid HEU fuel.[6] The other exception, on national security grounds, is new Navy propulsion reactors that continue to be fueled with HEU while NNSA researches the feasibility of using LEU.[7]

The EA indicates that the amount of HEU for the proposed facility is enormous, exceeding 600 kg, thereby magnifying the consequences for U.S. nonproliferation policy. On p. 13, the EA states that, "each furnace is limited to 9 kg of HEU per batch. With these restrictions, it is anticipated that a minimum of 72 batches (runs) of the synthesis process will be needed." This implies that at least 648 kg (i.e., 72 x 9) of HEU will be utilized in fuel for the facility. The U.S. Nuclear Regulatory Commission requires that the highest security (Category I) be applied to as little as 5 kg of HEU,[8] which according to independent experts is sufficient for a nuclear weapon.[9] This means the proposed action in the EA would utilize enough HEU for more than 100 nuclear weapons, thereby creating a dangerous precedent and a potential excuse for other countries to produce large quantities of weapons-grade uranium, which subsequently could be diverted or stolen for nuclear weapons.

The draft EA ignores entirely how the proposed fuel would contradict and undermine longstanding U.S. nonproliferation policy, and thus fails to assess the resulting increased risks of nuclear proliferation and nuclear terrorism, which could have significant consequences for human health and the environment. If the United States were to build this new research facility for commercial nuclear power, using over 600 kg of weapons-grade HEU, other countries would demand the right to produce such amounts of HEU for similar purposes, which would increase the risk of states and terrorists acquiring and using nuclear weapons. Even a single nuclear weapon of World War II-era design, detonated in an American city, could kill hundreds of thousands of people and compel evacuation of millions more.

Accordingly, DOE must prepare an Environmental Impact Statement (EIS) that includes assessment of such potentially significant impacts on human health and the environment. Moreover, the EIS must examine alternatives that would avert or reduce these significant impacts on human health and the environment, by avoiding HEU entirely, which the EA fails to do. Since the MCRE is intended to produce

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[3] U.S. Department of Energy, "NNSA's Molybdenum-99 Program: Establishing a Reliable Domestic Supply of Mo-99 Produced Without Highly Enriched Uranium," https://www.energy.gov/nnsa/nnsas-molybdenum-99-program-establishing-reliable-domestic-supply-mo-99-produced-without (accessed April 12, 2023).

[4] U.S. Secretary of Defense, "Request for Solutions: Pele Program Phase 1," May 2019.

[5] David I. Poston, Marc A. Gibson, Thomas Godfroy, and Patrick R. McClure, "KRUSTY Reactor Design," *Nuclear Technology*, 206 (2020), pp. S13-S30.

[6] White House, "Space Policy Directive–6, National Strategy for Space Nuclear Power and Propulsion," December 16, 2020. Alan J. Kuperman, "Avoiding HEU in Space Reactors: An Emerging Consensus," in *NETS - 2021, Nuclear and Emerging Technologies for Space, Conference Proceedings* (American Nuclear Society, Aerospace Nuclear Science and Technology Division, 2021).

[7] Letter from U.S. Congress to the Secretary of the Navy and the NNSA Administrator, January 27, 2023, https://sites.utexas.edu/nppp/files/2023/01/HEU-naval-Foster-Merkley-letter-2023-Jan.pdf.

[8] "Categorization of Nuclear Material," 10 CFR 110, Appendix M, https://www.ecfr.gov/current/title-10/chapter-I/part-110/appendix-Appendix%20M%20to%20Part%20110.

[9] Thomas B. Cochran and Christopher E. Paine, "The amount of plutonium and highly-enriched uranium needed for pure fission nuclear weapons," Natural Resources Defense Council, 1995.

experimental findings to facilitate a future Molten Chloride Fast Reactor (MCFR), which itself intends to avoid HEU fuel for both its demonstration-size and full-size facilities,[10] it should be possible to redesign the MCRE to avoid HEU fuel too, for example by increasing the amount of fuel.

In conjunction with preparation of the EIS, DOE also should prepare a Nonproliferation Impact Assessment of the proposed action and its alternatives. Previously, DOE has prepared such assessments in at least six instances in conjunction with an EIS on a proposed action that, like the MCRE, raises potential nuclear proliferation risks.[11] As DOE officials explained in 2009, such an assessment "draws on nonproliferation objectives of the U.S. Government as the basis for a policy evaluation of proliferation risk" of the proposed action, during DOE's preparation of the EIS.[12] As DOE elaborated in 2000 in response to members of Congress, such an assessment can "provide additional pertinent information to the Secretary of Energy so that he may make an informed decision with respect to the alternatives presented in the" EIS.[13] As DOE further declared in 1998, such an assessment "fulfills the DOE commitment to assess the nonproliferation aspects of the various technology options the Department is considering."[14] To honor that solemn obligation to the American people, DOE must not issue a decision on the proposed action, nor complete an EIS on the proposed action, prior to formally assessing the nuclear proliferation risks of the proposed action and its alternatives.

Thank you for this opportunity to provide public comment.

Sincerely,

Alan J. Kuperman
Coordinator, Nuclear Proliferation Prevention Project

[10] Jeff Latkowski, "TerraPower's Molten Chloride Fast Reactor (MCFR)," National Academies meeting on Merits and Viability of Different Nuclear Fuel Cycles and Technology Options and the Waste Aspects of Advanced Nuclear Reactors, February 22, 2021, p. 4, https://www.nationalacademies.org/documents/embed/link/LF2255DA3DD1C41C0A42D3BEF0989ACAECE3053A6A9B/file/DB0D308269688B2BD7B1AF60BAA143D48890C2DE80BB?noSaveAs=1.

[11] U.S. Department of Energy, Office of Arms Control and Nonproliferation, "The National Ignition Facility (NIF) and the Issue of Nonproliferation," December 1995, https://www.osti.gov/biblio/187216. U.S. Department of Energy, Office of Arms Control and Nonproliferation, "Nonproliferation and Arms Control Assessment of Weapons-Usable Fissile Material Storage and Excess Plutonium Disposition Alternatives," DOE/NN-0007, January 1997, https://www.osti.gov/biblio/425259. U.S. Department of Energy, Office of Arms Control and Nonproliferation, "Nonproliferation Impacts Assessment for the Management of the Savannah River Site Aluminum-based Spent Nuclear Fuel," DOE/NN-99001919, December 1998, https://www.osti.gov/biblio/319653. U.S. Department of Energy, Office of Arms Control and Nonproliferation, "Nonproliferation Impacts Assessment for the Treatment and Management of Sodium-Bonded Spent Nuclear Fuel," DOE/EIS-0306D, July 1999. U.S. Department of Energy, Office of Arms Control and Nonproliferation "Nuclear Infrastructure Nonproliferation Impact Assessment," DOE/NE-0119, September 2000. U.S. Department of Energy, Office of Nonproliferation and International Security, "Draft Nonproliferation Impact Assessment for the Global Nuclear Energy Partnership Programmatic Alternatives," December 2008, https://curie.pnnl.gov/system/files/documents/not%20yet%20assigned/gnep_npia.pdf.

[12] M. Goodman, A. Scheinman, and J. Sprinkle, "A Nonproliferation Impact Assessment of the GNEP Alternatives," Los Alamos National Laboratory, LA-UR-09-03011, Proceedings of GLOBAL 2009, Paris, France, Paper 9476, September 6–11, 2009, p. 2.

[13] U.S. Department of Energy, "Final Programmatic Environmental Impact Statement: Accomplishing Expanded Civilian Nuclear Energy Research and Development and Isotope Production Missions in the United States, Including the Role of the Fast Flux Test Facility," EIS-0310, December 1, 2000, p. 2-182.

[14] DOE/NN-99001919, p. 1-4.