

May 30, 2023

The Honorable Jennifer M. Granholm  
Secretary of Energy  
U.S. Department of Energy  
1000 Independence Ave. SW  
Washington DC 20585

The Honorable Jill Hruby  
Under Secretary for Nuclear Security, and  
Administrator of the National Nuclear Security Administration  
U.S. Department of Energy  
1000 Independence Ave. SW  
Washington DC 20585

**Re: Proposed MCRE Reactor Violates U.S. Nonproliferation Policy of HEU Minimization**

Dear Secretaries Granholm and Hruby,

We, the undersigned experts on nuclear nonproliferation, urge you to reconsider the proposed Molten Chloride Reactor Experiment (MCRE) on the grounds that it would use fuel containing more than 600kg of 93%-enriched, weapons-grade, highly enriched uranium (HEU)<sup>1</sup> – enough for dozens of nuclear weapons – which would undermine the longstanding U.S. policy of HEU minimization, and thereby increase risks of nuclear proliferation and nuclear terrorism.

The U.S. government established its HEU minimization policy in the 1970s, in belated recognition that fresh or even irradiated HEU fuel could be used to make nuclear weapons by states or terrorists. Since then, at least 71 reactor facilities around the world have converted their fuel from HEU to low-enriched uranium (LEU), which is impractical for use in nuclear weapons.<sup>2</sup> The U.S. government also has opposed construction of any new research facility using HEU, whether foreign or domestic, on grounds that it would undermine the international norm and thereby encourage further use of HEU that would increase risks of nuclear weapons spreading to states and terrorists. Your department did consider constructing one new research reactor with HEU fuel three decades ago, but as reported in 1995, “opposition to the use of highly-enriched uranium in the reactor’s core led to its cancellation.”<sup>3</sup>

A molten chloride reactor does not require HEU fuel, as is clear from the published specifications for planned commercial and demonstration versions of this type of reactor that would use LEU fuel.<sup>4</sup> Thus, using HEU in the MCRE would be a convenience rather than a necessity. When other countries seek HEU fuel for reasons of convenience rather than necessity, the U.S. government on nonproliferation grounds refuses to supply the HEU and tries to block others from doing so.

Converting the MCRE design to use LEU fuel would increase significantly the size of the facility and the amount of fuel, thereby incurring a delay and increasing some costs. However, other costs for security could be reduced since the fuel would switch from Category I to II, lowering the physical protection requirements. Overall, a net cost increase would be likely, as in all prior conversions from HEU to LEU for existing and newly designed reactors, which U.S. policy consistently has justified on grounds of reducing risks of nuclear proliferation and nuclear terrorism.

Considering the grave harm that could be inflicted on U.S. nonproliferation objectives if the U.S. government violated its own longstanding policy of HEU minimization, we urge you to suspend further

work on the MCRE until your department's Nuclear Energy office develops an alternative LEU design. We further urge you to order the preparation of a Nonproliferation Impact Assessment that examines both the proposed, HEU-fueled MCRE, and an alternative LEU design. Previously, your department has prepared such assessments in at least six instances of proposed actions that, like the MCRE, entail potential nuclear proliferation risks.<sup>5</sup> As your department explained in 1998, such a study "fulfills the DOE commitment to assess the nonproliferation aspects of the various technology options the Department is considering."<sup>6</sup> If DOE were to proceed with an HEU-fueled MCRE, the damage to national security could exceed any potential benefit from this highly speculative energy technology.

Thank you for considering our concerns, and we look forward to your reply.

Sincerely,

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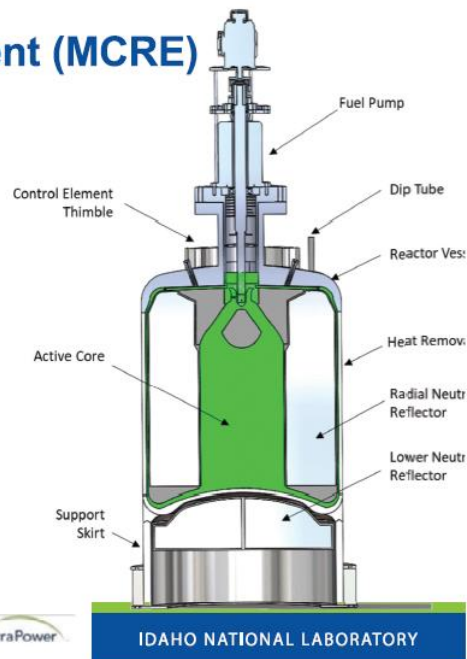
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Pranay Vaddi, Senior Director for Arms Control and Nonproliferation, National Security Council  
Rep. Chuck Fleischmann, Co-chair, Congressional Nuclear Security Caucus  
Rep. Bill Foster, Co-chair, Congressional Nuclear Security Caucus  
Sen. Dianne Feinstein, Chair, Appropriations Subcommittee on Energy and Water Development  
Sen. Ed Markey

## Molten Chloride Reactor Experiment (MCRE)

Parameter	MCRE
Rated Thermal Power	200 kW
Fuel Salt Mass Flow Rate Range	25-100 kg/s
Fuel $\Delta T$	10°C
Nominal Fuel Temperature	650°C
Design Temperature	700°C
Design Pressure	500 kPa
Fuel Salt Composition	NaCl-UCl <sub>3</sub> (67-33mol%)
Fuel Salt Mass	1225 kg
HEU Mass	630 kg
Heat Removal Method	Gas-Cooled Vessel



<sup>1</sup> Mark D. DeHart, "Multiphysics Modeling in Support of NASA Nuclear Thermal Propulsion Designs," Idaho National Lab, NL/MIS-22-69498, October 5, 2022, [https://inldigitallibrary.inl.gov/sites/sti/sti/Sort\\_63846.pdf](https://inldigitallibrary.inl.gov/sites/sti/sti/Sort_63846.pdf), Slide 36. Giuseppe Palmiotti, "Assessment of Nuclear Data Needs for Advanced Reactor Demonstrations: Application to the Molten Chloride Reactor Experiment (MCRE)," INL/CON-21-64838-Revision-0, Idaho National Laboratory, November 2021, p. 6. U.S. Department of Energy, Idaho Operations Office, "Draft Environmental Assessment (EA) for the Molten Chloride Reactor Experiment (MCRE) Project at the Idaho National Laboratory," DOE/EA-2209, Revision 0, March 2023, p. 13.

<sup>2</sup> Christina Nunez, "The ongoing effort to convert the world's research reactors," *Nuclear Newswire*, July 10, 2020.

<sup>3</sup> Peter Rodgers, "US cancels another megaproject," *Physics World* 8, 3 (March 1995), p. 5.

<sup>4</sup> 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/LF2255DA3DD1C41C0A42D3BEF0989ACAEC3053A6A9B/file/DB0D308269688B2BD7B1AF60BAA143D48890C2DE80BB?noSaveAs=1>.

<sup>5</sup> 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, <https://sites.utexas.edu/nppp/files/2023/04/NPIA-FFTF-2000-optimized.pdf>. 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](https://curie.pnnl.gov/system/files/documents/not%20yet%20assigned/gnep_npia.pdf).

<sup>6</sup> DOE/NN-99001919, p. 1-4.