



Thorium Energy Alliance

Stakeholder

*Concerned Experts in the Development of Thorium
For Power Products and Prosperity*

John Kutsch

Executive Director

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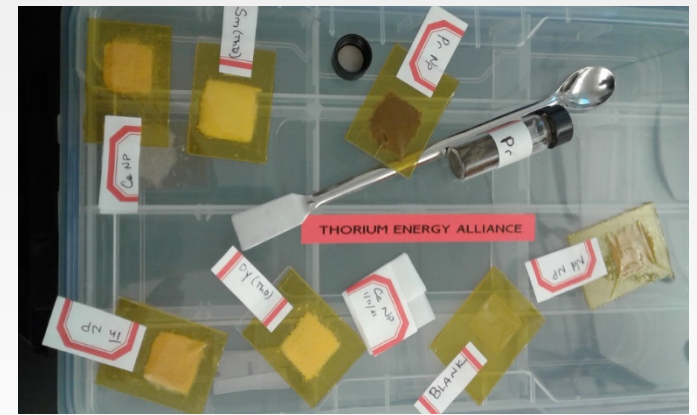
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About Thorium Energy Alliance (TEA)

- Exploring innovative uses of thorium for nuclear fuel and commercial uses
- Reviving established, realistic and novel handling solutions
- Supporting the work of Decision Makers



Report is Coming on Energy Law Language

It is under final review and will be delivered to congress shortly.

***Energy Act § 2001(b)(3):** The Secretary shall, after consulting with relevant entities, including National Laboratories, institutions of higher education, and technology developers, submit to Congress a report identifying any and all options for providing nuclear material, containing isotopes other than the uranium-235 isotope, such as uranium-233 and thorium-232 to be used as fuel for advanced nuclear reactor research, development, demonstration, or commercial application purposes.*

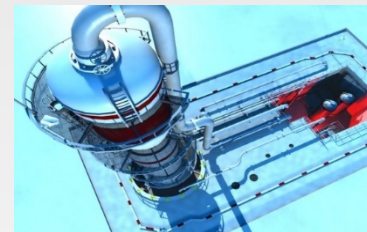
What The Report May Advocate For... That's Different than current policy

- **DOE can help industry solve the problem by *clearing the pathway***
 - Licensing & Handling
 - Safety and Security
 - Technology Demonstration
- **DOE funding sources are available, if scope can be tailored**
 - GAIN
 - ARPA-E
 - DOE iFOA

(if the policy against working with Thorium is changed)

Reviving Thorium Commercial Applications is Creating Markets for Thorium Fuels

- **Super Alloys**
(Mag Thor, Thor Chrome)
- **Cancer treatments**
(Bismuth 213 & Actinium 225)
- **Superconducting Magnets**



- Mag-Thor
- Mg-Th-Zr
- Mg-Th-Zn-Zr
- Mg-Ag-Th-(rare earth) - Zr

- **Catalysts**
(Cracking hydrogen and petroleum)
- **Advanced Commercial Devices**
(Lighting, Optics, and Magnetrons)
- **Coatings and Treatments**

Terrapower has been Commercializing Thorium derived Nuclear Medicines

Bismuth 213 & Actinium 225

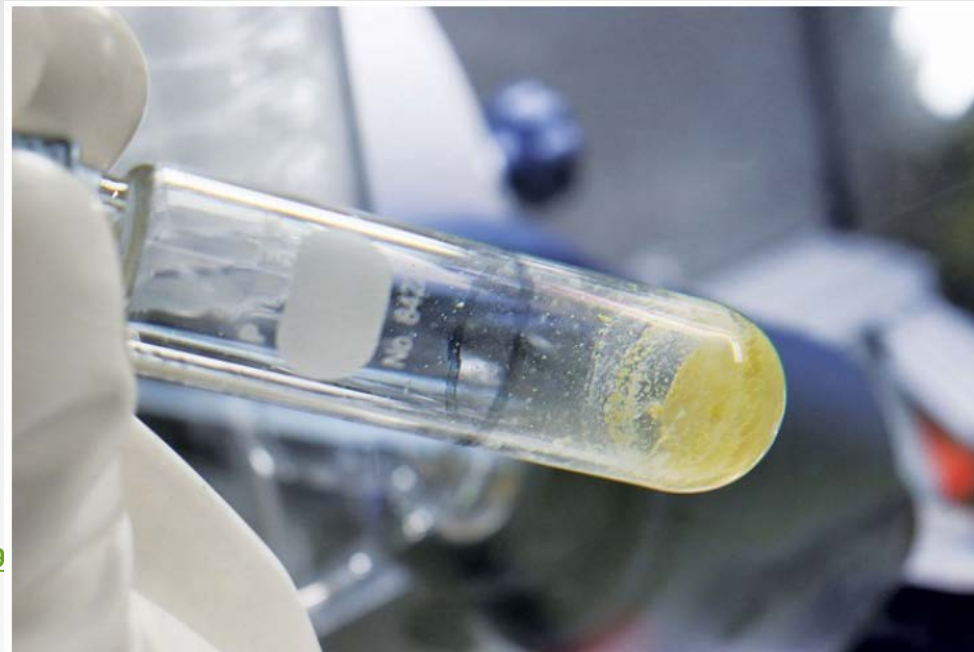
[Chemical & Engineering News: Nuclear Chemistry](#)

Mining medical isotopes from nuclear materials

Actinium-225 is in demand. Nuclear innovation company TerraPower hopes nuclear materials can supply it

by Wudan Yan, special to C&EN


July 27, 2020 | A version of this story appeared in [Volume 98, Issue 29](#)



Credit: Isotek

TerraPower plans to mine nuclear waste to capture actinium-225 for cancer clinical trials. This vial contains traces of actinium within a mixture of thorium and uranium.

However, there are related U233 issues



curio

Save Uranium-233 to
Support American
Energy Independence
& National Security

A Report by Curio Solutions, LLC

ABSTRACT

Uranium-233 is a special isotope of uranium that is not found in nature. Besides possessing unique nuclear properties that enable a cleaner and vastly more efficient fuel cycle, U-233 is the progenitor of isotopes that are effective in fighting cancer. The U.S. possesses a globally unique inventory of U-233 at Oak Ridge National Laboratory – both by quantity and quality. This inventory is currently slated for destruction by the DOE. The inventory should be preserved to provide the initial seed needed to power thorium fuel cycle reactors and to harvest meaningful quantities of radioisotopes for targeted cancer therapy. As the U.S. is destroying this material, the Chinese government is vigorously pursuing U-233 fuel cycle reactors.

- There is an ongoing effort to preserve clean U-233, so that the U-233 can be used for studying fuel cycles for MSR, as well as therapies and future medicines.
- Not preserving the supply may lead to a monopoly on targeted alpha therapy.

Why Thorium should be used as a Fuel for Molten Salt Reactors

1. Thorium Diversifies fuel supply, especially for countries like China, India & Indonesia that have extensive Thorium resources and limited Uranium
2. Th provides a great level of political domestic fuel security.
3. Shipping containers for Thorium exist, unlike HALEU
4. Thorium is separated during rare earth processing – it is a free by-product.
5. Thorium does not need to be enriched in an energy intensive process .
6. Thorium is easily handled and has a long history of industrial uses and therefore handling it safely is well understood.
7. Thorium narrows the parameter for MSR design and increases safety margins.
8. Thorium works well with Low Enriched Uranium, HALEU, Pu
9. In an MSR, Th can be added to the fuel salt over time to manage fuel behavior
10. Proliferation resistance



TOP 10

Thorium Enables Other Critical Technologies

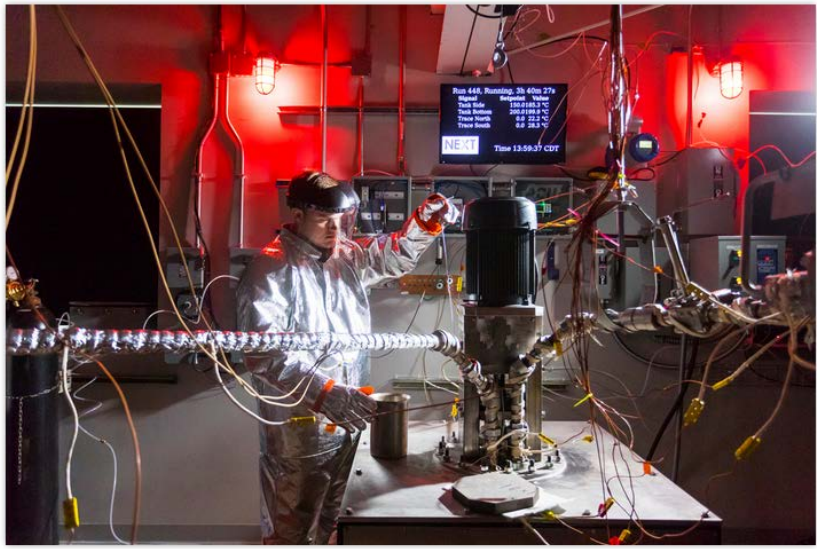
Note: Even if we do nothing with Thorium as an MSR Fuel
Or an Advanced Material,
A modern Domestic Thorium policy supports
A new USA based Rare Earth Metals Refining effort,
and thus renewable energy.

NEXT Lab (Abilene Christian University) is a Great Hope for Thorium MSR

NEXT Lab to lead \$30.5 million research collaboration

ACU News July 31, 2020 Academic News 4 Comments

ENLARGE



Undergraduate students research alongside faculty physicists, engineers and chemists on the molten salt test loop at Abilene Christian University's NEXT Lab. Photo by Jeremy Enlow / Steel Shutter Photography

NEXT LAB ADVANCES RELIABLE NUCLEAR ENERGY

ACADEMIC NEWS / ACU NEWS / RESEARCH

ENLARGE



ANEEL – a Solid Fuel Use for Thorium Will Pave Way for MSR Applications

The Solution: ANEEL Fuel

CCTE's advanced ANEEL fuel technology is a patent-pending combination of Thorium and HALEU.

Replacing existing uranium fuel in pressurized heavy water ("PHWR") and Canada Deuterium Uranium ("CANDU") reactors with ANEEL fuel:

- Reduces nuclear waste by **87.5%**
- Minimizes operating costs and fuel handling
- Minimizes the risk of nuclear proliferation
- Brings "Next-Gen" reactor technology benefits to current reactors

CCTE's ANEEL fuel resolves the core issues associated with nuclear power.

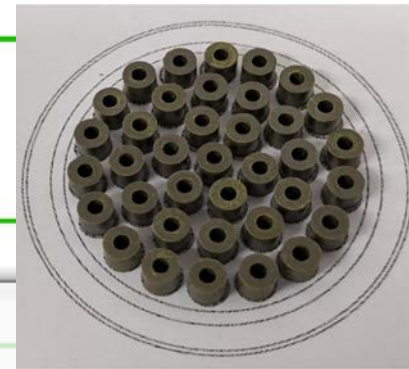
*ANEEL fuel has a very high burn-up
8x that of current PHWR/CANDUs fuel.*



Fuel Fabricated at TAMU – Testing beginning at INL



5



DOE Must Lead on Thorium Fuel Cycle



China Academy of Sciences LF1
Thorium Molten Salt Reactor, Sept. 2020

TMSR-LF1 (液态燃料钍基熔盐实验堆; "liquid fuel [thorium-based](#) molten salt experimental reactor") is a 2 MWt prototype [molten salt reactor](#) (MSR) currently under construction in an [industrial park in Minqin County,^{\[1\]}](#) in the province of [Gansu](#) in northwest China.^{[2][3][4]} Construction is expected to finish in August 2021, **with a test run by end of 2021.**^{[5][6]}

We have a chance to set the world standard for handling and using Thorium as a fuel and as an advanced material. The world is looking to the USA for guidance, or else they will start to look towards others for direction.

Economic competitors are making this a priority area of development.

Thorium is critical to the U.S. energy and economic future, and targeted DOE support will make a huge difference.

Thank you

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As an Alternate Nuclear Fuel and For Other Applications*

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