

Thorium isotopes in medicine



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Thorium molten salt reactors (TMSRs) offer significant potential for nuclear medicine as they open up efficient ways to produce life-saving isotopes. In projects such as the proposed research center in Bataan (Philippines) and Kenya, nuclear medicine is therefore a central research focus.

Here are the main medical isotopes and benefits listed in the document provided:

Important medical isotopes from thorium reactors

- **Actinium-225 (Ac-225):** This isotope can be produced directly in thorium MSR. It forms the basis for the so-called **Targeted Alpha Therapy (TAT)**.
- **Lutetium-177 (Lu-177):** Also produced in these reactors, it is used to treat neuroendocrine tumors and prostate cancer. Clinical studies have shown complete remission in some patients.
- **Technetium-99m (Tc-99m):** This isotope is used in over 80% of all nuclear medicine diagnostic procedures worldwide. While it is mostly extracted from uranium today, thorium reactors could enable more sustainable production

Advantages of thorium-based isotopes

The use of thorium for medicine offers specific therapeutic and environmental benefits:

- **Precision against cancer:** Targeted alpha therapy (TAT) with actinium-225 selectively attacks cancer cells while sparing the surrounding healthy tissue. This is especially effective for prostate, ovarian, and pancreatic cancer.
- **Fewer side effects:** Compared to conventional radiation therapy, TATs cause fewer unwanted side effects because the radiation remains extremely localized.
- **Sustainability and waste reduction:** The production of technetium-99m in thorium reactors could significantly reduce the amount of nuclear waste generated compared to conventional uranium processes.

Additional health benefits

In addition to direct cancer therapy, thorium reactors can indirectly promote public health by:

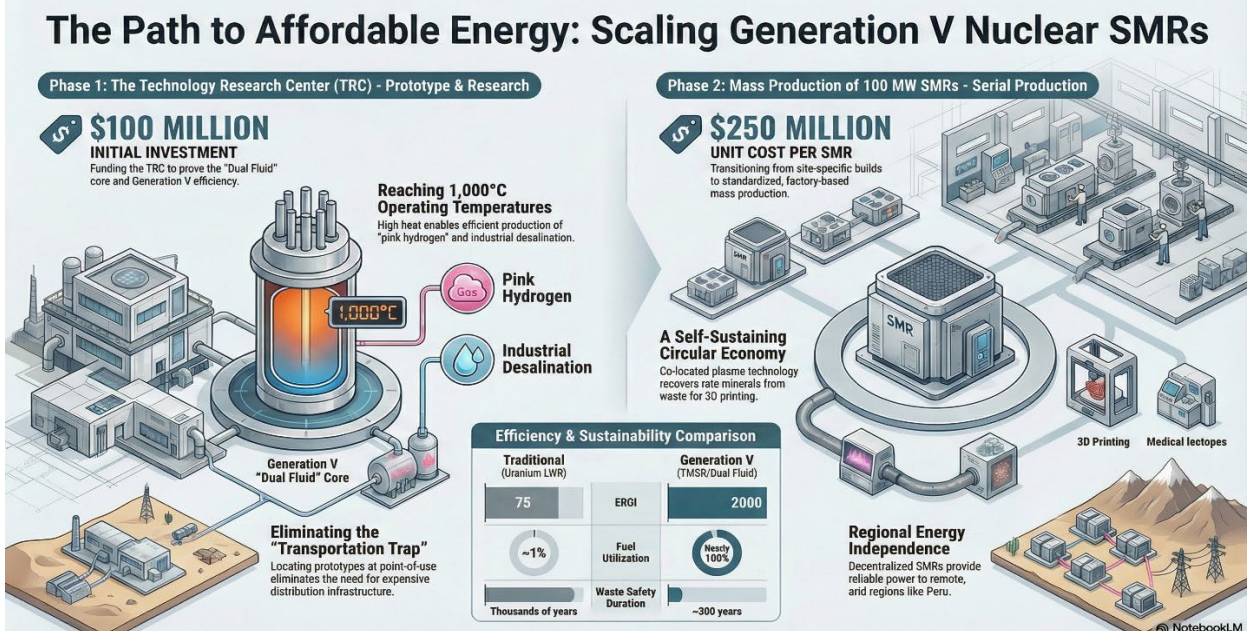
- Supplying energy for **desalination plants** to ensure access to clean drinking water.
- Reduce **air pollution** by replacing fossil fuels in energy production.
- *Factory production of SMRs lowers construction costs*
- *Isotope harvesting supply chains are established.*

Thorium isotopes in medicine

- Carbon Credits are applied to the output, penalizing fossil fuel competitors

The MSR vessel is much lighter/smaller
MSR looks like a chemical factory, not a nuclear plant
Smaller machinery footprint.

Aspect	Thorium Advantage	Utility
Energy Yield	Almost 100% fuel utilization	Affordable, CO2-free baseload energy
Isotope Yield	Direct extraction of Ac-225 / Lu-177	Highly effective cancer drugs
Bless you	Minimal collateral damage during therapy	Targeted destruction of metastases
Environment	Less long-lived waste	Protection of lungs and climate



Costs in Dubai: Incorporation

Total Base Setup ~50,000 – 150,000+EUR

Approvals and applications (energy sector)

In the energy sector, you will need additional permits from specialist authorities. These "external approvals" are the most time-consuming part.

Thorium isotopes in medicine

- **MOEI (Ministry of Energy & Infrastructure):** Required to work in the energy sector (regulation). Fees vary depending on technical complexity.
- **DEWA (Dubai Electricity & Water Authority):** If you want to generate electricity or feed it into the grid, technical approvals and licenses are required.
- **Dubai Municipality:** Environmental and Safety Certificates (HSE), especially for industrial facilities.
- **Costs for special permits:** Plan an additional 20,000 to 50,000 EUR for this, depending on whether you only offer advice or build infrastructure.

Feasibility Study

A professional study for the energy sector (e.g. thorium, solar or hydrogen) is often a prerequisite for banks and authorities in Dubai.

- **Standard study:** 20,000 – 45,000 EUR (market analysis & financial model).
- **Complex technical study:** 50,000 – 120,000+ EUR (incl. technical simulations, site inspection and detailed risk analysis).

As Dubai (UAE) aims to become a global hub for biotechnology and advanced energy, a feasibility study for isotope production (Ac-225, Lu-177) combined with thorium technology is a strategically smart move.

Hiring an expert consultant: In Dubai, you often need certified consulting firms that are recognized by the authorities for such studies.

Pre-consultation with the FANR: Before investing large sums of money, it is advisable to have an informal meeting with the regulatory authority to check the basic approvability of the thorium concept in Dubai.

Costs here are from 2 million EUR to be paid.

Total planned as required approx. 3 million euros in the short term, as the capital insurance of the Insurance of Scotland accompanies and 15 million liability capital of EcoSol LTD builds up the infrastructure.

Enormous health gain, which not only generates profits here, but also brings life-saving technology with it, and that worldwide.

ROI after 24 months of build-up, assuming a quick start, is 36-60 months.

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The medical miracle weapon: thorium-227

*In oncology, thorium-227 is considered a beacon of hope for so-called **alpha immunotherapy**.*

- **Precision strikes against cancer:** Thorium-227 emits alpha radiation. This has a very short range (only a few cell diameters), but an enormous energy.
 - **The mechanism:** The thorium is coupled to antibodies that dock specifically to cancer cells. When the thorium decays, it destroys the DNA of the tumor cell without causing massive damage to the surrounding healthy tissue.
 - **Potential:** It could save thousands of lives suffering from metastases (e.g. prostate cancer or lymphoma) that were previously difficult to treat.
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2. Clean energy: preventing air pollution

The greatest lever for saving lives lies in the energy industry. Thorium reactors (molten salt reactors) are considered safer than conventional uranium reactors.

- **Avoiding air pollution:** According to studies by NASA and other institutions, nuclear power has already prevented millions of deaths by replacing fossil fuels. Thorium could accelerate this effect, as it is more abundant and politically acceptable.
- **Safety profile:** Thorium molten salt reactors operate under normal pressure and have a "freeze protection". A worst-case scenario like the one in Chernobyl or Fukushima is almost impossible from a physical point of view.
- **Numbers:** It is estimated that the global switch to clean energy sources (to which thorium could contribute) could prevent up to **7 million premature deaths** from air pollution annually.