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**Committee:** United Nations Environment Program

**Issue:** The Potential of Thorium Nuclear Plants

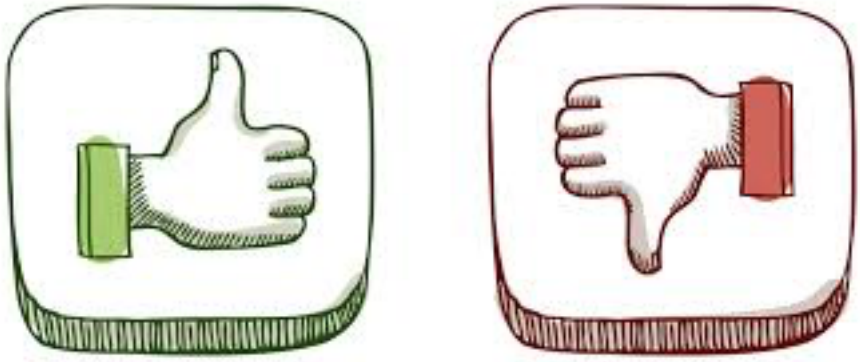
Thorium is a slightly radioactive metal that was discovered back in 1828 by a Swedish chemist. It has been proposed as a strong source of nuclear power. Moreover, thorium has been suggested as a potential, feasible replacement of uranium and plutonium which are currently being used. One of the major advocates to the scheme of using thorium is the country, India. Considering the fact that India has more thorium than uranium, it has been a proponent in expanding technologies that use the nuclear power of thorium.

However, why thorium? Thorium has certain characteristics in which emphasize its potential use in thorium nuclear plants. One example is the fact that thorium is considered to be more plentiful on earth than uranium; therefore, the ample amounts will be able to sustain the large , increasing, demand of power resources by all communities worldwide. Thorium is 3 times more abundant than uranium.

**Estimated world thorium resources**[1]

| Country | Tonnes |
|---|---|
| India | 846,000 |
| Brazil | 632,000 |
| Australia | 595,000 |
| USA | 595,000 |
| Egypt | 380,000 |
| Turkey | 374,000 |
| Venezuela | 300,000 |
| Canada | 172,000 |
| Russia | 155,000 |
| South Africa | 148,000 |
| China | 100,000 |
| Norway | 87,000 |
| Greenland | 86,000 |
| Finland | 60,000 |
| Sweden | 50,000 |
| Kazakhstan | 50,000 |
| Other countries | 1,725,000 |
| **World total** | **6,355,000** |

The following figures source is *http://www.world-nuclear.org/information-library/current-and-future-generation/thorium.aspx*. The data in the table is taken from the Uranium 2014: Resources, Production and Demand, OECD Nuclear Energy Agency and the International Atomic Energy Agency. It presents an overview of the estimated number of thorium resources that are present today. However, it is important to make sure that there isn't an standard data of the thorium resources that is taken by intentionally. Also, the following estimation is in relation to uranium resources.



Main Advantages of the Usage of Thorium in Nuclear Plants:

All those reactors that rely on thorium for operating depend on a fuel cycle called the Thorium-Uranium (Th-U) fuel cycle. The majority of already existing nuclear reactors use a lot of uranium (U-235) or plutonium (Pu-239) as fuel (in the Uranium-Plutonium cycle), and only a handful have already used thorium. Recently, designs that depend on thorium are being taken into consideration. According to an article presented on the "What is Nuclear" website, "Thorium cycles exclusively allow thermal breeder reactors , as opposed to fast breeders. More neutrons are released per neutron absorbed in the fuel in a traditional (thermal) type of reactor. This means that if the fuel is reprocessed, reactors could be fueled without mining any additional U-235 for reactivity boosts, which means the nuclear fuel resources on Earth can be extended by 2 orders of magnitude without some of the complications of fast reactors. Thermal breeding is perhaps best suited for Molten Salt Reaction." Also, Thorium is a radioactive element and it will last for a very long time because of its very long half-life (about 15 billion years). And finally, The Th-U fuel cycle doesn't irradiate Uranium-238 and that means that it doesn't produce big atoms like Plutonium, Americium, or Curium. These transuranics are the main health concern of long-term nuclear waste, and that means that the Th-U will be less toxic and dangerous.

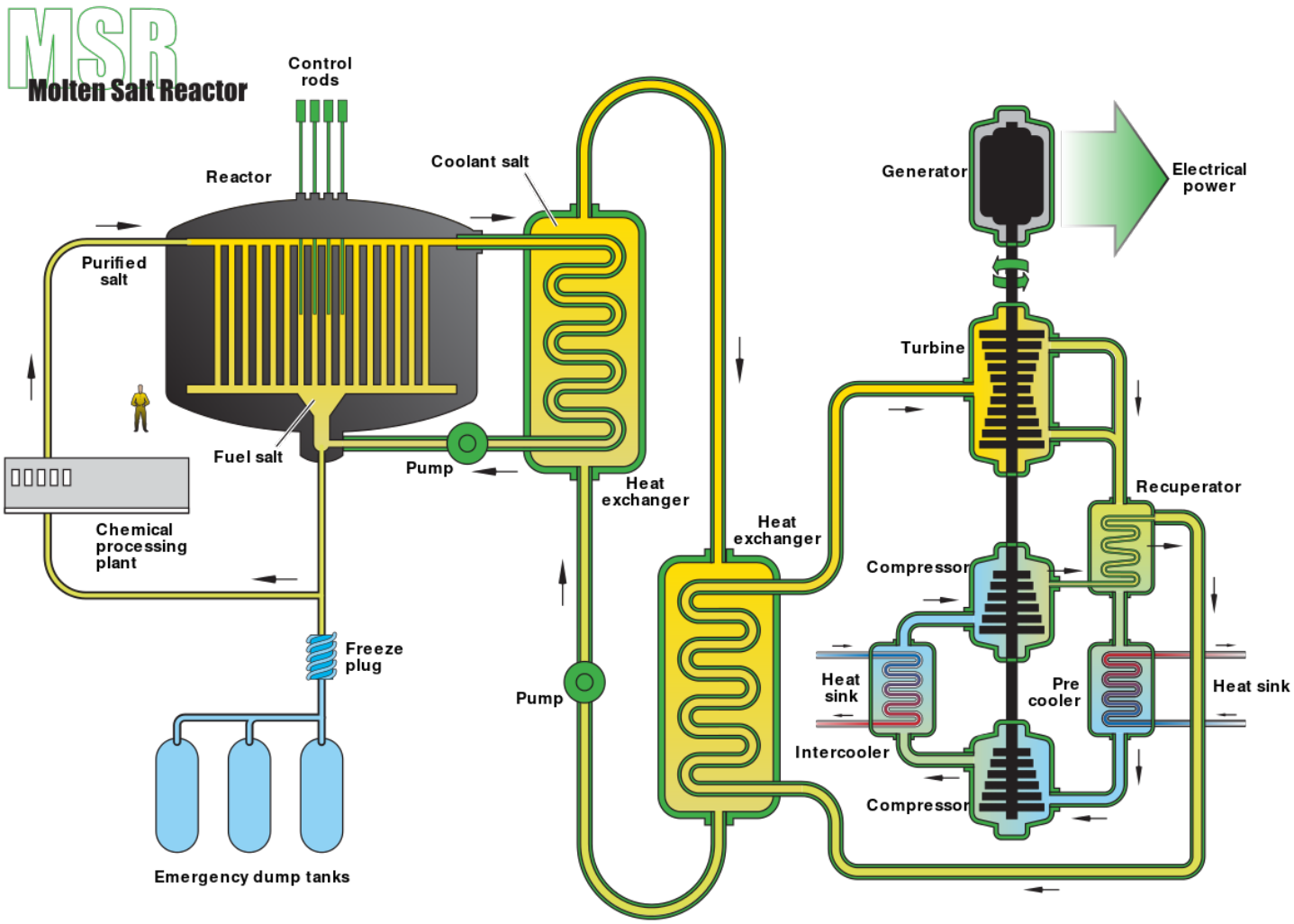
Disadvantages of the Usage of Thorium in Nuclear Plants:

1. Very little operational experience we have with thorium.
2. It is very difficult to change people and workers from the norm.
3. Thorium is slightly harder to get ready and prepare.
4. In the short term, if the thorium is irritated, it is more dangerously radioactive.
5. In a fast reactor, thorium doesn't work as good as in the U-Pu cycle.

Molten Salt Reactors:

One particularly practicability appropriate and fitting use for the thermal-breeding of the Th-U fuel cycle is the Molten Salt Reactor (MSR). These focus on the fuel to be present not into casts and pellets, but is rather dissolved in a tank of liquid salt. The chain reaction of thorium will therefore heat the salt which will be naturally converting through a heat exchanger to bring the heat out to a turbine which will be connected to a generator which will in turn make electricity. This will be a way to change the form of energy from nuclear to kinetic and finally to electrical.

**The following diagram will show an overview of MSR: (source: http://www.anthropoceneinstitute.com/science/generation/msr/)**



**Student Officer's Note:** When working on this topic, it is very important to see your country's point of view and how it has previously responded to thorium as a source of nuclear energy. This research report's main aim is to highlight the key points of what thorium is and its several advantages and disadvantages in that particular industry. As much as I would encourage all of you to read a lot about this topic, I would also like to encourage you to watch youtube videos about this particular issue since its a more practical, operational one. I will link a few videos that I have personally watched during my research on this topic and found very helpful and interesting.

- A ted talk about thorium in general and how it could be an alternative: https://www.youtube.com/watch?v=N2vzotsvvkw

- Nuclear energy explained in 3 parts:
  - https://www.youtube.com/watch?v=rcOFV4y5z8c
  - https://www.youtube.com/watch?v=HEYbgyL5n1g
  - https://www.youtube.com/watch?v=pVbLlnmxIbY