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THORIUM ENERGY AS AN ALTERNATIVE SOURCE OF POWER

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This research considers the issue of alternative sources of energy and their usage.

The topicality of the issue is supported by the current development of alternative sources of energy as a foreground tendency in power engineering due to their energy specifications, them being natural, reasonably-priced energy resources, and most importantly, them being safe and renewable.

The major concept touched upon in the article is thorium energy as an alternative source of energy.

In this research, we will study the specificity of thorium energy, its historical background, application, developmental prospects, its merits and demerits and enhancement prospects.

Looking back in to the history of thorium-based nuclear power it is possible to say that it is a comparatively new, under development kind of energy. The first experiments on thorium energy were carried out in the early 20s of the 20th century by two young professors E. Rutherford and R.B. Owens from the university in Montreal. The experimental data obtained showed thorium as an element highly potential for diagnostic purposes in medicine. However, due to its radioactivity, it was proved as an inefficient element with damaging post effects for people. Therefore, it was decided to try it as a source of energy and the results proved to be relatively positive.

Thorium is referred to as a naturally occurring mineral that holds large amounts of releasable nuclear energy similar to uranium. This nuclear-based element is special because it is easier to extract this energy completely than uranium due to some of the chemical and nuclear properties of thorium (see figure 1).

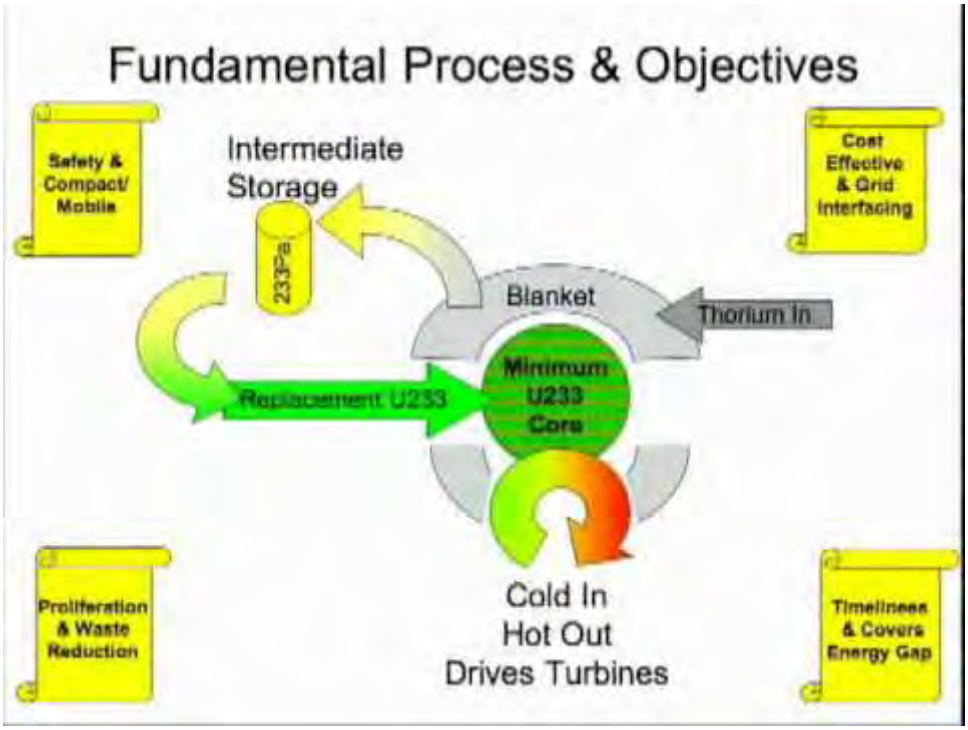

Fig 1 – Fundamental Process and Objectives of Thorium Energy Extraction

Among the countries having substantial deposits of thorium are Australia, the USA, Turkey, India, Brazil, Venezuela, which import thorium to the UK, China, France, the Check Republic, Russia, Canada, Israel and the Netherlands – the countries actively making use of it. It must be empha-

sized that such advanced countries including the USA and China find this energy type quite perspective in terms of its generation costs and its radioactive safety and that is why are tightly working on its development. For instance, it is estimated that the thorium reactor will provide enough power to produce 20 million liters per day at desalination plants. This is the equivalent amount that would power 3500 homes.

Many investigations have been done to develop thorium energy reactors. According to the World Nuclear Association there are seven types of reactors that can be designed to use thorium as a nuclear fuel. The five of them such as heavy water reactors (PHWRs), high-temperature gas-cooled reactors (HTRs), boiling (light) water reactors (BWRs), pressurized (Light) water reactors (PWRs) and fast neutron reactors (FNRs) have all entered into operational service at some point. The last two molten salt reactors (MSRs, LFTRs) and accelerator driven reactors (ADS) are still conceptual, although currently under development by many countries (see figure 2).

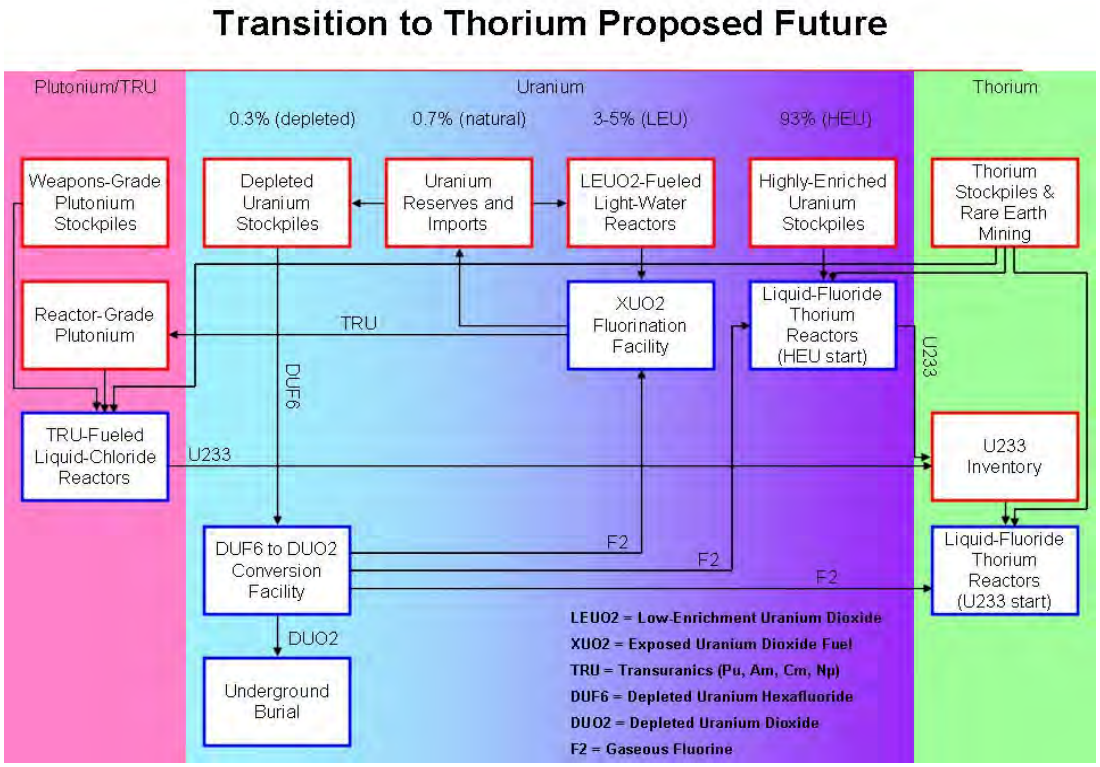

Fig 2 – Thorium Energy Based Future

There are a number of commercial advantages in using this energy source. Among the most the significant of them we can single out its worldwide abundance, low degree of radioactivity, high ecological compatibility concerning wastes, modularity, scalability, affordable price, and cost efficiency.

As far as the disadvantages of using this particular energy are concerned breeding in a thermal neutron spectrum, which is slow and requires extensive reprocessing, is named as its main drawback. The next problem is the necessity of significant and expensive testing and licensing work requiring business and government support. There is a higher cost of fuel fabrication and reprocessing in designs that use traditional solid fuel rods. Therefore, enhancement of power engineering technologies and equipment are also required.

Thorium reactors are more efficient and faster to build than conventional nuclear reactors and have no use in nuclear weapons. Thorium reactor is one-of-a-kind technology whose modular design can achieve output desired at significantly reduced capital and carrying costs. Thorium is readily available and can be turned into energy without generating transuranic wastes. Analyzing pluses and minuses mentioned above thorium as an energy source is represented as having a com-

petitive edge over uranium. Although further analysis must be done, feasibility of this project and reprocessing this energy is still open. Conferences with experts from as many as 32 countries are held, including one by the European Organization for Nuclear Research (CERN) in 2013, which focuses on thorium as an eco-friendly, nuclear waste free alternative energy technology (see figure 3).

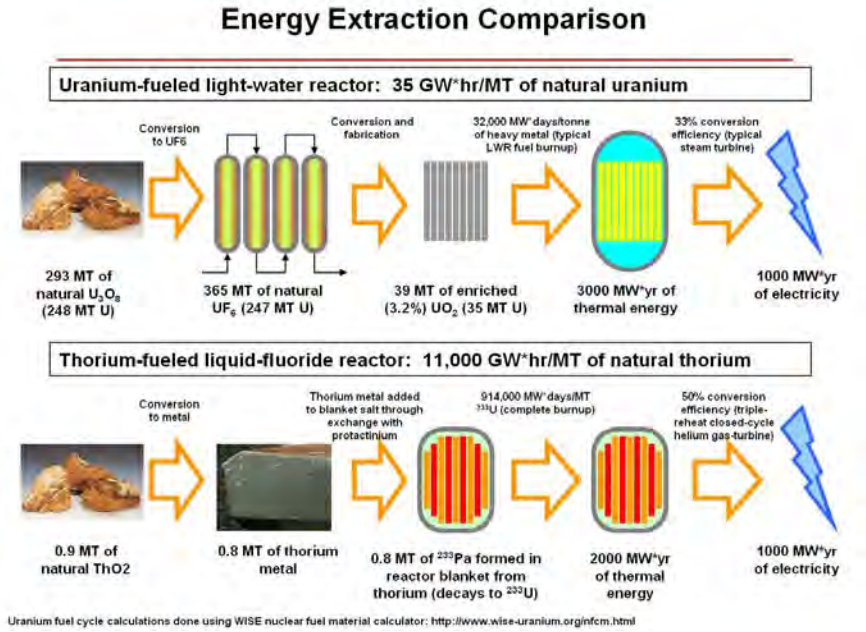

Fig 3 – Energy Extraction Comparison

Recognized expert Hans Blix, former head of the International Atomic Energy Agency, emphasizes that ‘the thorium option offers the world not only a new sustainable supply of fuel for nuclear power but also one that makes better use of the fuel's energy content’.

Summing up all the facts analyzed in the research we define thorium energy as a very promising and advanced energy type. All the advantages pointed out make it an absolutely indispensable energy source of the future.

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THE POTENTIAL OF ALTERNATIVE ENERGY SOURCES

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Nowadays energy security is attracting much attention among governments and the public. The first factor is the pressure of demand which continues to increase worldwide on the basis of population growth and the spread of prosperity. There are some 200 million new customers for commercial energy each year. The result is an increase of around 1.5% a year in oil demand and an increase of over 2% a year for natural gas. The second factor is that there is a growing requirement for trade because each of the four significant importers (the US, Europe, Japan and China) are all