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L&P Energy insights

Thorium-based Reactors: The Future of Nuclear Energy?

The old Nordic myths tell of Thor, the Norse god of thunder who rode across the sky in a goat-pulled chariot swinging his hammer and battling evil giants, thus creating lightning. The element thorium - a naturally occurring radioactive chemical element that was discovered by the Swedish scientist Berzeliuss - has the potential of generating nuclear energy in an almost equally environmentally friendly way. Lagerkvist & Partners believe that thorium could be a more efficient and safer real nuclear alternative in a post-Fukushima world.

It is the many beneficial properties of thorium that give it the potential to light up the future of the nuclear power industry. Thorium lacks non-fertile isotopes and thus cannot easily be converted to a weapon, meaning the risk of nuclear weapon contagion could be minimized compared to today's uranium based technologies. Thorium is also about as common as lead in the earth's crust, i.e. several times more abundant than uranium. What's more, if thorium is the fuel, then a Liquid Fluoride Thorium Reactor (LFTR) can be used. The LFTR has a passive cooling system and this means the risk of nuclear meltdown disappears; if the core overheats, a plug melts tipping the active fluid into a safety container to cool off. During the experiments with LFTR's run at the U.S. Oak Ridge laboratories, scientists would shut the reactor off on Fridays and fire it back up on Mondays – an impossible feat for uranium or plutonium based reactors! On top of this, thorium fuelled reactors produce much smaller quantities of the long-lived nuclear waste the world is struggling to safely store away.

If it has so many advantages, why weren't thorium based reactors developed in the first place?

This can be traced back to the days when nuclear power was first being developed in the U.S. In the 1940's, World War II is raging and at the Oak Ridge National Laboratory two reactors are being developed: one uranium-based, where the material can be enriched to create a weapon, and a LFTR, cleaner, safer, but worthless for bomb making. The U.S. wants The Bomb, and focused all resources into the uranium-based reactor. The rest, as they say, is history. Today, the whole U.S. defense machine, from atom bombs to nuclear submarines and aircraft carriers, is built around uranium-based technology. A powerful industry with the associated powerful lobby is deeply rooted, creating inertia and making the shift to thorium based reactors an unlikely prospect in the foreseeable future.

It is possible to imagine what a world with thorium-driven nuclear reactors could have looked like: no Three Mile Island, Chernobyl or Fukushima disasters, and fewer rouge states like North Korea and (soon) Iran with nuclear

weapons. The world would have access to safer, cleaner, nuclear energy. Also, since LFTRs can be built on a smaller scale than current reactors this would offer opportunities for developing countries with poor energy infrastructure.

However, the knowledge thorium based reactors still exists and is being developed. Several countries, including China and India, are working to produce commercial thorium-fuelled reactors. Whoever secures the intellectual property rights to commercial thorium reactors may control the nuclear industry in the 21st century. Just like the mythic Thor controls the thunder.

All countries and energy policy advisors would do well to look at thorium more closely. Contact Lagerkvist & Partners to learn more.

The story of thorium shows how also decisions taken can have unintended long term consequences. When laying out a strategy, be it for a market entry, an acquisition/divestment or other, mapping the possible outcomes is crucial to long term success. Lagerkvist and Partners has tool to help your organization make the right decisions for the long term. Contact us to learn more.