Thorium Energy Alliance News Letter 5.20.2021

Thorium Energy Alliance

Thorium Will Power The World

How Nuclear and Thorium will be Key in Green Steel & Decarbonizing our Industrial Partners

Steel is often a commodity we take for granted in our everyday lives, but it is critical to our modern life and is all around us in one fashion or another. Our cars are one obvious example, but think of all the reinforcing steel hidden in concrete roads and buildings, the towers and transformers that make up our electrical grid, to the stainless-steel appliances and cookware in our kitchens. We wouldn't be here without steel. The world average per capita use of steel is 229 kg (505 lbs) and as developing nations such as China and India modernize their way of life, increased steel production will have to meet these needs. Forming steel from iron ore has only seen modest gains in efficiency since the mid 1800s and even today the average ton of steel creates 1.9 tons of CO2. As steel production ramps up in the decades ahead, the industry will emit more and more CO2 emissions.

Just south of Chicago on the southern tip of Lake Michigan sits the Gary Steel Works that has been in operation since 1908. Image Public Domain National Archives at College Park, via Wikimedia Commons

---

How can Nuclear and Thorium provide a pathway forward for decarbonizing the iron and steel industry? The solution lies in the elegant chemical reduction of iron ore via pure hydrogen instead of the traditionally used fossil fuels. Named Hydrogen Direct Reduction of Iron (HDRI), the process uses hydrogen to directly reduce the iron oxide ores (Hematite and Magnetite) to pure metallic iron, which in turn is used to make steel. The only "waste" this technology produces is water. This Green Steel pathway only works when hydrogen can be produced at scale economically and using non-carbon energy sources. Enter nuclear power, the only carbon-free energy source that has the capacity and the reliability to make enough hydrogen to make HDRI practical. The current fleet of LWRs are built to provide electricity due to their low operating temperature (around 275-300 C), while our next generation of Molten Salt reactors will provide heat at double this temp (550-600 C) and provide even further efficiencies.

Making hydrogen, and other industrial processes, requires thermal energy and lots of it. By creating electricity from LWRs and turning that back into high temperature processes, a lot of energy is lost due to the inherent inefficiencies. A thorium-powered Molten Salt Reactor would minimize these losses through the reduction of steps needed to go from molten salt loops directly to process heat. These technologies aren't limited to hydrogen production alone; fertilizer, liquid transport fuels, marine propulsion, ammonia and other carbon-intensive industries would all benefit.

Due to the sketchy economics of renewables, our current fleet of LWRs are being underutilized and, in some horrific cases, being shuttered early due to "unprofitability." The carbon-free power can be optimized for green industrial applications. Through modest innovation and questioning entrenched standard industry practices, we can harness the power of our LWR fleet to see real and lasting decarbonization in our iron and steel production as well as other carbon-intensive industries. I'll briefly point out the resulting economic boom greentech advances would create through high-paying jobs, especially in steel production, where downsizing has been rampant. There are numerous examples of these "low hanging fruit" solutions across many sectors (see CORE-POWER below for one such example). Accepting industry-wide innovations and sustaining our current LWR fleet as we transition

into Next-Gen Reactor Technologies is the only realistic pathway towards reducing greenhouse gases.
A bright spot in the DoE's Office of Nuclear Energy and Office of Energy Efficiency and Renewable Energy (EERE) has seen these two offices combined forces to announce an upcoming funding opportunity to explore this synergistic approach to pairing nuclear-hydrogen-steel. There are real plans being made right now to begin actual change in industrial practices that can have realized effects on decarbonizing our environment. The TEA is proud to support these efforts as one real example of the untapped potential for Thorium to change our lives.

CORE-POWER: Propelling the Future of Shipping with MSRs.

London based CORE-POWER Ltd. is one such company developing a Marine Molten Salt Reactor for the marine industry through teaming with TerraPower, Southern Company, ORANO, and 3M. According to CEO Mikal Boe, "The modern modular molten salt nuclear reactor has potential to fulfill multiple applications in the maritime sector, including propulsion and floating power generation. It has the potential to power a commercial vessel for the entirety of its normal lifespan without refueling. Still, we must get to a point where ships move around without polluting the environment, and to do so we must embrace advanced atomic. Like it or not, there is no choice. Take a look at the ultimate origin of energy map and you can see for yourself."

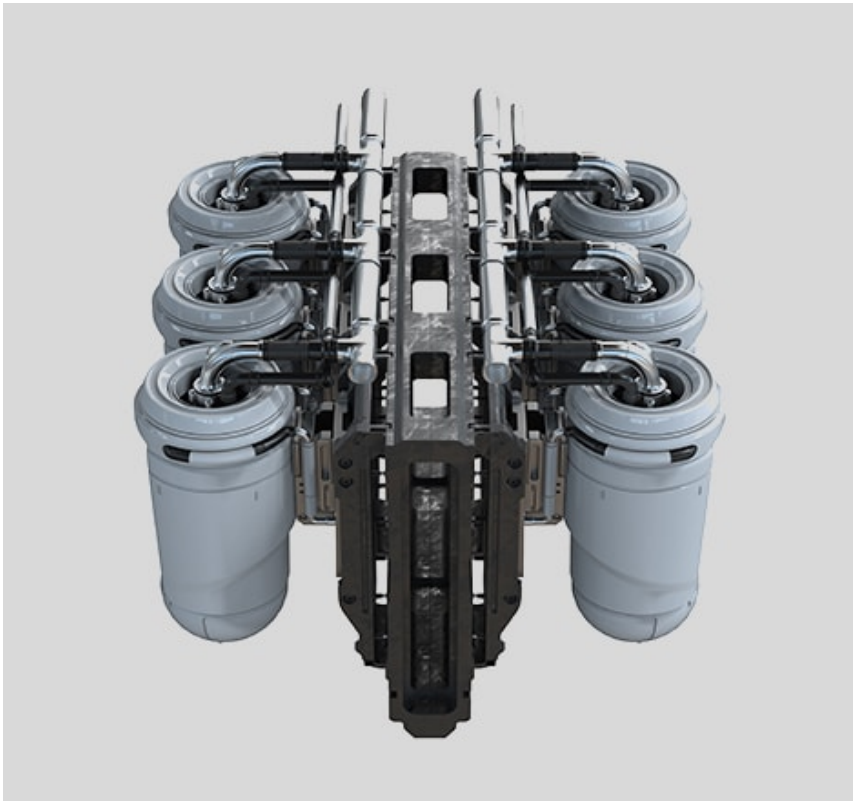

Illustration of Core Power's modular MSR concept. Image: Core Power

---

And finally, the **Thorium Museum Project** is back on track. After so many other projects have been sidelined since the start of the Pandemic, we are happy to say that the TEA is actively working towards promoting Thorium through exhibits as museums and interactive learning experiences open back up.

In the meantime, we can only take inspiration from the work done by the Alvin Weinberg Archive Collection, spearheaded by Ronnie Bogard at the Children's Museum of Oak Ridge. Please take advantage of this incredible resource.

**** WE ARE LIVE! ****

We have opened the Alvin Weinberg Archive Collection to the public. You are welcome to browse the collection and make exciting discoveries by clicking on:

WEINBERG ARCHIVE

Thanks to all the support from members new and old. We can't do this without you.
I hope to see you all at these upcoming events.

John Kutsch
Executive Director

Support the TEA