IS THORIUM THE ANSWER TO SAFE EDCONOMIC NUCLEAR ENERGY ?

The following “jottings” have been collected from a “blog” in the Daily Telegraph, and links from that A F Stobart 21st March 2011,

Perhaps Thorium will fulfill the promise if a Virginia-based company called Lightbridge (formerly Thorium Power) http://www.ltbridge.com/ lives up to the hype. Lightbridge was founded on the vision that the existing fleet of nuclear reactors would continue to function for decades to come, so its proprietary nuclear fuel assembly ”which features a small amount of uranium surrounded by a blanket of thorium”is designed to work in light water reactors, the most common

variety in service worldwide. Thorium-powered light water reactors reputedly produce less waste by volume that decay to relatively safe levels in just six to seven hundred years.

I understand that this is as a supplement to using salt reactors which are supposed to be more efficient. It therefore appears that development of this technology is not confined to China, but is being actively explored in India, USA and Russia so I am optimistic for the future.

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"Molten-Salt-Reactor Technology Gaps"
http://www.ornl.gov/~webworks/cppr/y2001/pres/124670.pdf

The paper concludes that many of the technology gaps revealed by the original Molten-Salt Reactor Experiment at Oak Ridge can be addressed using discoveries made in the 30 years since the experiment ended: this includes carbon-based materials that could be used for a high temperature version of the reactor, gas turbines (so no water/steam required, which would reduce the potential for accidents), and advances in reprocessing technology.
However, it does not discuss the greatest challenge of all - how a nuclear engineering company can make money out of services to such a reactor

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http://www.defence.pk/forums/china-defence/99304-safe-

nuclear-does-exist-china-leading-way-thorium.html

"Dr Cywinski is developing an accelerator driven sub-critical reactor for thorium, a cutting-edge project worldwide. It needs to Â£300m of public money for the next phase, and Â£1.5bn of commercial investment to produce the first working plant. Thereafter, economies of scale kick in fast. The idea is to make pint-size 600MW reactors.

"Typical, someone in the UK tries to innovate a new and advanced technology that could benefit the country and the state snuffs it out.

Professor Robert Cywinksi from Huddersfield University who anchors a UK-wide thorium team, said the residual heat left behind in a crisis would be “orders of magnitude less” than in a uranium reactor - thorium must be bombarded with

neutrons to drive the fission process. “There is no chain reaction. Fission dies the moment you switch off the photon beam. There are not enough neutrons for it continue of its own accord,” he said.

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Thorium is typically regarded as something of a nuisance to mining rare earths. The quantities needed are tiny. To give an idea thorium sells for something like $50kg, or $50,000 to keep one large reactor going for a year.That means that the average person's bill for the raw thorium for their electricity might be something like 5 cents - a year!Of course that doesn't meant that the power would be free, just that fuel

is an utterly insignificant part of the power costs from a thorium reactor.Overall we might hope to get the costs for early reactors down as near as possible to natural gas prices - but without the greenhouse gases, the need to frac to get the gas, or any possibility of running out.

Liquid
Fluoride
Thorium
Reactor

LFTR. Designed as an aircraft engine, a LFTR was run successfully for several years in the 1960's. LFTR, as a consequence, is 'throttleable' (an aircraft power source has to be).

For grid power generation, there are two requirements, which are 'baseload' capacity, and throttleable 'peak load' capacity.

Wind and solar are intrinsically incapable of providing neither! I say that as someone that is a huge fan of small scale wind and solar installations for off grid purposes. They have their place, but supplying Nations with their power requirements, 'ain't it'.

LFTR operates at atmospheric pressure, is a source of high grade heat (apart from other uses, think CO2 conversion into liquid fuels, etc), requires no expensive high pressure

containment, no 'decommissioning' (keep them running), does its own reprocessing, can reprocess all existing nuclear waste, turns the longest lived materials from 1,000's of years storage requirements to about 300 years, and reduces the volume of that to about a 35th of that from current reactors.

Not vulnerable to terrorist attack, the reason LFTR never got into production was its unsuitability for the production of weapons grade nuclear materials (like it or not, that was important during the Cold War).

For those who think it sounds too good to be true, check out the wiki page for the Oak Ridge Molten-Salt Reactor Experiment (MSRE):-

http://en.wikipedia.org/wiki/Molten-Salt_Reactor_Experiment

and the more general Molten-Salt Reactor page - http://en.wikipedia.org/wiki/Molten-salt_reactor

There is also a wiki article on all types of 'generation IV reactors', which would be expected to be operable around 2030 - http://en.wikipedia.org/wiki/Generation_IV_reactor

Could it be a simple case of vested interests in the current nuclear industry with sunk costs in uranium / water reactors not wanting to back a competitor? Apparently they make most of their cash from the sale of fuel rods, which molten-

salt reactors do not need.

See also Energy from Thorium and Welcome to the website STORMSMITH

AFS/as 21 March 2011 e & oe