Liquid Fluoride Thorium Reactor

Liquid: The fuel in this reactor is dissolved in molten salt. This liquid fuel form can be continuously circulated through the reactor, allowing complete burn up and continuous processing of the fuel with continuous addition of new fuel.

Fluoride: Fluoride salts are the most chemically stable substances on Earth. They don't change under high temperature or high radiation. They last forever. They lock up dangerous radioactive materials chemically and prevent them from being released to the environment, even in a severe accident. They stay liquid at high temperature but at normal pressure. This lets the reactor generate electricity efficiently and safely.

Thorium: Thorium is an abundant natural nuclear fuel, found in literally every country on Earth. It is so energy-dense that every nation can be energy-independent if it uses thorium. It can be completely burned in a LFTR, while less than 1% of uranium can be burned in a conventional reactor.

Reactor: This device is a nuclear reactor, but not like any reactor ever seen before. This is a closed system, extremely resistant to proliferation and producing a small amount of short lived, low toxicity waste which is benign within a few hundred years. It costs less to build, because it doesn't operate at high pressure and it costs less to run because thorium is a relatively cheap, plentiful fuel.

Conclusions

Thorium is a natural, abundant energy source of extraordinary energy density.

The technology to unlock the potential of thorium is real and proven—it needs to be engineered into a commercial product.

Small modular thorium reactors can be drop-in replacements for coal plants, Thorium energy can also be used to replace petroleum fuels and to desalinate seawater

Thorium energy cheaper than from coal will spread its benefits worldwide, without carbon taxes.

We need to move quickly to develop this energy source since environmental stresses are steadily growing worse.

Learn More

American Scientist, July/Aug 2010
Google “american scientist energy from thorium”

LFTR technology and social benefits
Google “aim high thorium”

Technical summary video
youtube.com “thorium in 10 minutes”

Blog, technical forum, and papers
energyfromthorium.com

YouTube Google Tech Talks
youtube.com “liquid fluoride thorium reactor”
youtube.com “thorium nuclear waste burning”
youtube.com “liquid fluoride reactor idea”

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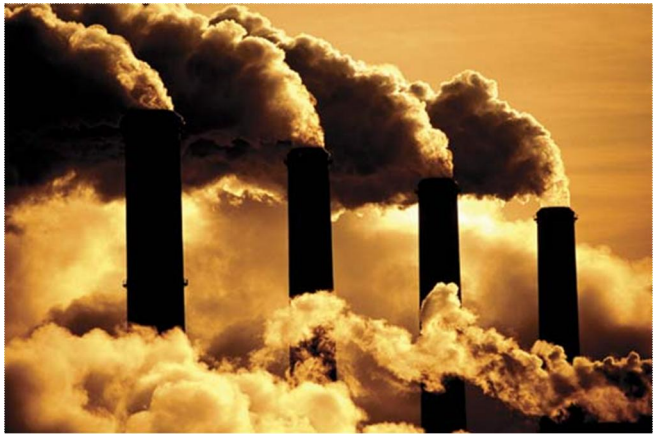
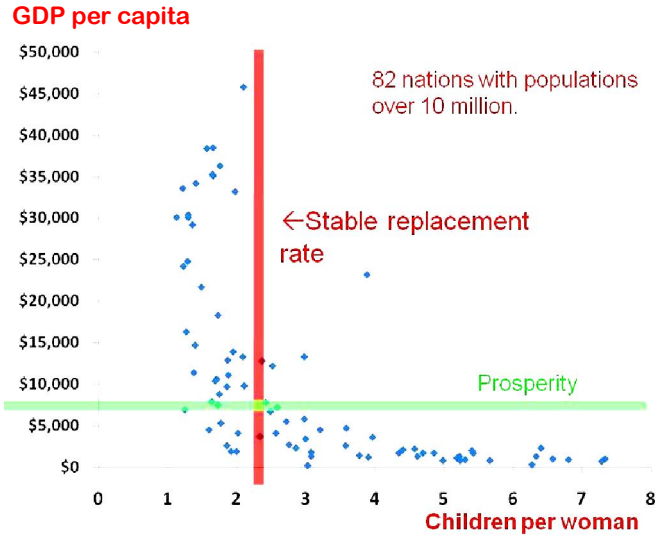
Aim High!

Thorium energy cheaper than from coal



Coal power dumps 130 million tons of ash and sludge onto the land, and its air pollution kills 13,000 US citizens a year.



Birthrates decline as affordable electricity helps people achieve modest prosperity, reversing overpopulation.

Thorium: the world's new energy future

Clean energy from thorium emits no deadly atmospheric pollution and CO_2. Its energy cheaper than from coal avoids any call for contentious carbon taxes. Widely affordable electricity can increase global prosperity, leading to low birth rates.

Thorium has a million times more energy than coal and is 3 times more abundant than uranium. Just 100 grams could provide you with all the energy you need for the whole of your life! And when you're done with it, what's left is a golf ball amount of waste, largely benign within a few hundred years.

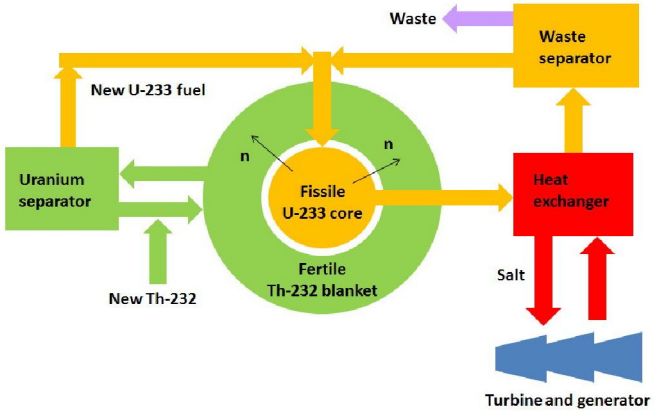
All of the thorium can be used for energy production, while less than 1% of naturally occurring uranium can be used in conventional reactors. Available in every country, there is more untapped energy available for use from thorium in the earth's crust than from all the uranium and fossil fuel sources worldwide.

In a traditional reactor, only about 3% of the energy in the fuel rod can be used before it deteriorates and becomes contaminated with waste products. In the right kind of reactor 100% of thorium's energy can be used. The only practical way to realize the full potential of thorium is with a *liquid fluoride thorium reactor*.

LIQUID FLUORIDE THORIUM REACTOR — LFTR

Molten Salt Reactor

In 1952, a radical US plan to develop a reactor-powered aircraft led to the development of the Molten Salt Reactor (MSR), a revolutionary reactor which operated successfully for five years. Capable of burning any nuclear fuel, and with many inherent safety and efficiency advantages, the MSR forms the fissile, energy producing part of the LFTR.



Thorium conversion

To convert thorium into a reactor fuel, it must be exposed to a neutron source. After absorbing neutrons from the reactor core, the thorium becomes uranium-233, the fuel for the reactor. Because the salts are fluids, one chemical process continuously separates the new uranium fuel formed in the thorium blanket. Another chemical process separates the fission product waste.

Walk away safe

What if there is a melt down?

A molten salt reactor can't have a meltdown, because the core is already molten. In a standard reactor, a meltdown is a potential disaster. In a fluid fueled reactor, it is normal operating procedure.

What if there is a leak?

All the salts are solid at room temperature. If any salt leaks out, it will solidify.

What if there is an explosion?

There is no internal pressure in the LFTR. If anything were to breach the reactor core, any leaked salts would simply solidify.

What if the reactor overheats?

As the fuel salt heats it expands, diluting the uranium, causing the reaction to slow down. If the fuel salt overheats, a solid plug of salt in a drain pipe would melt and the fuel would drain to a dump tank where a nuclear reaction is not possible. This 'freeze plug' can also be used to simply switch the reactor off.

What about the waste?

A LFTR produces less than 1% of the long-lived radioactive waste of a traditional reactor because the fuel is burned so completely. It can also burn up waste from solid fuel reactors.