

Using direct heat output of VHTRs

Very High Temperature Reactors (VHTR) are a class of nuclear reactors operating at temperatures above 600°C at about atmospheric pressure.

Conventional nuclear reactors are producing power by leading hot steam under very high pressure into a turbine which generates electric power. Hereby two third of the energy is lost: 3GW_{th} result in 1GW_{el} .

Since a long time, there are concepts to use the heat directly for minimizing the loss of energy. Such a reactor would harvest almost 200% additional energy with hardly any additional costs.

Lots of applications are waiting for CO₂ free heat input which nowadays get their heat from coal, gas, or oil - see the following figure.

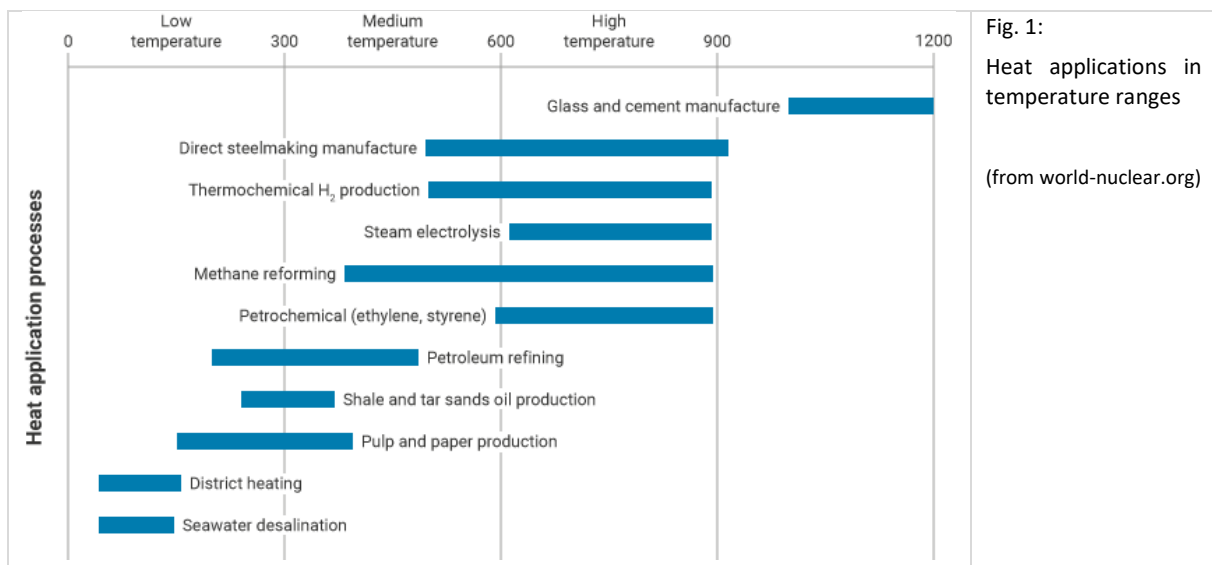


Fig. 1:
Heat applications in
temperature ranges
(from world-nuclear.org)

Furthermore, synfuels can be produced by using Direct Air Capture, this way resulting in negative emissions using the world's fuel tanks as a huge, distributed CO₂ sink. We have precise calculations which show that about 50 such VHTRs producing synfuels would be sufficient to reduce CO₂ in this earth's atmosphere down to preindustrial level (280ppm) within 30 years – in a profitable way.

Even cascading heat applications are possible, e.g. first steelmaking at 600° and then using the rest heat for district heating, paper production or seawater desalination.

While the construction time for nuclear reactors came into bad reputation, there are examples of faster realizations: Terrapower is building its reactor in 4 years' time. The Chinese HTR-PM (running) and Thorcon's MSR are aiming for serial production in a time span below two years.

There is a tendency to use Thorium instead of Uranium or Uranium-Thorium mixes as well as recycling used fuel rods. Thorium has a tenfold energy density in comparison to Uranium and is abundantly available in many countries, can even be picked up as "waste" from other mining activities.

Worth to mention that newer reactor concepts do not need water for cooling and support seawater desalination as a very urgent task in view of the advancing global warming.

Direct heat usage from VHTRs is a chance for Norway to jump on this very effective, commercially viable, and environmentally friendly technology, saving land usage and material.

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