WHY WON'T PBMR BECOME A SECOND CHERNOBYL?

The peak temperature that can be reached in the core of the reactor (1 600 ºC or 2912 ºF under the most severe conditions) is well below the temperature that may cause damage to the fuel. This is because the radionuclides, which are the potentially harmful products of the nuclear reaction, are contained by two layers of pyrocarbon and a layer of silicon carbide which are extremely good at withstanding high temperatures.

Even if there is a failure of the active systems that are designed to shut down the nuclear reaction and remove core decay heat, the reactor itself will stop any nuclear fission and eventually cool down naturally. Unlike the Chernobyl type of reactor, which during the accident produced more energy the hotter it became (known as "a positive temperature coefficient of reactivity"), the pebble-bed reactor has a strong negative temperature coefficient of reactivity which halts the chain reaction. It also cools naturally by heat transport to the environment.

The size of the PBMR core ensures a high surface area to volume ratio. This means that the heat that it loses through its surface (via the same process that allows a cup of tea to cool down) is more than the heat generated by the decay of fission products in the core. The reactor therefore never reaches a temperature at which significant degradation of the fuel can occur. The plant can never be hot enough for long enough to cause damage to the fuel.

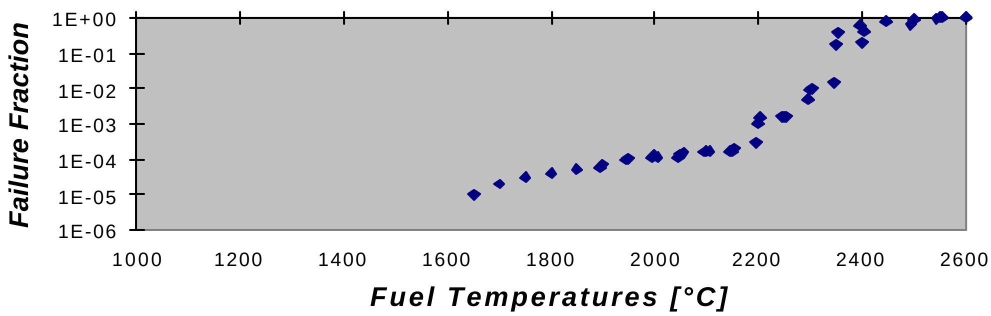
This inherently safe design of the PBMR renders obsolete the need for safety backup systems and most aspects of the off-site emergency plans required for conventional nuclear reactors. It is also fundamental to the cost reduction achieved over other nuclear designs. Although plans related to aspects such as the transport of fuel will still be required, they will be modified to suit the specific characteristics of the fuel and the transport mode.

The reactor core concept is based on the well-tried and proven German AVR power plant which ran for 21 years. This safe design was proven during a public and filmed plant safety test, when the flow of coolant through the reactor core was stopped and the control rods were left withdrawn just as if the plant was in normal power generation mode.

It was demonstrated that the nuclear reactor core shut itself within a few minutes. It was subsequently proven that there was no deterioration over and above the normal design failure fraction of the nuclear fuel. This proved that a reactor core meltdown was not credible and that an inherently safe nuclear reactor design had been achieved.

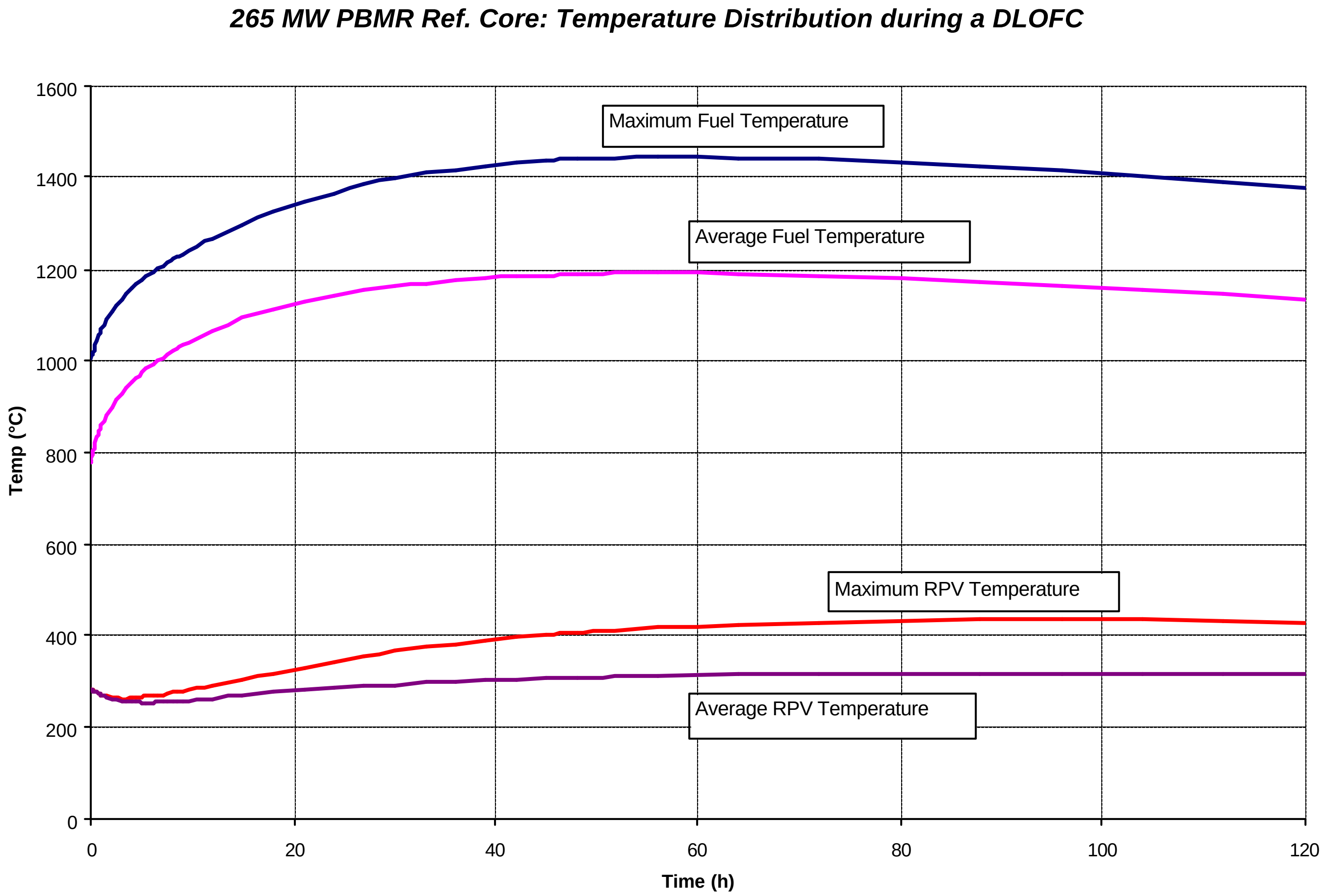
The graphs below show how PBMR fuel behave under extended periods of high temperature and how temperatures are affected by 'loss of coolant' type events.

Fuel Performance



The figure shows the performance of the fuel under extended periods at high temperatures

Loss of Coolant Event



The figure shows the temperature of the hottest part of the fuel and overall average after a total loss of coolant

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