STEENKAMPSKRAAL ThO_2RIUM
STL NUCLEAR (PTY) LTD

Company Profile

CLEANER, SAFER, SUSTAINABLE AND AFFORDABLE NUCLEAR POWER AND NUCLEAR DESALINATION

ABOUT US

Steenkampskraal Thorium (Pty) Ltd. (STL Nuclear) is a privately owned nuclear technology company based in the Northern suburbs of Pretoria whose core focus is directed towards Generation IV nuclear reactor technology.

STL Nuclear have built up a core team of technical specialists (fuel & reactor) who have successfully risen to the challenge of designing and building nuclear reactor and fuel plant technologies and have to date completed 10 years of engineering on a $100MW_{th}$ high-temperature modular gas-cooled reactor (HTMR) with the objective of providing cleaner, safer, sustainable and affordable nuclear power and desalination.

STL Nuclear were contracted by a US firm to develop first of a kind HTR fuel elements based on the U.S. Department of Energy (DOE) Advanced Gas Reactor (AGR) program for UCO TRISO fuel. The fuel data design package as well as a pilot plant for fuel production. This fuel development project is being commissioned by the U.S. company to accelerate the development of an innovative new nuclear technology.

STL Nuclear are also currently busy with a TRISO fuel plant design to fabricate fuel compacts for a European Client.

In addition, STL Nuclear are busy with a feasibility study to supply another TRISO fuel pilot plant to a US customer to produce fuel compacts.

REACTOR SAFETY

Reactor safety can mean different things to different people. At STL Nuclear we believe that a safe reactor must have the following attributes:
- It must not be able to meltdown – ever! (Even when subjected to the severity of a Fukushima type event).
- This means that fission products will always be retained within a safe containment structure.
- The containment structure will have multiple independent barriers to ensure fission product retention.
- During and after a worst case accident the evacuation of people from the surrounding area will not be necessary.
- Spent fuel will be passively safe – this means that no active cooling should ever be required for fuel storage to prevent release of fission products from spent fuel

MODULARISATION

A fundamental requirement to make HTMR100 plants viable especially for remote areas, due to its transportability. Centralized manufacturing facilities with Quality Assurance (QA) procedures in place will be responsible of building the Reactor Pressure Vessels (RPV), which later will be transported to the reactor sites. This transportability requirement imposes a limit in the RPV outer diameter, which in turn limits the maximum diameter of the pebble bed as well as the height.

The steam turbine and helium blowers along with various other components will be purchased straight off the shelf from a number of different suppliers; this modularity allows the HTMR100 Nuclear Power Plant to be built in a short period of time. The construction of the buildings can continue independently from the supply of the critical components. Most of the sub-systems will be constructed in skid mounted units, ready for coupling when delivered to site.

REACTOR OVERVIEW

The HTMR100 Reactor is a High Temperature Gas Cooled Modular Reactor. This Reactor can facilitate a variety of different fuels using the same geometry. The engineering maturity of pebble bed reactors, supported by experimental facilities, makes the HTMR100 as a Generation IV reactor licensable within a few short years. Gas-cooled HTRs (pebble bed and prismatic block) are the only ceramic meltdown-proof nuclear reactors currently available.

The HTMR100 nuclear plant power source is a 100 MWth high temperature helium cooled pebble bed modular reactor. It features a Once-Through-Then-Out (OTTO) fuel cycle. The reactor is versatile enough to accommodate various types of fuelling schemes such as the uranium, uranium/thorium or plutonium/thorium-based fuel cycles.
The HTMR100 produces high quality steam and is therefore versatile for various applications. Steam can be used for producing power via a steam turbine (35MWe), or it can be used for process heat in petrochemical plants, oil refineries and many other applications. In the future, high temperature heat can be supplied via an intermediate gas-to-gas heat exchanger; development of such a heat exchanger is to be undertaken.

HTR FUEL OVERVIEW/ EXPERIENCE

The primary goal of the US fuel development programme was to produce fuel containing uranium oxycarbide (UCO) for irradiation testing. Initially in South Africa fuel was made using simulant material only. No uranic material was be used locally for development of the fuel.

The fuel is based on the original AGR manufactured fuel where the kernel was uranium oxycarbide (UCO). This involves the development of the Kernel, Coated Particle and Fuel Element laboratories processing UCO to produce fuel to specification. The Quality Control methods and testing equipment required shall also be developed.

After development of the fuel and in the longer term, Fuel Element manufacturing plants will be designed to produce required quantities of released fuel elements per annum.

For more than 10 years key people at STLN were involved in the PBMR project in SA producing UO_2 TRISO particles. This involved the production of kernels using U_3O_8 powder, coating of the particles using a CVD process and then the manufacture of fuel spheres using graphite powders.

During this time a development laboratory was setup at NECSA and operated to produce fuel spheres for irradiation testing. The engineering design of the HTR fuel plant was completed by a team at PBMR some of which are now at STLN.

PWR FUEL EXPERIENCE

Key people at STLN were involved with the development of a UO_2 PWR Pellet fuel plant for the South African utility ESKOM when Eskom produced its own fuel for the Koeberg nuclear power station.

DECONVERSION EXPERIENCE

Key people at STLN were directly involved in the design, development, equipment manufacture, erection, commissioning, and operation of a deconversion facility converting UF_6 to UO_2 / U_3O_8 powder. This facility delivered 50 metric tons per year of enriched powder to the pelletising plant for the manufacture of fuel pellets.

This facility handled UF6 containers licensed to 5%U235 and converted the UF6 using the IDR process which uses steam and hydrogen to convert the UF6 to uranium powders with controlled moisture content.

CONTACT US

For further information please do not hesitate to contact us:

STL Nuclear (Pty) Ltd.

www.info@thorium100.com

Managing Director: David Boyes

CTO : Professor Johan Slabber