Superior Safety for Next Generation High Temperature Reactor

Chinergy Co., Ltd. is constructing the world's first High Temperature Reactor in Shidaowan, in the Shandong province of China.

China receives first glass-to-metal sealed hermetic penetration from SCHOTT

China's first commercial High Temperature Reactor (HTR) in the province of Shandong will be one of the most modern nuclear power plants in the world. Employing only the safest and most reliable technology available today, SCHOTT has been selected to supply its hermetic glass-to-metal sealed Electrical Penetration Assemblies (EPAs). The first feedthrough has now been delivered to the Institute of Nuclear and New Energy Technology (INET) at Tsinghua University for testing and training purposes.

China, the world's largest energy consumer, is focused on creating its independence in energy generation through scientific and technological advancements, in a safe and environmentally-friendly manner. Hence, the country has been described as developing into a leading center for new nuclear reactor designs. The high temperature reactor with pebble bed modules (HTR-PM), for example, is considered to be one of the most promising next generation reactors with its inherent safety features. A demonstration plant is currently under construction at Shidaowan, in the Shandong province of China. SCHOTT has been selected to equip the reactor with its unique glass-to-metal sealed Electrical Penetration Assemblies (EPAs).

The outstanding performance of the glass-to-metal sealing technology from SCHOTT has convinced Xu Yuanhui, Deputy General Manager of Chinergy, "Based on our investigations and comparisons, EPAs from SCHOTT can meet the high requirements for precision and quality of high temperature reactors. This is why we chose them over many other suppliers for the demonstrator reactor. In addition, SCHOTT has an extremely good reputation and is a reliable supplier. This is of great importance to our HTR project. The successful completion of the demonstration HTR plant would pave the way for future nuclear reactor modules."

Fukushima drastically underlined the imperative of safety

Following the Fukushima accident in March 2011, the Chinese government temporarily suspended its review and approval of new nuclear power projects. Safety checks at existing reactors and those under construction were also commissioned. In late July, a team of more than 40 representatives and experts from various government bodies, scientific community and nuclear related institutes conducted the safety review at Shidaowan.

TEPCO, the operator of the facility in Fukushima, has recently reconstructed the natural catastrophe that led to a breakdown of all available power supplies for the boiling water reactor's cooling system. TEPCO's analysis shows that the temperature inside the containment structure must have risen from a normal operating temperature

of approximately 60 degrees Celsius to above 250 degrees Celsius while the design pressure was exceeded by more than twofold. The extreme temperature and pressure levels seemed to have overstrained the epoxy seals of the electrical penetrations at the Fukushimafacility which are suspected to have led to the leakage of explosive hydrogen, according to TEPCO (also see for more details from TEPCO; Japanese only).

Next generation High Temperature Reactor is going through extensive testing phases

"The conditions inside the HTR are very demanding. The pressure in the nuclear reactor is about 80 bar and the temperature of the coolant can climb to as high as 1000 degrees Celsius. The temperature is already around 150 degrees Celsius even along the inside wall of the reactor pressure vessel," Professor Zhou Huizhong from the Institute of Nuclear and New Energy Technology (INET) at Tsinghua University explains. "SCHOTT's unique expertise in the area of glass-to-metal sealing, particularly in the nuclear industry, convinced us that this is the right technology for our advanced nuclear design."

"Our standard glass-to-metal sealed penetrations are able to comfortably withstand temperatures in the range of –200 to +240 degrees Celsius. Special material combinations can even tolerate up to 1000 degrees Celsius for a period of time", says Dr. Oliver Fritz, Head of Technology for the Nuclear Safety Division at SCHOTT Electronic Packaging. "As latest tests have shown, our EPAs remain completely airtight even at pressure peaks above 100 bar – it is the safest and most reliable sealing technology for EPAs available today."