

# A QUALIFIED SAFETY I&C FOR APPLICATION IN REACTORS OF ALL KINDS

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Advanced I&C systems for nuclear power plants have to meet increasing demands for safety and availability. Specific requirements coming from the nuclear qualification have to be fulfilled. To meet both subjects adequately, Siemens has developed the advanced digital I&C technology for safety applications TELEPERM XS.

National and international codes and standards impose special requirements on the safety I&C of a nuclear power plant. These concern:

- . Fault tolerance,
- . Robustness,
- . Qualification.

In order to be able to meet these requirements to the full without making operational automation tasks unnecessarily expensive by excessive conservatism, the TELEPERM XS I&C system platform was developed. It is largely based on standard Hardware devices selected for their quality characteristics and adapted by specific design measures. In the Software area a complete new development had to be undertaken in order to meet the stringent qualification requirements.

In 1992 the GRS (Gesellschaft für Reaktorsicherheit - Association for Reactor Safety) confirmed the suitability and licensibility of the underlying TELEPERM XS concepts. Subsequently, the development and qualification of the system software and the engineering tools as well as the type testing of the hardware components was performed. Operationally proven hardware components were selected for utilization, among others from the system families SIMATIC and SINEC. The first integration tests were performed successfully in mid-1996. Field testing of the first application projects could be finalised in 1997.

In many countries, the nuclear industry bases its licensing process for nuclear power plants on the US-NRC procedures. For this reason, and in order to ensure world-wide utilization of the TXS technology, it was decided in 1998 to submit a licensing application to the US-NRC. In May, 2000 Siemens has received a Safety Evaluation Report (SER) from the US-NRC approving use of its TELEPERM<sup>®</sup> XS (TXS) platform for instrumentation and control systems in U.S. nuclear power plants. \* Approval by the NRC reflects the results of a detailed technical and regulatory

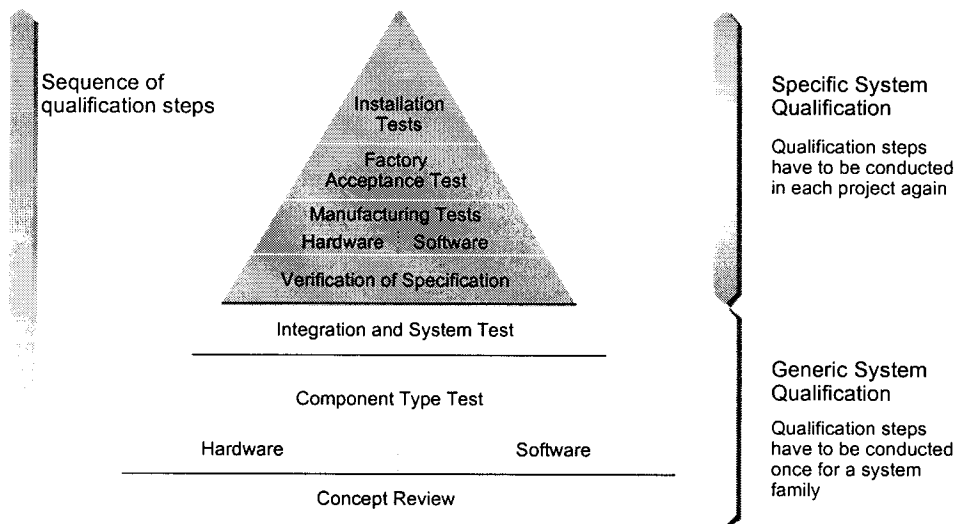
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review, following which the NRC Staff concluded, "...the design of the TXS system is acceptable for all safety-related I&C applications and meets the relevant regulatory requirements."

By now more than 20 modernisation projects of Safety I&C have successfully been completed in most of the European countries that operate nuclear power plants and also in China and the USA projects are underway.

It is remarkable, that in Germany, after first applications in safety related systems in nuclear power plants, the decision was made, to install TELEPERM XS in the research reactor FRM-II as protection system. The licensing process followed very much the guidelines of power reactors and was so far successful. The equipment has undergone a rigid test program in the test field and is ready for the startup tests at site.

The presentation will focus on the special licensing process and will explain why it was a good decision to utilize a system proven in commercial power reactors in a research reactor.



Generic Qualification of TELEPERM XS