

Ulli Kraft, Senior Vice President I&C and Electrical Systems, AREVA NP GmbH Safety I&C from AREVA – Your Safe Investment Over a Long Period

Abstract

New-build projects and major upgrade packages require high levels of investment over long periods. The systems deployed and/or upgraded make a crucial contribution to ensuring the security of these investments in the long term, thereby enabling projected returns to be achieved.

Ever shorter innovation cycles, loss of know-how and difficulties in ensuring long-term availability of spare parts have an increasingly negative impact on the safety of investments. This is particularly true in the field of automation. Instrumentation and control (I&C) systems, particularly for safety-related applications, are exposed to the conflicting pressures of customer demands for state-of-the-art technology, the influences of the technology market described above, and the need to assure spare parts supplies in the long term.

AREVA NP has developed and implemented concepts that ensure long-term security of investment for our customers in spite of these influences. These concepts concern both our technology and our staff.

From a technology viewpoint, TELEPERM XS, the digital system platform for safety-related applications, has been successfully deployed since 1998 as part of upgrade packages and new-build projects at more than 30 nuclear power plant (NPP) units built by various different vendors. The system platform is integrated into a sustainable program for service life management of electronic systems and equipment. Its ongoing future-oriented development ensures the long-term availability of hardware and software for TELEPERM XS applications already installed in the plants. The further development of platform and components continues to be based on the robust, service-proven TELEPERM XS architecture, with the aim of minimizing the risks associated with component qualification and project licensing. This continuous innovation process, combined with maximized compatibility, makes TELEPERM XS unique, and provides the basis for a sustainable system with a service life guaranteed for the long term.

Optimized management of human resources in both quantitative and qualitative terms ensures that projects are executed in line with quality and time schedule requirements, while at the same time safeguarding know-how for the long term and boosting motivation through appropriate promotion of young employees.

With these concepts for resource and service life management, AREVA NP is not only making sure that your investments are safe, it is also making a major contribution to a sustainable increase in the competitiveness of your plants.

Requirements

New-build projects and major upgrade packages require high levels of investment over long periods. The manufacturers and suppliers of the deployed system platforms are faced with the challenge of ensuring the security of these investments in the long term and enabling projected returns to be achieved. Service life expectancies extending over decades require not only long-term deliverability of spare parts, but also the safeguarding of system know-how.

Even when these requirements are met, I&C upgrades must be anticipated during the entire service life of the power plant due to the direct dependence of I&C systems on the development cycles of the electronics market.

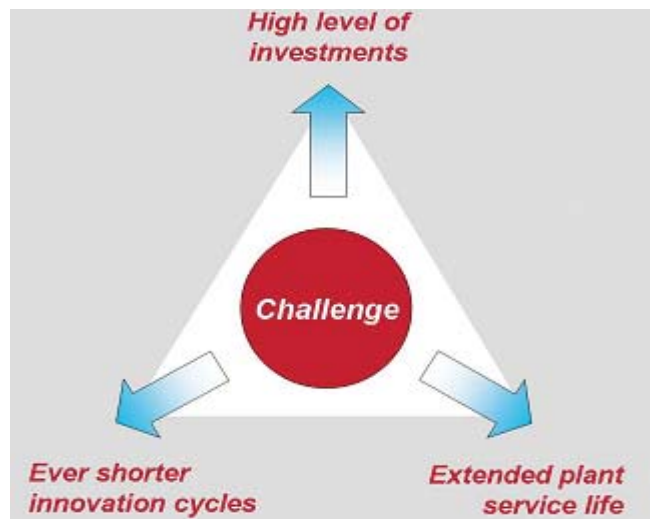


Figure 1

This framework for modernization projects is shown in Figure 1 depicting challenges which must be met.

The most important driving forces for these upgrades can be categorized as either Utility Management or Plant Technical Drivers.

Utility Management Drivers include:

- Worldwide considerations of plant lifetime extensions due to increasing energy demand
- Power up-rates to compensate for shutdowns and to enhance competitiveness of NPPs
- Compulsory modernizations due to requirements by the authorities, e.g. East-European countries entering the EU are forced to upgrade their plants to fulfill European requirements

Plant Technical Drivers include:

- Avoidance of non-availability of the power plant due to increasing failure rates as a result of accelerated

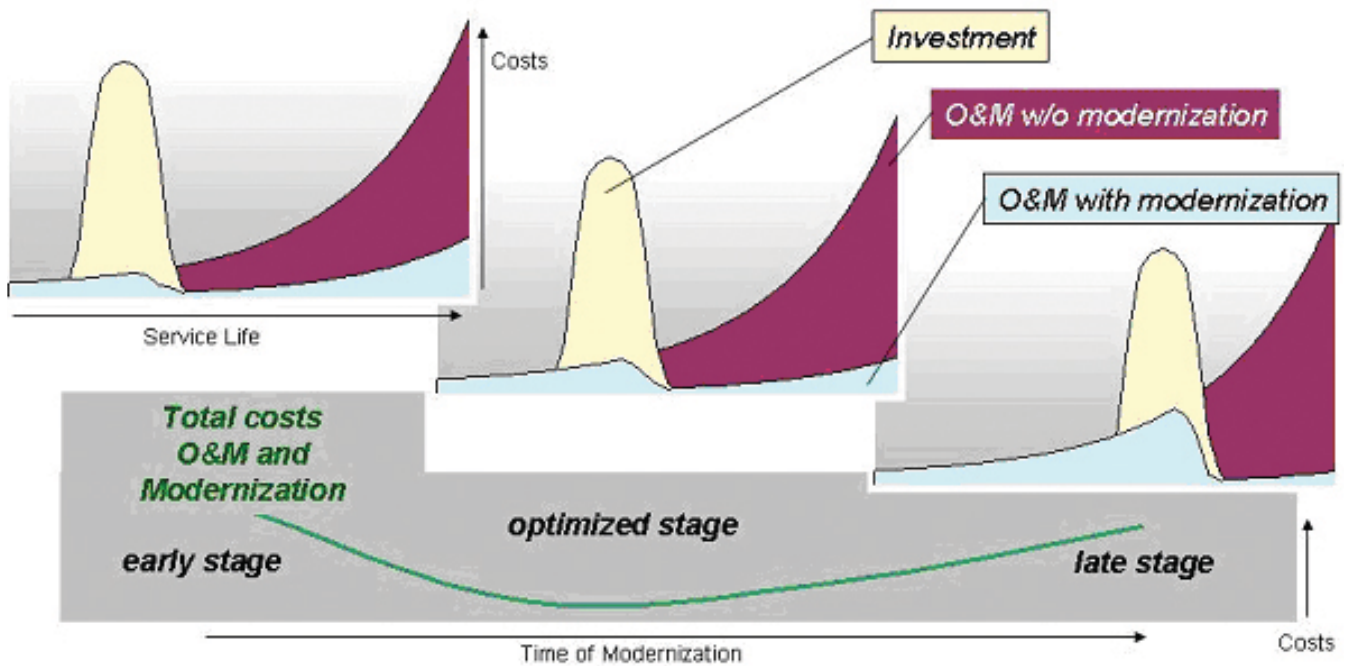


Figure 2: Cost optimizing timeframe for modernizations

- technological ageing of the deployed system platforms
- Need for the implementation of new functions due to quantitatively insufficient availability of components or inadequate performance of the system platforms in operation
- Loss of know-how for operation and maintenance of the deployed system platforms due to retirement of employees with relevant experience

In addition to the safeguarding of know-how and the retention of functionality which comes with regular upgrades, modern digital system platforms offer operators many possible ways of making their plants more competitive. A reduction in operating and maintenance costs as a result of extensive self-monitoring functions or improved performance through a decrease in tolerance ranges based on increased measuring and processing accuracies of the system platforms are just a few examples.

However, the same requirements with respect to long-term deliverability of spare parts and safeguarding of system know-how apply to the new system platform installed during the upgrade as to the initial installation based on the projected remaining service life of the plant. It must also be noted, however, that the transition from analog to digital technology requires that the continuing development of system platforms be based on concepts more innovative than ever before, so that the long-term security of the operator's investments can be guaranteed.

For the operating company, it is important to decide not only how to perform a modernization but also when to initiate the modernization activities. As shown in Figure 2, total expenditures for the project estimated over the whole lifetime of the plant vary depending on

the starting point of an investment. To find the cost-optimal timeframe for a possible modernization is a major challenge for the operating company.

The direct dependence of I&C systems on the ever shorter innovation cycles of the electronics market and the automation industry has an increasingly negative impact on investment security. Loss of know-how and difficulties in ensuring medium-term availability of spare parts are becoming an increasingly evident challenge in the computer industry.

The manufacturers of I&C system platforms, and of safety I&C system platforms in particular, find themselves in a force field. This results from the partly contradictory interests of

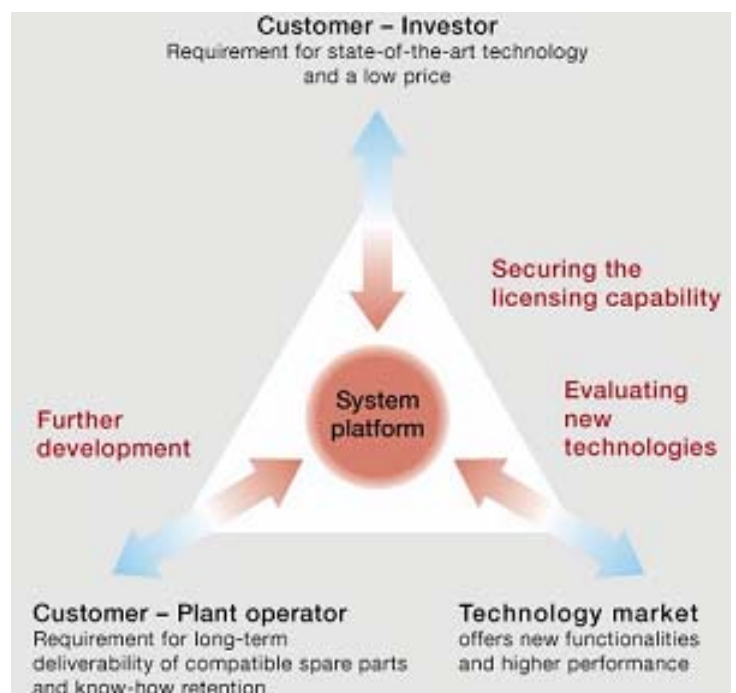


Figure 3

the power plant customers and the conditions of the electronics market. From the viewpoint of the developer and manufacturer of safety I&C, there are three “external” forces that arise from the market requirements and boundary conditions described below (Figure 3).

- *Demand for state-of-the-art technology*

Apart from provision of the specified functionality at the lowest price, investors implicitly demand state-of-the-art technology. For many customers, purchasing the most up-to-date product is an important step towards investment security and significantly affects their decision to purchase. The benchmark is often set by computer solutions in industrial automation or even office systems, e.g. a demand for use of the latest processors.

- *Demand for long-term after-sales support*

The most important demand of customers in their role as plant operators is for long-term, economical, fault-free operation of the safety systems based on this system platform. Binding assurances are required from the supplier on long-term deliverability of replacement parts with compatible functions and connections and on the retention of know-how by the manufacturer for manufacturing, repairing and testing these components.

- *Rate of innovation and product variety in the technology market*

The shorter and shorter innovation cycles of the electronics market are a considerable challenge to the design and development of safety I&C and other systems on which the expectancy of a long service life relies. The dependencies of production equipment and shorter and shorter availability cycles of components make it necessary to adapt and redevelop the system platform. At the same time, the development strategy of safety I&C constantly has to reposition itself with regard to the ever-increasing range of new technological possibilities and functionalities.

This force field comprising sometimes contradictory requirements and boundary conditions of the market must be balanced out by careful positioning of the system platform and by using stabilizing “internal forces”. AREVA NP has developed and deployed concepts that ensure long-term security of investment for our customers in spite of these influences. These concepts concern both our technology and our staff.

TELEPERM XS service life management

TELEPERM XS has established itself successfully on the market over the past 10 years. Operating experience with TELEPERM XS is currently supported by more than 8300 processor module operating years. Its suitability for use in virtually all power plant and reactor types, which has been verified in many references around the world, has made TELEPERM XS one of the most widely used system platforms for digital safety I&C (Figure 4).

With a view to safeguarding this market position, TELEPERM XS service life management constitutes an obligation on the one hand and on the other an essential component in the success of this system platform.

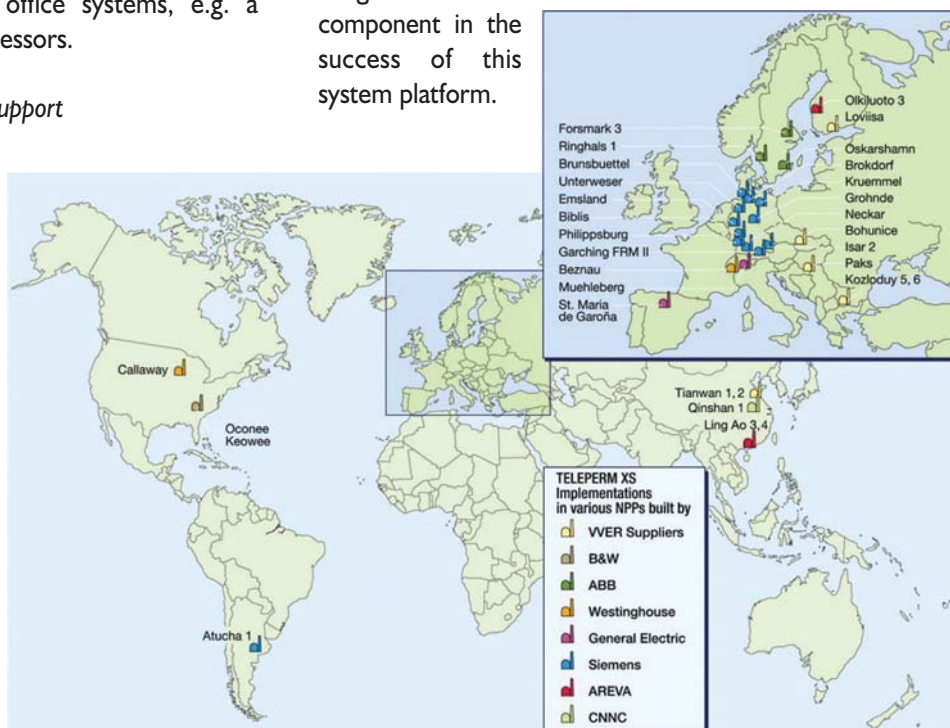


Figure 4

Evolutionary innovation concept of the TELEPERM XS system platform

Updating of the system platform for safety-related functions in NPPs incurs significant costs for continuous updating of system qualification for the limited number of installations that is a feature of this sector. This emphasizes the fact that cost-effective supply of products for safety I&C over the long-term is only feasible for “living” systems with a growing customer base.

Consequently long-term support of the system platform goes hand in hand with further development of this platform within the framework of an evolutionary innovation concept. It is supported and simplified to a considerable extent by forming long-term partnerships between plant operators and manufacturers.

The evolutionary principle provides step-by-step

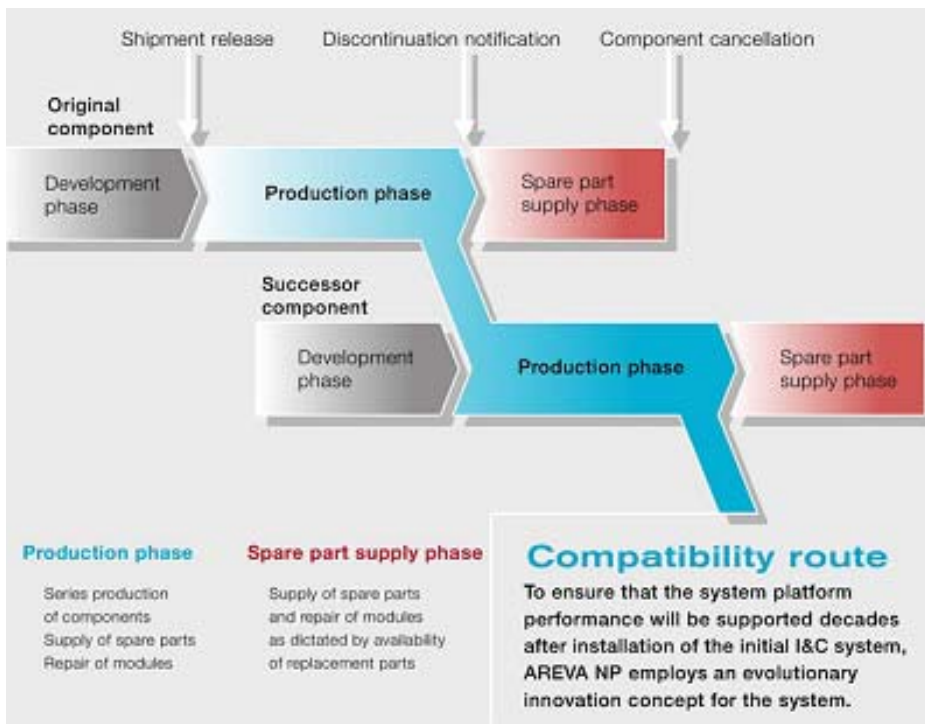


Figure 5: TELEPERM XS Compatibility route

development and integration of new, modern components in the platform parallel to general market developments. In this way, the important compatibility requirements are taken into account with the objective of using subsequent developments of system components both for new applications and for long-term coverage of the spare parts requirement for predecessor versions.

In this manner, compatibility routes as graphically shown in Figure 5 are formed that permit long-term spare parts supply of the most important function components of the system platform which extend far beyond the achievable life cycle of the individual electronic module.

Migration concepts are used to prepare existing systems for the implementation of future hardware and software versions and support efficient integration. Suitable procedures in project development ensure that modifications can be implemented with minimum outlay.

A constantly expanding base of experience and continuous further development of technology leads to successive enhancement of the platform and also lays the foundations for further widening of the range of applications. Ultimately, a broad installed base brings cost advantages for customers. It also creates suitable commercial conditions for long-term support of the system platform by the manufacturer when meeting the above-mentioned expectations.

The configuration management (Figure 6) of hardware and software provides a technical administrative basis for long-term support of the system platform. It assures the availability of all documentation and software for the installed systems as well as the information as to which versions of the different components can be operated with full compatibility.

The comprehensive configuration management for the system platform controls and monitors all changes within the framework of evolutionary development of the platform components. It comprises administrative processes for development planning, change management and releases as well as comprehensive data management with tool-based support.

Configuration management for the platform assures transparency in the development process and forms the information base for compatibility analyses.

It is supplemented by plant-specific configuration management for the installed system configuration and all modifications to the physical I&C system. This is the responsibility of the plant operator and ensures that documentation remains consistent and that the life cycle of the I&C can be reliably traced. Both management systems together allow future updates to be implemented cost-effectively in the I&C system of the power plant while maintaining the reliability of the system.

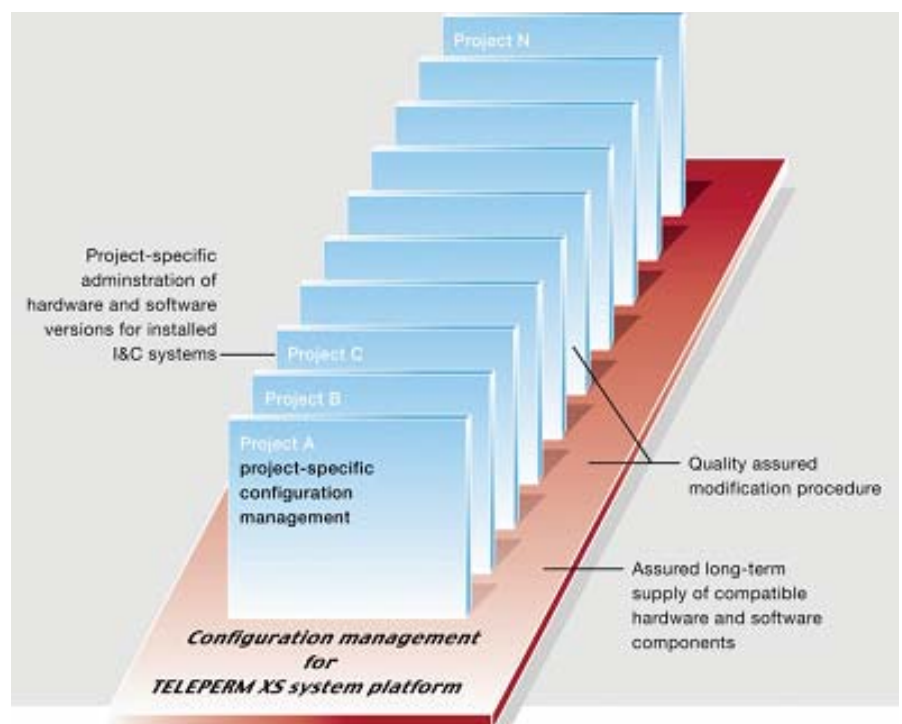


Figure 6: TELEPERM XS Configuration management

People & Competence

The greatest benefit which our employees offer our customers is the execution of projects in line with time schedule, cost and quality requirements. This requires optimized resource management. Key challenges include:

- The provision of sufficient personnel
- Qualification of personnel
- Personnel motivation
- Transfer of know-how to younger employees

Varying numbers of employees with varying qualifications are required depending on the type and size of projects concerned. With large-scale projects this usually starts with the project manager, a chief engineer and a sufficient number of appropriately qualified design engineers. With compact projects, various duties are performed by one and the same person, e.g. the project manager would also perform the duties of the chief engineer.

The introduction of structured qualitative and quantitative personnel planning (QQPP), which was implemented at AREVA NP in 2003, has proved to be of significant advantage for personnel planning. Actual and target requirements with respect to personnel numbers and qualifications are continuously adjusted in line with orders on hand and anticipated orders and appropriate measures are initiated accordingly, e.g. recruitment of young employees or scheduling of qualification measures.

Job profile-specific induction and qualification programs have been developed and successfully implemented with a view to achieving optimum induction and qualification of young employees. An essential component here is the mentor system. The formation of employee pairs and the close cooperation with an experienced bearer of knowledge afforded by it make possible the optimum and effective transmittal of knowledge which has been acquired over many years. An increasing amount of responsibility is transferred relative to the amount of knowledge which has been accumulated and this is extremely motivating for new employees.

Conclusion

Safety I&C from AREVA NP is a guarantee for the long-term security of our customers' investments. Knowledge about market requirements and the driving forces of our business constitute the necessary basis for the development and implementation of suitable concepts for resource and TELEPERM XS life service management.

Qualification programs and the performance of interesting and responsible duties are the preconditions for a motivated workforce.

The evolutionary innovation concept of TELEPERM XS ensures our customers a long-term deliverability of spare parts for important function components which extends far beyond the achievable life cycles of individual electronic modules.

As you can see, AREVA NP offers its safety I&C customers a high degree of investment security and makes a major contribution to a sustainable increase in the competitiveness of their plants.