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Addressing SMRs safety I&C specific requirements

SMRs development is entering a critical phase where initial assumptions are challenged by current operational constraints. Indeed, the combined requirements of safety and computer security, industrial supply chain setup, varying local safety regulations and multiple markets targeted besides electricity production is causing revaluation of their standardization objectives and ultimately their business cases.

We propose to demonstrate that carefully designed architectures and technologies can resolve this equation for SMRs safety I&C while guaranteeing safety and computer security.

First, the I&C systems provided shall be compact and modular to meet SMR footprint constraints, for that scalable technologies that can adapt to both individual reactor and shared functionalities between coupled reactors shall be used. To ensure limited footprint and cabling, these technologies shall be able to provide remote IO capacities, compact form factor and adaptable to multiple cabinets and enclosures format.

To match SMR fleet approach, the I&C components shall be manufactured/programmed in series to limit costs and shorten production time, this implies a strong standardization strategy while keeping room for customization to meet specific needs of various plant designers and different nuclear authorities.

In addition, to support licensing in all countries targeted, a proven architecture, compliant engineering lifecycle covering design and V&V, cybersecurity, HMI features and experience will facilitate acceptability.

Leveraging more than 60 years of international experience designing, manufacturing, and installing safety I&C systems for various types of NPPs, Framatome has designed new safety I&C technologies meeting SMR constraints, in particular: TXS compact, an FPGA-based digital technology and Hardline, a purely Hardwired platform. We will present what key characteristics make them optimized solutions for SMR safety and cybersecure I&C needs.

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