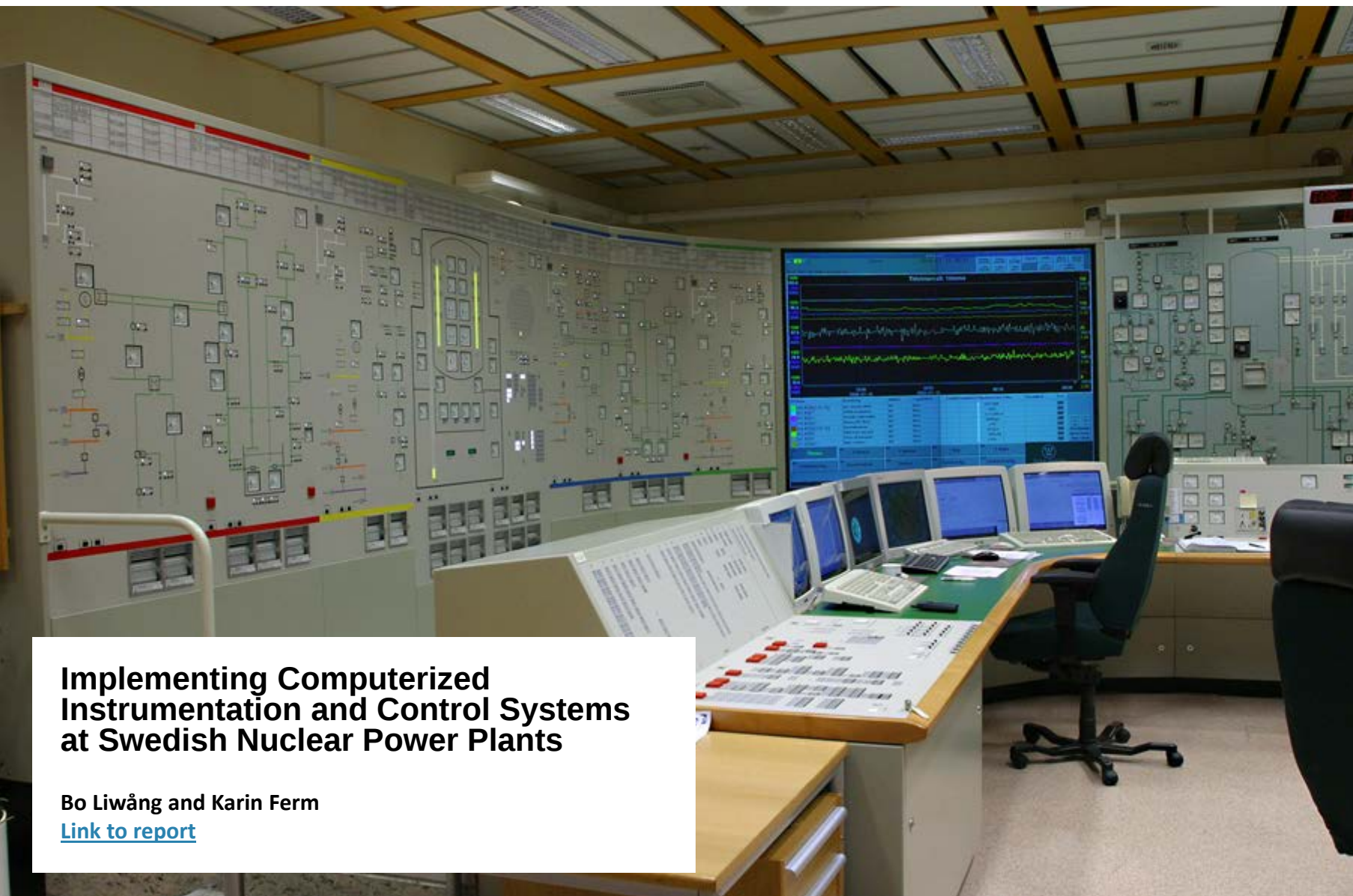




Implementing Computerized Instrumentation and Control Systems at Swedish Nuclear Power Plants

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[Link to report](#)

Scope

This report provides a historical description and reflection of the large modernization projects implemented at the Swedish NPP's from the Regulator's (SKI/SSM) perspective. It also includes reflections regarding cooperation, required accounting and issues occurred during the projects. The report covers the large modernization projects where computerized I&C platforms were introduced into the old NPP's.

Due to aging and to a sharpening of laws and regulations over the years, a need for modernization of the reactors started in the middle of the 90's. Modern computerized I&C platforms were chosen instead of staying analogue. The report treats the challenges this change of I&C technology resulted in, mainly from the Regulator's perspective but the Licensees reflections are also included.

The report is based on Bo Liwång's experiences, working as an analyst at the Regulator SKI/SSM from 1982 to 2015. The licensees have been represented by project team members from the projects covered by this report.



Results

Design and implementation of computerized I&C cannot be verified in the end of a project. A documented design process and a stepwise verification and validation (V&V) approach is necessary to quality assure these types of systems. Due to that, both the Regulator and the licensees had to adapt their way of working when computerized I&C was implemented at the Swedish NPP's.



When implementing computerized I&C systems, it is not possible to write a technical description in the end of a project that is graspable. Due to that, these types of projects require some kind of safety demonstration which is continuously accounted for during the project and also continues over the life cycle for the plant.



Recommendations for cooperation Licensee/Regulator

The recommendations are applicable for complex projects in general but especially when computerized I&C is involved:

- A Safety Demonstration is necessary and its extent must be adapted to the current project's needs.
- Agree on a definition and a way of working regarding Safety demonstration between the licensees and the Regulator.
- Clarify the relation between the Safety demonstration and SAR
- Ensure all relevant prerequisites are in place before the project starts, both at the Regulator as well as at the licensees.
- Involvement by the Regulator from the start is crucial, establish an early dialog between the licensee and the Regulator
- The Regulator needs to appoint an internal project manager for large projects, a single point of contact for the licensee.
- With the arrangement of a safety demonstration it must be possible for the Regulator to give a verdict of the chosen concept at an early stage.
- At an early stage identify and agree upon the required information which is needed for quality assurance and licensing, involving all parties; Regulator, Licensee and Suppliers.





Recommendations for licensees

- The prerequisites must be in place e.g. organization, competences, templates, agreement.
- Include the way of working with safety demonstration as a natural part of the licensees QMS
- Keep the concept and architecture as simple as possible
- A dedicated line organisation needs to own the computerized I&C platform overtime.
- Consider and plan for the complexity when several projects are performed in parallel during the same outage year
- Adjust the supplier agreement after type of project. Avoid Functional agreement when the scope and requirements are vague.