

Nuclear C&I Backfit Projects – Six Things That Can Go Wrong

Around the world, the record of major C&I backfit/digital upgrade projects (to replace power station DCS/DPCS/HMI systems) has been poor. Projects run late and significantly over-budget. The reasons for this are varied but can include some or all of the following:

1. Insufficient recognition by senior management (of both the utility/operating company/licensee (i.e. the client) and the C&I system vendor) of the project risks - especially licensing risks - leading to insufficient vigilance at all stages of the project.
2. Inadequate safety functional specification - including control loop functionalities and required Safety Integrity Levels (SILs or reliabilities) - by the utility before the prime contract is let.
3. Inadequate assessment of the available technologies before selecting the main candidate technology.
4. Insufficient recognition of the significance of the evolution of C&I/software standards since the power station was first commissioned.
5. Inadequate recognition by vendors of the extent to which their equipment SIL claims will be tested by licensees and regulators.
6. The complexity of backfit projects: (i) compliance with gated project management arrangements (such as PRINCE2 or FELGATE) , (ii) compliance with IEC 61508-type C&I lifecycle arrangements, (iii) full understanding of the design basis for all the C&I equipment to be replaced (thousands of I/O and full HMI replacement), (iv) compliance with the necessary design, manufacture, installation and testing standards consistent with the required Safety Integrity Levels, and (v) limited plant access to operational plant during station outages.

The way ahead seems to lie with some or all of the following:

- i. Designing power stations to facilitate mid-life backfits (e.g. by installing dual terminations).
- ii. The preparation and agreement of a high-level best-practice 'roadmap' for C&I upgrade projects in cooperation with the regulator.
- iii. Adequate resourcing of the project preparatory stages by the utility.
- iv. Adequate recognition of project risks by both the vendor and the utility.
- v. Openness and early engagement between the utility and the regulator.
- vi. Openness and partnership between the utility and the vendor.