



Rolls-Royce

Dedication of the Generic *SPINLINE* 3 Digital Safety I&C Platform

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Background

- **SPINLINE 3** is the third-generation digital safety instrumentation and control (I&C) platform originally developed by Rolls-Royce Civil Nuclear SAS (RRCN SAS) in accordance with European nuclear safety standards for such systems.
 - The platform software originally was developed under the life cycle process defined and used for the previous generation digital safety I&C system for the French N4 1400 MW PWR NPPs.
 - This life cycle process explicitly applies to the development of software for safety systems in NPPs.
 - This life cycle process is based on the guidance of IEC 880-1986, with enhancements to take into account the advances in software engineering as reflected in later revisions of that standard.
 - **SPINLINE 3** platform hardware originally was developed under an ISO-9001 QA program.
- The current RRCN SAS quality program complies with 10 CFR 50 Appendix B.
- A Dedication Plan defines the process employed by RRCN SAS specifically to dedicate the generic **SPINLINE 3** digital safety I&C platform and accept that hardware and software into the RRCN SAS 10CFR Part 50 Appendix B quality program.

Definition of the generic *SPINLINE 3* digital safety I&C platform

- The generic platform software is comprised of:
 - The standardized, Class 1E configurable Operational System Software (OSS)
 - The Class 1E application-oriented library of re-usable software components
 - The Class 1E embedded software on certain ***SPINLINE 3*** boards:
 - NERVIA+ communications board,
 - ICTO pulse input board
- The generic platform hardware is comprised of:
 - Chassis
 - Signal conditioning modules
 - Signal input modules
 - Digital processing modules
 - Signal output modules
 - Communication modules
 - Terminal blocks
 - Power supply modules
 - Power distribution hardware
 - Fan cooling hardware
 - Cable and wire sets

Dedication Guidance (1/2)

- The primary sources of guidance on commercial dedication are the following EPRI documents and the associated NRC Safety Evaluation Reports (SERs).
 - EPRI TR-107330
 - EPRI TR-106439 and supplement EPRI TR-107339
- These processes apply to “commercial-grade” digital equipment intended for use in nuclear safety applications.
 - **SPINLINE 3** is not “commercial-grade”. It is a European nuclear safety grade digital safety I&C platform.
 - However, the **SPINLINE 3** platform was not originally designed and developed under a quality system and software life cycle processes that comply with current NRC regulatory requirements.
 - Hence, RRCN SAS is employing the commercial dedication process to demonstrate the integrity of the **SPINLINE 3** platform and its suitability for use in U.S. NPPs.

Dedication Guidance (2/2)

- For the purpose of dedicating the generic **SPINLINE 3** digital safety I&C platform, the platform software will be treated as the “legacy software” described in Section 7.6 of EPRI TR-107330.
 - Compensatory measures for legacy software are identified in EPRI TR-106439, including performance of a Critical Digital Review (CDR).
- The generic **SPINLINE 3** digital safety I&C platform and associated software life cycle processes were subject to a CDR following the process defined in EPRI TR-1011710.
- The dedication process defined in EPRI TR-106439 is implemented via a Quality Procedure for Dedication and a Dedication Plan specifically for the generic **SPINLINE 3** digital safety I&C platform.

Results of the CDR

- Results of the independently performed CDR are reported in the Design Analysis Report (DAR).
- A primary conclusion reported in the DAR was that, “..... there is more than sufficient evidence of design integrity, system integrity, and high quality development processes” for the **SPINLINE 3** digital safety I&C platform.
- Despite some differences between the set of **SPINLINE 3** legacy software life cycle documentation and the comparable set of documentation expected by the NRC, the mapping in the LTR shows that the platform software was developed under processes that are closely aligned to current NRC guidance.
- The **SPINLINE 3** digital safety I&C platform has demonstrated its high quality and reliability through extensive use in operating NPPs.
- The CDR / DAR results support the RRCN SAS decision to dedicate the generic **SPINLINE 3** digital safety I&C platform.

Dedication Procedure and Plan

- The dedication process defined in EPRI TR-106439 is implemented via Quality Procedure 8 307 288 A, which requires preparation of a Dedication Plan and Dedication Report.
- The Dedication Plan applies specifically to the generic **SPINLINE 3** digital safety I&C platform.
 - This Plan defines the hardware and software being dedicated, and the acceptance activities to be performed to demonstrate compliance with the EPRI TR-106439 process.
 - The Plan includes a comprehensive checklist that shows:
 - Where the elements of the dedication process are addressed in **SPINLINE 3** licensing documentation
 - What additional acceptance activities need to be performed and documented in the Dedication Report.

Dedication Report

- Completion of dedication of the **SPINLINE 3** platform will be documented in a Dedication Report that will contain the completed checklist and supporting information.
- This report will be the evidence that the actions defined in the Dedication Plan have been completed and the generic **SPINLINE 3** digital safety I&C platform has been accepted into the RRCN SAS 10 CFR 50 Appendix B program.
- The Dedication Report will be issued after completion of equipment qualification testing.
 - Part of the EPRI TR-106439 dedication process involves review of the qualification test results, so dedication can't be completed until after the test reports are available to verify satisfactory completion of equipment qualification.