Rolls-Royce

Désignation du document *Document name*	**System Operations and Maintenance Plan**

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Equipement *Equipment*	☐	
Sous-ensemble *Subassembly*	☐	
Classé 1E ou équiv. *Safety classification*	☐	

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TABLEAU DE MISE A JOUR

Record of revisions

Indice /date **Rédigé par** *Revision letter / date* *Written by*	**Pages modifiées** *Modified pages*	**Origine et désignation de la modification** *Origin and designation of the modification*
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TABLE DES MATIERES

Table of contents

Guidance for Use of this Template

This section provides guidance for customizing this template for a specific project. This guidance section is deleted after the plan is customized.

Rolls-Royce Civil Nuclear SAS (RRCN) will use this template as the basis for preparing the corresponding plant-specific plan that will define specific life cycle processes for ***SPINLINE 3*** systems for use in nuclear power plants located in the United States (US). RRCN engineers will customize this plan for each plant-specific safety I&C system. The customization replaces symbols defined in this section, as necessary, to reflect the actual scope of the plant-specific project. The basic process defined in this template may not be changed.

Guidance is provided in this template as *italic text* and is either removed or replaced by appropriate normal text in the actual plan. Symbols are used to indicate places where changes are required to customize this template into a project-specific plan. These symbols must be replaced by names relevant to the actual project. The symbols defined in this template are as follows:

Project_Name	*Example:*	MYPROJECT
System_Name (project composed of one or more systems)	*Example:*	RPS
Processing_Unit_Name	*Example:*	FUx
Manager_Name	*Example:*	P. DUPONT
Document_Number (in RRCN format)	*Example:*	3 300 000]]

1 INTRODUCTION

This System Operations and Maintenance Plan (SO&MP) is one of a set of software and system life cycle plans that govern the life cycle for plant-specific ***SPINLINE 3*** systems. This Plan is compliant with the applicable requirements and guidance documents listed in Section 2.

1.1 Purpose

This document is the System Operations and Maintenance Plan (SO&MP) for the plant-specific ***SPINLINE 3*** digital safety I&C system(s) developed by Rolls Royce Civil Nuclear SAS (RRCN) for the *Project_Name.* The processes described in this Plan address preparation of the Operations and Maintenance Manuals (OMMs) and the subsequent use of the OMMs by utility staff at the nuclear power plant (NPP) after successful installation and site acceptance testing of ***SPINLINE 3*** *System_Name_1 to System_Name_n*.

Operations and maintenance training is addressed in the System Training Plan (Reference 1).

Certain limited changes to parameters used by the application software are allowed during operation, subject to various conditions and controls. Management of these limited changes is addressed in this Plan and in the OMMs. Modifying the application software itself is beyond the scope of the SO&MP and is governed by the formal application software life cycle Plans listed below:

- *Project_Name* Software Quality Assurance Plan (SQAP), (Reference 2)
- *Project_Name* Software Configuration Management Plan (SCMP), (Reference 3).
- *Project_Name* Software Development Plan (SDP), (Reference 4)
- *Project_Name* Software Validation & Verification Plan (SVVP), (Reference 5)

1.2 Relationship of this Plan to the Plans Defined in BTP 7-14

The U.S. Nuclear Regulatory Commission (USNRC) “Standard Review Plan“ Branch Technical Position (BTP) 7-14 (Reference 6) defines twelve software life cycle plans, with an additional cyber security plan defined in Regulatory Guide (RG) 1.152 (Reference 7). RRCN combines some of the NRC-defined software life cycle plans, and covers all aspects of the plans defined by BTP 7-14 and RG 1.152. This single SO&MP is equivalent to the separate Software Operations Plan (SOP) and Software Maintenance Plan (SMaintP) defined in NRC Branch Technical Position 7-14 and additionally addresses hardware operations and maintenance for the system(s) developed by RRCN for *Project_Name*.

1.3 Project Summary

1.3.1 Project objectives

*The SO&MP describes the process for preparing the Operations and Maintenance Manuals (OMMs) for the following **SPINLINE 3** systems at Project_Name:*

Safety Systems – Class 1E

- *System_Name*

  Processing_Unit_Name, … *(**SPINLINE 3** software)*

Non-safety Systems

- *Monitoring and Maintenance Unit (MMU)*

  Processing_Unit_Name, … *(PC software)*

- *Other system (to be determined))*

  Processing_Unit_Name, … *(software to be determined)*

1.3.2 Deliverables

This SO&MP directs production of the following deliverables.

Table 1-1.SO&MP Deliverables

Description	Number	Intended date

Set of Operations and Maintenance Manuals (OMMs):
• One introductory OMM that provides the following information:
  • Overview of the ***SPINLINE 3*** equipment
  • Related operating and maintenance principles
  • Maintenance Data Sheets (MDS)
• One OMM per equipment
• One OMM containing all technical data sheets		

List of Spare Parts		

1.3.3 Constraints and assumptions

The constraints for the operation and maintenance of *System_Name_1 to System_Name_n* are listed below:

1. The NPP instructors have trained the NPP operations, maintenance, and other designated staff in accordance with the plant-specific System Training Plan (Reference 1).
2. Prior to commissioning *System_Name_1 to System_Name_n,* the applicable OMMs have been validated and approved by the licensee.
3. Operations and maintenance activities are conducted as permitted by the NPP Technical Specifications.

This Plan makes the following assumptions about the operation and maintenance of *System_Name_1 to System_Name_n*:

1. The NPP operations, maintenance, and engineering staff meet the utility's minimum qualification requirements for their assigned operations or maintenance positions, as defined in Section 3.1 and in NPP procedures.

1.4 Definitions and Abbreviations

1.4.1 Definitions

The following definitions are important for understanding the scope and applicability of this Plan:

Equipment technology	This plan considers two different equipment technologies: ▪ ***SPINLINE 3*** is a proprietary Rolls-Royce Civil Nuclear SAS technology designed to implement safety functions ▪ A personal computer (PC) is a commercially available technology based on the Intel or equivalent microprocessors, run under a commercial operating system, and used to implement nonsafety control, monitoring, or communication functions
Software category	This plan considers two categories of software: safety (Class 1E) and nonsafety (non Class 1E)
Operating activities	All functions that are performed by the operators in the control rooms and periodic surveillance tests and calibration activities performed by other NPP staff
Preventive maintenance	Replacement of parts before a failure occurs
Corrective maintenance	Replacement of parts upon detection of failure, including manual activities associated with the corrective maintenance (i.e., inhibition of the affected division by the Operations staff)

1.4.2 Abbreviations

The following abbreviations are used in this Plan.

BTP	Branch Technical Position
EBS	Equipment Breakdown Structure
ESFAS	Engineered Safety Feature Actuation System
I&C	Instrumentation and Controls
LDU	Local Display Unit
MCR	Main Control Room
MDS	Maintenance Data Sheet
MMU	Monitoring and Maintenance Unit
NPP	Nuclear Power Plant
OMM	Operations and Maintenance Manual
O&M	Operations and Maintenance
PC	Personal Computer
RG	Regulatory Guide

RRCN	Rolls-Royce Civil Nuclear SAS (Société Anonyme Simplifié)
RTS	Reactor Trip System
SCMP	Software Configuration Management Plan
SDP	Software Development Plan
SMaintP	Software Maintenance Plan (BTP 7-14)
SOP	System Operation Plan (BTP 7-14)
SO&MP	System Operation and Maintenance Plan
SQAP	Software Quality Assurance Plan
SVVP	Software Verification & Validation Plan
USNRC	United States Nuclear Regulatory Commission

1.5 Creation and Update of the SO&MP

The system-specific SO&MP is prepared by RRCN and approved by *the NPP Operations and Maintenance Manager.*

The SO&MP is updated only in case of a change in *System_Name_1 to System_Name_n* that affects operation or maintenance activities at the level described in this Plan. Updates to the separate Operations and Maintenance Manuals must be reviewed to confirm if the proposed changes also require a change to this Plan.

2 REFERENCE DOCUMENTS

Reference Standards

The following documents apply to the operations and maintenance activities described in this Plan.

Branch Technical Position 7-14 (Reference 6)	"Guidance on Software Reviews for Digital Computer-based Instrumentation and Control Systems", Section B.3.1.8, "Software Operations Plan (SOP)"
Branch Technical Position 7-14 (Reference 6)	"Guidance on Software Reviews for Digital Computer-based Instrumentation and Control Systems", Section B.3.1.6, "Software Maintenance Plan (SMaintP)"
NUREG/CR-6101 (Reference 8)	"Vendor Assessments and Software Plans", Sections 3.1.9 and 4.1.9, "Software Maintenance Plan"

Project Documents

The following documents define the project execution processes.

Mnemonic	Reference	Designation
[CSP]	*Document_Number*	Cyber Security Plan (project-specific)
[PQP]	*Document_Number*	Project Quality Plan (project-specific)
[PMP]	*Document_Number*	Project Management Plan (project-specific)
	Document_Number	System Integration and Factory Test Plan (project-specific)
	Document_Number	System Installation and Site Test Plan (project-specific)
	Document_Number	System Training Plan (project-specific)

RRCN Quality Management System Reference Documents:

The following documents provide detailed engineering instructions to implement this system plan.

Mnemonic	Reference	Designation
[PMQ]	8 303 186 P (Reference 10)	RRCN Quality Manual *Manuel Qualité de RRCN*
[PRA]	8 303 314 J	Project Development Process *Processus Réalisation d'Affaire*
	8 307 032 C	Principles for Control of Design (safety systems) *Principes de Maîtrise de la Conception (système classé sûreté)*
	8 303 334 F	System Design (Safety Systems) *Ingénierie Système (Système classé sûreté)*

3 OPERATIONS AND MAINTENANCE ORGANIZATIONS

3.1 Utility Operating Organization

3.1.1 Organization, roles and responsibilities

The utility is responsible for defining the organization at the NPP that is responsible for operating the ***SPINLINE 3*** *System_Name* and for specifying the roles and responsibilities within that organization.

3.1.2 Qualifications

The utility is responsible for defining the qualification requirements for its operating personnel. Additional training for operation of ***SPINLINE 3*** systems is identified in the Training Plan (Reference 1).

3.1.3 Resources

The utility is responsible for assigning resources for operation.

3.2 Utility Maintenance Organization

3.2.1 Organization, roles and responsibilities

The utility is responsible for defining the organization at the NPP that is responsible for maintaining the ***SPINLINE 3*** *System_Name* and for specifying the roles and responsibilities within that organization.

3.2.2 Qualifications

The utility is responsible for defining the qualification requirements for its maintenance personnel. Additional training for maintenance of ***SPINLINE 3*** systems is identified in the Training Plan (Reference 1).

3.2.3 Resources

The utility is responsible for assigning resources for maintenance.

3.3 System Supplier

RRCN supports utility operation and maintenance of ***SPINLINE 3*** systems following commissioning of the systems and start of the operating phase of the system. As a minimum, that support includes:

- Warranty service for repair or replacements of failed components
- Spare parts supply
- Software updates other than simple parameter modifications that can be accomplished by NPP maintenance staff.

4 RISKS MANAGEMENT

The primary O&M risks for a ***SPINLINE 3*** systems are maintenance errors that cause a safety issue, such as a spurious trip or a configuration change that disables a safety function. This risk is mitigated by the following measures:

- NPP operating and maintenance staff. have been trained in accordance with the System Training Plan (Reference 1)
- Utility administrative procedures enforce Technical Specification restrictions on when maintenance can be performed and the scope of that maintenance. The utility administrative procedures also establish requirements for independent confirmation of configuration and completion of maintenance actions.
- Comprehensive Operating & Maintenance Manuals (OMMs) define a systematic basis for operating and maintaining a ***SPINLINE 3*** system safely.
- Comprehensive failure detection features that employ a combination of self-tests, surveillance functions, and periodic tests provide a means for detecting maintenance errors.

Cyber security and physical security risks and mitigating measures implemented during operations and maintenance are addressed in the plant-specific Cyber Security Plan (Reference 9).

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5 PREPARING THE OPERATIONS AND MAINTENANCE MANUALS (OMMS)

The set of Operations and Maintenance Manuals (OMMs),to be prepared for *Project_Name* is listed in Table 5-1.

Table 5-1. OMM Delivery Schedule

OMM Title	**Document Number**	**Delivery Date**
One introductory OMM		
One OMM *per equipment*		
One OMM containing all technical data sheets		

5.1 Guidance for Preparing the Introductory OMM

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5.2 Guidance for Preparing the Equipment OMMs

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5.3 Guidance for Preparing the Technical Data Sheet OMM

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6 RECORDING AND REPORTING SYSTEM FAULTS AND OPERATING OR MAINTENANCE ERRORS

After *System_Name_1 to System_Name_n* have been accepted by the licensee, it is the licensee's responsibility to record system faults and any operating or maintenance errors in accordance with applicable procedures, including 10 CFR 21, "Reporting of Defects and Noncompliance."

RRCN will assist the utility in evaluating a suspected defect or noncompliance in a ***SPINLINE 3*** system. If it is determined that a defect or noncompliance exists in the system or components delivered by RRCN, then RRCN also will provide the NRC with timely reporting under the RRCN Nuclear Quality Program (Reference 10).

7 O&M PROGRAM REVIEW

Periodic reviews of operating and maintenance activities will be conducted at intervals specified in the utility Quality Procedures.

8 RECORDS RETENTION

The NPP is responsible for retaining operating and records in accordance with their own procedures.

RRCN will retain records and supporting technical documentation in accordance with contractual requirements stipulated by the NPP, or at least for the operating life of the system. RRCN will retain superseded portions of records for at least 3 years after the record is superseded.

9 REFERENCES

1. *"Project_Name* System Training Plan*",* based on Rolls-Royce Civil Nuclear SAS System Training Plan template 8 307 242 A, June 30, 2009

2. *"Project_Name* Software Quality Assurance Plan*",* based on Rolls-Royce Civil Nuclear SAS Software Quality Assurance Plan template 8 307 208 B, June 30, 2009

3. *"Project_Name* Software Configuration Management Plan*",* based on Rolls-Royce Civil Nuclear SAS Software Configuration Management Plan template 8 307 209 B, June 30, 2009

4. *"Project_Name* Software Development Plan*"*, based on Rolls-Royce Civil Nuclear SAS Software Development Plan template 8 307 211 B, June 30, 2009

5. *"Project_Name* Software Validation & Verification Plan*",* based on Rolls-Royce Civil Nuclear SAS Software Validation & Verification Plan template 8 307 210 B, June 30, 2009

6. NUREG-0800, USNRC Standard Review Plan, Branch Technical Position BTP 7-14, Revision 5, "Guidance on Software Reviews for Digital Computer-based Instrumentation and Control Systems",

7. Regulatory Guide 1.152, Revision 2, "Criteria for the Use of Computer Systems in Safety Systems of Nuclear Power Plants"

8. NUREG/CR-6101, "Software Reliability and Safety in Nuclear Power Plant Protection Systems", Lawrence Livermore National Laboratory, November 1993

9. *"Project_Name* Cyber Security Plan", based on Rolls-Royce Civil Nuclear SAS Cyber Security Plan template, 8 307 255 A, June 30, 2009

10. "Quality Manual", Document No. 8 303 186 P, Rolls-Royce Civil Nuclear SAS, June 2009

APPENDIX A: OUTLINE OF A REPRESENTATIVE *SPINLINE 3* INTRODUCTION OPERATIONS AND MAINTENANCE MANUAL (OMM)

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APPENDIX B: OUTLINE OF A REPRESENTATIVE *SPINLINE 3* MAINTENANCE DATA SHEET (MDS)

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APPENDIX C: OUTLINE OF A REPRESENTATIVE *SPINLINE 3* EQUIPMENT OPERATIONS AND MAINTENANCE MANUAL (OMM)

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