

Enclosure 18 to ET 07-0022

Installation Plan for the Replacement MSFIS Controls, Revision 1

MAIN STEAM & FEEDWATER ISOLATION SYSTEM (MSFIS) CONTROLS REPLACEMENT



INSTALLATION PLAN

REVISION 1

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1 Project Information

1.1 Project Objectives

The purpose of the Main Steam and Feedwater Isolation System (MSFIS) Controls Replacement Project is to replace the existing MSFIS controls with an Advanced Logic System (ALS). The replacement installation is scheduled for Refueling Outage 16, spring 2008. The MSFIS Controls Replacement Project is one aspect of an overall project to replace the existing Main Steam Isolation Valve (MSIV) bodies and actuators as well as the Main Feedwater Isolation Valve (MFIV) bodies and actuators. The existing MSFIS controls does not support the operation of the replacement MSIV and MFIV actuators. A modified or replacement controls is required to operate the new valve actuators. In addition to the lack of capability, the existing MSFIS controls system is based on obsolete technology that has become less reliable as the system ages. A recent plant trip (August 2003) was due to a failed circuit card in the existing MSFIS controls. Several single points of failure exist in the existing MSFIS controls.

The objectives of the MSFIS Controls Replacement Project are as follows: 1) Provide the required logic updates to control the replacement MSIVs and MFIVs. 2) Increase the reliability of the MSFIS controls where no single point of failure shall cause a false actuation or prevent accomplishment of the MSFIS safety function. 3) Provide an improved test and maintenance interface. The existing system is very difficult to troubleshoot and maintain. The replacement MSFIS controls will reduce manual testing by providing automated and interactive automated testing. 4) Provide hot swap functionality for all system modules including the system power supplies. 5) Provide a summary trouble alarm for each cabinet, SA075A and SA075B.

1.2 System Description

The current channel separation scheme applied to the overall plant design will be maintained. The two redundant and equivalent MSFIS subsystems will be located in separate cabinets:

MSFIS Channel I (Separation Group 1) located in MSFIS Cabinet **SA075A** – also referred to as train A.
MSFIS Channel IV (Separation Group 4) located in MSFIS Cabinet **SA075B** – also referred to as train B.

The MSFIS functionally is divided into 2 independent functions:

MSIV control - The MSIV control receives the automatic actuation Steam Line Isolation Signal (SLIS) to close the MSIVs. Main Steam Line Isolation minimizes the uncontrolled cool down of the Reactor Coolant System (RCS) that would result from a main steam line rupture. Input signals pass from the detectors through the Solid State Protection System (SSPS) to the MSFIS cabinet where the output signal is generated to close the valves.

MFIV control - The MFIV control receives the automatic actuation Feedwater Isolation Signal (FWIS) to close the MFIVs. The feedwater isolation minimizes the potential for excessive post-trip cool down of the RCS due to overfilling the steam generators. It also prevents moisture carryover caused by high steam generator levels, and isolates normal feedwater in the event of a High Energy Line Break inside containment. Input signals pass from the detectors through the SSPS to the MSFIS cabinet where the output signal is generated to close the valves.

The MSFIS provides the control logic for a total of 8 valves:

4 Main Steam Isolation Valves (MSIV#1-4): **AB-HV-14, AB-HV-17, AB-HV-20, AB-HV-11.**
4 Main Feedwater Isolation Valves (MFIV#1-4): **AE-FV-39, AE-FV-40, AE-FV-41, AE-FV-42.**

Both separation groups actuate the same MSIV and MFIV. The replacement Main Steam and Feedwater Isolation valves are operated by system-medium. The valve actuators are controlled by pressure from the system-medium, which are in turn controlled by solenoid valves. Each Main Steam and Feedwater isolation valve has one actuator with two separate Class 1E electrical systems capable of closing the valve independently of the other system. MSFIS

is provided with operator inputs from Main Control Board (MCB) switches, ESFAS actuation signals from SSPS, valve position switches, and a local operator panel.

1.3 Roles and Responsibilities

The following sections outline the roles and responsibilities for the installation of the replacement MSFIS Controls.

1.3.1 WCNOG

WCNOG is the system owner and is ultimately responsible for the successful installation of the replacement MSFIS Controls. WCNOG is the lead organization for installing the replacement MSFIS controls. Lead by the WCNOG Project Manager, WCNOG is responsible for the following items:

- 1) Coordinate the modification to the plant via the Modification process,
- 2) Create and perform a Site Acceptance Test. Upon completion of the Site Acceptance Test the equipment will be staged and considered ready for the Refueling Outage.
- 3) Create work planning instructions for the physical removal of the existing equipment and the installation of the new equipment.
- 4) Perform the work to remove the existing equipment and install the new equipment.
- 5) Create and perform the Post Maintenance Test to ensure the equipment has been installed correctly and is functioning properly. Successful completion of the Post Maintenance Test determines that the system is capable of performing the intended function. The Post Maintenance Test satisfies the Technical Specification testing requirements, such that the system can be classified as Operable upon successful completion of the test.

1.3.2 Platform Owner and Design Consultant

The Platform Owner and Design Consultant is responsible for the design, development and integration of the ALS MSFIS controls. As the ALS Platform owner and control system designer, CS Innovations provides these functions for the MSFIS Controls Replacement project.

1.3.3 Qualification and Dedication Contractor

The Qualification and Dedication Contractor is responsible for providing both oversight and direct actions to ensure that the requirements on qualification and dedication of the design and implementation of the safety related hardware for a Class 1E system, including its performance, integration, and configuration control, design, and documentation, are satisfied. As the Appendix B supplier, Nutherm International is providing this function.

1.4 References

1.4.1 MSFIS Project Plan

1.4.2 J-105A(Q)

1.4.3 MSFIS Level 1 Specification

2 Installation Plan

2.1 Scope

The scope of the MSFIS Controls Replacement Project is to replace the existing controls, with a control system based on the Advanced Logic System (ALS) technology.

The MSFIS Controls Replacement Project replaces the existing safety related electronic MSFIS with a hardware-based system to perform the control functions of the MSIVs and MFIVs. The replacement MSFIS will be installed in conjunction with replacement of the existing electro-pneumatic-hydraulic MSIVs and MFIVs by new MSIVs and MFIVs with system-medium actuators. The MSFIS controls, existing and replacement, has two redundant subsystems located in separate cabinets:

MSFIS Channel I (1) located in MSFIS Cabinet SA075A
MSFIS Channel IV (4) located in MSFIS Cabinet SA075B

The replacement project will retain the existing cabinets, external power supply feeds, and channel separation scheme in the overall plant configuration. The replacement project will include changes to the functions by which the replacement MSFIS controls the replacement MSIVs and MFIVs. These changes account for the differences in the function of the existing and replacement MSIVs and MFIVs, that is, electro-pneumatic-hydraulic actuators replaced by system medium actuators.

The replacement project will implement a new digital control system, new power supplies, new assembly panels and new vendor wiring. The replacement project will retain without modifications, the existing cabinets including mechanical structures used to mount racks and components, field-wiring and terminal blocks within the cabinets. The replacement project will modify the functionality of the current MSFIS (per J-105A (Q) Rev. 2 requirements) [1]. This will include changes to the functions by which the replacement MSFIS controls the replacement MSIVs and MFIVs. These changes account for the differences in the function of the existing and replacement MSIVs and MFIVs, that is, electro-pneumatic-hydraulic actuators, replaced by system-medium actuators. The replacement project will not re-use existing electronic boards, sub-racks, interconnecting wiring/cables, fuse blocks, circuit breakers, test panel, switches, indicators, power supplies, actuation relays, assembly panels etc. Nor will the replacement project include the actual installation of the replacement MSFIS components in the MSFIS cabinets, the new system-medium MSIV / MFIV actuators or any of the field cables.

After replacement, each cabinet will contain the following components:

- **2 ALS Racks:** One Main Steam (MS) rack and one Feedwater (FW) rack. Each rack is identical and will contain the following circuit boards:
 - 1 Core Logic board (ALS-101)
 - 2 Digital Input board (ALS-301)
 - 1 Solid-state output board (ALS-401)
 - 3 Solid State FET & Sensor output board (ALS-411)
 - 1 Service & Test board (ALS-201)
 - 2 Power supply modules (ALS-905)
- **1 Assembly panel,** with MS and FW components
 - Terminal and distribution block for 125Vdc class I E power train
 - Fuse blocks for solenoid outputs and ALS rack
- **Cables** between vendor and field terminal blocks

In summary, the replacement project will provide a complete set of MSFIS controls, which can be installed in existing racks, replacing the existing control system. An overview of the replacement MSFIS can be seen in Figure 1 below.

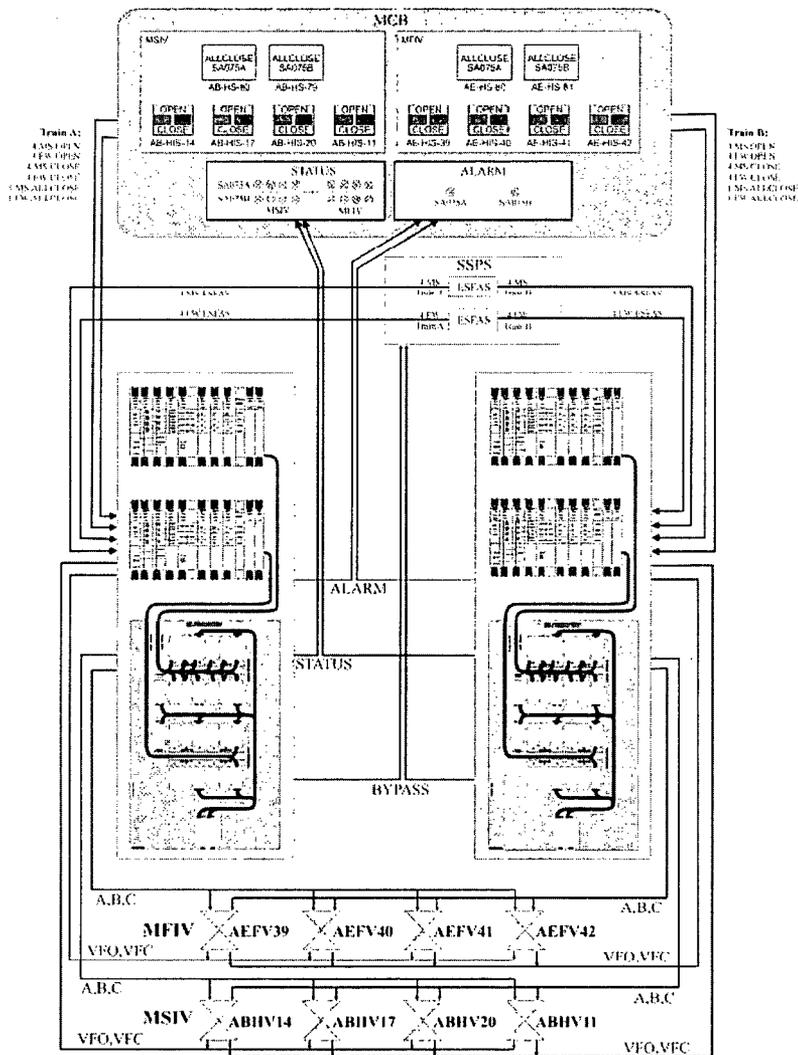


Figure 1: MSFIS Overview

2.2 Installation Environment

The replacement project will retain the existing cabinets, external power supply feeds, and the channel separation scheme in the overall plant configuration. The equipment installation of the replacement MSFIS controls is limited to instrumentation cabinets SA075A and SA075B. Instrumentation cabinets SA07A and SA075B are both located in the Main Control Building within the Control Room equipment area.

2.2.1 Environmental Requirements

The environment of the Main Control Building is considered a Mild Environment with normal operating temperature of ~68 F. The accident temperature for the Main Control Room is 104F. The replacement controls have been designed for a more robust environment, and based on the qualification they easily meet the mild environment requirements.

The existing cabinets are a closed cabinet design with no forced ventilation. The cabinets have equivalent access from both the front and rear of the cabinet. Based on a comparison between the existing controls and the replacement controls the replacement controls dissipate less heat than the existing controls. Therefore, no changes to the cabinets will be made regarding cooling aspects.

2.2.2 EMI/RFI Environment

The existing cabinets have Lexan door inserts which provide no shielding for EMI/RFI. Based on the qualification testing of the replacement controls no cabinet shielding was accounted for therefore the existing cabinet doors can remain as is. The replacement controls have been tested to the EPRI Topical Report TR-102323-R2 "Guideline for Electromagnetic Interference Testing in Power Plants," which is endorsed by the NRC Regulatory Guide 1.180 Rev.1 "Guidelines for Evaluating Electromagnetic and Radio-Frequency Interference in Safety-Related Instrumentation and Control Systems"

2.2.3 Security Environment

The existing cabinets are located in the Control Building, specifically the Main Control Equipment Room. This room is secured by the plant security system, which only allows authorized personnel into the area. Both the existing as well as the replacement controls are not permanently connected to either the corporate network or the Plant Process Computer. In addition both the existing and replacement controls are stand-alone, in that they operate based on the plant equipment inputs and output only to direct plant equipment. Based on the fact that the replacement controls are secured in the same manner as the existing controls no additional security functionality will be added.

2.3 Installation Entry and Exit Criteria

2.3.1 Items which must be completed before installation can begin.

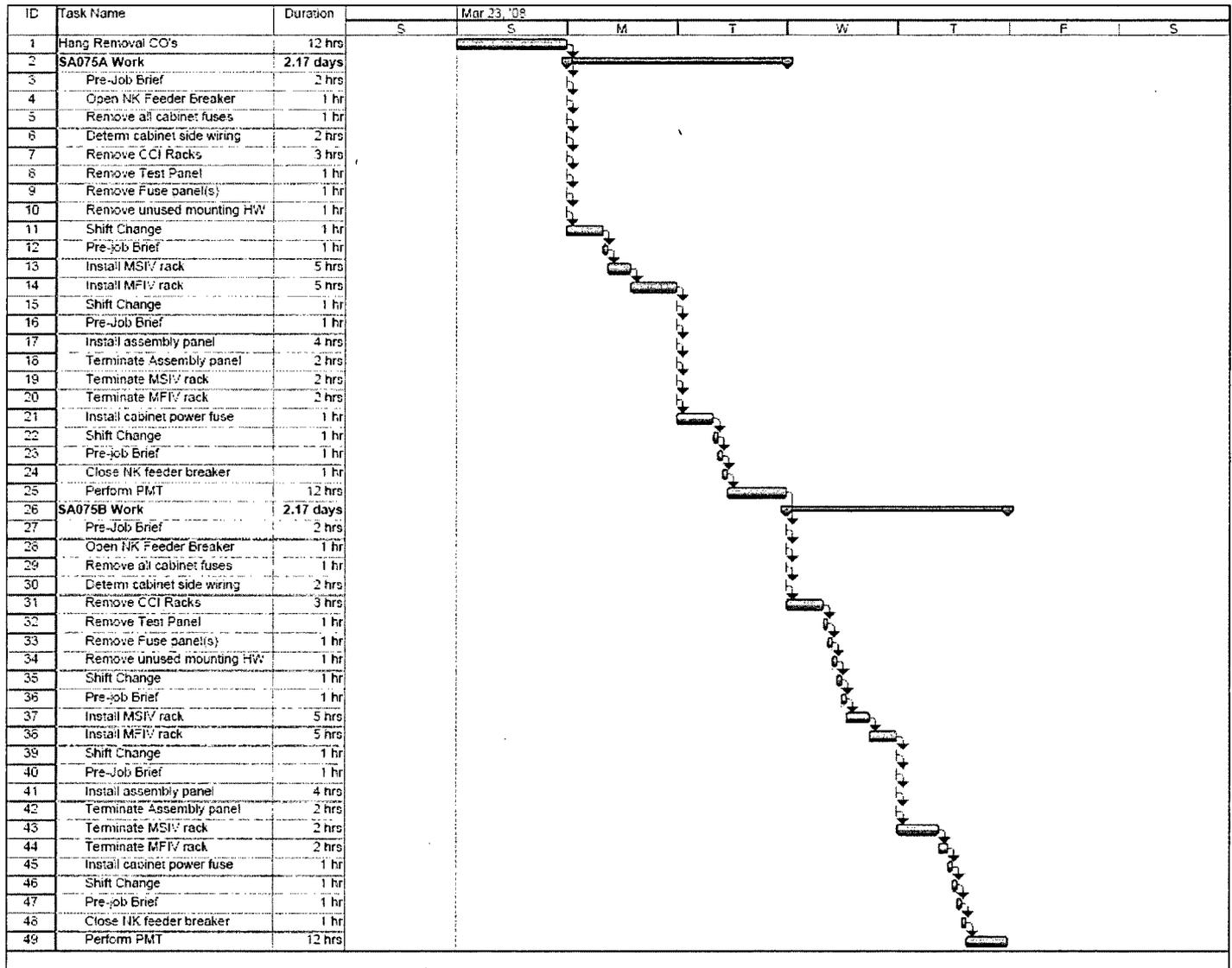
- DCP10414 issued and planned
- DCP9952 issued and planned
- DCP11608 issued and planned
- All equipment delivered to site
- All equipment successfully completing Site Acceptance Test
- All equipment staged and ready for installation 1 month prior to refueling outage
- NRC approval of license amendment for the installation of the replacement MSFIS Controls

2.3.2 Items which must be achieved for the installation to be deemed complete.

- Existing equipment removed
- New equipment installed as designed
- Successful completion of Post Maintenance Testing
- Successful Installation and Operation of replacement MSIVs and MFIVs

2.4 Installation Schedule

Below is a high level schedule of the refueling outage implementation work for the replacement of the MSFIS Controls. This schedule will be incorporated into the WCNOG Outage Planning Group (OPG) Schedule and maintained by the OPG starting at 3 months prior to implementation.



2.5 Installation Test Procedure

The Post Maintenance Test (PMT) procedure will be generated by WCNOG personnel, including the V&V Engineer as well as the planners involved with the project. The purpose of the PMT is to ensure the equipment was installed correctly, validate all existing field wiring is correct per the existing design drawings, and ensure the new equipment functions as designed. The Post Maintenance Test satisfies the Technical Specification testing requirements, such that the system can be classified as Operable upon successful completion of the test.

2.6 Dependencies

The replacement MSFIS controls will be installed in conjunction with replacement of the existing electro-pneumatic-hydraulic MSIVs and MFIVs by new MSIVs and MFIVs with system-medium actuators. The installation of the replacement MSFIS controls must be performed along with the mechanical MSIV and MFIV replacement. If the mechanical MSIV and MFIV is delayed to a later refueling outage then the replacement MSFIS Controls must be delayed to the same refueling outage. Likewise, if the replacement MSFIS Controls is delayed to a later refueling outage then the mechanical MSIV and MFIV replacement must be delayed to the same refueling outage.