Enclosure XII to ET 08-0014

WCNOC ALS Architecture Evaluation, Rev.0, Non-Proprietary

ADVANCED LOGIC SYSTEM

(ALS)

CLASS 1E CONTROLS

ALS ARCHITECTURE EVALUATION

REVISION 0

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Revision Control

Rev #	Approval	Approval Date	Description of Change(s)
0	GWC	2/25/2008	Initial Revision

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1 Purpose and Scope

1.1 Purpose

The purpose of this document is to evaluate the ALS architecture for use at WCGS. The ALS will initially be installed as a replacement for the existing MSFIS controls. This evaluation will focus on this particular replacement, but also serve as a generic evaluation for modifications going forward.

1.2 Scope of Evaluation

As stated in the purpose this evaluation is focused on the MSFIS Controls replacement modification, but also serves as a generic evaluation of the ALS for use at WCGS.

The scope of the MSFIS modification as defined by J-105A(Q) "Replacement MSFIS System" 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, have 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 and 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 panels, switches, indicators, power supplies, actuation relays, assembly panels, and so on, 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:

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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.

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[ ]

1.3 References

1.3.1 WCNOC, J-105A(Q), "Replacement MSFIS System"

1.3.2 [ ] c,d

1.3.3 CS Innovations, 6101-00000, "MSFIS Level 0 Specification"

1.3.4 CS Innovations, 6101-00002, "MSFIS System Specification"

2 ALS Architecture Evaluation and Deliverables

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2.1

2.2 ALS Architecture for the MSFIS replacement

The ALS architecture provides the correct solution for the replacement of the MSFIS Controls at WCGS. In addition to the overall aspects discussed in section 2.1, the ALS provides the proper interface for the MSFIS Controls. The table below shows the I/O interface for the MSFIS Controls at WCGS. This I/O interface meets the requirements for the replacement MSFIS Controls at WCGS. The solenoid interface provides additional functionality and eliminates the requirement for an interposing contactor for switching the large solenoids located on the actuators.

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2.3 ALS Equipment Deliverables

The following is a list of equipment deliverables for the MSFIS Controls replacement. This list of deliverable items meets the requirements as stated in J-105A(Q) specification.

Item Description	CSI Part #
WC-MSFIS, Ms ALS Rack	5101-100
WC-MSFIS, MF ALS Rack	5101-101
Assembly Panel, SA075A	4101-036
WC-MSFIS Cable, C1M1	4101-020
WC-MSFIS Cable, C1F1	4101-020
WC-MSFIS Cable, C1M2	4101-024

WC-MSFIS Cable, C1F2	4101-024
WC-MSFIS Cable, C1M3	4101-028
WC-MSFIS Cable, C1F3	4101-028
WC-MSFIS Cable, C1M4	4101-032
WC-MSFIS Cable, C1F4	4101-032
Assembly Panel, SA075B	4101-038
WC-MSFIS Cable, C4M1	4101-022
WC-MSFIS Cable, C4F1	4101-022
WC-MSFIS Cable, C4M2	4101-026
WC-MSFIS Cable, C4F2	4101-026
WC-MSFIS Cable, C4M3	4101-030
WC-MSFIS Cable, C4F3	4101-030
WC-MSFIS Cable, C4M4	4101-034
WC-MSFIS Cable, C4F4	4101-034
Rack Level Equipment	
ALS-101, ALS Board, Core Logic Board	5101-007
ALS-201, ALS Board, Service & Test Board	5101-008
ALS-301-1, ALS Board, Input Board	5101-010
ALS-301-2, ALS Board, Input Board	5101-011
ALS-401-1, ALS Board, Output Board	5101-012
ALS-411-1, ALS Board, Output Board	5101-001
ALS-411-2, ALS Board, Output Board	5101-002
ALS-411-3, ALS Board, Output Board	5101-003
ALS-905, ALS Board, Power Supply Unit	5101-009

2.4 ALS Drawing and Documentation Deliverables

The following is a list of drawing and documentation deliverables for the MSFIS Controls replacement. This list of deliverable items meets the requirements as stated in J-105A(Q) specification.

CSI Part #	Item Description
4101-008	Bill of Material and Assembly Drawing, ALS Backpanel, MSFIS
4101-007	Schematic, Backpanel, MSFIS
5101-007	ALS-101, ALS Daughter Card, CLB
4101-010	Bill of Material and Assembly Drawing, ALS-101
4101-009	Schematic, ALS-101
5101-008	ALS-201, ALS Daughter Card, STB
4101-012	Bill of Material and Assembly Drawing, ALS-201
4101-011	Schematic, ALS-201
4101-018	Bill of Material and Assembly Drawing, ALS-201 Bypass Switch Board
4101-017	Schematic, ALS-201 Bypass Switch Daughterboard
5101-010	ALS-301-1, ALS Daughter Card, IPB
4101-004	Bill of Material and Assembly Drawing, ALS-301
4101-003	Schematic, ALS-301
5101-011	ALS 301-2, ALS Daughter Card, IPB

4101-004	Bill of Material and Assembly Drawing, ALS-301
4101-003	Schematic, ALS-301
5101-012	ALS-401-1, ALS Daughter Card, OPB
4101-006	Bill of Material and Assembly Drawing, ALS-401
4101-005	Schematic, ALS-401
5101-001	ALS-411-1, ALS Daughter Card, FSB
4101-002	Bill of Material and Assembly Drawing, ALS-411
4101-001	Schematic, ALS-411
5101-002	ALS-411-2, ALS Daughter Card, FSB
4101-002	Bill of Material and Assembly Drawing, ALS-411
4101-001	Schematic, ALS-411
5101-003	ALS-411-3, ALS Daughter Card, FSB
4101-002	Bill of Material and Assembly Drawing, ALS-411
4101-001	Schematic, ALS-411
5101-009	ALS-905, ALS Daughter Card, PSU
4101-014	Bill of Material and Assembly Drawing, ALS-905
4101-013	Schematic, ALS-905
4101-035	Drawing, Assembly Panel, SA075A
4101-036	Bill of Material and Wirelist, Assembly Panel, SA075A
4101-037	Drawing, Assembly Panel, SA075B
4101-038	Bill of Material and Wirelist, Assembly Panel, SA075B
4101-049	Drawing, SA075A, Vendor wiring
4101-050	Drawing, SA075B, Vendor wiring
4101-019 / 4101-021	Drawing, WC MSFIS Cable, Cxx1 (MS/MF)
4101-020 / 4101-022	Bill of Material and Wirelist, WC MSFIS Cable, Cxx1
4101-023 / 4101-025	Drawing, WC MSFIS Cable, Cxx2
4101-024 / 4101-026	Bill of Material and Wirelist, WC MSFIS Cable, Cxx2
4101-027 / 4101-029	Drawing, WC MSFIS Cable, Cxx3
4101-028 / 4101-030	Bill of Material and Wirelist, WC MSFIS Cable, Cxx3
4101-031 / 4101-033	Drawing, WC MSFIS Cable, Cxx4
4101-032 / 4101-034	Bill of Material and Wirelist, WC MSFIS Cable, Cxx4
4101-065	Drawing, MSFIS Logic Overview
4101-061	Drawing, SA075A MS One Line Diagram
4101-062	Drawing, SA075A FW One Line Diagram
4101-063	Drawing, SA075B MS One Line Diagram
4101-064	Drawing, SA075B FW One Line Diagram

2.5 ALS Design Documents

The following design documents were reviewed to ensure the ALS architecture design is found acceptable for use at WCGS.

2.5.1 [ ] [c,d]

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2.5.2 CS Innovations, 6101-00000, "MSFIS Level 0 Specification"

This document provides the Conceptual Design of the Main Steam Feedwater Isolation System (MSFIS) controls replacement project for Wolf Creek Generating Station. The conceptual design is the initial look at what the MSFIS Controls replacement looks like using the ALS.

2.5.3 CS Innovations, 6101-00002, "MSFIS System Specification"

This document addresses the overall system specifications of the replacement system for the safety related Main Steam and Feedwater Isolation System (MSFIS) controls for Wolf Creek Generating Station (WCGS). The document provides an overall description of the replacement MSFIS based on the Advanced Logic System (ALS) The document addresses the overall MSFIS implementation, as well as the specification for the cabinet content and detailed specification of the assembly panel.

2.6 Conclusion of Evaluation

The ALS architecture is found to be acceptable for use as MSFIS Controls replacement as well as a generic safety related controls platform at WCGS. This evaluation is based on the final acceptance by WCNOC of the CS Innovations documentation, drawings, and actual equipment as discussed in this document.