



HF Controls

**Responses to First Round of RAI
From NRC in Correspondence to
HFC Amendments 2 and 3
for the HFC-6000 Platform**

RR901-002-11

Rev. A

Effective Date: 5/17/2016

Prepared By: Eugene O'Donnell

Reviewed By: Yang Lu

Approved By: Allen Hsu

**Responses to First Round of RAI from NRC in correspondence to HFC
Amendments 2 and 3 for the HFC-6000 Platform**

Revision History

Date	Revision	Preparer	Changes
5/11/2016	A	E. O'Donnell	Initial Revision

TABLE OF CONTENTS

<u>Section</u>	<u>Description</u>	<u>Page</u>
1.0	Introduction.....	3
2.0	Complete RAI and Responses	3
3.0	List of Supporting Documents for the RAI Responses.....	11

Responses to First Round of RAI from NRC in correspondence to HFC Amendments 2 and 3 for the HFC-6000 Platform

1.0 Introduction

This document contains the responses to the Request for Additional Information (RAI) issued by the Office of Nuclear Reactor Regulation in correspondence to the HFC Amendments 2 and 3 for the HFC-6000 platform.

The complete RAI is listed in section 2.0. Response to a particular RAI question is listed immediately following the RAI with the heading "HFC Response:" and in blue color font.

In section 3.0, the supporting documents to the responses are listed.

2.0 Complete RAI and Responses

REQUEST FOR ADDITIONAL INFORMATION FOR DOOSAN HF CONTROLS CORP. HFC-6000 SAFETY SYSTEM PLATFORM TOPICAL REPORT AMENDMENTS FOR ENHANCED EQUIPMENT (TAC NO. MF0597)

On April 27, 2011, the U.S. Nuclear Regulatory Commission (NRC) staff issued a Safety Evaluation for the Doosan HF Controls Corporation (HFC), "HFC-6000 Safety System" Topical Report (TR) PP901-000-01, Revision C (Agencywide Documents Access and Management System (ADAMS) Accession No. ML110831017), for the HFC-6000 safety system platform for use in digital upgrades in nuclear power plants.

By letters dated September 30, 2011, and August 31, 2012 (ADAMS Accession Nos. ML11297A041 and ML131420097), HFC submitted two amendments (Amendments 2 and 3) to the approved TR for NRC staff review. These TR amendments, "Amendment for the Enhanced Equipment of HFC-6000 Safety Evaluation Report," and "Amendment for Fast Performance Controller Platform of HFC-6000 Safety Evaluation Report," include enhanced equipment for use with the approved HFC-6000 safety system platform.

The NRC staff performed an acceptance review of TR Amendments 2 and 3 and by letter dated May 14, 2015 (ADAMS Accession No. ML15114A004), concluded that supplemental information was needed to perform the review. In response to the NRC's acceptance review letter requesting supplemental information HFC submitted letters dated June 15, June 26, and July 9, 2015 (ADAMS Accession Nos. ML15175A314, ML15198A275, and ML15211A292). By letter dated September 10, 2015 (ADAMS Accession No. ML15222A009), the NRC staff found the supplemental information submitted by HFC to be sufficient to perform the review of the HFC-6000 TR amendments for enhanced equipment.

The NRC staff has identified additional information that is needed to complete the technical review. The following request for additional information (RAI) questions are related to open items that have been discussed with HFC during monthly conference calls.

Responses to First Round of RAI from NRC in correspondence to HFC Amendments 2 and 3 for the HFC-6000 Platform

RAI-1 (related to Open Items 1, 6.1, 7, 8, 9, 11, 12, 15, and 16.1)

The HFC-6000 TR Amendments 2 and 3 and the supplemental documentation provided identify several modules that can be used with the HFC-6000 safety system platform. In order to perform the review of the TR amendments, HFC must identify which modules are part of the NRC review, as well as the necessary identification information for the modules. Therefore, please provide a table listing all modules that are part of the HFC-6000 safety system platform TR amendments and within the scope of the NRC review. Also, for each module provide the following information:

- module name,
- module type (function),
- base part number (see the note below),
- part number (without bezel),
- part number with bezel (if applicable),
- test system (i.e., ERD921 or ERD1192),
- test specimen(s) within the test system (i.e., TUV Triple Modular Redundancy (TMR), TUV Double Modular Redundancy (DMR), Single-Loop Controller (SLC) SBC04A, Remote 1 SBC06, or Remote 3 FPC08).

Note: For the modules that have a common printed circuit board (PCB) but whose part number changes based on variations in the firmware and/or software, or based on a hardware change (e.g., fuses, electrical housing), please include a column in the table that specifies the base PCB part number.

[

Table 1: Modules for Review

Module Name	Type	Base P/N	P/N Without Bezel	P/N With Bezel	Test System
[

]

**Responses to First Round of RAI from NRC in correspondence to HFC
Amendments 2 and 3 for the HFC-6000 Platform**

**Responses to First Round of RAI from NRC in correspondence to HFC
Amendments 2 and 3 for the HFC-6000 Platform**

**Responses to First Round of RAI from NRC in correspondence to HFC
Amendments 2 and 3 for the HFC-6000 Platform**

**Responses to First Round of RAI from NRC in correspondence to HFC
Amendments 2 and 3 for the HFC-6000 Platform**

]

Responses to First Round of RAI from NRC in correspondence to HFC Amendments 2 and 3 for the HFC-6000 Platform

RAI-2 (related to Open Item 15)

The HFC-6000 TR Amendments 2 and 3 include enhanced modules for use with the HFC-6000 safety system platform. These modules were tested as part of several test specimens (i.e., TUV TMR, TUV DMR, SLC SBC04A, Remote 1 SBC06, and Remote 3 FPC08) within two test systems (i.e., ERD921 and ERD1192).

The Environmental Qualification (EQ) for the HFC-6000 enhanced modules was conducted using multiple data sets for each of the following EQ testing areas: Temperature/Humidity, Radiation, Electromagnetic Interference/Radio-frequency Interference (EMI/RFI), and Seismic. HFC must identify the EQ data sets for these four EQ testing areas, and identify which EQ data sets apply to the enhanced modules.

- a. For each of the EQ testing areas (i.e., Temperature/Humidity, Radiation, EMI/RFI, and Seismic), please provide a table identifying the applicable EQ data sets.

Additionally, please identify in these tables the following information for each EQ data set: relevant sections in the TR amendment where the data sets are described, relevant supporting documentation (e.g., test procedures and test reports (including summary reports and laboratory test reports)), and any applicable notes.

- b. For each of the EQ testing areas (i.e., Temperature/Humidity, Radiation, EMI/RFI, and Seismic), please provide a table that specifies the applicable EQ data set (see RAI-2.a, above) for each of the enhanced modules.

The Equipment Qualification data sets for Amendments 2 and 3 are as follows in Table 2:

Table 2: Data sets for Amendments 2 and 3

[
]				

Responses to First Round of RAI from NRC in correspondence to HFC Amendments 2 and 3 for the HFC-6000 Platform

The sections in the related Topical Report documents are as described in Table 3:

Table 3: TR Data Set References

[

]

RAI-3 (related to Open Item Clarifications C7.1 and C15.1.a)

Table 1 of TR901-201-03, Rev. B, "ERD921 Environmental Stress Detail Test Report," shows the Jasper 24 volts Power Supply and the Jasper Power Supply Rack for the ERD921 test specimen. However, the master configuration lists for the DMR (VV901-301-02-PI, Rev. C), TMR (VV901-302-02-PI, Rev. C), and SLC HFC-SBC04A (VV901-303-02-PI, Rev. C) show Kepco Power Supplies and Racks for the ERD921 test specimen.

Please specify which power supplies were used in the ERD921 test specimens and specify the updated revision to the documentation that shows these power supplies (i.e., "ERD921 Environmental Stress Detail Test Report" and/or MCLs) as applicable.

Jasper 24V Power Supplies [] and Jasper Power Supply Racks [] were used in all Test Specimen within the scope of Amendment 2 and 3. The documents covering the use of these power supplies in all Test Specimen are:

- VV901-301-02, TUV DMR Master Configuration List, Rev D
- VV901-302-02, TUV TMR Master Configuration List, Rev D
- VV901-304-01, ERD1192 Master Configuration List, Rev C

[

Responses to First Round of RAI from NRC in correspondence to HFC Amendments 2 and 3 for the HFC-6000 Platform

]

3.0 List of Supporting Documents for the RAI Responses

Table 1 shows the list of supporting documents for the RAI Responses.

Table 4: List of Supporting Documents

Document	Related RAI
VV901-301-02, TUV DMR Master Configuration List, Rev D	
VV901-302-02, TUV TMR Master Configuration List, Rev D	
VV901-304-01, ERD1192 Master Configuration List, Rev C	
RR901-002-01, Amendment for Enhanced Equipments of HFC-6000 Safety Platform, Rev. B	
RR901-003-01, Amendment for Fast Performance Controller of HFC-6000 Safety Platform, Rev. B	
Environmental Testing Laboratory Certificate of Test 11188	
Environmental Testing Laboratory Certificate of Test 12057	
Nemko Engineering Test Report 47110RG1.180	
Nemko Engineering Test Report 1029582RG1.180	
NTS Report No. TR014792-13N	
RR901-003-06 Radiation Exposure Evaluation of HFC-6000 HFC-FPC08 , Rev C	
TR901-201-03, ERD921 Environment Stress Detail Report, Rev. B	
TR901-202-03, ERD1192 Environmental Stress Test Detail Report, Rev. A	
TR901-201-04, ERD921 EMI-RFI Detail Report, Rev. B	
TR901-202-04, ERD1192 EMI-RFI Detail Report, Rev. A	