

REACTOR PROTECTION AND CONTROL  
PROCESS INSTRUMENTATION REPLACEMENT PROJECT AT  
DONALD C. COOK NUCLEAR PLANT UNITS 1 AND 2

FUNCTIONAL REQUIREMENT SUMMARY

REPORT NO. 2985-DPS-01, REV 0

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12/18/92

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12/10/92

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# Reactor Protection Process Instrumentation Replacement Project

## Functional Requirement Summary

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### 1.0 Forward

The Instrumentation presently installed for the Reactor Protection Systems at the Donald C. Cook Nuclear Plant Units 1 and 2 is Foxboro H-line equipment. This equipment is no longer manufactured by Foxboro, spare parts are difficult, if not impossible, to obtain, and the failure rate for the equipment is increasing due to aging.

Design change number RFC 12-2985 has been initiated to replace the H-line equipment. The new equipment will be the Foxboro Spec 200 line of instrumentation.

### 2.0 Objective

The first objective of this summary is to demonstrate that RFC 12-2985 involves a replacement of instrumentation hardware only. Functionality of the new hardware will replicate the functionality of the existing Foxboro H-line equipment. No changes are being made to the present functional requirements.

The second objective is to discuss the measures taken to ensure that the original functionality requirements are successfully replicated by the new Foxboro Spec 200 equipment.

### 3.0 Method of Approach

The Design objective of RFC 12-2985 is to replicate the functionality currently performed by the existing Foxboro H-line equipment using Foxboro Spec 200 Micro equipment. In achieving this objective, no new functions, instruments or loops were added to the instrument system. The function of the signal processing equipment was not changed. No functions were deleted, and no interfaces to remaining plant systems were changed to the extent that their functions would be altered.

At the beginning of the project, a thorough functional review was made of all of the Reactor Protection instrument loops for each Unit. This involved reviewing the AEPSC Functional drawings as itemized in Section 6.1 of this document and the Precautions, Limitations, and Setpoints (PLS) documents as itemized in Section 6.3. The PLS documents are in the form of Engineering Control Procedures (ECPs) and contain the parameters (such as time constants for lead/lag functions, setpoints for Reactor Trip and Safeguards Actuation functions, etc.) for the operation of the Reactor and associated systems.



After review completion, these documents, along with current Cook Nuclear Plant Surveillance and Calibration Procedures, were transmitted to the Foxboro Company, the new equipment vendor. From these documents, the vendor has developed a new set of Functional Drawings and Software Configuration Documents, reflecting the use of Foxboro Spec 200 equipment to replicate the functionality of the existing Foxboro H-line equipment.

Throughout the development of the new Functional Drawings and the Configuration Documents by Foxboro, systematic reviews have been conducted by the AEPSC engineering staff to ensure that the functional requirements as dictated by AEPSC design input are being implemented properly. Accomplishment of this goal has required the establishment of close communications between AEPSC and vendor engineering staffs; close liaison has been established between the Foxboro staff and the AEPSC engineering team for discussion and clarification purposes. AEPSC engineers visit the Foxboro engineering offices regularly, inspecting their factory and assembly areas and conducting in-depth technical discussions with the vendor's engineering staff.

#### 4.0 Method of Validating Results .

The following tests will be performed to demonstrate that the required functionality has been correctly implemented into the new Foxboro Spec 200 equipment.

In-house testing of Reactor Protection loops will be conducted at the AEPSC offices using a "Training" rack provided by Foxboro. The training rack will contain sufficient Foxboro Spec 200 equipment to allow configuration and testing of any Reactor Protection loop that appears on the Functional Drawings.

A detailed Factory Acceptance Test (FAT) will be performed at the Foxboro manufacturing facilities. Foxboro Document No. TP-150, Factory Acceptance Test Procedure for the Upgrade of the Reactor Protection Process Instrumentation (Ref. 6.5), will be used for performing the FAT. FAT testing will be conducted by Foxboro and monitored by AEPSC and Cook Nuclear Plant engineering personnel.

After completion of the FAT, and after the new equipment has been delivered to Cook Nuclear Plant, an Integrated Test will be performed prior to actual installation. This test will involve interconnecting the new Reactor Protection equipment with the new Reactor Control equipment (which is also being replaced under RFC 12-2985). This test is to validate correct functionality of instrument loops from the sensor input to the final output to the field device (control valve, etc.) as well as to identify any adverse interactions between Reactor Protection equipment and Reactor Control equipment. This test will be conducted and monitored by AEPSC and Cook Nuclear Plant engineering personnel.

Before release of the system for operation, Cook Nuclear Plant Instrument and Control personnel will perform Calibration and Surveillance Procedures to ensure that the new Spec 200 Micro equipment meets its functional requirements.

Performance of In-house Testing, FAT, and the Integrated Test, along with the performance of the Surveillance and Calibration Procedures, will ensure proper operation and integration of the replacement equipment in compliance with the AEPSC design specifications and plant functional requirements.

## 5.0 Conclusion

The objective of Design Change RFC 12-2985 is to replicate the functionality performed by the existing Foxboro H-line equipment using Foxboro Spec 200 equipment. To ensure the success of this objective, careful attention has been given to the review and preparation of the Design documents which have been transmitted to the new equipment vendor, Foxboro. The vendor has used these design documents to develop a new set of documents which reflect the functionality duplication using Foxboro Spec 200 equipment.

Throughout the development process of the new documentation, the AEPSC engineering staff has conducted periodic reviews to ensure that the functional requirements as dictated by the AEPSC design input has been implemented properly.

Validation that the required functionality has been correctly implemented will be demonstrated by extensive testing, both at the vendor's manufacturing facilities and at Cook Nuclear Plant.

## 6.0 References

### 6.1 AEPSC Functional Drawings

OP-1-98501-5	OP-2-98501-3
OP-1-98502-9	OP-2-98502-9
OP-1-98503-7	OP-2-98503-7
OP-1-98506-9	OP-2-98596-8
OP-1-98507-6	OP-2-98507-7
OP-1-98508-8	OP-2-98508-8
OP-1-98509-5	OP-2-98509-6
OP-1-98512-9	OP-2-98512-12
OP-1-98513-3	OP-2-98513-3
OP-1-98514-6	OP-2-98514-6
OP-1-98516-1	OP-2-98516-1

### 6.2 Foxboro Functional Drawings

FD-2101, Sheets 1, 2, 3, 4, 5, 6
FD-2102, Sheets 1, 2, 3, 4
FD-2103, Sheets 1, 2, 3, 4
FD-2104, Sheets 1, 2, 3, 4

FD-2205, Sheets 1, 2, 3, 4, 5, 6  
 FD-2206, Sheets 1, 2, 3, 4, 5, 6  
 FD-2207, Sheets 1, 2, 3, 4  
 FD-2208, Sheets 1, 2, 3, 4  
 FD-2309, Sheets 1, 2, 3, 4, 5, 6  
 FD-2310, Sheets 1, 2, 3, 4, 5, 6, 7, 8, 9  
 FD-2311, Sheets 1, 2, 3, 4, 5  
 FD-2412, Sheets 1, 2, 3, 4, 5  
 FD-2413, Sheets 1, 2, 3, 4

### 6.3 Engineering Control Procedures

1-05-01, Rev. 4 - Precautions, Limitations and Setpoints, Unit 1

2 05-01, Rev. 5 - Precautions, Limitations and Setpoints, Unit 2

### 6.4 AEPSC Bid Specification DCC-IC-500-QCN, Reactor Protection and Control Instrumentation

### 6.5 Cook Nuclear Plant Calibration Procedures

2 IHP 6030 IMP.194, Rev.11	2 IHP 6030 IMP.219, Rev. 04
2 IHP 6030 IMP.199, Rev. 09	2 IHP 6030 IMP.223, Rev. 07
2 IHP 6030 IMP.204, Rev. 08	2 IHP 6030 IMP.256, Rev. 06
2 IHP 6030 IMP.208, Rev. 08	2 IHP 6030 IMP.265, Rev. 02
2 IHP 6030 IMP.211, Rev. 09	2 IHP 6030 IMP.267, Rev. 02
2 IHP 6030 IMP.212, Rev. 08	2 IHP 6030 IMP.400, Rev. 02
2 IHP 6030 IMP.215, Rev. 09	2 IHP 6030 IMP.401, Rev. 02

### 6.6 Cook Nuclear Plant Surveillance Procedures

2 IHP 4030 STP.101, Rev. 03	2 IHP 4030 STP.115, Rev. 04
2 IHP 4030 STP.104, Rev. 12	2 IHP 4030 STP.119, Rev. 08
2 IHP 4030 STP.108, Rev. 08	2 IHP 4030 STP.120, Rev. 07
2 IHP 4030 STP.111, Rev. 08	2 IHP 4030 STP.146, Rev. 05

### 6.7 Foxboro Document TP-150, Factory Acceptance Test Procedure for the Upgrade of the Reactor Protection Process Instrumentation

### 6.8 Foxboro Document No. DB-151, Data Base Printout for the Reactor Protection Process Instrumentation, Reactor Protection Set I, Unit 2