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Rockville, MD 20852

Subject: **Response to Portion of NRC Request for Additional Information Letter No. 263 Related to ESBWR Design Certification Application - RAI Number 7.7-11**

Enclosure 1 contains the GE Hitachi Nuclear Energy (GEH) response to Request for Additional Information (RAI) Number 7.7-11 from the U.S. Nuclear Regulatory Commission (NRC) sent by NRC letter dated November 6, 2008. Enclosure 2 contains the DCD and LTR markup pages associated with the response to RAI 7.7-11.

Verified DCD and LTR changes associated with this RAI response are identified in the enclosed DCD and LTR markups by enclosing the text within a black box.

If you have any questions or require additional information, please contact me.

Sincerely,

Richard E. Kingston

Richard E. Kingston
Vice President, ESBWR Licensing

Reference:

1. MFN 08-625, Letter from U.S. Nuclear Regulatory Commission to Robert E. Brown, *Request For Additional Information Letter No. 263 Related To ESBWR Design Certification Application*, dated November 6, 2008

Enclosures:

1. Response to Portion of NRC Request for Additional Information Letter No. 263 Related to ESBWR Design Certification Application - RAI Number 7.7-11

2. Response to Portion of NRC Request for Additional Information Letter No. 263 Related to ESBWR Design Certification Application - DCD & LTR Markups for RAI Number 7.7-11

cc:

AE Cubbage	USNRC (with enclosures)
RE Brown	GEH/Wilmington (with enclosures)
DH Hinds	GEH/Wilmington (with enclosures)
eDRF Section:	0000-94-3354 (RAI 7.7-11)

MFN 09-145

Enclosure 1

Response to Portion of NRC Request for Additional Information Letter No. 263 Related to ESBWR Design Certification Application

RAI Number 7.7-11

NRC RAI 7.7-11

SECY-93-087, Item II.Q, Defense Against Common-Mode Failures in Digital Instrumentation and Control Systems, Position 3 states:

If a postulated CCF could disable a safety function, then a diverse means, with a documented basis that the diverse means is unlikely to be subject to the same CCF, should be provided to perform either the same function or a different function. The diverse or different function may be performed by a non-safety-related system, if the system is of sufficient quality to perform the necessary function under the associated event conditions.

SRP Section 7.7 (both revisions 4 and 5) states that control system elements credited in the Diversity and Defense-in-Depth (D3) assessment should be reviewed using the criteria for Diverse I&C systems described in Section 7.8.

DCD Tier 2 Figure 7.8-1, Simplified Diverse Protection System (DPS) Block Diagram, identifies several systems which, including the Nuclear Boiler System (non-safety-related portion), the Neutron Monitoring System, the Rod Control and Information System (RC&IS), the Feedwater Control System (FWCS), and the Reactor Water Cleanup/Shutdown Cooling System (RWCU/SDC), that provide diverse sense or actuation functions. However, neither DCD Tier 2 Table 7.1-1 nor the DCD Tier 2 Chapter 7 system discussions specify that the SRM on SECY 93-087 Item II.Q is applicable to these systems. In addition, while functions of the above systems are included in the applicant's D3 assessment (NEDO-33251); it is unclear which non-safety systems are specifically credited in the D3 assessment. Please clarify the following:

- *Clearly identify in NEDO-33251 and DCD Section 7.8 which non-safety-related are being specifically credited to perform diverse functions.*
- *For those non-safety-systems specifically credited, clarify the applicability of SRM on SECY 93-087 Item II.Q and SRP BTP HICB-19 for these systems.*
- *Clarify the applicability of Generic letter 85-06 to these systems, consistent with the staff discussion in RAI 7.8-8.*

GEH Response

GEH concurs with the NRC request to clarify which nonsafety-related systems are being specifically credited to perform diverse functions in the DCD, and to clarify the applicability of the SRM on SECY 93-087 Item II.Q, SRP BTP HICB-19, and Generic Letter 85-06.

a) DCD Tier 2 Figure 7.8-1, "Simplified DPS Block Diagram," shows the interfacing systems that contain components that are subject to the guidance contained in SRM on SECY 93-087 Item II.Q, SRP BTP HICB-19, and Generic Letter 85-06. These

interfacing systems will be listed in Revision 2 to NEDO-33251, Section 2.4, as shown in the enclosed markups.

Figure 7.8-1 also will be revised for completeness to depict the feedwater runback function described in Subsection 7.8.1.1.4 and shown in Figure 7.8-2, and the RC&IS input to the SCRRI/SRI logic as listed in Subsection 7.8.1.1.3. Figure 7.8-1 and Table 7.8-3 will be revised to depict the FAPCS sensor interface used to open the IC/PCCS expansion pool to equipment pool cross-connect valve described in Subsection 7.8.1.2.5.

b) DCD Revision 5, Tier 2, Table 7.1-1 identifies the safety-related systems that conform to the SRM on SECY 93-087 Item II.Q and SRP BTP HICB-19 because there is a diverse means provided with a documented basis that the diverse means is unlikely to be subject to any common-mode failures of the safety system. The diverse instrumentation and control functions are initiated by DPS and ATWS/SLC, using inputs from sensors that are different from those used by the RTIF or SSLC/ESF platforms.

The sensors and actuators used for the diverse containment isolation function and diverse ESF logic described in DCD Tier 2, Section 7.8 conform to the criteria for diverse I&C systems described in SRP Section 7.8, as shown in the Safety Evaluation of Subsection 7.8.3. The diverse instrumentation and control requirements imposed upon these sensors and actuators are not repeated throughout Chapter 7.

Portions of the RC&IS, CRD, FWCS, and TGCS support the performance of the SCRRI, SRI, feedwater pump runback and trip functions, and provide the turbine trip and PLU event signals described in Subsection 7.8.1. The portions of these systems that are used for diverse I&C functions also conform to the above guidance. Applicability of the SRM on SECY 93-087 Item II.Q and SRP BTP HICB-19 will be revised in DCD Tier 2 Subsections 7.7.2.3.4 and 7.7.2.3.5 (RC&IS), 7.7.3.3.4 and 7.7.3.3.5 (FWCS).

The conformance descriptions of the SRM on SECY 93-087 Item II.Q and of SRP BTP HICB-19 will be revised for clarity in DCD Tier 2 Subsections 7.1.5.3.3, 7.1.5.3.5, 7.1.6.3, and 7.1.6.5 as shown in the enclosed markups.

c) The response to RAI 7.8-8 in MFN 08-742, Supplement 1, dated December 8, 2008 also is being clarified in this RAI response. The statement added to Subsection 7.8.3 in response to RAI 7.8-8 will be revised to indicate that the portions of the systems that are required to perform sense and actuate functions in support of the diverse instrumentation and control functions also are subject to the guidance applicable to diverse instrumentation and control systems.

Applicability of the guidance contained in Generic Letter 85-06 to the portions of all systems that support diverse I&C functions will be clarified in DCD Tier 2, Subsection 7.8.3. The components in the interfacing systems subject to this guidance are listed in DCD Tier 2 Table 3.2-1, as modified by the GEH response to RAI 3.2-6 Supplement 2.

DCD Impact

DCD Tier 2, Subsections 7.1.5.3.3, 7.1.5.3.5, 7.1.6.3, and 7.1.6.5 will be revised for Revision 6 as shown on the enclosed markup to clarify that the portions of the systems that support diverse I&C requirements support the diverse instrumentation and controls to the SRM on SECY 93-087 Item II.Q and to SRP BTP HICB-19.

DCD Tier 2, Subsections 7.7.2.3.4 and 7.7.2.3.5 (RC&IS), 7.7.3.3.4 and 7.7.3.3.5 (FWCS) will be revised for Revision 6 as shown on the enclosed markup to clarify the applicability of the SRM on SECY 93-087 Item II.Q and SRP BTP HICB-19.

DCD Tier 2, Subsection 7.8.3 will be revised for Revision 6 as shown in the enclosed markup to state that portions of the systems shown in DCD Tier 2, Figure 7.8-1 are subject to the guidance applicable to diverse instrumentation and control systems. Table 7.8-3 will be revised to include FAPCS as an interfacing system.

DCD Tier 2, Figure 7.8-1, will be revised for Revision 6 for completeness to ensure that all DPS interfacing systems described in Section 7.8 are represented in Figure 7.8-1.

LTR Impact

NEDO-33251, Section 2.4 – Diverse Protection System Overview, will be revised in Revision 2 as shown in the enclosed markup.

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Enclosure 2

Response to Portion of NRC Request for Additional Information Letter No. 263 Related to ESBWR Design Certification Application

DCD & LTR Markups for RAI Number 7.7-11

Table 7.1-1 identifies the N-DCIS elements and the associated regulatory requirements, guidelines, and codes and standards applied. The following subsections address I&C systems conformance to regulatory requirements, guidelines, and industry standards.

General DCIS conformance to regulatory requirements, guidelines, and industry standards is also addressed in Subsection 7.1.6.

7.1.5.3.1 Code of Federal Regulations

10 CFR 52.47(a)(1)(iv), Resolution of Unresolved and Generic Safety-Related Issues:

- Conformance: The N-DCIS is nonsafety-related. Resolution of unresolved and generic safety issues is discussed in Section 1.11.

10 CFR 52.47(a)(1)(vi), ITAAC in Design Certification Applications:

- Conformance: Inspection, Test, Analyses, and Acceptance Criteria (ITAAC) for the N-DCIS are identified in Tier 1.

10 CFR 52.47(a)(1)(vii), Interface Requirements:

- Conformance: There are no interface requirements for this section.

7.1.5.3.2 General Design Criteria

GDC 1, 2, 4, 13, 19, and 24:

- Conformance: The N-DCIS design conforms to these GDCs. Refer to Subsections 3.1.2 and 3.1.3 for a general discussion of each GDC.

7.1.5.3.3 Staff Requirements Memorandum

SRM, SECY-93-087, Item II.Q, Defense Against Common Mode Failures in Digital Instrumentation and Control Systems:

- Conformance: SRM on SECY 93-087, II.Q, states that if a postulated common mode failure could disable a safety function, then a diverse means, with a documented basis that the diverse means is unlikely to be subject to the same common-mode failure, shall be required to perform either the same function or a different function. The diverse or different function may be performed by a non-safety system if the system is of sufficient quality to perform the necessary function under the associated event conditions.

  The N-DCIS provides diverse functionality via the DPS and associated interface systems. The nonsafety-related portions of the systems that conform to this guidance are, further discussed in Section 7.8 and in Reference 7.1-4.

SRM, SECY-93-087, Item II.T, Control Room Alarm Reliability:

- Conformance: The N-DCIS AMS follows guidance in the above document for redundancy, independence, and separation so that the "alarm system" is considered

redundant, has its own redundant processors and uses signals from distributed and redundant controllers. Alarm points are sent through a dual network to redundant processors that have dual power feeds. The alarm processors are dedicated, redundant, and conservatively sized. The alarms can be displayed on multiple independent VDUs, each with dual power supplies. Alarms are driven by redundant data links to the AMS. The alarm processors are redundant. There is one horn and one voice speaker. Test buttons test the horn and the lights.

7.1.5.3.4 Regulatory Guides

RG 1.151, Instrument Sensing Lines:

- Conformance: RG 1.151 is not applicable to the N-DCIS. The N-DCIS receives signals from sensors in various systems in the plant that are from instrument sensing lines from nonsafety-related instrumentation but the N-DCIS itself does not contain instrument sensing lines.
- For details on conformance to the Regulatory Guides listed in subsection 7.1.4.4, refer to Subsection 7.1.6.4.

7.1.5.3.5 Branch Technical Positions

BTP HICB-14, Guidance on Software Reviews for Digital Computer-based I&C Safety-related systems:

- Conformance: The N-DCIS design conforms to the intent of BTP HICB-14 as outlined in References 7.1-8, 7.1-10, and 7.1-12 for the N-DCIS Control Network.

BTP HICB-16, Guidance on Level of Detail Required for Design Certification Applications Under 10 CFR Part 52:

- Conformance: The level of detail in this subsection (7.1.5) conforms to BTP HICB-16.

From the foregoing analyses, it is concluded that the N-DCIS meets its regulatory and industry design bases.

BTP HICB-19, Guidance for Evaluation of Defense-in-Depth and Diversity in Digital Computer-Based Instrumentation and Control Systems:

- Conformance: The nonsafety-related portions of the systems that conform to BTP HICB-19 are discussed in Section 7.8 and in Reference 7.1-4.

7.1.5.4 N-DCIS Testing and Inspection Requirements

Testing and inspection requirements for N-DCIS systems are presented as specific subsections in Chapter 7.

7.1.6.3 Staff Requirements Memorandum

SRM on SECY 93-087 II.Q, Defense Against Common-Mode Failures in Digital Instrumentation and Control Systems:

- Conformance: To minimize exposure to common-mode failures, the digital I&C systems are designed for high reliability, with the application of quality assurance requirements as specified in 10 CFR 50.55a(a)(1). Additionally, ~~T~~the digital I&C is designed ~~with~~ applying principles of defense-in-depth and diversity ~~for~~ defense against common mode failures. Section 7.8 includes the description of the diverse I&C systems that specifically addresses the requirements of this SRM.

SRM on SECY 93-087 II.T, Control Room Annunciator/Alarm Reliability:

- Conformance: The AMS follows guidance in the above document for redundancy, independence, and separation because the "alarm system" is considered redundant. Alarm points are sent through dual networks to redundant message processors on dual power supplies. The processors are dedicated to only doing alarm processing. The alarms are displayed on multiple independent VDUs that each have dual power supplies. The alarm tiles, or their equivalent, are driven by redundant datalinks (with dual power). There are redundant alarm processors. There are no alarms that require manually controlled actions for safety-related systems to accomplish their function. Thus the requirements for safety-related equipment and circuits are not applicable.

7.1.6.4 Regulatory Guides

A discussion of the general conformance of the I&C equipment to RGs is provided below.

RG 1.22, Periodic Testing of Protection System Actuation Functions. Safety-related systems have provision for periodic testing. Proper functioning of analog sensors is verified by channel cross-comparison and is done continuously by the PCF. Some actuators and digital sensors, because of their locations, cannot be fully tested during actual reactor operation. Such equipment is identified and provisions for meeting the guidance of Paragraph D.4 (per BTP HICB-8) are discussed in the Safety Evaluation subsections within Sections 7.2 through 7.8.

RG 1.47, Bypassed and Inoperable Status Indication for Nuclear Power Plant Safety Systems. Bypass indications are designed to satisfy the guidance of IEEE Std. 603, Paragraph 5.8.3, and RG 1.47. The design of the bypass indications allows testing during normal operation and is used to supplement administrative procedures by providing indications of safety-related systems status.

Bypass indications use isolation devices that preclude the possibility of any adverse electrical effect of the bypass indication circuits on the plant safety-related system.

RG 1.53, Application of the Single-Failure Criterion to Nuclear Power Plant Protection Systems. The safety-related system designs conform to the single failure criterion; additionally the design meets N-2 conditions.

RG 1.62, Manual Initiation of Protective Actions**.** The applicable I&C systems are designed to comply with RG 1.62. Specific conformance of the I&C systems is addressed in Sections 7.3

included in Section 7.8, and specifically addresses the issues of defense-in-depth and diversity and defense against common mode failures.

BTP HICB-16, Guidance on Level of Detail Required for Design Certification Applications Under 10 CFR Part 52. BTP HICB-16 is applicable to all sections of Chapter 7 of the Design Control Document and all sections conform to it.

BTP HICB-16 states that the application should:

- Describe the resolution of unresolved and generic safety issues applicable to the I&C systems,
- Describe the interface requirements to be met by portions of the plant for which the application does not seek certification and which are necessary to ensure proper functioning of the I&C system, and
- Identify and describe the validation of innovative means of accomplishing I&C system safety-related functions.

Applications that propose the use of computers for systems with safety-related uses should describe the computer system development process. Applications that propose the use of computers for RTS and ESFAS functions should also describe the design of the overall I&C systems with respect to defense-in-depth and diversity requirements.

The I&C design has no unresolved or generic safety-related issues applicable to I&C systems. In Section 1.11, unresolved and generic safety-related issues are discussed. There are several new generic issues that are related to I&C systems, such as failure of protective devices on safety-related equipment, electromagnetic pulse, identification of protection system instrument sensing lines, and protection system testability. These issues either are not applicable to safety-related I&C systems or are addressed by the safety-related I&C design. Within the scope of the DCD submitted for certification application, there are no interface requirements described here that fall into this category.

The design uses the voluminous data available from operating plants and from the testing and licensing efforts performed to license the predecessor designs and individual plants. The I&C design does not use innovative means for accomplishing safety functions.

BTP HICB-17, Guidance on Self-Test and Surveillance Test Provisions in Digital Computer-based I&C Systems. Refer to Subsection 7.2.1.3.5 and 7.3.4.3 discussions. The Q-DCIS design conforms to BTP HICB-17.

BTP HICB-18, Guidance on Use of Programmable Logic Controllers in Digital Computer-based I&C System. The Q-DCIS design conforms to BTP HICB-18.

BTP HICB-19, Guidance for Evaluation of Defense-in-Depth and Diversity in Digital Computer-Based Instrumentation and Control Systems (Item II.Q of SECY-93-087). The Q-DCIS, DPS and associated N-DCIS interfacing systems design conforms to BTP HICB-19. The implementation of an additional diverse instrumentation and control system is described in Section 7.8.

- Conformance: ITAAC are provided for the I&C equipment in Tier 1.

10 CFR 52.47(a)(1)(vii), Interface Requirements:

- Conformance: There are no interface requirements for this section.

7.7.2.3.2 General Design Criteria

GDC 1, 13, 19, 24, 28 and 29:

- Conformance: The RC&IS complies with these GDC.

7.7.2.3.3 Regulatory Guides

RG 1.180, Guidelines for Evaluating Electromagnetic and Radio-Frequency Interference in safety-related Instrumentation and Control Systems

- Conformance: The RC&IS design conforms to RG 1.180.

RG 1.204, Guidelines for Lightning Protection of Nuclear Power Plants:

- Conformance: The RC&IS design conforms to RG 1.204.

7.7.2.3.4 Branch Technical Positions

BTP HICB-16, Guidance on Level of Detail Required for Design Certification Applications Under 10 CFR Part 52:

- Conformance: The level of detail provided for the RC&IS design conforms to BTP HICB-16.

BTP HICB-19, Guidance for Evaluation of Defense-in-Depth and Diversity in Digital Computer-Based Instrumentation and Control Systems:

- Conformance: The portions of RC&IS that provide interface support for DPS conform to BTP HICB-19

7.7.2.3.5 Staff Requirements Memorandum

Staff Requirements Memorandum (SRM) on SECY 93-087 II.Q, Defense Against Common-Mode Failures in Digital Instrument and Control Systems:

- Conformance: The portions of RC&IS that provide interface support for DPS conform to Item II.Q of SECY-93-087.

7.7.2.4 Testing and Inspection Requirements

The RC&IS equipment is designed with consideration for online testing capabilities. The system can be maintained on line while repairs or replacement of hardware take place without causing any abnormal upset condition. The single-channel bypass capabilities support having continued

10 CFR 52.47(a)(1)(vi), ITAAC in Design Certification Applications:

- Conformance: ITAAC are provided for the I&C equipment in Tier 1.

10 CFR 52.47(a)(1)(vii), Interface Requirements:

- Conformance: There are no interface requirements for this section.

7.7.3.3.2 General Design Criteria

GDC 1, 13, 19, and 24:

- Conformance: The FWCS design complies with these GDC.

7.7.3.3.3 Regulatory Guides

RG 1.151, Instrument Sensing Lines:

- Conformance: The FWCS receives signals from sensors on vessel instrument lines in the NBS. Refer to Subsection 7.7.1.3 for a discussion of the guidance of RG 1.151 in relation to the NBS.

RG 1.180, Guidelines for Evaluating Electromagnetic and Radio-Frequency Interference in Safety-Related Instrumentation and Control Systems

- Conformance: The FWCS design conforms to RG 1.180.

RG 1.204, Guidelines for Lightning Protection of Nuclear Power Plants:

- Conformance: The FWCS design conforms to RG 1.204.

7.7.3.3.4 Branch Technical Positions

BTP HICB-16, Guidance on Level of Detail Required for Design Certification Applications Under 10 CFR Part 52:

- Conformance: The level of detail in this subsection conforms to BTP HICB-16.

BTP HICB-19, Guidance for Evaluation of Defense-in-Depth and Diversity in Digital Computer-Based Instrumentation and Control Systems:

- Conformance: The portions of FWCS that provide interface support for DPS conform to BTP HICB-19.

7.7.3.3.5 Staff Requirements Memorandum

Staff Requirements Memorandum (SRM) on SECY 93-087 II.Q, Defense Against Common-Mode Failures in Digital Instrument and Control Systems:

- Conformance: The portions of FWCS that provide interface support for DPS conform to Item II.Q of SECY-93-087.

- Redundant sensors. Data messages from the sensors have unique identifications in each division;
- Identical modules that provide simple, readily verifiable functions such as setpoint comparison and two-out-of-four logic; and
- Standard protocols for multiplexing and other data transmission functions that are verified to industry standards and are qualified to safety-related standards.

7.8.3 Safety Evaluation

The DPS is designed as a highly reliable nonsafety-related system that meets the probabilistic risk assessment (PRA) requirements to minimize failures on demand and to minimize inadvertent operation. The DPS components are designed to ensure that reliability goals and system design requirements are met. The sensors and actuation devices that interface directly with safety-related structures, systems, and components (SSC) are qualified to meet the seismic category I classification ~~(IEEE Std. 603, Section 5.4)~~.

Consistent with the guidance in IEEE Std. 603, Section 5.6 and IEEE Std. 384, the nonsafety-related DPS is designed to avoid adverse interaction with the protection systems with which it interfaces. Because the DPS logic does not communicate with the RPS logic, credible DPS failure modes do not prevent the RPS from performing a reactor scram~~trip~~. The DPS cannot cause the RPS to initiate a reactor scram ~~trip~~ prematurely. Credible DPS failure modes cannot prevent the SSLC/ESF actuation system from initiating ECCS functions and/or performing fission product barrier isolation functions. Additionally, credible DPS failure modes cannot result in premature operation of these protection systems.

The ATWS/SLC logic is designed to mitigate a failure of the normal reactor trip system to function and is diverse from and independent of the RPS. The ATWS/SLC logic platform is designed as a safety-related system with four independent divisions powered from divisionally separated safety-related power sources. Each redundant division of ATWS/SLC logic, which uses two-out-of-four voting logic, is capable of performing ATWS mitigation during reactor operation.

A quality assurance program that meets or exceeds the guidance contained in NRC Generic Letter 85-06, "Quality Assurance Guidance for ATWS Equipment That Is Not Safety-Related," is applied to all diverse I&C systems and components described in this section. Software used in diverse instrumentation and control systems is designed and developed in accordance with the requirements of Reference 7.8-3.

The guidance contained in the SRM on SECY 93-087 Item II.Q, SRP BTP HICB-19, and Generic Letter 85-06 is applicable to the DPS and to all portions of the systems show in Figure 7.8-1 and identified in Table 3.2-1 that are required to perform sense and actuate functions in support of the diverse instrumentation and control functions described in this Section.

Table 7.1-1 identifies the diverse I&C and the associated codes and standards applied, in accordance with the SRP. This subsection addresses I&C systems conformance to regulatory requirements, guidelines, and industry standards.

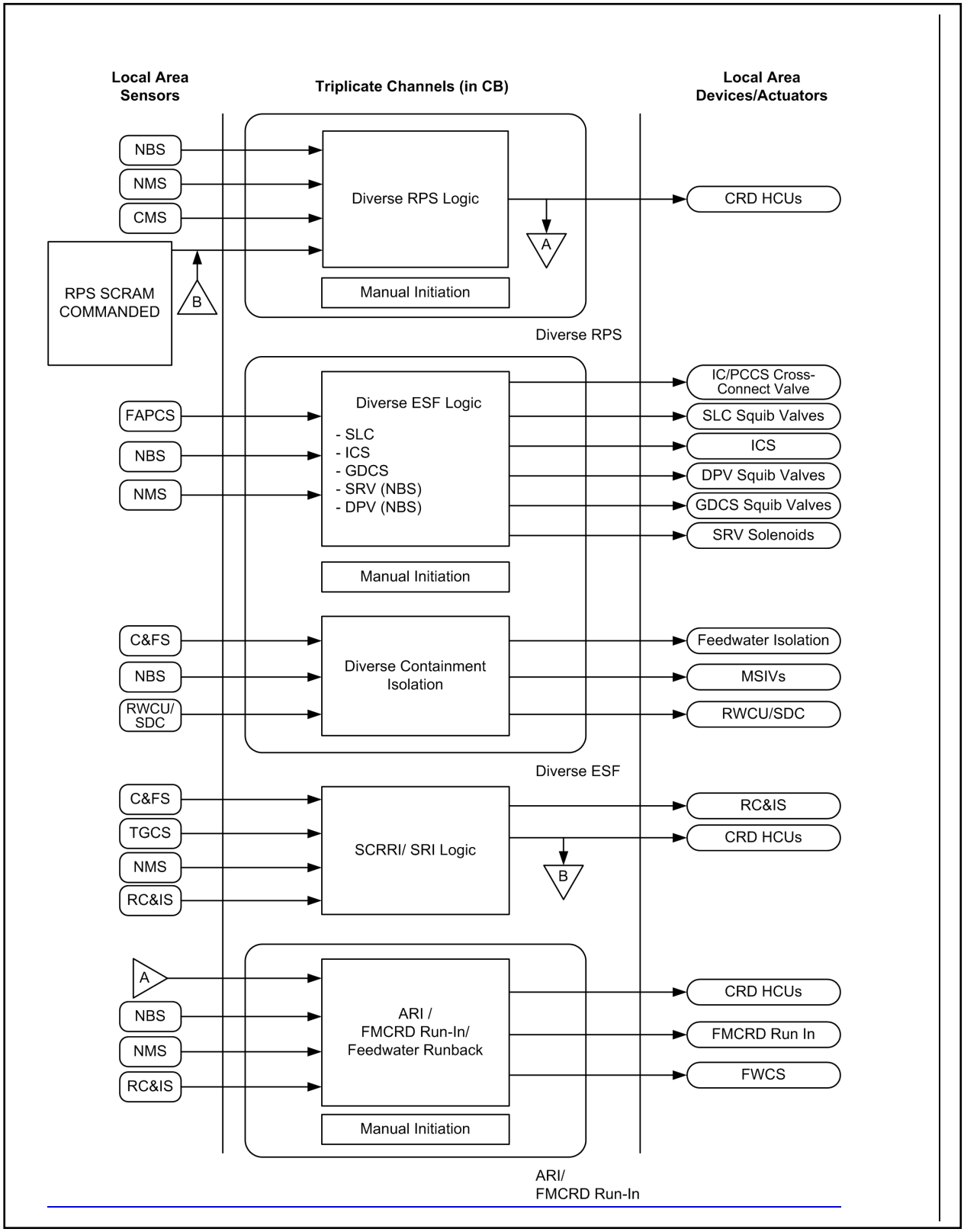
Table 7.8-3

Diverse Instrumentation and Control Systems

Functions, Initiators, and Interfacing Systems to Address BTP HICB-19[1]

Function	Initiator	Interfacing System
MSIV closure (DPS)	Steam flow high	NBS
	RPV pressure low	NBS
	RPV water level low (Level 2)	NBS
RWCU/SDC isolation valve closure (DPS)	Differential flow rate high	RWCU/SDC
Feedwater Isolation (DPS)	Line differential pressure high coincident with high DW pressure	C&FS, NBS
Feedwater Pump Trip (DPS)	RPV water level high (Level 9)	NBS, FWCS
IC/PCCS expansion pool to equipment storage pool cross-connect valve opening (DPS)	Low IC/PCCS expansion pool water level	FAPCS, ICS
ADS inhibit (DPS)	RPV water level low (Level 2) and SRNM ATWS permissive	NBS, NMS
	RPV dome pressure high and SRNM ATWS permissive with time delay	NBS, NMS

[1] Implementing system is shown in parentheses


Local Area Sensors
Triplicate Channels (in CB)
Local Area Devices/Actuators
NBS
NMS
CMS
RPS SCRAM COMMANDED
B
Diverse RPS Logic
Manual Initiation
A
CRD HCUs
Diverse RPS
FAPCS
NBS
NMS
Diverse ESF Logic
- SLC
- ICS
- GDCS
- SRV (NBS)
- DPV (NBS)
Manual Initiation
IC/PCCS Cross-Connect Valve
SLC Squib Valves
ICS
DPV Squib Valves
GDCS Squib Valves
SRV Solenoids
C&FS
NBS
RWCU/SDC
Diverse Containment Isolation
Feedwater Isolation
MSIVs
RWCU/SDC
Diverse ESF
C&FS
TGCS
NMS
RC&IS
SCRRI/ SRI Logic
B
RC&IS
CRD HCUs
A
NBS
NMS
RC&IS
ARI / FMCRD Run-In/ Feedwater Runback
Manual Initiation
CRD HCUs
FMCRD Run In
FWCS
ARI/ FMCRD Run-In

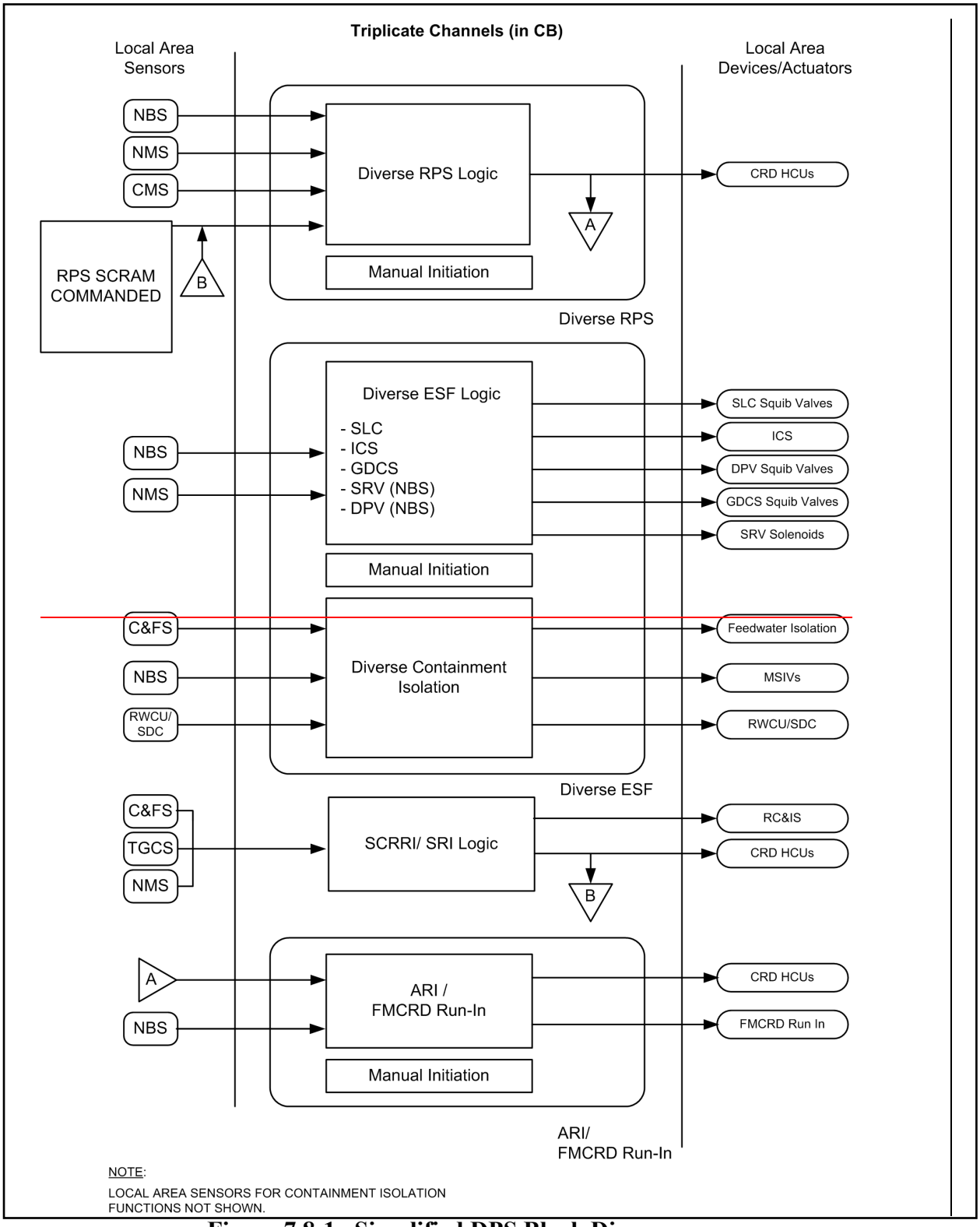


Figure 7.8-1. Simplified DPS Block Diagram

from either the Q-DCIS and other N-DCIS controllers so it can be expected to operate even if PIP A, PIP B or the Q-DCIS controllers are inoperable. Additionally the DPS RMU cabinets in the RB are in two pairs of two cabinets each with each pair in a separate fire zone. The DPS input signals are divided evenly between each pair of cabinets. To further prevent inadvertent actuation of the ADS valves, the solenoids/squibs connected to DPS each require a series connected two or three switches to close before the final device is energized; each of the series connected switches is individually two-out-of-three voted and located in a different cabinet to eliminate the possibility of hot short circuits.

The interfacing systems (i.e. Nuclear Boiler System, Condensate and Feed System sensors, CMS (including the SPTM subsystem), FAPCS sensors, TGCS, GDCS, SLC, ICS, RWCU/SDC, RC&IS, CRD, and FWCS) provide nonsafety-related sense and actuate features required to perform the diverse functions. The portions of these systems used to support the diverse functions are developed using a quality assurance program that meets or exceeds the guidance contained in NRC Generic Letter 85-06, "Quality Assurance Guidance for ATWS Equipment That Is Not Safety-Related."