ArevaEPRDCPEm Resource

From: Pederson Ronda M (AREVA NP INC) [Ronda.Pederson@areva.com]
Sent: Friday, March 27, 2009 3:40 PM
To: Getachew Tesfaye
Cc: DELANO Karen V (AREVA NP INC); BENNETT Kathy A (OFR) (AREVA NP INC); NOXON David B (AREVA NP INC); WELLS Russell D (AREVA NP INC)
Subject: Response to U.S. EPR Design Certification Application RAI No. 183, Supplement 1
Attachments: RAI 183 Supplement 1 Response US EPR DC.pdf

Getachew,

AREVA NP Inc. provided responses to 2 of the 4 questions of RAI No. 183 on February 26, 2009. The attached file, "RAI 183 Supplement 1 Response US EPR DC.pdf," provides technically correct and complete responses to the remaining 2 questions, as committed.

Appended to this file are affected pages of the U.S. EPR Final Safety Analysis Report in redline-strikeout format which support the response to RAI 183 Questions 08.03.01-20 and 08.03.01-22.

The following table indicates the respective pages in the response document, "RAI 183 Supplement 1 Response US EPR DC.pdf," that contain AREVA NP's response to the subject questions.

Question #	Start Page	End Page
RAI 183 — 08.03.01-20	2	5
RAI 183 — 08.03.01-22	6	7

This concludes the formal AREVA NP response to RAI 183, and there are no questions from this RAI for which AREVA NP has not provided responses.

Sincerely,

Ronda Pederson
ronda.pederson@areva.com
Licensing Manager, U.S. EPR Design Certification
AREVA NP Inc.
An AREVA and Siemens company
3315 Old Forest Road
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From: WELLS Russell D (AREVA NP INC)
Sent: Thursday, February 26, 2009 1:39 PM
To: 'Getachew Tesfaye'
Cc: Pederson Ronda M (AREVA NP INC); BENNETT Kathy A (OFR) (AREVA NP INC); DELANO Karen V (AREVA NP INC); SLIVA Dana (EXT)
Subject: Response to U.S. EPR Design Certification Application RAI No. 183, FSAR Ch 8

Getachew,

Attached please find AREVA NP Inc.'s response to the subject request for additional information (RAI). The attached file, "RAI 183 Response US EPR DC.pdf" provides a technically correct and complete response to 2 of the 4 questions.

The following table indicates the respective pages in the response document, "RAI 183 Response US EPR DC.pdf," that contain AREVA NP's response to the subject questions.

Question #	Start Page	End Page
RAI 183 — 08.03.01-19	2	2
RAI 183 — 08.03.01-20	3	3
RAI 183 — 08.03.01-21	4	4
RAI 183 — 08.03.01-22	5	5

A complete answer is not provided for 2 of the 4 questions. The schedule for a technically correct and complete response to these questions is provided below.

Question #	Response Date
RAI 183 — 08.03.01-20	March 27, 2009
RAI 183 — 08.03.01-22	March 27, 2009

Sincerely,

(Russ Wells on behalf of)
Ronda Pederson
ronda.pederson@areva.com
Licensing Manager, U.S. EPR Design Certification
New Plants Deployment
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From: Getachew Tesfaye [mailto:Getachew.Tesfaye@nrc.gov]
Sent: Wednesday, January 28, 2009 8:23 PM
To: ZZ-DL-A-USEPR-DL
Cc: Peter Kang; Ronaldo Jenkins; James Steckel; Joseph Colaccino; Meena Khanna; ArevaEPRDCPEm Resource
Subject: U.S. EPR Design Certification Application RAI No. 183 (1464), FSARCh. 8

Attached please find the subject requests for additional information (RAI). A draft of the RAI was provided to you on January 26, 2009, and on January 28, 2009, you informed us that the RAI is clear and no further clarification is needed. As a result, no change is made to the draft RAI. The schedule we have established for review of your application assumes technically correct and complete responses within 30 days of receipt of RAIs. For any RAIs that cannot be answered within 30 days, it is expected that a date for receipt of this information will be provided to the staff within the 30 day period so that the staff can assess how this information will impact the published schedule.

Thanks,
Getachew Tesfaye
Sr. Project Manager
NRO/DNRL/NARP

(301) 415-3361

Hearing Identifier: AREVA_EPR_DC_RAIs
Email Number: 346

Mail Envelope Properties (5CEC4184E98FFE49A383961FAD402D31C66650)

Subject: Response to U.S. EPR Design Certification Application RAI No. 183, Supplement 1
Sent Date: 3/27/2009 3:39:32 PM
Received Date: 3/27/2009 3:39:36 PM
From: Pederson Ronda M (AREVA NP INC)

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Files	**Size**	**Date & Time**
MESSAGE	4003	3/27/2009 3:39:36 PM
RAI 183 Supplement 1 Response US EPR DC.pdf	1037210	

Options
Priority: Standard
Return Notification: No
Reply Requested: No
Sensitivity: Normal
Expiration Date:
Recipients Received:

Response to

Request for Additional Information No. 183 (1464), Supplement 1, Revision 0

01/28/2009

U. S. EPR Standard Design Certification
AREVA NP Inc.
Docket No. 52-020
SRP Section: 08.03.01 - AC Power Systems (Onsite)
Application Section: 08.03-1 (Table 1.8-1)

QUESTIONS for Electrical Engineering Branch (EEB)

Question 08.03.01-20:

The staff has reviewed the FSAR Table 1.8-2 (U.S. EPR Combined License Information Items) list of items that a COL applicant should provide with their application. The staff finds that the table needs to include the following additional information as it requires site-specific information:

1. Verification of degraded grid voltage setpoint analysis results by actual voltage measurements per BTP 8-6 (position B.4).
2. Periodic inspection and testing program for underground cables in the duct banks if they are suspected for water intrusion per GL 2007-01.
3. Periodic inspection and testing program for: (1) containment penetration protective devices,(2) surge arresters, grounding, and lightning protection systems, and (2) isolation devices per RG 1.75.
4. Programs for maintenance risk assessment (U.S. EPR FSAR 17.4) and maintenance rule implementation in accordance with 10 CFR 50.65(a)(4) (U.S. EPR FSAR 17.6).
5. Procedure for establishing a divisional pair (i.e., alternate feed) arrangement.

Response to Question 08.03.01-20:

1. In response to RAI 11 Question 08.03.01-7, a new section was added to U.S. EPR FSAR, Tier 2, Section 14.2 Initial Test program. This new section, Section 14.2.12.13.19, provides information on performing distribution system voltage measurements in accordance with BTP 8-6 (position B.4). These measurements verify the analytical techniques and assumptions used to optimize the voltage levels at the safety-related buses, which are based on the analysis of the voltage at the terminals of the Class 1E loads. The selection of the degraded voltage and time delay setpoints is determined from the analysis of the voltage requirements of the Class 1E loads at all onsite system distribution levels. This verification of distribution system analysis is performed on the as-built electrical distribution system, including site-specific information. A COL applicant that references the U.S. EPR FSAR incorporates this test by reference. No additional information is necessary in U.S. EPR FSAR, Tier 2, Table 1.8-2 related to degraded grid voltage setpoint analysis verification.

2. In response to RAI 11 Question 08.03.01-6, U.S. EPR FSAR, Tier 2, Table 1.8-2 was revised to add item 8.3-2. This new COL Information item states: “A COL applicant that references the U.S. EPR design certification will describe inspection, testing, and monitoring programs to detect the degradation of inaccessible or underground power cables that support EDGs, offsite power, ESW and other systems that are within the scope of 10 CFR 50.65.” (Note: EDG = emergency diesel generator, ESW = essential service water.) The COL Information item indicates that the COL applicant is to provide the information as requested in Part (2) of GL 2007-01, Requested Information. No additional information related to GL 2007-01 is necessary in U.S. EPR FSAR, Tier 2, Table 1.8-2.

3. Periodic inspection and testing program for:

    a) Containment penetration assembly protective devices — The U.S. EPR FSAR, Tier 2, Section 8.3.1.1.10 will be revised as follows:

"Circuit breakers used as containment penetration conductor overcurrent protection devices are periodically tested by performing the following periodic testing requirements:

1) At least once per 24 months each circuit breaker is verified by performing a calibration of the associated protective relays.

2) At least once per 24 months (so that all RCP circuit breakers are demonstrated operational at least once per 72 months) select and functionally test a representative sample of at least 10 percent of circuit breakers of each type. Circuit breakers selected for functional testing are selected on a rotating basis. The functional test consists of injecting a current input at the specified setpoint to each selected circuit breaker and verifying that each circuit breaker functions as designed. For each circuit breaker found inoperable during the functional tests, additional representative samples of at least 10 percent of all the circuit breakers of the inoperable type are also functionally tested until no more failures are found or all circuit breakers of that type have been functionally tested." (Note: RCP = reactor coolant pump.)

The 24 month frequency is modified to indicate that all RCP circuit breakers are functionally tested at least once per 72 month period. This recognizes the importance of the RCP circuits to the safe operation of the plant, as well as the potentially large amount of short-circuit current associated with a fault on these circuits.

The 10 percent sample of circuit breakers that are functionally tested is large enough to provide confidence that any failure mechanism that systematically affects circuit breakers of a given type will be detected. Selecting the circuit breakers on a rotating basis means all breakers are tested within several testing periods. The additional representative sample of at least 10 percent of the inoperable type circuit breakers verifies that the identified defect is not a common cause failure affecting other circuit breakers of the same type.

The information provided in the revised U.S. EPR FSAR, Tier 2, Section 8.3.1.1.10 is applicable to COL applicants that reference the standard U.S. EPR certified design; therefore, no COL Information item is necessary.

b) Surge arresters, grounding, and lightning protection systems — The U.S. EPR FSAR, Tier 2, Section 8.3.1.3.5 will be revised as follows to capture RG 1.204 regulatory guidance regarding lightning protection system periodic inspections: "The lightning protection system will be inspected following installation and after alterations or repairs made to a protected structure, as well as following lightning transients to the system. Additionally, the lightning protection system is inspected annually and an in-depth inspection is conducted every four years." The indicated inspection frequency is consistent with the guidance provided in RG 1.204. A COL applicant that references the U.S. EPR FSAR incorporates this inspection by reference. No additional information related to inspection of the lightning protection system is necessary in U.S. EPR FSAR, Tier 2, Table 1.8-2.

The second bullet of RG 1.204, Regulatory Position 2 is addressed by U.S. EPR FSAR, Tier 2, Table 1.8-2, Item number 13.5-1, which states: "A COL applicant that references the U.S. EPR design certification will provide site-specific information for administrative, operating, emergency, maintenance, and other operating procedures." The indicated COL Information item—located in Table 1.8-2 and in Tier 2 Section 13.5—provides sufficient information to the COL applicant to provide the information indicated in RG 1.206, Section C.I.13.5. As indicated in RG 1.206: "In general, the FSAR is not expected to include detailed written procedures. The FSAR should provide a brief description of the nature and content of the procedures and a schedule for the preparation of appropriate written administrative procedures." No additional information is necessary in U.S. EPR FSAR, Tier 2, Table 1.8-2.

c) Isolation devices per RG 1.75 — The U.S. EPR FSAR will be revised by adding the following information to Tier 2, Section 8.3.1.1.9: "Periodic testing of circuit breakers (visual inspection of fuses and fuse holders) used as isolation devices are performed during every refueling to demonstrate that the overall coordination scheme under multiple faults of non-safety-related loads remains within the limits specified in the design criteria." The information in the U.S. EPR FSAR is applicable to COL applicants that reference the standard U.S. EPR certified design; therefore, no COL Information item is necessary.

4. U.S. EPR FSAR, Tier 2, Table 1.8-2, Item number 17.6-5 states: "A COL applicant that references the U.S. EPR design certification will describe the program for maintenance risk assessment and management in accordance with 10 CFR 50.65(a)(4). Since the removal of multiple SSC from service can lead to a loss of Maintenance Rule functions, the program description will address how removing SSC from service will be evaluated. For qualitative risk assessments, the program description will explain how the risk assessment and management program will preserve plant specific key safety functions." The COL Information item indicates that the COL applicant is to provide the information requested by this question. No additional information is necessary in U.S. EPR FSAR, Tier 2, Table 1.8-2 to indicate the COL applicant's responsibility for maintenance risk assessment and maintenance rule implementation programs.

5. U.S. EPR FSAR, Tier 2, Table 1.8-2, Item number 13.5-1 states: "A COL applicant that references the U.S. EPR design certification will provide site-specific information for administrative, operating, emergency, maintenance, and other operating procedures." The indicated COL Information item located in Table 1.8-2 and Tier 2 Section 13.5 provides sufficient information to the COL applicant to provide the information indicated in RG 1.206, Section C.I.13.5. As stated in RG 1.206: "In general, the FSAR is not expected to include detailed written procedures. The FSAR should provide a brief description of the nature and content of the procedures and a schedule for the preparation of appropriate written administrative procedures."

   The level of detail requested in this portion of the question is inconsistent with the level of detail indicated for a COL applicant who is to provide a schedule for preparing equipment control procedures (e.g., alternate feed arrangement implementation) and a brief description of their nature and content. No additional information is necessary in U.S. EPR FSAR, Tier 2, Table 1.8-2.

FSAR Impact:

U.S. EPR FSAR, Tier 2, Section 8.3.1.1.9, Section 8.3.1.1.10, and Section 8.3.1.3.5 will be revised as described in the response and indicated on the enclosed markup.

Question 08.03.01-22:

FSAR Page 8.3-41 discusses 120 Vac uninterruptible single phase power supplies (31 through 34 BGA01) and overcurrent protection for safety related and selected non-safety-related loads. Provide a sample of panel board drawings for 120 Vac UPS single power supplies and elaborate how those overcurrent protection systems for safety related and selected non-safety-related loads are designed.

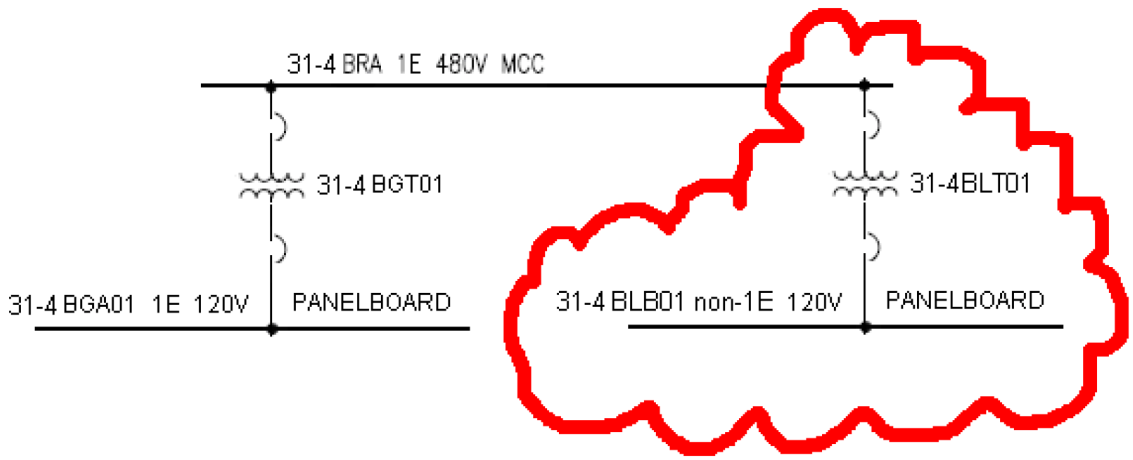
Response to Question 08.03.01-22:

The U.S. EPR FSAR will be revised to add Class 1E Uninterruptible Power Supply (EUPS) 120 Vac panelboards for non-safety-related loads. The additional panelboards supply only the selected non-safety-related EUPS 120 Vac loads, while the existing panelboards supply only safety-related loads. U.S. EPR FSAR, Tier 2, Section 8.3.2.1.1.7 will be changed to add: "Panelboards 31BLB01, 32BLB01, 33BLB01, and 34BLB01 provide a 120 Vac uninterruptible single phase power supply and overcurrent protection for the selected 120 Vac non-safety-related EUPS loads," and "Isolation of the non-safety-related loads from the EUPS is described in Section 8.3.1.1.9."

The configuration of the additional panelboards for non-safety-related loads, in relation to the existing panelboards, is shown in Figure 08.03.01-22-1—EUPS Panelboard Single Line Drawing Sample. The safety-related EUPS motor control center (MCC) (31 through 34 BRA) supplies the non-safety-related transformer (31 through 34 BLT01) of the respective division. The non-safety-related transformer (31 through 34 BLT01) provides 120 Vac to the non-safety-related panelboards (31 through 34 BLB01) of the respective division.

The Class 1E circuit breaker located on 31 through 34 BRA MCC provides isolation from the non-safety-related transformer (31 through 34 BLT01) and non-safety-related loads. The circuit breaker is a qualified isolation device in accordance with IEEE Standard 384-1992 (Reference 1) and meets the regulatory guidance of RG 1.75.

Figure 08.03.01-22-01—EUPS Panelboard Single Line Drawing Sample



Reference for RAI Question 08.03.01-22

1. IEEE Standard 384-1992, “IEEE Standard Criteria for Independence of Class 1E Equipment and Circuits,” Institute of Electrical and Electronics Engineers, 1992.

FSAR Impact:

U.S. EPR FSAR, Tier 2, Section 8.3.2.1.1.7 will be revised as described in the response and indicated on the enclosed markup.

U.S. EPR Final Safety Analysis Report Markups

8.3.1-20

fuses that are automatically opened by fault current meet the guidelines provided in RG 1.75. Periodic testing of circuit breakers (visual inspection of fuses and fuse holders) used as isolation devices are performed during every refueling to demonstrate that the overall coordination scheme under multiple faults of non-safety-related loads remains within the limits specified in the design criteria. Non-Class 1E circuits that are not analyzed and do not meet the minimum separation distances or have barriers providing separation between Class 1E circuits are treated as Class 1E.

Fiber optic cable routed throughout the plant may be placed in the same raceway as low-level analog and communication cables. Fiber optic cable routing is limited to non-hazard and limited hazard areas to the extent practical. Class 1E fiber optic cable routed through a hazard area, has physical protection provided. Class 1E fiber optic cable passing through another division~~,~~ is in a fire-protected enclosure to prevent a fire in one division from damaging fiber optic cable of another division. Damage to fiber optic cable does not result in spurious equipment actuation, but the loss of the component function.

A qualified cable routing program is used to plan cable routing throughout the plant. Field installation information, including as-installed cable lengths and proper routing verification is entered into the cable routing program. Proper cable installation is demonstrated using reports generated by the cable routing program to show that physical separation, physical protection, identification, separation of non-Class 1E and Class 1E cables, separation of redundant Class 1E cables, and terminations meet acceptance criteria.

8.3.1.1.10 Containment Electrical Penetrations

Redundant Class 1E containment electrical penetration assemblies are physically separated to maintain Class 1E circuits and equipment independence so that safety-related functions required during and following DBEs can be accomplished. The redundant containment penetration assemblies are located in four quadrants of the Reactor Building. The minimum separation between redundant electrical penetration assemblies containing Class 1E or associated cables and non-Class 1E cables is provided in accordance with ~~Reference 9~~Reference 10, as endorsed by RG 1.75. Containment electrical penetration assemblies that contain Class 1E circuits~~,~~ contain only Class 1E circuits.

Redundant, series connected, overcurrent interrupting devices are provided for electrical circuits going through containment electrical penetration assemblies where the maximum available fault current is greater than the continuous rating of the penetration assembly. Class 1E protection devices are used for Class 1E circuits that meet this criterion. Overcurrent protection devices are designed, selected and coordinated in accordance with ~~Reference 5~~Reference 23. Containment electrical penetration assembly fault current clearing time curves for the current interrupting

device are coordinated with the thermal capability curve of the containment electrical penetration assembly. The protective devices are located in separate panels or separated by barriers and are independent so that failure of one will not adversely affect the other. The penetrations will withstand the full range of fault current (minimum to maximum) available at the penetration. Protection devices are capable of being tested, calibrated and inspected.

8.3.1-20

Circuit breakers used as containment penetration conductor overcurrent protection devices are periodically tested by performing the following periodic testing requirements:

- At least once per 24 months each circuit breaker is verified by performing a calibration of the associated protective relays.
- At least once per 24 months (so that all RCP circuit breakers are demonstrated operational at least once every 72 months) select and functionally test a representative sample of at least 10 percent of circuit breakers of each type. Circuit breakers selected for functional testing are selected on a rotating basis. The functional test consists of injecting a current input at the specified setpoint to each selected circuit breaker and verifying that each circuit breaker functions as designed. For each circuit breaker found inoperable during the functional tests, additional representative samples of at least 10 percent of all the circuit breakers of the inoperable type are also functionally tested until no more failures are found or all circuit breakers of that type have been functionally tested.

The MV cables are routed through penetration assemblies separate from low voltage power and low voltage control cables.

Containment electrical penetration assemblies are Class 1E devices that are classified Seismic Category I in accordance with RG 1.29 to withstand a design basis seismic event without the loss of safety function. Additionally, the penetration assemblies are qualified for a harsh environment, as indicated in Section 3.11.2.1.

8.3.1.1.11 Criteria for Class 1E Motors

Class 1E motor nominal voltages are 6.6 kV for medium voltage motors and 460 Vac for low voltage motors. The nominal bus voltage that provides power to these motors is 6.9 kV for Class 1E distribution system medium voltage switchgear and 480 Vac for low voltage load centers and MCCs. The minimum voltage criteria for Class 1E motors to start and accelerate the connected load for medium voltage motors is 75 percent, low voltage motors is 70 percent, and ~~motor operated~~motor-operated valve actuators is 80 percent. The motor terminal voltage supplied by the EPSS remains above the motor minimum starting voltage criteria during worst case bus loading conditions, which is when the EDG is supplying their respective switchgear while the medium and low voltage motors are being sequenced onto the buses. The Class 1E minimum voltage criteria is met during these loading conditions by maintaining EDG output voltage

8.3.1.3.5 Insulation Coordination (Surge and Lightning Protection)

U.S. EPR surge and lightning protection is provided for protection of plant personnel and equipment from the effects of transient over-voltages that can occur in electrical systems due to electrical faults or lightning strikes. The surge and lightning protection is designed in accordance with Reference 15, Reference 16, and Reference 18, which are endorsed by RG 1.204.

Lightning protection is provided for, as a minimum, the MSU, EATs, NATs, and structures containing safety-related equipment. Surge arresters are installed on each phase of the primary and secondary windings of the transformers. The surge arresters are connected as close as possible to the terminals of the equipment to be protected and have a path to the ground grid as short and direct as practicable. The ground conductor from the surge arrester to the ground grid is one continuous run without splices. Each surge arrester has its own ground conductor for bonding to the ground grid. Surge arresters for lightning and surge protection are shown on Figure 8.3-2 and Figure 8.3-3.

8.3.1-20

The lightning protection system will be inspected following installation and after alterations or repairs made to a protected structure, as well as following lightning transients to the system. Additionally, the lightning protection system is inspected annually and an in-depth inspection is conducted every four years.

Insulation coordination is performed in accordance with the procedures described IEEE Std 1313.1-1996 (Reference 33) and IEEE Std 1313.2-1999 (Reference 34). Surge arrester selection is determined so that protection of major equipment, such as MSU, EATs and NATs is provided while giving maximum protection to the insulation of other equipment. The insulation coordination is determined from the known characteristics of voltage surges and the characteristics of the specific surge arresters used. From these characteristics, the proper insulation level of distribution system components and arrangement of protection components are selected to provide an insulation structure that will withstand voltage stresses to which the system and equipment could be subjected.

Insulation coordination is defined as the selection of insulation strength consistent with expected overvoltages to obtain an acceptable risk of failure. The degree of coordination is measured by the protective ratio, which is the ratio of the insulation withstand level to the voltage at the protected equipment. Three protective ratios are analyzed, comparing protective levels with corresponding insulation withstands.

$$PR_{L1} = \frac{CWW}{FOW}$$

modules in parallel, supplied from the battery switchboard to provide a dual power supply to the I&C systems. The output of each converter module has a fuse or circuit breaker installed for individual component protection. Electrical isolation between the converter cubicles is provided by blocking diodes.

Normally the ~~ac~~AC/~~dc~~DC and ~~dc~~DC/~~dc~~DC converter module sets are located in separate converter cubicles. For I&C cabinet groups with low power requirements the ~~ac~~AC/~~dc~~DC and ~~dc~~DC/~~dc~~DC converter module sets are located in the same cabinet. The ~~ac~~AC/~~dc~~DC and ~~dc~~DC/~~dc~~DC converter module sets can also be installed directly inside the I&C cabinet they supply. The converter cubicles are located near the I&C cabinet group ~~which~~ they supply in the respective S~~afeguard~~ B~~uilding~~ and EPGB~~Diesel Building~~.

8.3.2.1.1.6 Uninterruptible Motor Control Centers

MCCs 31BRA, 32BRA, 33BRA and 34BRA distribute the respective inverter output to the safety-related loads, including the ~~ac~~AC/~~dc~~DC converter feeds and select non-safety-related loads as shown in Table 8.3-13—Division 1 Class 1E Uninterruptible Power Supply Nominal Loads, Table 8.3-14—Division 2 Class 1E Uninterruptible Power Supply Nominal Loads, Table 8.3-15—Division 3 Class 1E Uninterruptible Power Supply Nominal Loads, and Table 8.3-16—Division 4 Class 1E Uninterruptible Power Supply Nominal Loads respectively.

8.3.2.1.1.7 Panelboards

8.3.1-22

Panelboards 31BGA01, 32BGA01, 33BGA01 and 34BGA01 provide a 120 Vac uninterruptible single phase power supply and overcurrent protection for safety-related ~~and selected non-safety-related~~ loads. Panelboards 31BLB01, 32BLB01, 33BLB01, and 34BLB01 provide a 120 Vac uninterruptible single phase power supply and overcurrent protection for the selected 120 Vac non-safety-related EUPS loads. The panelboards are supplied with uninterruptible power from the respective division BRA MCC. Isolation of the non-safety-related loads from the EUPS is described in Section 8.3.1.1.9.

8.3.2.1.2 12 Hour Uninterruptible Power Supply

The 12UPS is a non-Class 1E system that supplies uninterruptible ~~ac~~AC and ~~dc~~DC power to non-safety-related loads in the S~~afeguard~~ B~~uilding~~s. In addition to these loads, the 12UPS supplies SBODG auxiliary loads and control power for circuit breakers used to align the SBODGs to the NPSS and EPSS.

The 12UPS system, as shown in Figure 8.3-6—12-Hour Uninterruptible Power Supply System Single Line Drawing, is comprised of two separate trains supported by separate ~~dc~~DC battery systems. Each train consists of a 250 Vdc non-Class 1E battery, a 100 percent capacity battery charger, a static bypass switch inverter, a 250 Vdc distribution