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REVISION HISTORY

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01	Integration of technical and co-applicant review comments	26/04/08
02	PCSR June 2009 update: – Integration of references	27/06/09
03	Consolidated Step 4 PCSR update: - Minor editorial changes - Update of references - Section 1 and 2, text added to clarify that switchboards will have a control voltage different from the power circuit and supplied with two redundant uninterruptible sources.	29/03/11
04	Consolidated PCSR update: - References listed under each numbered section or sub-section heading numbered [Ref-1], [Ref-2], [Ref-3], etc - Minor editorial changes - New material added (section 1) for consistency with report 17074-709-000-RPT-0002, Issue 03 (CAE Document)	21/08/12

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SUB-CHAPTER 8.2 - POWER SUPPLY TO THE CONVENTIONAL ISLAND AND BALANCE OF PLANT (BOP)

1. POWER SUPPLY TO THE CONVENTIONAL ISLAND

The main elements of the conventional island distribution system are:

1. Distribution through four trains to retain the same structure as the nuclear island [Ref-1] to [Ref-4]. This distribution is also shown on single line diagrams, Sub-chapter 8.3 - Figure 1. A train-based connection between the external supplies and the emergency switchboard via a 10 kV switchboard in the unclassified electrical buildings. The system of connection between the main switchboard and its associated emergency switchboard simplifies the situation and minimises the risk of losing the supply to the emergency switchboards from the off-site supplies.
2. Distribution which is specific to the unclassified electrical buildings from the 10 kV switchboards. Each 10 kV switchboard provides power for non-emergency power-consuming equipment (10 kV drives), a 690 V switchboard and a 400 V AC switchboard.
3. Specific distribution through two trains of the unclassified electrical buildings so as to supply sensitive devices within the conventional island [Ref-5]. Supplies to each of these two trains are secured by a back-up provided by a 10 kV emergency diesel generator within the nuclear island.
4. Siting of the unclassified electrical building switchboards within two segregated fire areas, designated areas 1 and 2, to minimise the risk of losing external supplies to two divisions within the nuclear island, in the event of a fire in one unclassified electrical buildings fire area.
5. Switchboards will have a control voltage different from the power circuit. This control voltage is supplied with two redundant uninterruptible sources.

2. POWER SUPPLY TO THE BOP

The main elements of the distribution system to the BOP are:

1. Specific distribution to the pump house is via four 10 kV secondary switchboards [Ref-1] to [Ref-4]. Each secondary switchboard supplies power to non-emergency equipment, 10 kV drives and a 400 V AC switchboard for each of the four trains of the pump house.
2. Segregation of the pump house switchboards into four fire areas so that, in the event of a fire in one sector of the pump house, the loss of supplies is limited to only one pump train.
3. Switchboards will have a control voltage different from the power circuit. This control voltage is supplied with two redundant uninterruptible sources.

3. EMERGENCY POWER SUPPLIES

3.1. OPERATING ROLE

Drives which are important to support major secondary side plant are supplied by emergency 690 V and 400 V AC switchboards from two areas, which can be supplied by an emergency diesel generator from the nuclear island in the case of loss of off-site power.

The main role of the uninterruptible 400 V AC power supplies is to supply the instrumentation and control equipment which must remain unaffected by any disruption to the upstream power supplies, and also some of the turbine generator sub-systems which have important functions (e.g. lubrication and hydrogen tightness).

220 V DC sources are used to supply the control rod gripper mechanisms (see section 5 of Sub-chapter 8.3), the instrumentation and control equipment which must remain unaffected by any disruption to the upstream power supplies and some components of the turbo-alternator which have sensitive functions (e.g. lubrication and hydrogen tightness).

3.2. SYSTEM DESCRIPTION

The conventional island's emergency system comprises two power supplies which are electrically independent [Ref-1]. Each of them is supplied by a main switchboard in the unclassified electrical buildings or one of the nuclear island's electrical divisions (see section 1 of Sub-chapter 8.3).

The 690 V emergency switchboards are supplied from the 690V emergency switchboard of the nuclear island.

The 400 V AC emergency switchboards [Ref-2] are supplied from 690 V emergency switchboards through transformers 690V / 400V.

The 220 V DC uninterruptible switchboards [Ref-3] to [Ref-6] are supplied from the 690 V emergency switchboard through 220 V DC rectifier/batteries.

The 400 V AC uninterruptible switchboards [Ref-7] are supplied from 220 V DC uninterruptible switchboards through inverters.

The 400 V AC uninterruptible switchboards can be supplied from the 400 V AC non-emergency switchboards [Ref-8] to [Ref-11] in these two cases:

- via an automatic static contactor in the event of 220 V DC uninterruptible switchboards failure or inverter failure,
- via a manual bypass during maintenance operations.

4. NON-EMERGENCY POWER SUPPLIES

4.1. OPERATING ROLE

The purpose of the non-emergency power supplies on the conventional island is to supply all the secondary side auxiliaries involved in production. This distribution comprises three voltage ratings:

- 10 kV for the power supply to the nuclear island and for the large motors principally used for unit operation,
- 690 V for the motors used during the plant's at-power and shutdown phases,
- 400 V AC for the motors, valves, lighting, and static equipment.

4.2. SYSTEM DESCRIPTION

The electrical structure of the conventional island's high voltage scheme (HTA) is consistent with the separation of the nuclear island's distribution system into four divisions. This results in the creation of four sections each equipped with a main 10 kV switchboard supplied by a unit transformer (TS) winding.

The 10 kV distribution system therefore comprises four main switchboards [Ref-1] to [Ref-4] each of which corresponds to a division of the nuclear island.

Each of these switchboards supplies a non-emergency and an emergency 10 kV switchboard of one of the nuclear island's divisions. The separation between emergency and non-emergency boards reduces the risk of the emergency switchboards losing power from off-site supplies.

The non-emergency low voltage network (690 V or 400 V AC) of the unclassified electrical buildings [Ref-5] to [Ref-12] is supplied from the main 10 kV switchboards through transformers.

Each 10 kV main switchboard supplies a 10 kV secondary switchboard in the pump house [Ref-1] to [Ref-4].

The non-emergency low voltage network (400 V AC non-classified) in the pump house [Ref-9] to [Ref-12] is supplied from the 10 kV switchboards through transformers.

SUB-CHAPTER 8.2 – REFERENCES

External references are identified within this sub-chapter by the text [Ref-1], [Ref-2], etc at the appropriate point within the sub-chapter. These references are listed here under the heading of the section or sub-section in which they are quoted.

1. POWER SUPPLY TO THE CONVENTIONAL ISLAND

- [Ref-1] System Design Manual – 10 kV Normal Power Supply System (Conventional Island) (LGi), Part 2 – System operation. ETDOFC080180 Revision A1. EDF. September 2009. (E)
- [Ref-2] System Design Manual – 10 kV Normal Power Supply System (Conventional Island) (LGi), Part 3 – System sizing. ETDOFC080274 Revision A1. EDF. September 2009. (E)
- [Ref-3] System Design Manual – 10 kV Normal Power Supply System (Conventional Island) (LGi), Part 4 – Flow diagrams. ETDOFC080275 Revision A1. EDF. September 2009. (E)
- [Ref-4] System Design Manual – 10 kV Normal Power Supply System (Conventional Island) (LGi), Part 5 - Instrumentation and Control. ETDOFC070285 Revision B1. EDF. November 2009. (E)
- [Ref-5] System Design Manual – 690 V Emergency Power Supply System (Conventional Island) (LJL/LJM), Part 5 - Instrumentation and Control. ETDOFC070288 Revision C1. EDF. December 2009. (E)

2. POWER SUPPLY TO THE BOP

- [Ref-1] System Design Manual – 10 kV Normal Power Supply System (Conventional Island) (LGi), Part 2 – System operation. ETDOFC080180 Revision A1. EDF. September 2009. (E)
- [Ref-2] System Design Manual – 10 kV Normal Power Supply System (Conventional Island) (LGi), Part 3 – System sizing. ETDOFC080274 Revision A1. EDF. September 2009. (E)
- [Ref-3] System Design Manual – 10 kV Normal Power Supply System (Conventional Island) (LGi), Part 4 – Flow diagrams. ETDOFC080275 Revision A1. EDF. September 2009. (E)
- [Ref-4] System Design Manual – 10 kV Normal Power Supply System (Conventional Island) (LGi), Part 5 - Instrumentation and Control. ETDOFC070285 Revision B1. EDF. November 2009. (E)

3. EMERGENCY POWER SUPPLIES

3.2. SYSTEM DESCRIPTION

- [Ref-1] System Design Manual – 690 V Emergency Power Supply System (Conventional Island) (LJL/LJM), Part 5 - Instrumentation and Control. ETDOFC070288 Revision C1. EDF. December 2009. (E)
- [Ref-2] System Design Manual – 400 V Emergency Power Supply System (Conventional Island) (LLL/LLM), Part 5 - Instrumentation and Control. ETDOFC070287 Revision C1. EDF. December 2009. (E)
- [Ref-3] System Design Manual 2 hour 220 V DC Uninterruptible Power Supply System (LAV/W), Part 2 – System operation. ETDOFC080062 Revision A1. EDF. November 2009. (E)
- [Ref-4] System Design Manual 2 hour 220 V DC Uninterruptible Power Supply System (LAV/W), Part 3 – System sizing (Stage 2). ETDOFC080260 Revision A1. EDF. November 2009. (E)
- [Ref-5] System Design Manual 2 hour 220 V DC Uninterruptible Power Supply System (LAV/W), Part 4 – Flow Diagrams. ETDOFC080264 Revision A1. EDF. September 2009. (E)
- [Ref-6] System Design Manual 2 hour 220 V DC Uninterruptible Power Supply System (LAV/W), Part 5 - Instrumentation and Control. ETDOFC070283 Revision C1. EDF. November 2009. (E)
- [Ref-7] System Design Manual – 400 V Uninterrupted Power Supply (Conventional Island) (LVL/LVM), Part 5 - Instrumentation and Control. ETDOFC070286 Revision C1. EDF. November 2009. (E)
- [Ref-8] System Design Manual. LK – 400 V Normal Distribution System (Conventional Island), Part 2 – System Operation. ETDOFC080199 Revision A1. EDF. October 2009. (E)
- [Ref-9] System Design Manual. LK – 400 V Normal Distribution System (Conventional Island), Part 3 – System sizing (Stage 2). ETDOFC080258 Revision A1. EDF. October 2009. (E)
- [Ref-10] System Design Manual. LK – 400 V Normal Distribution System (Conventional Island), Part 4 – Flow Diagrams. ETDOFC080265 Revision A1. EDF. September 2009. (E)
- [Ref-11] System Design Manual. LK – 400 V Normal Distribution System (Conventional Island), Part 5 - Instrumentation and Control. ETDOFC070282 Revision C1. EDF. November 2009. (E)

4. NON-EMERGENCY POWER SUPPLIES

4.2. SYSTEM DESCRIPTION

- [Ref-1] System Design Manual – 10 kV Normal Power Supply System (Conventional Island) (LGi), Part 2 – System operation. ETDOFC080180 Revision A1. EDF. September 2009. (E)
- [Ref-2] System Design Manual – 10 kV Normal Power Supply System (Conventional Island) (LGi), Part 3 – System sizing. ETDOFC080274 Revision A1. EDF. September 2009. (E)
- [Ref-3] System Design Manual – 10 kV Normal Power Supply System (Conventional Island) (LGi), Part 4 – Flow diagrams. ETDOFC080275 Revision A1. EDF. September 2009. (E)
- [Ref-4] System Design Manual – 10 kV Normal Power Supply System (Conventional Island) (LGi), Part 5 - Instrumentation and Control. ETDOFC070285 Revision B1. EDF. November 2009. (E)
- [Ref-5] System Design Manual – 690 V Normal Distribution System (Conventional Island) (LIA/B/C/D), Part 2 – System operation. ETDOFC080063 Revision A1. EDF. September 2009. (E)
- [Ref-6] System Design Manual – 690 V Normal Distribution System (Conventional Island) (LIA/B/C/D), Part 3 – System sizing. ETDOFC080259 Revision A1. EDF. September 2009. (E)
- [Ref-7] System Design Manual – 690 V Normal Distribution System (Conventional Island) (LIA/B/C/D), Part 4 – Flow diagrams. ETDOFC080266 Revision A1. EDF. September 2009. (E)
- [Ref-8] System Design Manual – 690 V Normal Distribution System (Conventional Island) (LIA/B/C/D), Part 5 - Instrumentation and Control. ETDOFC070274 Revision C1. EDF. November 2009. (E)
- [Ref-9] System Design Manual. LK – 400 V Normal Distribution System (Conventional Island), Part 2 – System operation. ETDOFC080199 Revision A1. EDF. October 2009. (E)
- [Ref-10] System Design Manual. LK – 400 V Normal Distribution System (Conventional Island), Part 3 – System sizing (Stage 2). ETDOFC080258 Revision A1. EDF. October 2009. (E)
- [Ref-11] System Design Manual. LK – 400 V Normal Distribution System (Conventional Island), Part 4 – Flow Diagrams. ETDOFC080265 Revision A1. EDF. September 2009. (E)
- [Ref-12] System Design Manual. LK – 400 V Normal Distribution System (Conventional Island), Part 5 - Instrumentation and Control. ETDOFC070282 Revision C1. EDF. November 2009. (E)