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GE Nuclear Energy

ABWR

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To Claire Goodman

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This page plus 5 page(s)

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Subject HFE ITAAC/DAC ACTION PLAN

Message ATTACHED IS ITEM (4) OF THE SUBJECT ACTION PLAN

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SUMMARY OF ABWR OPERATOR INTERFACE TECHNOLOGY

Introduction

The ABWR operator man-machine interface (MMI) includes a variety of equipment used for control and monitoring of the plant processes. The purpose of this section is to provide a summary listing and description of the technology which is utilized in these control and monitoring functions. For this purpose, the term "technology" is taken to have the following definition:

> *"the equipment, including both hardware and software, employed to directly accomplish the functions of control and monitoring of the plant processes".*

Hardware such as consoles, panels, cabinets, control room lighting and HVAC and plant communication equipment which has a supporting role but is not directly involved in the control and monitoring processes is excluded. Hard copies of procedures are excluded for the same reason.

The scope of this section is limited to the main control room and the remote shutdown station areas of the plant and includes all technology, regardless of use in prior designs.

The list format includes a brief description of each item of equipment followed by references to the codes and standards which shall be used as the basis for evaluation of the acceptability of each particular ABWR MMI design implementation.

Item	Description	Applicable Codes/Standards (Refer to end of table for complete titles)
1.	Switches	
a.	Key-locked, multi-position rotary switch	NUREG-0700, Sect. 6.4.4.3
b.	Two or more position rotary switch	NUREG-0700, Sect. 6.4.4.5
c.	Collar-armed pushbutton switch	NUREG-0700, Sect. 6.4.3.1-3
d.	Momentary pushbutton switch (returns to original position upon cessation of pressure)	NUREG-0700, Sect. 6.4.3.1-3

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Item	Description	Applicable Codes/Standards
e.	Maintained pushbutton switch (two-position)	NUREG-0700, Sect. 6.4.3.1-3
f.	Rocker switch, momentary or retained	NUREG-0700, Sect. 6.4.5.4
g.	Two or more position toggle switch, momentary or retained	NUREG-0700, Sect. 6.4.5.3
h.	Soft switch, the functions of which may be changed through the execution of software functions	NUREG-0700, Sect. 6.4.3.1-3
i.	Pull-to-lock switch	NUREG-0700, Sections 6.4.1, 6.4.2
2.	Continuous adjustment controls	
a.	Rotary control	NUREG-0700, Section 6.4.4.4
b.	Thumbwheel	NUREG-0700, Section 6.4.4.4
3.	Visual Display Units with full color screens	
a.	Large reverse projection screen	NUREG-0700, Section 6.7.2.1, 6.7.2.2
b.	Cathode ray tube	NUREG-0700, Section 6.7.2.1, 6.7.2.2
c.	Flat panel display screens (e.g., liquid crystal, electroluminescent or plasma technology, etc.)	NUREG-0700, Section 6.7.2.1, 6.7.2.2
d.	On-screen control utilized with 2.b and 2.c, above.	NUREG-0700, Section 6.7.2.1, 6.7.2.2
4.	VDU screen format types	

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Item	Description	Applicable Codes/Standards
a.	Large screen optical projection displays	MIL-STD-1472C, Section 5.2.5 Joint Steering Comm. Report, Section 10.3.5
b.	Menus (e.g. lists of related displays to facilitate selection by the user)	ESD-TR-86-278, Section 3.1.3
c.	Text or pictorial displays of alarm information	NUREG-0700, Section 6.7.2 ESD-TR-83-122, Section 2
d.	Trend Plot displays which present plant parameters vs. time. Scales can be changed by the user.	NUREG-0700, Section 6.7.2 ESD-TR-83-122, Section 2
e.	Two-Dimensional displays which present trends in relationship between two plant parameters	NUREG-0700, Section 6.7.2 ESD-TR-83-122, Section 2
f.	Status displays which present summary evaluation of selected equipment or data status in tabular form..	NUREG-0700, Section 6.7.2 ESD-TR-83-122, Section 2
g.	Diagram displays which schematically illustrate a systems configuration and the status of its major components.	NUREG-0700, Section 6.7.2, ESD-TR-83-122, Section 2, ESD-TR-86-278, Section 2.4.6
h.	Pictorial displays which utilize text, color, labels, highlighting and graphs to present historical, present status and future status prediction information on plant components, systems and processes.	NUREG-0700, Section 6.7.2, ESD-TR-83-122, Section 2, ESD-TR-86-278, Section 2.4.6.1-4

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Item	Description	Applicable Codes/Standards
4.	Text/graphical displays which provide summary of plant procedures and guidance.	NUREG-0700, Section 6.7.1.3
5.	Analog Meters which employ a hardware medium to pictorially or graphically present quantitative and qualitative information concerning plant process parameters. This includes analog meters using digitally controlled LEDs and digital readouts.	NUREG-0700, Section 6.5.2 ESD-TR-83-122, Section 2
6.	Fixed-Position Digital Displays which present alphanumeric information in a hardware medium. These can be back-lit.	NUREG-0700, Sections 6.5.1.3, 6.5.5.1, 6.5.5.2 ESD-TR-83-122, Section 2
7.	Fixed-position hardware mimic displays which schematically represent plant systems and components and their relationships utilizing pictorial elements, labels and indicator lights.	NUREG-0700, Sections 6.6, 6.7.1.7, 6.7.2.3, 6.7.2.4, 6.7.2.5, 6.7.2.7, 6.8
8.	Fixed-Position alarm tiles which use light to indicate the alarm state.	NUREG-0700, Section 6.3.3
9.	Light Emitting Diodes (LEDs) which are multicolor and are incorporated in both text and grapnic display elements.	NUREG-0700, Sections 6.5.1, 6.3.3, 6.3.4
10.	An Audio Signal system which is coordinated to the alarm tiles in #8, above, and utilizes prioritization and alarm reduction logic and pre-defined set points to alert operators to plant status changes.	NUREG-0700, Section 6.3.1, 6.3.2

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Item	Description	Applicable Codes/Standards
11.	Keyboards which are composed of alphanumeric and/or assignable function keys and function as computer input devices.	NUREG-0700, Section 6.7.1.4, ESD-TR-83-122, Sect. 1, ANSI/HFS-100-1988
12.	Printers and Printer/Plotters used to provide hard copy output in the form of plots, logs and text.	NUREG-0700, Section 6.7.3

List of Codes and Standards

1. NUREG-0700, "Guidelines For Control Room Design Reviews", USNRC, 1981

2. ESD-TR-83-122, "Design Guidelines for Designing User Interface Software", United States Air Force, 1983

3. ESD-TR-86-278, "Guidelines For Designing User Interface Software Systems", United States Air Force, 1986

4. ANSI/HFS 100-1988, "American National Standard for Human Factors Engineering of Video Display Terminal Work Stations", Human Factors Society, 1988

5. MIL-STD-1472C, "Human Engineering Design Criteria for Military Systems, Equipment and Facilities", 1981

6. "Human Engineering Guide to Equipment Design", Joint Army/Navy /Air Force Steering Committee, 1972

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