From:	Carolyn Lauron
To:	"Justin Hawkins"
Cc:	Greg Cranston; "Andrew Brenner"
Subject:	NRC Staff response to Question re: Manual Initiation of Protective Action for the SMR-160 design (Project Number 99902049)
Date:	Friday, March 31, 2023 7:39:00 AM

Hi Justin –

Please find the NRC staff response to the subject question below.
Please let me know if you have questions or need additional information.

Thanks,
Carolyn

Question: Does the NRC have a position on whether manual initiation of protective action needs to be accomplished with "conventional" hardwired switches, vs using Safety Related touch screen displays?

Background/Context:

Requirements for manual initiation of protective action stem from IEEE 603-1991.[1] RG 1.62 provides NRC acceptable methodology for meeting the IEEE 603 requirements.[2] Both of these are silent on the method for manual initiation of protective action. ISG-04 provides:[3]

> *"Safety-related controls and displays may be provided via operator workstations, or they may be provided via hardwired devices such as switches, relays, indicators, and analog signal processing circuits. In either case, the safety-related controls and indications must consist of safety-related devices with safety-related software and must be dedicated to specific safety divisions."*

This points to using safety related workstations (touch screens) as acceptable if the other provisions in IEEE 603 for independence and redundancy are met.

NRC Response:

Regulatory requirements for manual initiation are provided in Clause 4.17 of IEEE 279 and in Clause 6.2 of IEEE 603 1991. These requirements are as follows:

> IEEE 279 – *4.17 The protection system shall include means for manual initiation of each protective action at the system level (for example, reactor trip, containment isolation, safety injection, core spray, etc). No single failure, as defined by the note following Section 4.2, within the manual, automatic, or common portions of the protection system shall prevent initiation of protective action by manual or automatic means. Manual initiation should depend upon the operation of a minimum of equipment.*

> IEEE 603 1991 – *6.2.1 Means shall be provided in the control room to implement manual initiation at the division level of the automatically initiated protective actions. The means provided shall minimize the number of discrete operator manipulations and shall depend on the operation of a minimum of equipment consistent with the constraints of 5.6.1.*
>
> IEEE 603 1991 – *6.2.2 Means shall be provided in the control room to implement manual initiation and control of the protective actions identified in 4.5 that have not been selected for automatic control under 6.1. The displays provided for these actions shall meet the requirements of 5.8.1.*
>
> IEEE 603 1991 – *6.2.3 Means shall be provided to implement the manual actions necessary to maintain safe conditions after the protective actions are completed as specified in 4.10. The information provided to the operators, the actions required of these operators, and the quantity and location of associated displays and controls shall be appropriate for the time period within which the actions shall be accomplished and the number of available qualified operators. Such displays and controls shall be located in areas that are accessible, located in an environment suitable for the operator, and suitably arranged for operator surveillance and action.*

These requirements are technology neutral and therefore do not prohibit the use of digital systems or of touch screen displays to meet this criteria.

As noted in the Background/Context of the question, guidance for manual initiation of protective actions is also provided by RG 1.62. This regulatory position provides a method for complying with IEEE Std 603-1991 in regard to the manual initiation of protective actions that the NRC considers to be acceptable.

The method does not stipulate the use of any particular technology such as digital based equipment, however, it does specify performance criteria and qualification criteria for equipment that performs these functions. If this method is chosen as a means of meeting the regulatory requirements, then each of the eight positions in Section C of RG 1.62 would be evaluated by the NRC staff to determine if the proposed design meets the guidance criteria of the RG.

Regulatory Position 7 of RG 1.62 states the following:

> *In providing diverse manual initiation of protective actions, a set of independent and diverse displays and manual controls should be provided in the main control room. These displays and controls may be safety or nonsafety. The point at which the manual controls are connected to safety equipment should be downstream of the digital I&C safety system outputs. These connections should not compromise the integrity of interconnecting cables and interfaces between local electrical or electronic cabinets and the plant's electromechanical equipment.*

Therefore, the answer to the question depends upon the design of the safety system that performs the automatic safety function. If the system is digital, such as a digital I&C platform, then a diverse means of providing manual initiation must be provided. This diverse means may be based on any technology including conventional hard-wired switches or a touch screen display and must be demonstrated to be sufficiently diverse

from the protection system performing the automatic safety function, such that a loss of the safety system would not impact the ability of the operator to initiate all required protective actions.

References:

1. Institute of Electrical and Electronics Engineers, IEEE 603, “IEEE Standard Criteria for Safety Systems for Nuclear Power Generating Stations -Description,” 1991.
2. U.S. NRC, Regulatory Guide (RG) 1.62, “Manual Initiation of Protective Actions,” Revision 1, June 2010. (ML092530559)
3. U.S. NRC, Interim Staff Guidance (ISG) DI&C-ISG-04, “Interim Staff Guidance on Highly-Integrated Control Rooms – Communications Issues (HICRc),” Revision 1, March 2009. (ML083310185)