

## CONCEPTUAL DESIGN OF THE INTELLIGENT AND COMPACT CONTROL ROOM FOR SMART

Sa-Kil Kim<sup>1</sup> and Chang-Hwoi Kim<sup>2</sup>

<sup>1</sup> Senior Researcher, Nuclear ICT Research Division, Korea Atomic Energy Research Institute, Korea

<sup>2</sup> Director, Nuclear ICT Research Division, Korea Atomic Energy Research Institute, Korea

### ABSTRACT

The SMART control room consists of a main control room and remote shutdown room. The SMART main control room encompasses a large display panel, a main monitoring & control workstation, auxiliary monitoring & control workstation, and a safe shutdown workstation. Large display panel provides operators with overall plant information for determining the current process and safety status of the plant. It serves operators by formulating a common mental model of the plant status. The main monitoring & control workstation - a seated-type compact workstation consisting of LCD displays, keyboards, and trackball input devices - provides operators and supervisor with a means of monitoring and controlling the plant processes. The safe shutdown workstation provides operators with safe shut-down capabilities in the event of failures of the main control board. It also contains a set of hardwired switches for a manual actuation of the ESF equipment and reactor trip.

The main control room is the place where the operators reside in every operating condition and perform their work in order to operate SMART with safety excluding evacuation situation caused by a fire, high-level radiation, toxic gases, etc. Therefore, the safety of SMART is depended upon the quality of the tasks to be performed by the operators. As such tasks are performed through HSIs (Human-System Interfaces) in accordance with pre-established operation procedure, it is important to develop HSI designs and operation procedures suitable to the tasks in order to guarantee the safety of SMART. When main control room is unavailable in terms of habitability due to fire, high-level radiation, toxic gases, etc., the SMART operators shall shutdown the reactor with safety after going to the remote shutdown room rapidly. Remote shutdown panel has the controllers and displayers needed for shutdown of reactor with safety and the operators operate the reactor in hot shutdown state using them. If the functions of control room cannot be restored for a long time, the operators operate the reactor in cold shutdown state using the controllers and displayers of remote shutdown panel. The controllers of remote shutdown room cannot be operated concurrently with the controllers of main control room. The main control room and remote shutdown room has the equipment to transfer control authority; movement to remote shutdown room for sheltering is done after transferring control authority and, in contrast, when returning to control room after restoration, movement is done after the control authority is transferred from remote shutdown room to main control room.

The SMART control room has intelligent and compact features for the safety and efficient operations in accordance with human factors design process based on systems approach. The features will be introduced on the SMiRT 24 conference.