

A Plan to develop the process sensors of the primary system for Innovative Small Modular Reactor(ISMR)

Jung Taek Kim¹, Ryun Sub Kim², In Koo Hwang³, Sang Hoon Bae⁴, Sub Hur⁵, Wan Man Park³

¹Div. of Advanced I&C Research , Korea Atomic Energy Research Institute, Republic of Korea, ¹I&C Department, KAERI, Republic of Korea, ¹Div of I&C research, KAERI, Republic of Korea, ¹Div. of I&C Research, KAERI, Republic of Korea, ¹Div.of I&C Research, KAERI, Republic of Korea

KHNP(Korea Hydro and Nuclear Power) are developing Innovative Small Modular Reactor(ISMR) which is 4.5 m width and 18.0 m height. ISMR has 4 reactors which have 170 MWe for each reactor, and is designed to the positive safety systems, no boron operation, long term operation over 24 months and 3 persons for operation of 4 reactors. The conventional type nuclear power plants on the Korean Standard Nuclear Power Plant(KSNP) is very huge power plant that is 1000 MWe or 1400 MWe for each reactor which has one reactor, 2 Steam Generators and 4 Reactor Coolant Pumps. On the other hand, ISMR is designed to the small modular plant, integrated 4 Steam Generators, 4 circulating pumps, and reactor with one structure(containment). ISMR cannot use the conventional type sensors, especially flow measurement for Reactor Coolant System, level measurement for Pressurizer, and pressure transmitter for the primary system, because ISMR is designed to the small modular integrated plant, and so operation condition is different with the convention nuclear power plants. Therefore, the innovative instrumentation system is to develop and adapt to measure flow, level and pressure for developing ISMR. Process sensors to measure flow, level and pressure will be designed, manufactured, tested and evaluated on the ISMR operational condition, that is Temp: 321 °C (Normal (Core Outlet), 295 °C (Core Inlet)), Pressure: 15 Mpa and Flow Rate ~2m/s (anticipated) with RCP, and Radiation: 1.5*E+6 Gy (neutron), 1.7*E+5 Gy(gamma). And so we will test the developing instrumentation on Temp: 354 °C (0.5hrs), 315 °C (others), Radiation: 4*E+4 Gy (gamma, Zone D) on Accidental Conditions (PZR Wall). For the sake of establishing those objectives, KAERI takes charge of supplying the operation requirements, environment requirement, and testing and evaluated the developed process instrumentation, and the joint industries, Woojin instruments design and manufacture the ultrasonic flow measurement, Duon systems design and manufacture the radar type(GWR) level measurement, and Manometer company in Ukraine design and manufacture the pressure transmitter for ISMR.