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# Study on the Establishment of Technical Regulations for Secondary System of NPPs

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## 1. Introduction

The regulatory inspection authority had been split into two organizations until 2005, one was Ministry of Science and Technology (MOST) the other was Ministry of Commerce Industry and Energy(MCIE). The regulatory inspection jurisdiction for secondary system of NPPs have been transferred to the MOST to strengthen and intense the regulatory inspection. Korea Institute of Nuclear Safety has performed the periodic regulatory inspection for secondary parts of NPPs on behalf of the MOST since 2005.

This study presents how to establish the technical regulation and propose a draft technical regulation for secondary system of NPPs. KINS surveyed the codes and standard to be applied to secondary system of NPPs, surveyed domestic and foreign countries technical regulations and regulatory inspection framework and surveyed the thermal power plants technical regulation system. Finally, to adapt the draft revision of "The Regulation on technical standards for nuclear reactor facilities, etc." this study suggests attaining the consensus among the government, regulatory organization, licensee and other electric & generating plants licensees.

## 2. Object and Necessity

Although KINS has performed the regulatory inspection for secondary system of NPPs, there has not been an applicable technical regulation. The regulatory inspection has been performed by application of regulatory experiences or the thermal power plants technical regulation, etc. Most regulatory practices such as NRC information notices, letters, inspection guide, regulatory standard plans, etc. are in SSCs of NPPs important to safety such as primary system and part of the secondary system classified as safety-related and seismic category. In this circumstance, the regulatory inspection can depend on inspectors personal capacity, and could be influenced by personal judgment as well. There has been some confusion between regulatory inspectors and plant operators. To avoid these uncertainties, KINS have been developing the technical regulation for secondary system of NPPs.

## 3. Method and Contents

Regulatory practices, safety control systems, applicable codes and standards for secondary system of NPPs domestic as well as of those in foreign countries were surveyed and reviewed to establish a comprehensive technical regulation.

Codes and standard to be applied to secondary system of NPPs were surveyed. The pressure vessels, pumps, relief, control and safety valves, heat exchangers, piping systems, etc which are not related to the nuclear safety are manufactured and installer in compliance with ASME, ANS, TEMA, HEI, IEEE, etc. But those codes and standards cover the material, manufacture and installation, and does not include the periodic inspection, operation or performance test since installation.

During the MCIE have performed the regulatory inspection, the "Chapter 3 Steam Turbine and its subordinated Facilities of Directive for Facility of Thermal Power in Electrical Business Act" has been applied to inspect the Secondary System of NPPs. That technical regulation contains the turbine, generator and sub facilities, condensate system, feedwater system. However, because Chapter 3 steam turbine and its subordinated facilities have been developed for thermal power plant it didn't reflect the NPPs characteristics properly.

Technical regulation, standard and conformity assessment procedures related to secondary system of NPPs in the U.S.A(Illinois state case presented) and JAPAN are surveyed. Illinois Emergency Management Agency(IEMA) has sole jurisdiction over all boilers and pressure vessels at the NPP in Illinois and duties as the Board and OSFM have and exercise in relation to all boilers and pressure vessels in Illinois. The "Rules for safe Operation of Nuclear Facility Boilers and Pressure Vessels" ensure all Boilers Vessel, and Relief Valves at NPP are constructed, installed, and maintenaned per the ASME code, and inspected per the National Board Inspection Code. National Board Inspection Code describes the method, precautions, acceptance criteria for this inspection. Such inspection code includes the visual internal and external inspection, other techniques such as volumetric ultrasonic examination. In case of Japan, JNES has regulatory inspection authority for secondary system of NPPs. JNES has performed in compliance with the thermal power plant technical standard which are divided into materials, boilers, pressure vessels, piping system and steam turbine to secondary system of NPPs.

## 4. Results and Conclusions

The suggested draft revision of technical regulation is divided into two parts. One is about electrical supply system and the other is about power conversion system. Some specific items of the technical regulation are as follows.

- Secondary electrical supply system requires achievement of redundancy design criteria and remains the high reliability to minimize the unexpected plant trip caused by electrical malfunction or trouble. The secondary electrical supply system also requires the periodic test, inspection and examinations of some components, equipments or system to verify the performance and soundness.
- Power conversion system should be designed to meet the stable control of the turbine and to prevent the turbine over speed response to normal operation, anticipated abnormal operation and turbine trip condition. Those shall be designed to minize false and spurious trips during normal operation and testing of the system.
- The turbine or auxiliary component material which stands pressure shall be designed to remain the

mechanical soundness such as stress, fatigue, brittle fracture at the significant temperature transients.

- The turbine control system, lube oil system, and emergency trip system shall be designed for automatic control of the turbine speed and acceleration through the entire speed range.
- The structure of generator hydrogen control system shall be designed to avoid the fire or explosion.
- Condensed water and feedwater quality shall be remained under the control limit. The detection and management system shall be designed for in case of the cooling water inflow to condensation system.
- The draft revision of technical regulation requires the periodic test, inspection and examinations of some components, equipments or system to verify the performance and soundness. The new MOST notice regard the power conversion system test, inspection and examination, etc is planned to be proposed.
- The MOST notice(2005-4) will be revised to include KEPIC MG(general mechanism), MT(Turbine Generator), EM(detectors and control), EE (electrical equipments). This draft revision is planned to be proposed until the end of this year.

The suggested technical regulation will be applied to periodic inspection and regulation for secondary system of NPPs and will minimize the confusion between regulatory inspectors and plant operators.

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