Development of flowchart based Technical Specification

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INTRODUCTION

In operating a nuclear power plant in accordance with the Nuclear Safety Act the operator of a nuclear power plant and its employees must comply with the Technical Specification. Operational technical specification are applied according to the operation mode of the power plant and power plant operators are concerned about whether or not to apply the operation technical specification in the event of a system or facility failure. Such a decision is known to be a difficult job for operators or business operators, and it is expected that writing in a schematic flowchart so that it is easy to understand the application point in each item when a problem occurs can alleviate these difficulties.

METHODS and MODELING

It is easy to access from the point of application in the event of a facility system failure in a nuclear power plant so that the operator of the main control room can quickly judge whether or not to apply a flowchart for major failure items. It aims to provide convenience in developing technical specification and applying operational technical specification(TS).

2.1 Composition of technical specification

Nuclear power plants have operational technical specification that describe basic matters to be followed by power plant operators to ensure that facilities and operation parameters necessary for safe operation of the power plant are maintained within the operating limit conditions determined by safety analysis. The nuclear safety law stipulates that operators and employees of nuclear power reactors comply with operational technical specification as part of operational safety measures.

In addition if the nuclear safety and security commission a nuclear safety regulatory body recognizes that safety measures are insufficient it may order the operator of the nuclear power reactor to change operational technical specification remove contamination and take other necessary measures for safety.

2.2 *Current model*

The current operating technical specification requires time-consuming interpretation for items whose contents are not clear as several sentences are connected for each applicable item and procedures must be found when emergency or abnormal procedures are applied.

EXAMPLES

Table I: Complex configuration model

ACTIONS

CONDITION	REQUIRED ACTION	COMPLETION TIME
A. One or more valves inoperable.	A.1 Restore valve(s) to OPERABLE status.	4 hours
B. Required Action and associated Completion Time not met.	B.1 Be in MODE 3. AND B.2 Be in MODE 4.	6 hours 12 hours

3.4.13 RCS Operational LEAKAGE

LCO 3.4.13 RCS operational LEAKAGE shall be limited to:
a. No pressure boundary LEAKAGE,
b. 1 gpm unidentified LEAKAGE,
c. 10 gpm identified LEAKAGE, and
d. 150 gallons per day primary to secondary LEAKAGE through any one steam generator (SG).

APPLICABILITY: MODES 1, 2, 3, and 4

Table II: Current actions model

ACTIONS

CONDITION	REQUIRED ACTION	COMPLETION TIME
A. Pressure boundary LEAKAGE exists.	A.1 Isolate affected component, pipe, or vessel from the RCS by use of a closed manual valve, closed and de-activated automatic valve, blind flange, or check valve.	4 hours
B. RCS operational LEAKAGE not within limits for reasons other than pressure boundary LEAKAGE or primary to secondary LEAKAGE.	B.1 Reduce LEAKAGE to within limits	4 hours
C. Required Action and associated Completion Time not met. OR Primary to secondary LEAKAGE not within limit.	C.1 Be in MODE 3. AND C.2 Be in MODE 5.	6 hours 36 hours

Table III: Current surveillance requirements model

SURVEILLANCE REQUIREMENTS

SURVEILLANCE		FREQUENCY
SR 3.4.13.1	----------NOTES---------- 1. Not required to be performed until 12 hours after establishment of steady state operation. 2. Not applicable to primary to secondary LEAKAGE. ---------- Verify RCS operational LEAKAGE is within limits by performance of RCS water inventory balance.	[72 hours OR In accordance with the Surveillance Frequency Control Program]
SR 3.4.13.2	----------NOTES---------- Not required to be performed until 12 hours after establishment of steady state operation. ---------- Verify primary to secondary LEAKAGE is ≤ 150 gallons per day through any one SG.	[72 hours OR In accordance with the Surveillance Frequency Control Program]

RESULTS

The operation technology specification is concerned with how to apply it in case of system and equipment failure of the power plant. If the existing operational technology specifications are prepared in the form of a flow chart, actions taken in case of dissatisfaction and surveillance requirements can be immediately grasped, there is no need to interpret the contents, and difficult notations are easily marked (yes, no) to clearly indicate the application point. It is classified so that the operator can secure spare time for safe operating with quick judgment.

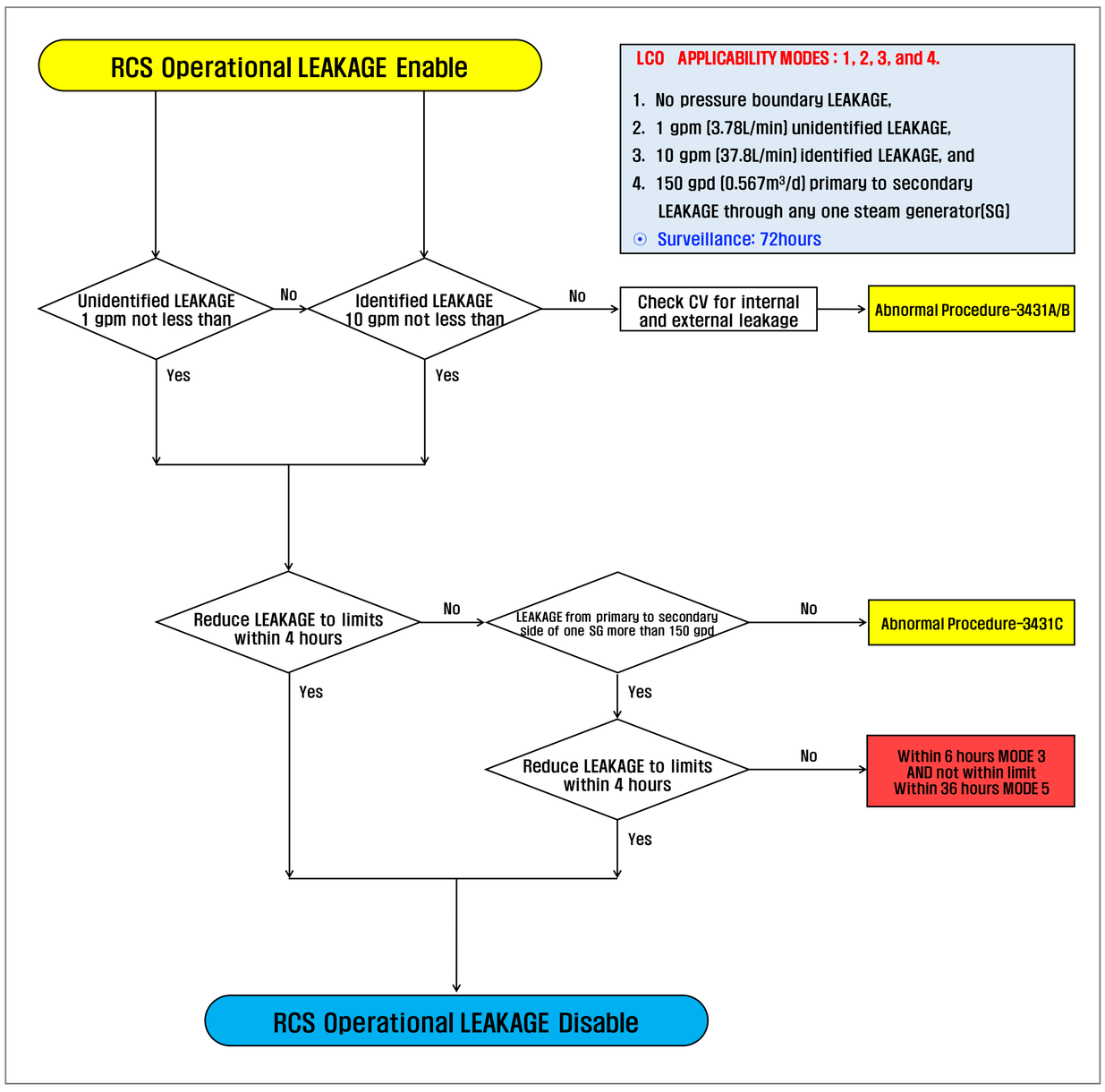

Fig. 1. Flowchart based technical specification

CONCLUSIONS

The results of this study are expected to provide convenience in applying nuclear power plant operation technical specification, which are expected to help operators working in the main control room in emergency or abnormal response strategies. In the future it is considered that the operation technical specification based on the flowchart that can immediately determine the application time of the operating technical specification actions in case of dissatisfaction action requirements and time limit will be very helpful.

Reference

NUREG-1432, “Standard Technical Specifications Combustion Engineering Plants”

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