# FUNCTION AND TASK ANALYSIS

# OF THE WNP-2

# EMERGENCY OPERATING PROCEDURES

WASHINGTON PUBLIC POWER SUPPLY SYSTEM

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## 1.0 INTRODUCTION

This document describes a methodology for function and task analysis of WNP-2 EOPs. Applications for the results of the analysis are also discussed.

## 2.0 DEFINITIONS

| | |
|---|---|
| Action Function: | An operator function involving a conscious movement, operation of controls, or execution of a series of procedural steps. Example: "Inject boron into the RPV with SLC." |
| Control Requirement: | The specific controls required to enable the operator to accomplish an action. Examples: Pump breaker control switch, valve control switch, selector switch. |
| Decision Analysis: | A form of task analysis in which operator decisions are identified and systematically examined to identify information requirements. |

Decision Function: An operator function involving a determination, evaluation, or judgement through which a procedural branch path is selected. Example: "If suppression pool temperature cannot be maintained below the Heat Capacity Temperature Limit . . ."

Function: A higher order activity by which the plant operating crew meets the objectives of the operating procedures. Within the context of this document, functions include decisions and actions.

Information Requirement: Knowledge of system or plant status required as an input to a decision. Examples: Pump status, breaker status, valve lineup status, RPV water level status.

| | |
|---|---|
| Instrumentation Requirement: | Specific parameters, displays, and design characteristics required to fulfill an information requirement. Example: Pressure indicator with a range of 0 - 150 psig. |
| Task: | A well defined subdivision of a function; a specific activity contributing toward the accomplishment of a function. Examples: Closing a valve, tripping a breaker. |
| Task Analysis: | A systematic process by which operator tasks are identified and examined in terms of the conditions, control, instrumentation, skills, etc. associated with the task. |

## 3.0 METHODOLOGY

### 3.1 General

The EOPs specify the emergency functions of the plant operating crew. Through analysis of these functions and their constituent tasks, control and information requirements necessary to support the performance of the EOPs will be determined.

The function and task analysis of the EOPs will be conducted in the following steps:

(1) Principal control functions will be identified.

(2) Decision and action functions will be identified for each principal control function.

(3) Control and information requirements will be identified for each decision and action function.

The result of the function and task analysis will be identification and application of action and decision functions and the control and information requirements necessary to performing the procedures.

## 3.2 Identification of Principal Control Functions

The new, symptomatic BWR EOPs typically define principal control functions. These functions generally correspond to the grouping of procedural steps within the EOPs. Examples include RPV water level control, reactor power control, suppression pool level control, and primary containment pressure control.

## 3.3 Identification of Decision and Action Functions

The EOPs specify performance of the principal control functions in a series of procedural steps containing decision and action functions. These decisions and action functions will be separately identified for analysis in terms of control and information requirements.

To facilitate subsequent analysis, the decision and action functions identified in the functional analysis will be classified as follows:

D1 - Decisions which require comparison of a parameter to a predetermined value or limit, such as "above" or "below".

D2 - Decisions related to system status, such as "open" or "initiated".

D3 - Decisions based upon a procedural requirement, such as "If Boron Injection is required".

D4 - Decisions that are judgmental or which require an estimation of the future state of parameters or system status. Examples include "If RPV water level cannot be maintained", "If RCIC is available", and "If adequate core cooling can be assured".

A1 - Actions that are not directly conditioned upon an explicit decision process, such as "Open the discharge valve" or "Monitor RPV water level".

A2 - Actions that are directly based on the less complex decision functions (type D1 and D2), such as "If pressure is below 10 psig, then stop the pump".

A3 - Actions that are directly based on the more complex decision functions (type D3 and D4), such as "If reactor power is above the APRM downscale trip or cannot be determined, then trip the recirculation pumps".

## 3.4 Decision Analysis

Before making a decision, the operator must gather and process a set of information. This set includes both information explicitly identified in the step itself such as plant variables, system parameters, and associated limits, and certain supplemental or implicit information. Implicit information may be required to varying degrees, depending upon existing plant conditions, and on system or component availability at the time the decision must be made.

In the decision analysis process, each identified decision function will be examined in terms of the information, both explicit and implicit, the operator requires to effect an evaluation of plant conditions and make the decision. Explicit information needs may be obtained directly from the EOP step itself. Implicit information needs must be derived through analysis of the operator's expected response, system characteristics, and procedural requirements.

## 3.5 Action Analysis

Actions specified in the EOPs generally require the performance of a particular act or the execution of a series of procedural steps. In the task analysis process, each identified action function will be examined in terms of its constituent tasks. Controls required for the performance of each task may then be identified using available technical reference material, operator input, and installed equipment.

In addition to identifying control requirements, analysis of operator actions will also identify a set of implicit information requirements. Once the action has been taken, the operator must obtain feedback information to verify that the action was performed properly and that it resulted in the desired effect. This feedback

information may be the same set of information processed to make the decision leading to the action, an independent set, or more likely, an intersecting set. It necessarily includes considerable information pertaining to system status, system availability, component operating status and system performance. All of this information falls into the category of implicit information.

## 3.6 Classification of Information

To facilitate subsequent analysis, the information requirements identified through the analysis of operator decision and action functions will be classified as follows:

I1 - Directly measurable plant parameters, such as RPV water level, suppression pool temperature, or RCIC steam line pressure.

I2 - Parameters derived from one or more type I1 parameters, such as RPV saturation temperature or the Heat Capacity Temperature Limit.

I3 - Type I1 parameters as a function of time, such as RPV cooldown rate.

I4 - Parameters related to system status, such as valve position or breaker status.

As previously discussed, the information may be explicit, implicit, or both, depending upon the decision or action function which requires it.

## 4.0 APPLICATION

A sample functional analysis is illustrated in Figure 1. The format and content shown is for illustrative purposes only and is not designed to be prescriptive.

The results of the function and task analysis will be used in the following applications:

(a) Identifying operator information and instrumentation requirements for refining the Graphics Display System (SPDS).

(b) In conjunction with the DCRDR, identifying operator control, information and instrumentation requirements for emergency operating procedures.

(c) Verifying provision of instrumentation under Regulatory Guide 1.97.

(d) Refining plant-specific emergency operating procedures.

(e) Identifying performance and knowledge requirements for development of operator training programs.

## 5.0 SUMMARY

Through functional analysis of the WNP-2 emergency operating procedures, principal control functions and specific emergency response action and decision functions will be identified. The identified action and decision functions will then be analyzed to detemine the information and control requirements necessary to support the accomplishment of these functions. The information and control requirements thus determined are used to define or prioritize requirements for procedures, training, and control room system improvements.

| | | I | B | A | Implicit Information Requirements | Type |
|---|---|---|---|---|---|---|
| PC/P | Monitor and control | | | A1 | Primary containment pressure trend<br>See primary containment pressure control PC/P below | I3 |
| | primary containment pressure. | I1 | | | | |
| PC/P-1 | Operate [the following systems, | | | A2 | See below | |
| | as required: | | D4 | | None | |
| | • Containment pressure control systems. | | | A2 | See Table A-21, Drywell/Containment HVAC and Cooling System<br>See Table A-22, Drywell/Containment Purge System | |
| | Use containment pressure control system operating procedure.] | | | A2 | None | |
| | [a] SBGT | | | A2 | See Table A-23, SBGT System | |
| | [and drywell purge], | | | A2 | See Table A-22, Drywell/Containment Purge System | |
| | only when the temperature in the space being evacuated | I1 | | | | |
| | is below | | D1 | | None | |
| | [212°F (Maximum Noncondensible Evacuation Temperature)]. | I1 | | | | |
| | Use [SBGT and drywell purge operating procedures]. | | | A3 | None | |
| | ((CAUTION 02)) | I5 | | | See Caution 21 | |
| PC/P-2 | Before suppression chamber pressure | I1 | | | | |
| | reaches | | D1 | | Suppression chamber pressure trend | I3 |
| | [the Pressure Suppression Pressure] [17.4 psig (Suppression Chamber Spray Initiation Pressure)], | I1 | | | | |
| | but only if [suppression chamber pressure | I1 | | | | |
| | is above | | D1 | | None | |
| | 1.7 psig (Mark III Containment Spray Initiation Pressure Limit)] | I1 | | | | |
| | [suppression pool water level | I1 | | | | |
| | is below | | D1 | | None | |
| | 24 ft. 6 in. (elevation of suppression pool spray nozzles)] | I1 | | | | |
| | initiate suppression pool sprays. | | | A3 | See Table A-9, RHR/Suppression Pool Spray Mode | |
| | ((CAUTION 08))<br>((CAUTION 018)) | I5<br>I5 | | | See Caution 8<br>See Caution 18 | |
| PC/P-3 | If suppression chamber pressure | I1 | | | | |
| | exceeds | | D1 | | None | |
| | [17.4 psig (Suppression Chamber Spray Initiation Pressure)] | I1 | | | | |
| | but only if [suppression chamber temperature | I1 | | | | |
| | and drywell pressure | I1 | | | | |
| | are below | | D1 | | None | |
| | the Drywell Spray Initiation Pressure Limit]. | I2 | | | | |

*Figure 1. Sample Functional Analysis*