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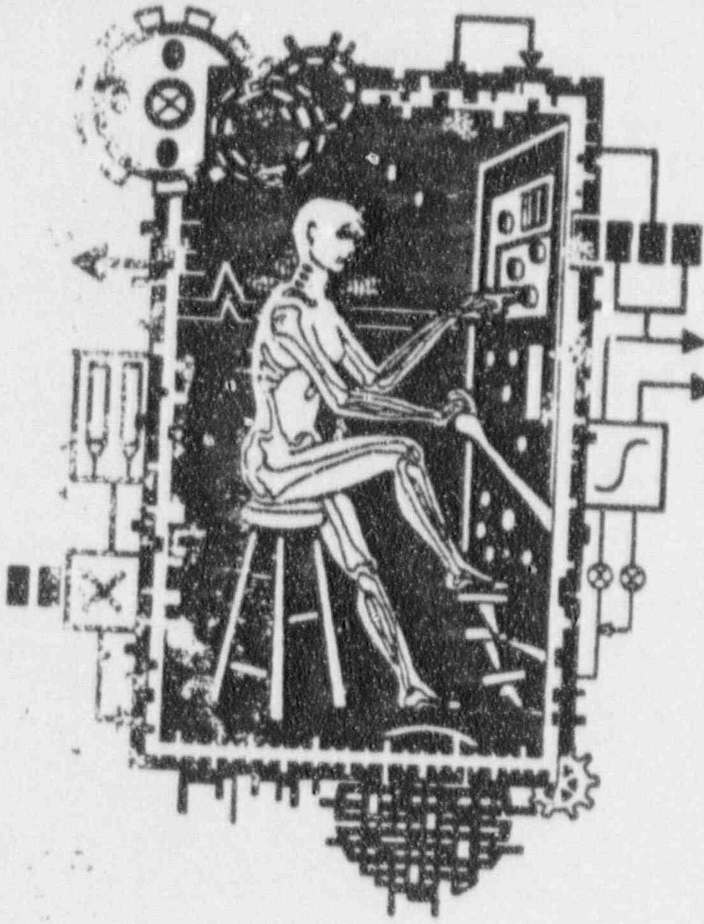

SYSTEM 80+

Function & Task Analysis

Final Report

Prepared by:
Human Factors Services

January 1989

OPERATIONS SERVICES

COMBUSTION ENGINEERING

Function & Task Analysis
for
Nuplex 80 +

Nuclear Power Systems
Combustion Engineering, Inc.
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1.0 Purpose

The purpose of this document is to provide design data for the NUPLEX80+ control room design for Combustion Engineering Standard Safety Analysis Report- Design Certification (CESSAR-DC). This data was obtained using a functional task analysis technique developed specifically to suit the design objectives of the new generation control room.

2.0 Scope

This document generates detailed design support information for the:

1. function allocation
2. general panel layout
3. Reactor Coolant System (RCS) panel design

This information is generated by the Functional Task Analysis technique discussed in this document.

The function allocation information is intended for design engineers developing the overall man-machine function allocation in the control room. Allocation recommendations are based on system operations constraints, operator task information , as well as human and machine capabilities. This information is intended to be used as an input to preliminary design efforts.

General panel layout information and RCS instrumentation information is intended for design engineers involved in panel design activities. This information is intended to provide input to the panel arrangement and high level organization of instrumentation. The detailed RCS information is intended to provide information on how and when each instrument is used in the operator's decision process. This provides input to RCS panel detailed design.

This analysis uses as input System 80+ conceptual design studies, System 80 design information, Combusition Engineering (CE) operations experience and procedures, and NUPLEX 80+ conceptual design information. A list of references is provided in section 3.0.

3.0 References

The following table provides references for the material used as input for this analysis.

Document Reference Number Assigned	Document Number	Reference Name
01		Advanced Light Water Reactor Requirements Document Draft 0 by:Electric Power Research Institute (EPRI)
02		System 80 CESSAR FSAR Amendment No. 12 by:Combustion Engineering, Inc.
03	CEN-152 Rev. 03	Combustion Engineering Emergency Procedure Guidelines Revision 03 by:Combustion Engineering, Inc
04	CEN-128	Response of CE NSSS to Transients and Accidents by:Combustion Engineering, Inc
05	CE-NPSD-407	NSSS Response to Operator Actions during Postulated Events for Resolution of CE EPG SER items by:Combustion Engineering,Inc
06	CEN-268	Justification of Trip Two/Leave Two RCP Trip Strategy During Transients by:Combustion Engineering,Inc.
07	SOP-8.1	Startup Cold Shutdown to Hot Standby A C-E Simulator Operating Procedure by:Combustion Engineering,Inc
08	SOP-8.2	Nuclear Startup to Minimum Load A C-E Simulator Operating Procedure by:Combustion Engineering, Inc
09	SOP-8.3	Turbine Startup & Syncronization of Generator A C-E Simulator Operating Procedure by:Combustion Engineering, Inc
10	CEN-114-P	Review of Small Break Transients in CE NSSS (propriety information) by:Combustion Engineering, Inc.
11		PVNGS System Description

Document Reference Number Assigned	Document Number	Reference Name
12		PVNGS Final Safety Analysis Report by:
13	CENPD-263-P (draft)	ATWS analysis by:Combustion Engineering, Inc.
14	SYS80-PE-TP Revision 00	NSSS Transient Performance Report for System 80 by:Combustion Engineering
15	CE-NPSD-156	Natural Circulation Cooldown Task 430 Final Report by:Combustion Engineering, Inc.
16	14273-ICE-6218 Rev. 00	Lecture Notes source: FWCS Functional Description Palo Verde Nuclear Station Unit # 1 by:Combustion Engineering
17	14273-ICE-6024 Rev. 01	Lecture Notes source: Project Specification for RRS FWCSS, & SBCS PVNGS by:Combustion Engineering
18	SYS80-PE-IC15 Revision 01	Lecture Notes source: Instrument & Controls Design Requirements for NSS & FWS. PVNGS # 1 by:Combustion Engineering
19	SYS80-PE-CR15 Rev. 01	Lecture Notes source: Component Design for NSS & FWS by:Combustion Engineering
20	SYS80-PE-IR15 Revision 04	Lecture Notes source: NSSS Interface Requirements for NSS & FWB by:Combustion Engineering
21		The Psychology of Human-Computer Interaction by:Card, S.K.,Moran, T.P. & Newell, A.,
22		A Model of Human Decision Making in Complex Systems and Its use for Design of System Control Strategy by:Rasmussen, J. & Lind, M.,

Document Reference Number Assigned	Document Number	Reference Name
23	EPRI NP-3659	Human Factors Guide for Nuclear Power Plant Control Room Development, by:Electric Power Research Institute (EPRI)
24		Information Processing and Human-Machine Interaction by:Rasmussen, J.
25	NUREG 0700	Guidelines for Control Room Design Reviews by:
26	CE-NPSD-299	Generic Operator Information and Control Requirements Review Based on CE EPGs (CEN-152) by:Combustion Engineering

4.0 Applicability

4.1 Status of Data: Design Status 3

The information provided by this analysis is provided for preliminary use, and is not verified for any specific application.

4.2 Uncertainties on Input and Data

Task information collected for this analysis is based on operations expert judgement, and available system 80 and System 80+ documentation. The exact order of tasks performed may vary depending on operator preference. To help control for this variance, independent operational reviews of of all function task data (Appendix A-H) were conducted. Hardware assumptions were also made on systems that were not in existence at the time of data collection. Major equipment assumptions for this analysis are listed in Appendix A.

Function allocation evaluation data and recommendations are based on the "human processor" cognitive model[1] for simple decision processes. The reaction time estimates are "middle man" estimates which assume an average reaction time halfway between "slow man" (worst case) and "fast man" (best case). Further, the reaction times are based on generic human processing time and does not take into account specific hardware implementation. These results assume that the data will be displayed correctly according to good human factors criteria.

This data is used to evaluate the feasibility of one human operator cognitively processing multiple parameters in some required time frame.

4.3 Analysis Methods Used

The functional task analysis approach is developed from the methodologies outlined in Rasmussen & Lind[2], EPRI NP-3659[3], and NUREG 0700. The analysis focuses on the cognitive decision tasks required of the operator to control the thermal process of the plant. Historically nuclear control rooms have presented an overwhelming amount of information to the operator. Studies have shown that this information can overload the operator under certain situations, increasing the

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[1]Card, S.K., Moran, T.P. & Newell, A., The Psychology of Human-Computer Interaction, Lawerence Erlbaum Ass.:NJ, 1983, pp. 23-97.

[2]Rasmussen, J. & Lind, M., "A Model of Human Decision Making in Complex Systems and Its Use for Design of System Control Strategies", Proceedings of the American Control Conference, June, 1982.

[3]Human Factors Guide for Nuclear Power Plant Control Room Development, EPRI NP-3659, August, 1984, pp.21-46.

probability of operator error. This task analysis details the operator's tasks involved in decision processing to ensure that:

1. only needed information is displayed to the operator
2. the amount of information does not exceed human cognitive limitations
3. information is presented in usable form.

This will prevent information overload situations currently found in conventional power plants.

Detailed analysis of plant controls was omitted from this analysis due to the acceptance of conventional control strategies for NUPLEX 80+. Information for control design and implementation is available in past DCRDR task analyses and historical operations reports.

This analysis is based on a mass-and-energy flow framework to provide a uniform, generic representation of the causal structures of the physical plant. This framework allows the mapping of all disturbances through the system independent of specific hardware implementation.

Extending from this framework, all operator control actions on the system are based on maintaining satisfactory operations of a target state (Rasmussen). Recognizing that human behavior is goal oriented in nature, all control tasks of a control room operator can be generically categorized into 3 deviations from this goal:

1. Maintain target state
2. Change target state
3. Reconfigure the plant by changing the constraints of plant variables.

This functional task analysis will be based on these categories of operator control. Table 4.3-1 lists the categorization of event sequences into these categories. Organizing all possible plant events into these categories allows operator tasks to be analyzed with reference to a specific target state as opposed to previously learned fault patterns. This helps provide an analysis technique that is unbiased by diagnostic and control strategies inherent in existing control room designs.

Table 4.3-1

Categories of Plant Control Variables for Nuplex80+ Event Sequences

Category of Plant Control	Event Sequences
Maintain State of Plant	o Steady State Power o Transient Power o Low Power operation o Shutdown Decay Heat Removal
Change State of	o Startup o Shutdown o Abnormal Operations o Reactor Trip o Loss of Power
Reconfigure State of Plant	o Loss of Coolant Accident o Steam Generator Tube Rupture o Steam Line Break o Loss of Feedwater o Station Blackout o Refueling

The functional task analysis was completed using the following steps. Each step is summarized by title with more detailed information provided within the titled section.

1. Establish analysis assumptions
2. Establish function allocation criteria
3. Review basic documentation
4. Establish analysis structure
5. Analyze operator tasks and document
6. Evaluate existing System 80/80+ function allocation for Nuplex 80+ design
7. Document allocation recommendations

4.3.1 Establish analysis assumptions

The following is a list of assumptions utilized in the overall analysis.

4.3.1.1 System Assumptions

Assumption S-1: The System 80+ design activities are being conducted as the next generation of Combustion Engineering's power plant. It is an enhanced and improved design based on the previous design - System 80. It is assumed that the plant design functions and features of the Combustion Engineering System 80+ design were derived using a mass-and-energy flow topology and historical design experience.

Assumption S-2: This analysis assumes an event sequence basis can best support the design of the man-machine interface for one man operation. The events are defined as plant situations of significance requiring operator interaction to maintain, change, or reconfigure the state of the plant. The event sequences can be modelled as a series of occurrences along a time line to evaluated operator loading, cognitively or otherwise.

Assumption S-3: For the data of this analysis, it is assumed that the following general event sequences can represent a good cross section of operations for the conceptual design and layout of the NUPLEX 80+ control room. The general event sequences of this analysis are significantly different from the"case" event sequences required for plant Final Safety Analysis Report (FSAR) or licensing purposes. The general event sequences of this analysis are written to overview many "case" event sequences. The general event sequences identifies decision points and decisions and not detailed specific variations of these decisions.

For <u>maintaining the plant</u> the following represent general operations:

Steady State Power Operations
Transient Power Operations
- 90 to 100% step change (BOL)
- 100 to 90% step change (BOL)
- 15 to 100% ramp change @ 5%/min. (EOL)
- 100 to 15% ramp change ^ 5%/min. (EOL)

Shutdown Decay heat remo

More specific operations not included in this analysis are:

Low Power (physics) operation

For <u>changing the state of the plant</u> the following represent general operations:

Startup
Shutdown
Reactor Trip(1)

More specific operations not included in this analysis are:

Abnormal Operations
Loss of Power Operations

For <u>reconfiguring the state of the plant</u> the following represent a cross section of operations to be included in this analysis:

Loss of Coolant Accident
Steam Generator Tube Rupture
Refueling
Steam Line Break
Loss of Feedwater
Station Blackout

Note (1): Event sequences depicted could represent a number of "case" events. The event strategies themselves are generic and were extracted from CEN-152 Rev. 03, Combustion Engineering Emergency Procedure Guidelines.

Assumption S-4: It is assumed that the system functions provided by Appendix A provides adequate input to this analysis.

Assumption S-5: At the time of this analysis portions of System 80+ were not available. Assumptions made on System 80+ equipment is listed in Appendix A, table x.x.

4.3.1.2 Human Assumptions

Assumption H-1: Human behavior is goal oriented.

Assumption H-2: The operators overall goal is to produce safe and efficient power.

4.3.1.3 Data Assumptions

Specific assumptions relating to the data will be described in the appendix to which it applies.

4.3.2 Establish function allocation criteria

Two types of criteria were developed for the function allocation evaluation.

1. A list of man-machine capabilities were adopted from NUREG 0700. These criteria, listed in table 4.3-2, provides the allocation recommendations based on optimal man and machine capabilities.

2. A list of criteria was developed for the minimum time required to complete various operator tasks. These criteria, listed in table 4.3-3, are estimates of cognitive processing time per task independent of hardware and software implementation. It is intended to identify area of possible overload situations and provide input into the hardware and software development.

Table 4.3-2
Function Allocation Criteria

	Humans Excel In		Machines Excel In
H-1	Sensitivity to ambiguous stimuli	M-1	Monitoring (personnel and equipment
H-2	Perceiving patterns and making generalizations about them	M-2	Performing routine, repetitive, or very precise operations
H-3	Detecting signals in high noise levels	M-3	Responding very quickly to control signals
H-4	Ability to exercise judgment where events cannot be completely defined	M-4	Exerting great force, smoothly and with precision
H-5	Improvising and adopting flexible procedures	M-5	Storing and recalling information quickly and accurately
H-6	Ability to react to unexpected low-probability events	M-6	Performing complex, rapid and repetitious computations with high accuracy
H-7	Applying originality in solving problems: i.e., alternative solutions	M-7	Doing many different things at once
H-8	Ability to profit from experience and alter course of action	M-8	Collecting multiple data points at once
H-9	Ability to perform fine manipulation, especially where misalignment appears unexpectedly	M-9	Insensitivity to extraneous factors
H-10	Ability to reason inductively	M-10	Ability to repeat operations rapidly, precisely, continuously, and consistently over a period of time
		M-11	Operating in environments hostile to humans
		M-12	Deductive processes

TABLE 4.3-3

Parameter Access Time Criteria for Specific Hardware Implementation Methods

Hardware:	Minimum Access Time Required:
Discrete continuous display (estimated time for physical movement and visual orientation)[a]	1 second
CRT displays (access through menu levels)	
1 level menu access (touch target rt[b] + choice decision rt[c])	0.9 seconds*
2 level menu access (touch target rt + choice decision rt) x2	1.9 seconds*
3 level menu access (touch target rt + choice decision rt) x3	2.8 seconds*

* Orientation time (1 second) must be added to access time if operator must move between 2 or more CRTs.

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[a] Orientation time is an estimate of the average time it may take an operator to physically and visually orient himself to parameter locations on the MCC.

[b] Touch target reaction time (rt) is an estimate of the time necessary to physically move hand to and press a target. This is estimated by Fitt's law assuming 'distance' = 2 feet and 'target size' = 1 inch.

[c] Choice decision reaction time (rt) is an estimate of the time necessary to cognitively choose a menu option. This is estimated by Hick's law assuming n=7 and Ic=157.

4.3.3 Review basic documentation

System 80+ is based on System 80 design and includes design enhancements and improvements to address current Advanced Light Water Reactor (ALWR) requirement document criteria and the NRC's Severe Accident and Standardization policies. Documentation for this design was reviewed to identify the plant processes, configurations, and modes of operation.

4.3.3.1 Plant processes

Drafts of the ALWR Requirements document and CESSAR-DC were reviewed against System 80 CESSAR-F materials, Arizona Nuclear Power Plant (ANPP) system descriptions, and ANPP training materials to identify the systems, their processes, and the features and functions of the systems. The purpose of which is to establish a basis for the role of the systems in operations and a baseline from which current operational experience can be used. The results of this review are documented as a list of basic functions or system purposes for the plant by plant system. This data appears as Appendix A.

4.3.3.2 Plant configurations

Drawings, system descriptions, and CESSAR-DC were reviewed to develop a configuration of systems from which to base this analysis. Assumptions for the various plant configurations are provided in Appendix A.

4.3.3.3 Modes of operation

Lists of plant procedures, technical specifications, and CESSAR were reviewed to develop an understanding of how the plant is to be operated employing current control conventions. (Current control conventions are being retained in the NUPLEX 80+ control room. The design changes are primarily directed at the information systems of a nuclear power plant.)

4.3.4 Establish analysis structure

Plant event sequences were assigned to one of the 3 control categories described above in section 4.3, table 4.3-1. These event sequences were systematically analyzed to various levels of the following structure:

- Gross-function
  - Sub-function
    - Task
      - Elements
        - Time profiles

The level of detailed of analysis for each event varies depending on the nature of the event. Refer to section 4.3.5 for discussion on analysis detail. Table 4.3-3 represents the overall level of detail for all event sequences analyzed.

4.3.4.1 Gross-function and sub-function level

This level of the analysis structure is a high level description of operator functions. Each statement represents multiple tasks and is written from the operator's perspective, e.g. **Maintain RCS Heat Removal**. All functions are recorded in a generic order of their performance. The order of performance may change slightly depending on the specific situation. For example in the event, Loss of Coolant Agent (LOCA), the order of performance for each function may vary depending on the size of the break. Overall the order of functions will be similar enough to only warrant an analysis of one generic event sequence.

In each case the listing of gross-functions and sub-functions approximates generic operator procedures.

4.3.4.2 Task level

This analysis models operator processes using concepts presented by Rasmussen[4] This generic model of the human decision and control process was developed to allow the analysis of a large repertoire of specific situations and tasks. The nuclear plant operator employs the following four generic processes in this model:

1. **Collect** or obtain the information (needed)
2. **Evaluate** collected information to determine deviation from desired state
   a. Evaluating the information obtained against a known reference (either a trained operator's knowledge, a setpoint set by a machine, or guide specific for the evaluation).

   Plan (or make decisions) for control actions by
   a. Deciding on a course of action (specifically if more than one course of action is available).
3. **Perform actions** planned (e.g., actions set 1, actions set 2, etc.).
4. **Monitor Feedback** to confirm actions were performed according to plan.

In actual real-life situations these operations iterate between collect, evaluate/plan, control and feedback. This model does not represent the actual decision process involved in plant control, but instead provides an organized map which is useful for analysis purposes.

The task statements are written using a prescribed format to conform to this model. Each task is started with a well-defined verb from the verb list (Table 4.3-4) followed by the object of the verb, which may be a plant parameter, process parameter set, plant component, sub-system, or

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[4] Rasmussen, J. Information Processing and Human-Machine Interaction, North-Holland: NY, 1986.

system. The task statement may also include a clarifying clause. The following example observes this prescribed format.

Example:	Collect (verb)	Pressurizer pressure (object)	Information (clarification clause)

Table 4.3-4 defines the verb sets used in this analysis.

At this level of the analysis, existing system function decomposition information is attached to the operator functions. All operations statements are tagged to actual System 80+ systems or equipment involved in accomplishing each operation.

Table 4.3-4

VERB LIST for the NUPLEX80+ TASK STATEMENTS

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Category	Verb	Usage	Definition
Collect	Collect	task	The process by which an operator brings together, gathers, or assembles in a group information
	Detect	task elmt	To note, hear, see, sense or become aware of, (object of verb examples; a plant alarm, a change in valve status, etc.)
	Read	task elmt	To visually collect specific information which uses a display containing printed or written characters or symbols to represent words, pictographs, or numerical data.
Plan[5]	Compare	task	A process that selects, sorts, or arranges data, people, or things, and judges whether their readily observable functional, structural, or compositional characteristics are similar to or different from prescribed standards.
	Copy	task	A process to transcribe, enter, and/or post data, following a scheme or plan to assemble or make things by using any of a variety of work aids.
	Compute	task	A process for performing arithmetic operations and makes reports and/or carries out a prescribed actions in relation to them.

[5] Definitions provide a successive set of verbs to express various decision processes. This set compliments the assessment of data or information from which to base actions. This set was extracted in part or in its entirety from the reference: Sidney A. Fine and Wretha W. Wiley, Methods for Manpower Analysis No. 4: An Introduction to Functional Job Analysis, The W.E. Upjohn Institute for Employment Research, September 1971.

Table 4.3-4

VERB LIST
for the
NUPLEX80+ TASK STATEMENTS

sheet 2 of 4

Category	Verb	Usage	Definition
Plan[5]	Compile	task	A process of gathering, collating, or classifying information about data, people, or things, following a scheme or system by which discretion in application is used.
	Analyze	task	A process that examines and evaluates data (about things, data, or people) with reference to criteria, standards, or requirements of a particular discipline, art, technique, or craft to determine interaction effects (consequences) and considers alternatives.
	Innovate	task	A process that modifies, alters and/or adapts existing designs, procedures or methods to meet unique specifications, unusual conditions, or specific standards or effectiveness within the overall framework of operating theories, principles, and/or organizational contexts.
	Coordinate	task	A process that decides time, place, and sequence of operations of a process, system, or organization, and/or the need for revision of goals, policies (boundary conditions), or procedures on the basis of analysis of data and of performance review of pertinent objectives and requirements.

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[5]Definitions provide a successive set of verbs to express various decision processes. This set compliments the assessment of data or information from which to base actions. This set was extracted in part or in its entirety from the reference: Sidney A. Fine and Wretha W. Wiley, Methods for Manpower Analysis No. 4: An Introduction to Functional Job Analysis, The W.E. Upjohn Institute for Employment Research, September 1971.

Table 4.3-4

VERB LIST
for the
NUPLEX80+ TASK STATEMENTS

sheet 3 of 4

Category	Verb	Usage	Definition
Plan[5]	Synthesize	task	A process that allows one to take off in new directions on the basis of personal intuitions, feelings, and ideas (with or without regard for tradition, experience, and existing parameters) to conceive new approaches to or statements of problems and the development of system, operational, or aesthetic "solutions" or "resolutions" of them, typically outside of existing theoretical, stylistic, or organizational content.
Action	Align	task	The act of arranging or configuring components so as to allow or let flow or current pass.
	Block	task	An act to manipulate instrumentation or controls such that the automatic initiation of a system's or component's operation is inhibited or prevented.
	Close	task	An act to shut; e.g. to shut a valve.
	Control	task	The act of regulating a plant parameter. Control is performed by way of an instrument or apparatus which is available in the control room, which in turn regulates some mechanism.
	Energize	task	An act to give electrical energy to, activate, or charge; with a process to join, unite, or bring into contact. e.g., Energize a circuit.

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[5] Definitions provide a successive set of verbs to express various decision processes. This set compliments the assessment of data or information from which to base actions. This set was extracted in part or in its entirety from the reference: Sidney A. Fine and Wretha W. Wiley, Methods for Manpower Analysis No. 4: An Introduction to Functional Job Analysis, The W.E. Upjohn Institute for Employment Research, September 1971.

Table 4.3-4

VERB LIST
for the
NUPLEX80+ TASK STATEMENTS

sheet 4 of 4

Category	Verb	Usage	Definition
Action	Open	task	An act to remove obstructions from, to clear; to form spaces or gaps between, e.g., open a valve.
	Select	task	The act of making a choice or selection.
	Start	task	To set into motion, operation, or activity; e.g., start the pump.
	Stop	task	To cause to halt, cease or terminate; e.g., to cause a motor to stop operating.
Feedback	Confirm	task	Following an action performed, the process of assuring the certainty or validity of the action taken.
	Monitor	task	To continually scrutinize or check systematically the status or condition of a system, component, or parameter with the intent to collect with a purpose certain specific types of data.
	Verify	task	To give confidence to the certainty or validity of; not following a previously performed human action, e.g., Verify a condition exists.

4.3.4.3 Elements level

This level of analysis specifies individual process parameters associated with each collect statement listed in the previous level. In addition, information on 'how' each parameter is used by the operator is noted.

These element listing are a sequential parameter list in time by gross function. Various sorting of this data are provided in the appendices to support specific design needs. These sorts are titled parameter lists to distinguish them from the core functional task data. The element lists were sorted on the following variables:

- detailed usage sorted by parameter
- summarized usage sorted by parameter

4.3.4.4 Time profile structure level

This level of analysis provides a time window on the event time line that each task (parameter) must be attended to and evaluated.

4.3.5 Analyze operator tasks and document results

Event sequences were analyzed by an expert in operations.

Twelve out of fifteen event sequences were analyzed to at least the function level. Refer to table 4.3-5. This is assumed to represent the majority of operator tasks in the control room. 'Low power operations' and 'Loss of power' event sequences were not analyzed due to extreme similarities with other event sequences listed in this analysis. The normal operations' event sequence was not analyzed due to the the d range of operations it pertains to.

The following 7 event sequences (of the 12 in this analysis) were analyzed to the element/collect level for all systems:

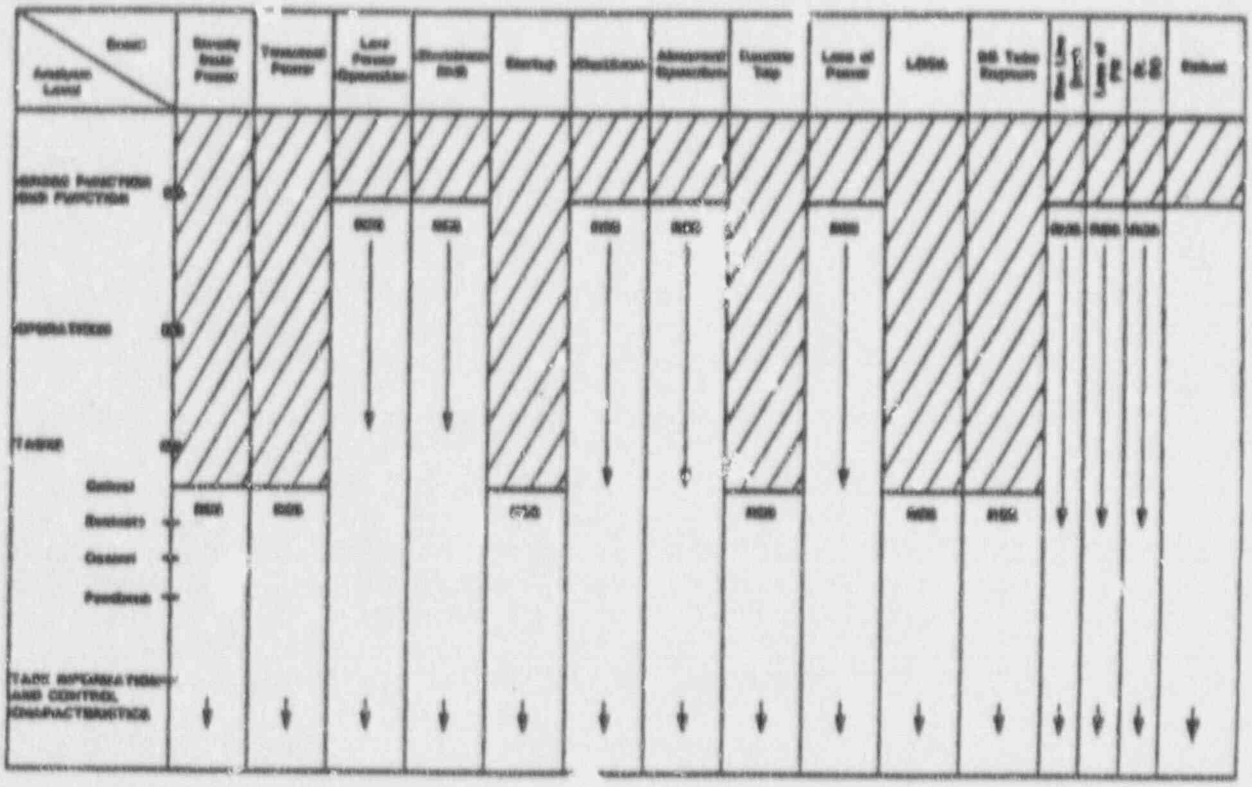
- o steady state power
- o transient power
- o startup
- o shutdown
- o reactor trip
- o LOCA
- o steam generator tube rupture

This provides detailed information for RCS panel design as well as the basis data for the function allocation evaluation. These 7 events are assumed to represent an adequate cross section of operator actions for evaluation of the existing SYSTEM 80 function allocation.

'Transient power', startup' and 'reactor trip' event sequences are evaluated against time line criteria and cognitive processing reaction time estimates. Operator actions in transient power operations and startup are targeted for one man staffing. The time line evaluation will assess operator's ability to cognitively process and respond to the

TABLE 4.3-5

Overview of Analysis Scope



informational demands of these situations. Although a larger staffing is expected according to the NUPLEX 80+ philosophy during emergency situations, one operator will have to at least the initial stages of an reactor trip until additional help is available. Therefore it is essential to evaluate cognitive loading on the operator during a reactor trip.

The remaining 5 of these 8 events are evaluated against the generic function allocation criteria. These events represent a cross section of the remaining MCC functions and the ACSC functions.

The last 5 of the original 12 events analyzed for this analysis focus only on RCS elements.

- o steam line break
- o loss of feedwater
- o station blackout
- o shutdown DHR
- o refueling

All tasks and elements relating to the RCS were identified at the gross function level in order to focus attention on the RCS parameters for support of the detailed panel design efforts.

4.3.6 Data review

Two additional, independent, operational reviews were done on the task data to ensure accuracy. A high degree of agreement was seen between both reviewers and the original data. Discrepancies were identified only in approximately 1 or 2% of the data. These discrepancies were resolved and the appropriate changes made to the data.

4.3.7 Document results

The functional task analysis data was stored on a PC database system to allow easy manipulation of information. This data is provided in the appendices of this document.

4.3.8 Function Allocation

4.3.8.1 Develop time profiles

Time profiles were developed for the sequential parameter lists for each of the following event sequences:

- o (4) normal power ramps
- o startup
- o reactor trip

These time profiles include time into event that each parameter must be viewed and the allotted time for the required decisions to be made. Time estimates were derived by evaluating data from specific event profiles, operator experience and process transient response models.

4.3.8.2 Calculate estimate cognitive processing time for simple decisions

Estimates of operator perceptual processing time and decision processing time were made for each parameter (see Appendix H). Calculated estimates were based on the Human Processor cognitive model[6]. Refer to table 4.3-6 for a summary of model.

4.3.8.3 Assign cognitive processing time estimates to task element list

A cognitive time estimate was assigned to each parameter based on what type of decision was made. Refer to table 4.3-7 for assignment criteria. Most of the decisions associated with each parameter were simple decision tasks. Operations and cognitive experts reduced all complex decisions into simple decisions. Cognitive processing time estimates were assigned to all simple decisions.

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[6] Card, S.K., Moran, T.P. & Newell, A., The Psychology of Human-Computer Interaction, Lawerence Erlbaum Ass,: NH, 1983, pp. 23-97.

Figure 4.3-6
Human Process Cognitive Model

sheet 1 of 2

CHOICE REACTION TIME: User has to make a choice between responses.

Reaction Time: $I_c H$ = 248 msec

Where $H = \log_2 (n+1)$ (Hick's Law)
and $n=2$
I_c = 150 [0-157]

The following variables apply to remaining equations

s_p = perceptual system process cycle time
s_c = cognitive system process cycle time
s_m = Motor system process cycle time

[X-X] indicates the [fast man - slow man] cycle time range

PHYSICAL MATCHES: User compares a stimulus to some code contained in working memory.

Reaction Time:= $s_p + 2 s_c + s_m$

= 100 [50-200] + 2x(70 [25-170]) + 70 [30-100]
= 310 [130-640] m sec.

NAME MATCHES: User compares a stimulus to some code in long term memory.

Reaction Time:= $s_p + 3 s_c + s_m$

= 100 [50-200] + 3x(70[25-170]) + 70 [30-100]
= 380 [155-810] m sec.

Figure 4.3.7.3-1
Human Processor Cognitive Model

sheet 2 of 2

Class Matches: User compares a stimulus to multiple codes in long term memory.

Reaction Time:= $s_p + 4s_c + s_m$

= 100 [50-200] + 4x(70[25-170]) + 70 [30-100]
= 450 [180-980] m sec.

TABLE 4.3-7

Cognitive Decision Time Assignment Criteria

page 1 of 2

Decision Type:		Criteria for Assignment:
Choice Reaction: (248 msec)	1.	determine end of scale or out of range, e.g. CEAs in bottom position.
	2.	observe for open/close or active/non-active.
	3.	observe for existence of signal, e.g. existence of flow.
Physical Match: (310 msec)	1.	determine rate of change over a short period of time.
	2.	match one value with the immediately following parameter.
	3.	confirm actions by parameter value check.
Name Match: (380 msec)	1.	compare a parameter value with a value in memory as a result of training, mental recording, e.g. observe for adequate value.
	2.	determine rate of change over long periods of time which requires the operator to store discrete observations in long term memory, e.g. Maintain RCS temperature.

TABLE 4.3-7

Cognitive Decision Time Assignment Criteria

page 1 of 2

	3.	mentally record value for later use.
Class Match: (450 msec)	1.	Compare value to the expected parameter value for that plant situation.
	2.	Observe for abnormal changes.

Note: Estimate for calculation time and complex decisions that could not be reduced to simple decisions have been estimated by operations experts.

4.3.8.4 Calculate cumulative processing times

The time profiles were plotted on a time line for each event. Each time line was sectioned into discrete time intervals to provide manageable time units for operator loading calculations. For example, minute 2 into a event through minute 3 may represent a 1 minute evaluation interval where all monitoring and control actions of an operator will be evaluated. The length of the evaluation interval specified depends on the informational demands of each event. If the concentration of information is great, the interval chosen for evaluation will be 1 minute. If the information concentration thins out, the interval for evaluation is 2 minutes.

As described earlier in section 4.3.4.2, the operator employs 4 generic processes in monitoring and controlling the plant: collect process information, plan or evaluate, perform controls and monitor feedback. The cognitive processing time estimates assigned to each element in Appendix H takes into account collecting process and feedback information as well as fundamental evaluation and planning. A correction factor[7] was added to the estimated processing time to account for reading complex stimuli since the human processor cognitive model bases all decision time estimates on reading only 1 or 2 letters.

As described above, 3 of 4 of the generic operator processes are presently accounted for in the corrected cognitive processing estimates. In order to adequately evaluate operator task loading, the amount of time required by control actions must also be considered. The number of required control actions were estimated for each evaluation interval by operations experts. The time required to physically move an operators arm and press a target was estimated by using Fitt's law to be 1 second, where distance = 4 feet and target size = 1 inch.

The corrected cognitive processing times and control reaction times for each evaluation interval were summed together. In instances where the system allotment times[8] are not fully within a specified evaluation interval, the percentage of the total cognitive

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[7]This correction factor is based on an average 0.230 second rt/eye saccade and 4 saccades/display, where the saccades are roughly associated with 1. number value, 2. unit of measure, 3. display label, and 4. graphical axis. Repeated reading of the same or closely related parameters will presumably not require repeated scanning of meter lables and units of measure, hence a correction factor in these circumstances of 0.5 seconds.

[8]System allotment time refers to the time frame by which each parameter must be observed and evaluated based on plant conditions. Refer to appendix H for allotment times for each parameter.

processing time corresponding to the percentage of system allotment time within the evaluation interval is added in.

This total represents the time it will take an operator to collect (read), evaluate/plan, perform control actions and collect (read) feedback within that evaluation interval. This total used time calculated here can be subtracted from the total time in that evaluation interval. This results in an estimate of the remaining unused time.

Since the hardware is not designed and available for empirical testing at this time, the amount of time needed by the operator to access (move to or call up on a computer) each parameter has not been considered to this point. The total remaining time was divided by the number of parameters that the cperator was required to access during that evaluation interval to get an estimate of the average time available for parameter access from hardware.

All calculation results for cumulative processing times are provided in Appendix J.

4.3.8.5 Identify overload situations and make recommendations

Operator task loading was assessed to ensure tnat the total used time per evaluation interval did not exceed the time interval. Further, the average access time available for each parameter was compared to the criteria in table 2.3-3, section 4.3.2. This criteria estimates parameter access time for various types of hardware and software implementations. This will not only evaluate the cognitive loading on the operator but also provide guidelines on hardware implementation.

General compliance to optimal man-machine function allocation criteria according to NUREG 0700 (see section 4.3.2, table 4.3-2 of this document) is also determined. Recommendations concerning future automation are documented in Appendix I of this document.

5.0 DATA

The data for this analysis will be presented in the following appendices:

5.1 Background Information/Data

Appendix A	System Summary for System 80+
Appendix B	Gross Function by Event

5.2 General Panel Organization Information/Data

Appendix C	Task List by Event Sequence
Appendix D	Elements by Gross Function and Task
Appendix E	Detailed Usage of 'Collect" Elements by Gross Function

5.3 RCS Detailed Panel Design Information/Data

Appendix F	Detailed RCS Parameter Uses by Parameter
Appendix G	Summary RCS Parameter Uses by Parameter

5.4 Function Allocation Information/Data

Appendix H	Time Profiles for Event Sequences and Function Allocation Evaluation Data and
Appendix I	Function Allocation Evaluation Results
Appendix J	Process Time Calculations

Appendix A

System Functions

The contents of this appendix provide the System Functions which define the Plant configurations and system objectives.

ASSUMPTIONS FOR THE POWER PLANT EQUIPMENT CONFIGURATIONS

sheet 1 of 3

System	Assumption #	Assumption
General	S-1	It is assumed that system/equipment configurations for System 80 Plus™ are simular to System 80™ with deviations in CESSAR-DC from CESSAR-F as noted by Table A-1. Table A-1 also provides general information about the major components of the System 80 Plus™ design. Other noted deviations are: a. The LPSI system and components have been replaced by a Direct Vessel Injection (DVI) configuration using four HPSI equivalent safety injection pumps.
General	S-6	It is assumed for this analysis that the features for the control and protection systems previously provided with the System 80™ NSSS package will be retained for the System 80 Plus™ package. These systems are assumed to consist of sensors, calculators, logic, and other equipment to perform the function for which the systems were designed. It is assumed that these systems have the same operational characteristics and capabilities as the System 80™ designed systems (except where noted deviations have been made for System 80 Plus™). Table A-2 lists the electronic hardware systems assumed to support the operations analyzed.

NOTE: Assumptions S-1 to S-5 are listed on pgs. 8&9 of main report.

ASSUMPTIONS
FOR THE
POWER PLANT EQUIPMENT CONFIGURATIONS

sheet 2 of 3

System	Assumption #	Assumption
Feed & Condensate	S-7	It is assumed that the feed and condensate system conforms to the ALWR design reuirements document. The system (shown as figure A-1) is assumed to consist of: a. Three 50% capacity feed pumps and one Startup feedpump. b. Automatic feedwater control which has been extended over the full range of power operation. (i.e. 0-100% rated power) c. Feedwater pre-heating using a deareator and 6 stages of feedwater heaters (qty. 16 feed heaters). d. Three 50% capacity condensate pumps.
Air	S-8	It is assum d that pressurized air or gas systems will be available for: o Diesel starting o valve operation o pnuematic control and instrument systems

ASSUMPTIONS
FOR THE
POWER PLANT EQUIPMENT CONFIGURATIONS

sheet 3 of 3

System	Assumption #	Assumption
Cooling Water	S-9	It is assumed that cooling water systems servicing system 80 Plus* will be partioned between NSSS & BOP service functions. a. The NSSS cooling water systems servicing the: o Letdown Heat Exchanger o Containment Spray Heat Exchanger o Residual Heat Removal Heat Exchanger o CEDM coolers o RCP oil and seal coolers o SIP oil and seal coolers b. The BOP cooling water system(s) servicing the: o Turbine Generator o Turbine Condenser o Turbine oil and seal coolers o Feedpump oil and seal coolers o Steam Generator Blowdown and Sampling Heat Exchangers

TABLE A-1

GENERAL SYSTEM 80 PLUS™ COMPONENT DATA

sheet 1 of 13

Component	Component Design & Operating Data CESSAR-DC(Sys80+)	CESSAR-F(Sys80)
Reactor Vessel		
Total core heat output (MWt)	3,800	3,800
Design pressure (psia)	2,500	2,500
Primary system pressure (psia)	2,250	2,250
RCS inlet temperature (°F)	558	568
RCS outlet temperature (°F)	615	624
Design Minimum RCS flow rate (gpm)	445,600	445,600
Steam Generator		
Number of units	2	2
Primary Side (or tube side)		
Design pressure (psia)	2,500	2,500
Design temperature (°F)	650	650
Operating pressure (psia)	2,250	2,250
Inlet temperature (°F)	615.8	621.2
Outlet temperature (°F)	557.8	564.5
Secondary Side (or shell side)		
Design pressure (psia)	1,200	1,270
Design temperature (°F)	570	575
Full Load Steam Pressure (psia)	1,000	1,070
Full Load Steam Temperature (°F)	545	552.8
Zero Load Steam Pressure (psia)	1,100	1,170
Total Steam Flow per gen. (lb/h)	8.56×10^6	9.59×10^6
Full load steam quality (%)	99.75	99.75
Feedwater temperature, full power (°F)	450	450
Pressurizer		
Internal free Volume (ft^3)	2,400	1,800
Design Pressure (psia)	2,500	2,500
Design Temperature (°F)	700	700
Operating Pressure (psia)	2,250	2,250
Operating Temperature (°F)	653	653
Vessel height (ft)	54	42
Volume/Power ratio	0.629	0.472
Pressurizer/RCS volume ratio	0.194	0.147

TABLE A-1

GENERAL SYSTEM 80 PLUS™ COMPONENT DATA

sheet 2 of 13

Component	Component Design & Operating Data CESSAR-DC(Sys80+)	CESSAR-F(Sys80)
<u>Safety Injection Pump</u>		
Number of units	4	
Type	Multistage, Horizontal Centrifugal	
Design pressure (psia)	2,050	
Design temperature (°F)	350	
Design flow rate (gpm)	815	
Design head (ft)	2,850	
Maximum flow rate (gpm)	1,130	
Maximum head (ft)	1,580	
<u>Safety Injection Tank</u>		
Number of units	4	
Volume, Total (ft^3)	2,400	
, Liquid (ft^3)	1,858	
Design pressure (psia)	700	
Design temperature (°F)	200	
Normal Operating pressure (psig)	610	
Minimum Operating pressure (psig)	600	
Operating temperature (°F)	140	
Borated Fluid (ppm)	1,750-2,500	
<u>Incontainment Refueling Water Storage Tank</u>		
Number of units	1	None
Volume, Total (ft^3)	116,000	
, Liquid (ft^3)	85,000	
Design Pressure	Atmospheric	
Design Temperature (°F)	400	
Operating Pressure	Atmospheric	
Operating Temperature (°F)	70	
Borated Fluid (ppm)	1,750-2,500	

TABLE A-1

GENERAL SYSTEM 80 PLUS™ COMPONENT DATA

sheet 3 of 13

Component	Component Design & Operating Data CESSAR-DC(Sys80+)	CESSAR-F(Sys80)
<u>Refueling Water Storage Tank</u>		
Number of units		1
Volume (gallons)		620,000
Design Pressure (psig)		1.5
Design Temperature (°F)		200
Operating Pressure (psig)		Atmospheric
Operating Temperature (°F)		60-120
Borated Fluid (wt%)		3.6
<u>Regenerative Heat Exchanger</u>		
Number of units	1	1
Type	Shell & Tube, Vertical	Shell & tube, Vertical
Tube side (Letdown)		
Fluid	Reactor coolant	Reactor coolant
Borated Fluid (wt%)	3.6	3.6
Design Pressure (psig)	2,485	2,485
Design Temperature (°F)	650	650
Normal Flow (gpm)	80	72
Design Flow (gpm)	200	150
Shell side (Charging)		
Fluid	Reactor coolant	Reactor coolant
Borated Fluid (wt%)	3.6	3.6
Design Pressure (psig)	3,025	2,735
Design Temperature (°F)	550	550
Normal Flow (gpm)	65	67
Design Flow (gpm)	250	135

TABLE A-1

GENERAL SYSTEM 80 PLUS™ COMPONENT DATA

sheet 4 of 13

Component	Component Design & Operating Data CESSAR-DC(Sys80+)	CESSAR-F(Sys80)
Letdown Heat Exchanger		
Number of units	1	1
Type	Shell & tube, Horizontal	Shell & tube, Horizontal
Tube side (Letdown)		
Fluid	Reactor coolant	Reactor coolant
Borated Fluid	3.6	3.6
Design Pressure (psig)	2,485	650
Design Temperature (°F)	550	550
Normal Flow (gpm)	80	72
Design Flow (gpm)	200	150
Shell side (Cooling Water)		
Fluid	CCW	CCW
Design Pressure (psig)	150	150
Design Temperature (°F)	250	250
Normal Flow (gpm)	950	870
Design Flow (gpm)	2,400	1,500
Seal Injection Heat Exchanger		
Number of units	1	1
Type	Shell & tube, (steam heater)	Shell & tube, (steam heater)
Tube side (Seal Injection)		
Fluid	Reactor coolant	Reactor coolant
Borated Fluid (wt%)	3.6	3.6
Design Pressure (psig)	3,025	2,735
Design Temperature (°F)	200	200
Normal Flow (gpm)	30	26
Design Flow (gpm)	50	30
Shell side (Steam)		
Fluid	Steam-saturated	Steam-saturated
Design Pressure (psig)	110	110
Design Temperature (°F)	360	360
Design Flow (lbm/hr)	1,740	1,410

TABLE A-1

GENERAL SYSTEM 80 PLUS™ COMPONENT DATA

Sheet 5 of 13

Component	Component Design & Operating Data CESSAR-DC(Sys80+)	CESSAR-F(Sys80)
Charging Pumps		
Number of units	2	3
Type	Centrifugal	Positive Displacement
Design Pressure (psig)	3,025	2,735
Design Temperature (°F)	200	200
Design Flow (gpm)	200	44
Design Head (psig)	2,700	2,735
Normal Suction pressure (psig)	60	15-20
Normal Temperature (°F)	120	120
NPSH required	50. ft	9. psia
Borated Fluid (wt%)	3.6	3.6
Charging Pump Mini-flow Heat Exchanger		
Number of units	1	None
Type	Shell & tube, Horizontal	
Tube side (Charging)		
Fluid	Reactor coolant	
Borated Fluid	3.6	
Design Pressure (psig)	200	
Design Temperature (°F)	200	
Normal Flow (gpm)	35	
Design Flow (gpm)	100	
Shell side (Cooling Water)		
Fluid	CCW	
Design Pressure (psig)	150	
Design Temperature (°F)	200	
Normal Flow (gpm)	2	
Design Flow (gpm)	200	

TABLE A-1

GENERAL SYSTEM 80 PLUS™ COMPONENT DATA

sheet 6 of 13

Component	Component Design & Operating Data CESSAR-DC(Sys80+)	CESSAR-F(Sys80)
Boric Acid Makeup Pumps		
Number of units	2	2
Type	Centrifugal	Centrifugal
Design Pressure (psig)	200	200
Design Temperature (°F)	200	200
Design Head (ft)	300	300
Design Flow (gpm)	240	165
Normal Operating Temperture (°F)	120	40-120
NPSH required (ft)	30	18
Borated Fluid (wt%)	3.6	3.6
Reactor Makeup Water Pumps		
Number of units	2	2
Type	Centrifugal	Centrifugal
Design Pressure (psig)	200	200
Design Temperature (°F)	200	200
Normal Operating Temperature (°F)	40-120	40-120
Normal Design Flow (gpm)	200	165
Design Head (ft)	300	300
NPSH required (ft)	30	18
Fluid	Demineralized Water	Demineralized Water
Holdup Pumps		
Number of units	2	2
Type	Centrifugal	Centrifugal
Design Pressure (psig)	100	100
Design Temperature (°F)	200	200
Normal Operating Temperature (°F)	40-120	40-120
Design Flow (gpm)	50	50
Design Head (ft)	145	145
NPSH required (ft)	17	17
Borated Fluid (wt%)	3.6	3.6

TABLE A-1

GENERAL SYSTEM 80 PLUS™ COMPONENT DATA

sheet 7 of 13

Component	Component Design & Operating Data	
	CESSAR-DC(Sys80+)	CESSAR-F(Sys80)
Reactor Drain Pumps		
Number of units	2	2
Type	Centrifugal	Centrifugal
Design Pressure (psig)	100	200
Design Temperature (°F)	200	200
Normal Operating Temperature (°F)	40-120	120
Design Flow (gpm)	50	50
Design Head (ft)	145	145
NPSH required (ft)	17	17
Borated Fluid	3.6	3.6
Boric Acid Batching Pump		
Number of units	1	None
Type	Centrifugal	
Design Pressure (psig)	200	
Design Temperature (°F)	200	
Normal Operating Temperature (°F)	155	
Design Flow (gpm)	50	
Design head (ft)	145	
NPSH required (ft)	20	
Borated Fluid	3.6	
Volume Control Tank		
Number of units	1	1
Type	Vertical, Cylindrical	Vertical, Cylindrical
Internal volume (gallons)	5,800	4,917
Design Pressure, internal (psig)	75	75
Normal Operating Temperature (°F)	120	120
Normal Operating Pressure (psig)	20	20
Blanket Gas (during operation)	Hydrogen	Hydrogen
Borated Fluid (wt%)	3.6	3.6

TABLE A-1

GENERAL SYSTEM 80 PLUS™ COMPONENT DATA

sheet 8 of 13

Component	Component Design & Operating Data CESSAR-DC(Sys80+)	CESSAR-F(Sys80)
Boric Acid Batching Tank		
Number of units	1	1
Type	not specified	not specified
Internal volume (gallons)	630	630
Design pressure	Atmospheric	Atmospheric
Design Temperature (°F)	200	200
Normal Operating Pressure	Atmospheric	Atmospheric
Normal Operating Temperature (°F)	155	155
Heater Temperature (°F)	360	
Heater Type	Saturated Steam	Electrical immersion
Heater Capacity, min.	600. lb/hr	45
Borated Fluid (wt%)	12	12
Equipment Drain Tank		
Number of units	1	1
Type	Horizontal, Cylindrical	Horizontal, Cylindrical
Internal volume (gallons)	10,500	10,500
Design Pressure (psig)	60	60
Design Temperature (°F)	300	300
Normal Operating Pressure (psig)	3	3
Normal Operating Temperature (°F)	120	120
Borated Fluid (wt%)	3.6	3.6
Reactor Drain Tank		
Number of units	1	1
Type	Horizontal, Cylindrical	Horizontal, Cylindrical
Internal volume (gallons)	2,000	2,850
Design Pressure (psig)	130	130
Design Temperature (°F)	not specified	350
Normal Operating Pressure (psig)	3	3
Normal Operating Temperature (°F)	120	120
Blanket Gas	Nitrogen	Nitrogen
Borated Fluid (wt%)	3.6	3.6

TABLE A-1

GENERAL SYSTEM 80 PLUS™ COMPONENT DATA

sheet 9 of 13

Component	Component Design & Operating Data CESSAR-DC(Sys80+)	CESSAR-F(Sys80)
Holdup Tank		
Number of units	1	1
Type	Field Fabricated, Vertical	Field Fabricated, Vertical
Internal volume (gallons)	435,000	435,000
Design Pressure (psig)	1.5	1.5
Design Temperature (°F)	200	200
Operating Pressure	Atmospheric	Atmospheric
Operating Temperature (°F)	40-120	40-120
Borated Fluid (wt%)	3.6	3.6
Reactor Makeup Water Tank		
Number of units	1	1
Type	Field Fabricated, Vertical	Field Fabricated, Vertical
Internal volume (gallons)	420,000	420,000
Design Pressure (psig)	1.5	1.5
Design Temperature (°F)	200	200
Operating Pressure (psig)	Atmospheric	Atmospheric
Operating Temperature (°F)	40-120	40-120
Fluid	Demineralized Water	Demineralized Water
Boric Acid Storage Tank		
Number of units	1	None
Type	Field Fabricated, Vertical	
Internal volume (gallons)	180,000	
Design Pressure (psig)	1.5	
Design Temperature (°F)	200	
Operating Pressure	Atmospheric	
Operating Temperature (°F)	60-120	
Borated Fluid (wt%)	3.6	

TABLE A-1

GENERAL SYSTEM 80 PLUS™ COMPONENT DATA

sheet 10 of 13

Component	Component Design & Operating Data CESSAR-DC(Sys80+)	CESSAR-F(Sys80)
Purification and Deborating Ion Exchangers		
Number of units	3	3
Type	Flushable; Cation/anion mixed bed resin	Flushable; Cation/anion mixed bed resin
Resin volume (ft^3) min.	38	32
Design Pressure (psig)	200	200
Design Temperature (°F)	200	200
Normal Operating Temperature (°F)	120	120
Normal Flow (gpm)	80	72
Maximum Flow (gpm)	200	135
Borated Fluid (wt%)	3.6	3.6
Pre-holdup Ion Exchanger		
Number of units	1	1
Type	Flushable; Cation/anion mixed bed resin	Flushable; Cation/anion mixed bed resin
Resing volume (ft^3)	38	32
Design Pressure (psig)	200	200
Design Temperature (°F)	200	200
Normal Operating Temperature (°F)	120	120
Normal Flow (gpm)	80	72
Maximum Flow (gpm)	200	135
Borated Fluid (wt%)	3.6	3.6
Boric Acid Condensate Ion Exchanger		
Number of units	1	1
Type	Flushable; anion resin	Flushable; anion resin
Resing volume (ft^3)	32	32
Design Pressure (psig)	200	200
Design Temperature (°F)	200	200
Normal Operating Temperature (°F)	120	120
Normal Flow (gpm)	20	20
Maximum Flow (gpm)	100	100
Borated Fluid (ppm) max.	10	10

TABLE A-1

GENERAL SYSTEM 80 PLUS™ COMPONENT DATA

sheet 11 of 13

Component	Component Design & Operating Data CESSAR-DC(Sys80+)	CESSAR-F(Sys80)
Purification Filter		
Number of units	2	2
Type	Replaceable cartridge	Replaceable cartridge
Design Pressure (psig)	200	200
Design Temperature (°F)	200	200
Normal Operating Temperature (°F)	120	120
Normal Flow (gpm)	160	150
Maximum Flow (gpm)	80	72
Borated Fluid (wt%)	3.6	3.6
Retention for 2 micron and larger particles, (% by wt)	98	98
Boric Acid Filter		
Number of units	1	1
Type	Replaceable cartridge	Replaceable cartridge
Design Pressure (psig)	200	200
Design Temperature (°F)	200	200
Normal Operating Temperature (°F)	40-120	40-120
Design Flow (gpm)	240	200
Borated Fluid (wt%)	3.6	3.6
Retention for 2 micron and larger particles, (% by wt)	98	98
Reactor Makeup Water Filter		
Number of units	1	1
Type	Replaceable cartridge	Replaceable cartridge
Design Pressure (psig)	200	200
Normal Operating Temperature (°F)	40-120	40-120
Design Flow (gpm)	200	200
Fluid	Demineralized Water	Demineralized Water
Retention for 2 micron and larger particles, (% by wt)	98	98

Table A-1

General System 80 Plus™ Component Data

sheet 12 of 13

Component	Component Design & Operating Data CESSAR-DC(Sys80+)	CESSAR-F(Sys80)
Reactor Drain Filter		
Number of units	1	1
Type	Replaceable cartridge	Replaceable cartridge
Design Pressure (psig)	200	200
Design Temperature (°F)	200	200
Normal Operating Temperature (°F)	120	120
Design Flow (gpm)	100	100
Borated Fluid (wt%)	3.6	3.6
Retention for 2 micron and larger particles, (% by wt)	98	98
Seal Injection Filter		
Number of units	2	2
Type	Replaceable cartridge	Replaceable cartridge
Design Pressure (psig)	2,735	2,735
Design Temperature (°F)	200	200
Normal Operating Temperature (°F)	125	125
Normal Flow (gpm)	30	26
Borated Fluid (wt%)	3.6	3.6
Retention for 5 micron and larger particles, (% by wt)	95	95
Boric Acid Concentrator		
Number of units	1	1
Design DF (Bottoms to Distillate)	$1.x10^4$	$1.x10^4$
Max. distillate effluent concentration (ppm boron)	10	10
Design Flow: process (gpm)	20	20
Cooling Water Flow (gpm) max.	700	700
Steam Flow (lb/hr) required @ 50 psig	13,500	13,500

TABLE A-

GENERAL SYSTEM 80 PLUS™ COMPONENT DATA

sheet 13 of 13

Component	Component Design & Operating Data CESSAR-DC(Sys80+)	CESSAR-F(Sys80)
Gas Stripper		
Number of units	1	1
Design DF	$1.x10^3$	$1.x10^3$
Design Flow: process (gpm)	200	140
Cooling Water Flow (gpm)	700	700
Chemical Addition Tank		
Number of units	1	1
Internal volume (gallons) min.	8	8
Design Pressure	Atmospheric	Atmospheric
Design Temperature (°F)	150	150
Normal Operating Temperature (°F)	40-90	40-90
Fluid	N_2H_4 or Li^7OH solution	N_2H_4 or Li^7OH solution
Chemical Addition Pump		
Number of units	1	1
Type	Positive Displacement variable capacity	Positive displacement variable cap.
Design Pressure (psig)	2,735	2,735
Design Temperature (°F)	150	150
Normal Operating Temperature (°F)	40-90	40-90
Flow Capacity (gph)	0-25	0-25
Design Head (psig)	2,735	2,735
Fluid	N_2H_4 or Li^7OH solution	N_2H4 or Li^7OH solution

TABLE A-2
NUPLEX 80 PLUS™ FUNCTION & TASK ANALYSIS
HARDWARE FEATURES ASSUMED

Purpose of Hardware	Features of Hardware		Remarks
1) Reactor protection	o Trip reactor	on...	Variable overpower High logarithmic power level High local power density Low DNBR High pressurizer pressure Low pressurizer pressure Low steam generator water level Low steam generator pressure High steam generator water level High containment pressure Manual Trip
2) Engineered Safety Features Actuations to protect plant systems	o Containment isolation o Containment spray o Main steam isolation o Safety injection actuation o Recirculation actuation o Emergency feedwater actuation		

TABLE A
NUPLEX 80 PLUS™ FUNCTION [illegible] ANALYSIS
HARDWARE FEATURES [illegible]

Purpose of Hardware	Features of Hardware	Remarks
3) Reactor Control	o Reactivity control system using	Reactor regulatory system - Tref program - CEA rate program - CEA mechanism control system
	o Reactor power cutback system	Signals from the SBCS, feedpump, or operator
	o Boron control system	Boronometers information system in CVCS
	o In-Core instrument system	61 in-core monitoring assemblies to monitor the axially reactor flux distributions.
	o Ex-Core monitoring system	Information and control monitoring of neutron flux from source levels to full power operation.
	o Boron dilution alarm system	Detection on alarming the event.

TABLE A-2
NUPLEX 80 PLUS™ FUNCTION & TASK ANALYSIS
HARDWARE FEATURES ASSUMED

Purpose of Hardware	Features of Hardware		Remarks
6) Plant control and monitoring	o RCS pressure control system	using	Pressurizer pressure control system (PPCS)
	o Pressurizer level control system	using	CVCS letdown & charging control logic
	o Feedwater Control System (FWCS)	using	*full range feedwater control
	o Steam Bypass Control System (SBCS)		
	o Core Operating Limit Supervising System (COLSS)		

Date: 09/12/88

Nuplex 80 + Function & Task Analysis
System Purposes or Basic Functions

System Name: Compressed Air and Gas System

System Purposes or Basic Functions	Derived from Reference
1) Provide a pressurized air supply for valve operation, control systems, and pneumatic instrumentation	SB
2) Provide a pressurized source of air for diesel starts	SB

Date: 09/12/88

Nuplex 80 + Function & Task Analysis
System Purposes or Basic Functions

System Name: Auxiliary Steam System

System Purposes or Basic Functions	Derived from Reference
1) The auxiliary steam system supplies low pressure clean steam to various plant components during periods when the main steam system is not available. Additionally, the auxiliary steam system is the normal steam source for the radwaste evaporators when it is required to operate.	01

Date: 09/12/88

Nuplex 80 + Function & Task Analysis
System Purposes or Basic Functions

System Name: Building

System Purposes or Basic Functions	Derived from Reference
1) Structure to provide an environment, workspace, and equipment laydown area to allow a human to operate or maintain the equipment of the power plant during all phases of plant operation.	01
2) Provide a structure for an environment or workspace to house or support equipment not designed to withstand the elements of weather to operate and function properly.	01
3) Provide physical separation and protection of equipment and personnel	01

Date: 09/12/88

Nuplex 80 + Function & Task Analysis
System Purposes or Basic Functions

System Name: Boron Recycling System

System Purposes or Basic Functions	Derived from Reference
1) BRS shall receive and collect, via the letdown line in the CVCS, the excess reactor coolant that results from the following plant operations during one core cycle:	01
1) Dilution for core burnup from the beginning of core cycle to the end of the core cycle, with allowances for deboration ion exchange at the end of core life.	01
1) Hot shutdowns and startups. Two hot shutdowns and startups are assumed to take place per year.	01
1) Cold shutdowns and startups. Three cold shutdowns are assumed to take place per year. The system shall also be desinged to handle two back-to-back shutdowns at 90 percent core life.	01
1) Refueling shutdown and startup.	01
2) The BRS shall also have the ability to receive and collect reactor quality coolant, which escapes from the RCS and can be returned to the RCS with minimal processing, without going to liquied radwaste. This will include, for example, liquid from:	01
2) Equipment drains, relief valve discharges, valve leakoffs, and reactor coolant pump seal atmospheric leakoffs.	01
2) Reactor coolant system loop drains during refueling operations.	01
2) Fuel transfer canal (via the spent fuel pool cooling and cleanup system).	01
3) The BRS shall recycle the plant effluents by demineralization, degasification an davaporation to produce reusable makeup water and 2.5 percent by weight boric acid stripped of hydrogen, radioactive gases and other dissolved gases.	01

Nuplex 80 + Function & Task Analysis
System Purposes or Basic Functions

System Name: Component Cooling Water

System Purposes or Basic Functions	Derived from Reference
1) Provide a supply of cooling water to NSSS equipment or components: Letdown Heat exchanger CSS(RHR) Heat exchanger CEDM coolers RCP oil coolers HPSI seal coolers	59

Date: 09/12/88

Nuplex 80 + Function & Task Analysis
System Purposes or Basic Functions

System Name: Control Rod Drive System

System Purposes or Basic Functions	Derived from Reference
1) Position (withdraw and insert) the control rods in the core in response to commands from the rod control system.	01
2) Release the control rods for gravity insertion into the core upon power interruption in respnse to a reactor trip initiated from either manual or automatic reactor protection system controls at the required rate to maintain fuel integrity.	01
3) Permit the latching and unlatching of the connection between the drive rod and the control rod assemblies.	01
4) Provide for control of position of individual control rods and control rod banks.	01

Date: 09/12/88

Nuplex 80 + Function & Task Analysis
System Purposes or Basic Functions

System Name: Combustible Gas Control

System Purposes or Basic Functions	Derived from Reference
1) The plant design shall provide a means of controlling the generation, release, and combustion of hydrogen so as to assure that necessary accident prevention and mitigation functions can be performed during and after events in which hydrogen is produced.	01
2) The Gas control system shall be capable of controlling the hydrogen gas concentration in containment	01
3) The Gas control system shall be capable of measuring the hydrogen concentration in containment	01
4) Assuring that equipment necessary for safe shutdown and containment integrity is capable of performing its function during and after exposure to hydrogen.	01
5) Providing a mixed atmosphere in Containment	01
6) Assuring that containment structural integrity is maintained.	01

Date: 09/12/88

Nuplex 80 + Function & Task Analysis
System Purposes or Basic Functions

System Name: Containment Leakage Rate Testing

System Purposes or Basic Functions	Derived from Reference
1) Provisions are designed to permit periodic verification that the containment leakage rate is within appropriate acceptance criteria.	01

Date: 09/12/88

Nuplex 80 + Function & Task Analysis
System Purposes or Basic Functions

System Name: Containment

System Purposes or Basic Functions	Derived from Reference
1) The containment is designed to provide a leak-tight barrier to prevent uncontrolled release of radioactivity in the event of a postulated accident.	01
2) Containment integrity function, which provides for high contaiment integrity under conditions of core damage. This function includes cntmt leakage rate testing, cntmt heat removal, cntmt isolation, and cntmt combustible gas control	01
3) Fission Product control function which ensure that radioactive fission products released from a damaged core are controlled so that specified allowable leakage from the containment does not pose a significant off-site threat. This includes removal of fission products inside and outside cntmt	01

Date: 09/12/88

Nuplex 80 + Function & Task Analysis
System Purposes or Basic Functions

System Name: Condensate Storage System

System Purposes or Basic Functions	Derived from Reference
1) Provide demineralized water for initial fill of the condensate and feedwater systems.	02
2) Provide makeup or receive excess condensate as necessary and as dictated by Hotwell Level Control System.	02
3) Provide storage capacity to maintain the RCS at hot standby for four hours and then perform a controlled cooldown and depressurization to shutdown cooling system entry conditions in the next twenty hours.	02
4) Maintain water purity and exclude oxygen.	02

Date: 09/12/88

Nuplex 80 + Function & Task Analysis
System Purposes or Basic Functions

System Name: Containment Spray System

System Purposes or Basic Functions	Derived from Reference
1) Remove heat from the primary containment atmosphere following a licensing design basis accident to prevent pressure from exceeding containment design pressure.	01
2) Rapidly reduce containment pressure and temperature following a LOCA or secondary system pipe break and maintain them at acceptably low levels.	01
3) Remove Decay Heat from the in-containment refueling water storage tank (IRWST) during post-LOCA operation, with return flow to either the IRWST or to the reactor vessel.	01
4) Transfer Refueling water from the IRWST to the refueling cavity.	01
5) Reduce the concentration of fission products within the containment atmosphere to the extent required to ensure that the regulatory requirements with regard to radioactive release from containment following design basis accident can be met.	01

Date: 09/12/88

Nuplex 80 + Function & Task Analysis
System Purposes or Basic Functions

System Name: Chemical, Volume and Control System

System Purposes or Basic Functions	Derived from Reference
1) Maintain required water inventory in the reactor coolant system during normal operation, power changes, startup, and shutdown.	01
2) Supply pressurizer auxiliary spray water for depressurization.	01
3) Provide reactor grade water to and accept controlled bleed-off from the reactor coolant pump seals.	01
4) Control boron concentration in the reactor coolant system during normal operation and normal shutdown.	01
5) Provide means for chemical addition.	01
6) Provide means for demineralization and filtration of reactor coolant during normal operation and during refueling shutdown.	01
7) Provide a means of removal of noble gases from the reactor coolant letdown stream by means of a connection to the boron recycle system (BRS).	01
8) Provide a means to store borated water for normal operation.	01
9) Provide borated makeup water for the spent fuel pool and the refueling water storage tank.	01
10) Provide a reactor coolant makeup water supply to various auxiliary equipment.	01
11) Provide makeup for losses from small leaks in reactor coolant system piping.	01
12) Receive, Store and seperate borated waste for reuse and/or discharge to the Liquid Waste Management System. Note: Reference 01 defines this function as part of the Boron Recycling System.	02
13) Provide a means for functionally testing the check valves which isolate the Safety Injection System (SIS) form the Reactor Coolant System (RCS).	02
14) Provide capability to leak test the RCS	02

Nuplex 80 + Function & Task Analysis
System Purposes or Basic Functions

System Name: Chemical, Volume and Control System

System Purposes or Basic Functions	Derived from Reference
15) Provide a means for sluicing ion exchanger resin to the Solid Waste Management System (SWMS).	02

Date: 09/12/88

Nuplex 80 + Function & Task Analysis
System Purposes or Basic Functions

System Name: Emergency Feedwater System

System Purposes or Basic Functions	Derived from Reference
1) Provide feedwater to the steam generators for removal of heat from the reactor coolant system for events in which main or startup feedwater systems are unavailable.	01
2) Provides a supply of feedwater to refill the steam generators following a LOCA to minimize leakage through pre-existing tube leaks.	01
3) Provide feedwater as a dedicated safety system which has no functions for normal operation.	01
4) Provides adequate inventory control for residual heat removal, capable of maintaining hot standby, and facilitate a plant cooldown at a maximum controlled rate of 75 deg F/hr.	02

Date: 09/12/88

Nuplex 80 + Function & Task Analysis
System Purposes or Basic Functions

System Name: Feedwater and Condensate System

System Purposes or Basic Functions	Derived from Reference
1) The feed and condensate system is designed to return high quality feedwater from the condenser hotwell to the S/Gs. In addition, the system includes a number of stages of regenerative feed heating and provisions for maintaining feedwater quality.	01

Date: 09/12/88

Nuplex 80 + Function & Task Analysis
System Purposes or Basic Functions

System Name: Equipment and Floor Drainage System

System Purposes or Basic Functions	Derived from Reference
1) Provide a means to collect leakage from other systems	S1

Date: 09/12/88

Nuplex 80 + Function & Task Analysis
System Purposes or Basic Functions

System Name: Fuel Handling System

System Purposes or Basic Functions	Derived from Reference
1) The Fuel Handling System is designed to handle and store fuel assemblies and CEAs. In addition, the system includes that required to assemble, disassemble and store the reactor closure head and internals.	02
2) Provide for spent fuel transfer. This includes use of a coolant medium (spent fuel pool) which cooling and water quality (via purification) is maintained.	02
3) Provide adequate shielding during refueling to permit visual control of fuel transfer at all times. Fuel handling operations are designed to be conducted underwater.	02
4) Provide for control of fuel assembly reactivity control during refueling. Boric acid water chemistry control is required to assure subcritical conditions during refueling	02

Nuplex 80 + Function & Task Analysis
System Purposes or Basic Functions

System Name: Core and Fuel

System Purposes or Basic Functions	Derived from Reference
1) Provide a suitable combination of fuel enrichment and burnable poison to achieve the core power and cycle energy objective. Power generation is the principle objective of the reactor systems.	01
2) Retain fuel and fission products within the fuel rod cladding. The fuel cladding is the first barrier against release of fuel and radioactive fission products to the reactor surroundings.	01
3) Provide an adequate means for controlling excess reactivity in the core. Control of core reactivity is essential for satisfactory core operation.	01

Date: 09/12/88

Nuplex 80 + Function & Task Analysis
System Purposes or Basic Functions

System Name: Heating, Ventilation and Air Conditi'ning

System Purposes or Basic Functions	Derived from Reference
1) Heating, ventalationg and air conditioning	02

Date: 09/12/88

Nuplex 80 + Function & Task Analysis
System Purposes or Basic Functions

System Name: Main/Extraction Steam System

System Purposes or Basic Functions	Derived from Reference
1) Transport Main steam from the steam generator to the high pressure turbine and to the moisture separator reheater.	01
2) Remove moisture and provide reheating of high pressure turbine exhaust steam.	01
3) Transport extraction steam from the high pressure and low pressure turbines to the feedwater heaters.	01
4) Provide steam to the auxiliary steam system.	01
5) Provide steam bypass capability via the turbine bypass system for startup, shutdown, and step-load reduction transients.	01
6) Provide steam bypass and relief capability (via the turbine bypass system, power operated relief valves, and safety valves) for naormal operating conditions and off-normal transients such as turbine trip or isolation of the main steam line	01
7) Provide steam to SJAE and to gland seals	01
8) Provide isolation of the main steam lines in case of a steam line break.	01
9) Provide steam to Emergency Feedwater System turbine-driven pumps	01

Date: 09/12/88

Nuplex 80 + Function & Task Analysis
System Purposes or Basic Functions

System Name: Makeup and Purification System

System Purposes or Basic Functions	Derived from Reference
1) The condensate makeup purification system takes water from the raw water makeup system and provide further treatment and storage of the water suitable for filling flushing, and make-up for the feedwater and condensate system. In addition, this system provides purified water to the primary water storage system.	01
2) Provide high quality water to other systems requiring filtered demineralized water.	02

Date: 09/12/88

Nuplex 80 + Function & Task Analysis
System Purposes or Basic Functions

System Name: Process Sample Systems

System Purposes or Basic Functions	Derived from Reference
1) Collect and deliver representative samples of liquids and gases in various process systems to one or more central sample stations.	01

Date: 09/12/88

Nuplex 80 + Function & Task Analysis
System Purposes or Basic Functions

System Name: Pressurizer

System Purposes or Basic Functions	Derived from Reference
1) Maintain RCS pressure such that the 1) minimum pressure during transients is above SIAS and low pressure reactor trip setpoints, 2) maximum pressure is below the high pressure reactor trip setpoint.	02
2) Provide sufficient water volume to prevent uncovering pressurizer heaters during design transient outsurges.	02
3) Provide sufficient steam volume to avoid lifting primary safety valves during design transient insurges	02
4) Minimize the total reactor coolant mass changes (and associated charging and letdown flow rates). This is to reduce the quantity of waste generated by transient operations.	02
5) Provide sufficient heater capacity to maintain an adequate degree of subcooling in the RCS loops at the zero power level and hot standby conditions.	02
6) Provide steam volume spray flow capability sufficient to keep pressure below the reactor trip setpoint during design transient insurges and below pressurizer safety valve setpoints during design overpressure transients	02

Date: 09/12/88

Nuplex 80 + Function & Task Analysis
System Purposes or Basic Functions

System Name: Reactor Coolant System

System Purposes or Basic Functions	Derived from Reference
1) Transport hot primary coolant from the reactor vessel to the steam generator and transport cooled primary coolant from the steam generator to the reactor vessel.	01
2) During normal operation and upset conditions, maintain a high integrity boundary for the primary coolant which prevents leaks to the containment atmosphere.	01
3) During normal operation and upset conditions, maintain pressure in the primary coolant system within specified limits for all anticipated reactor coolant transients, without dependence on pressure relief devices. Maintenance of system pressure is accomplished in the pressurizer.	01
4) Provide forced circulation for primary coolant.	01
5) Support natural circulation sufficient to remove decay heat from the reactor.	01
6) Provide overpressure protection.	01
7) In conjunction with the reactor system, assure that there is only one steam/water interface during normal operations, and that this steam/water interface is located in the pressurizer.	01
8) Following severe accidents, provide for high point venting of hydrogen and other non-condensible gases.	01

Date: 09/12/88

Nuplex 80 + Function & Task Analysis
System Purposes or Basic Functions

System Name: Residual Heat Removal System

System Purposes or Basic Functions	Derived from Reference
1) Remove core decay heat and reactor coolant sensible heat during normal plant cooldowns after partial cooldown is accomplished.	01
2) Remove core decay heat and RCS sensible heat during safe cold shutdowns after partial cooldown is accomplished	01
3) Remove core decay heat during refueling and maintenance outages	01
4) Transfer reactor coolant to the CVCS for purification when the RCS is at reduced pressure.	01
5) Transfer refueling water from the refueling cavity.	01
6) Remove heat from the RWST during feed and bleed operation	01
6) Provide a backup to the CSS for removing core decay heat in the long-term following a LOCA	01

Date: 09/12/88

Nuplex 80 + Function & Task Analysis
System Purposes or Basic Functions

System Name: Reactor Pressure Vessel and Internals

System Purposes or Basic Functions	Derived from Reference
1) Provide a high integrity pressure boundary to contain the reactor coolant reactor core, and fuel fission products. The RPV is the primary pressure boundary for the reactor coolant and the secondary barrier against the release of radioactive fission products	01
2) Provide support for fuel assemblies and maintain their orientation and position within the reactor core. The reactor core must be supported and aligned to facilitate control of core reactivity and to ensure that the core remains in a coolable configuration.	01
3) Provide the necessary structure that will result in a flow path for the reactor coolant to adequately remove heat generated by each fuel assy. while 1) assuring proper reactor flow distribution, 2) Resisting upward flow-induced movement of fuel assy., 3) Avoiding flow-induced vibration, and 4) positive location of CEAs.	01
4) Provide information regarding reactor pressure vessel (RPV) level during shutdown.	01

Date: 09/12/88

Nuplex 80 + Function & Task Analysis
System Purposes or Basic Functions

System Name: Reactor Systems

System Purposes or Basic Functions	Derived from Reference
1) Generate the thermal power necessary to meet required plant electrical power output while not exceeding specified nuclear, thermal/hydraulic, and mechanical design limitations.	01
2) Serve as a pressure boundary and a barrier to prevent the release of radioactivity from the reactor core or reactor coolant.	01
3) Provide a flow path for the forced circulation or coolant to remove heat generated by the reactor core under all operating conditions and facilitate removal of decay heat by natural or force circulation from the core after shutdown.	01
4) Provide for control of core reactivity.	01

Date: 09/12/88

Nuplex 80 + Function & Task Analysis
System Purposes or Basic Functions

System Name: Secondary Chemical Addition Sys.…

System Purposes or Basic Functions	Derived from Reference
1) The chemical addition system is designed to add liquid chemicals as necessary to maintain condensate, and feedwater with required li… ts	01

Date: 09/12/88

Nuplex 80 + Function & Task Analysis
System Purposes or Basic Functions

System Name: Safety Depressurization and Vent System

System Purposes or Basic Functions	Derived from Reference
1) Provide a means to vent non-condensible gases from the pressurizer, the reactor vessel upper head, or other RCS high points.	01
2) Provide a means to depressurize the RCS in the event that main and auxiliary pressurizer spray is unavailable during natural circulation cooldown to cold shutdown or following a steam generator tube rupture.	01
3) Provide a capability to rapidly depressurize the RCS to initiate a primary system feed and bleed for the beyond licensing design bases event of total loss of feedwater.	01
4) Provide a capability to depressurize the RCS in response to a severe accident scenario.	01

Date: 09/12/88

Nuplex 80 + Function & Task Analysis
System Purposes or Basic Functions

System Name: Startup Feedwater System

System Purposes or Basic Functions	Derived from Reference
1) Provide low pressure feedwater	57

Date: 09/12/88

Nuplex 80 + Function & Task Analysis
System Purposes or Basic Functions

System Name: Steam Generating System

System Purposes or Basic Functions	Derived from Reference
1) Produce steam with no more than 0.25 percent moisture carry-over using reactor coolant as the heat source.	01
2) Provide capability for continuous hot blowdown of the secondary side of both recirculating and once-through steam generators (SG). Provide capability for heat recovery, purification and reuse of SG blowdown rate for recirculating SGs. SG blowdown rate shall permit reasonable plant heat-up capability w/in 8 hour period.	01
3) Provide an indication of secondary side water level. Provide automatic control of water level at any power level from hot no load to full power.	01
4) Provide a leak tight boundary between the reactor coolant and the steam generator secondary side.	01
5) Serve as the primary means for removal of decay heat from reactor coolant during plant shutdown using main or emergency feedwater down to a primary coolant temperature which is at a reasonable value below the saturation temperature corresponding to the actuation pressure of the residual heat removal system.	01
6) Provide for full wet layup (water to upper tube sheet) of the steam generator under deoxygenated, pH-controlled conditions.	01

Date: 09/12/88

Nuplex 80 + Function & Task Analysis
System Purposes or Basic Functions

System Name: Safety Injection System

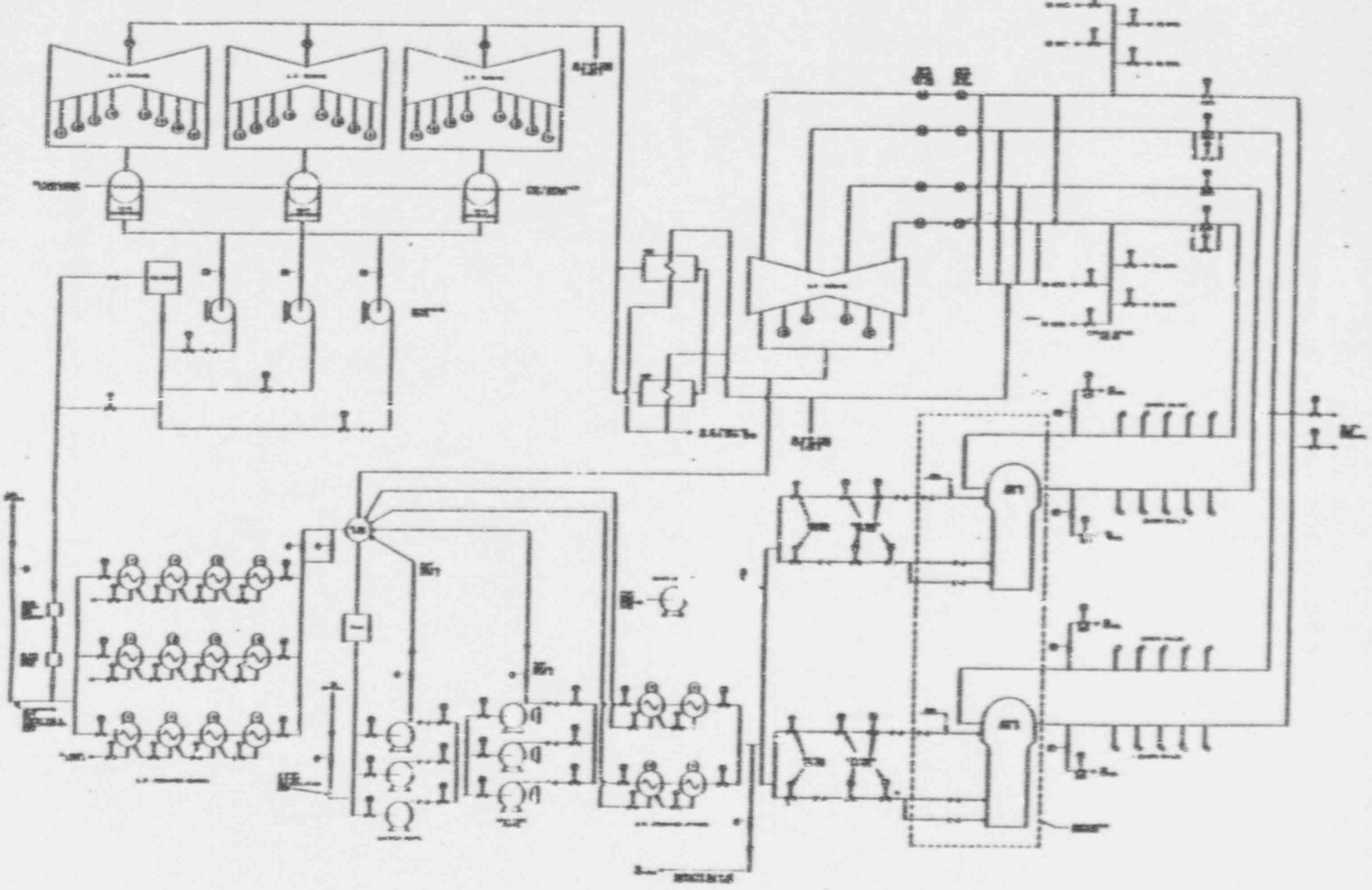
System Purposes or Basic Functions	Derived from Reference
1) Provide coolant makeup to the reactor coolant system following a LOCA to assure that sufficient water inventory is maintained to permit adequate core cooling	01
2) Inject boron into the RCS to achieve safe cold shutdown	01
3) Inject boron into the RCS following a main steam line break for supplementary reactivity control.	01
4) Prevent excess concentration of boron in the RCS in the long-term following a cold leg LOCA.	01
5) Provide beyond design basis event decay heat removal when the steam generators are not available using bleed-and-feed.	01

Nuplex 80 + Function & Task Analysis
System Purposes or Basic Functions

System Name: Turbine Generator

System Purposes or Basic Functions	Derived from Reference
1) Provide electric power to grid	S1

FIGURE A-1



SYSTEM 80+

FIGURE A-2

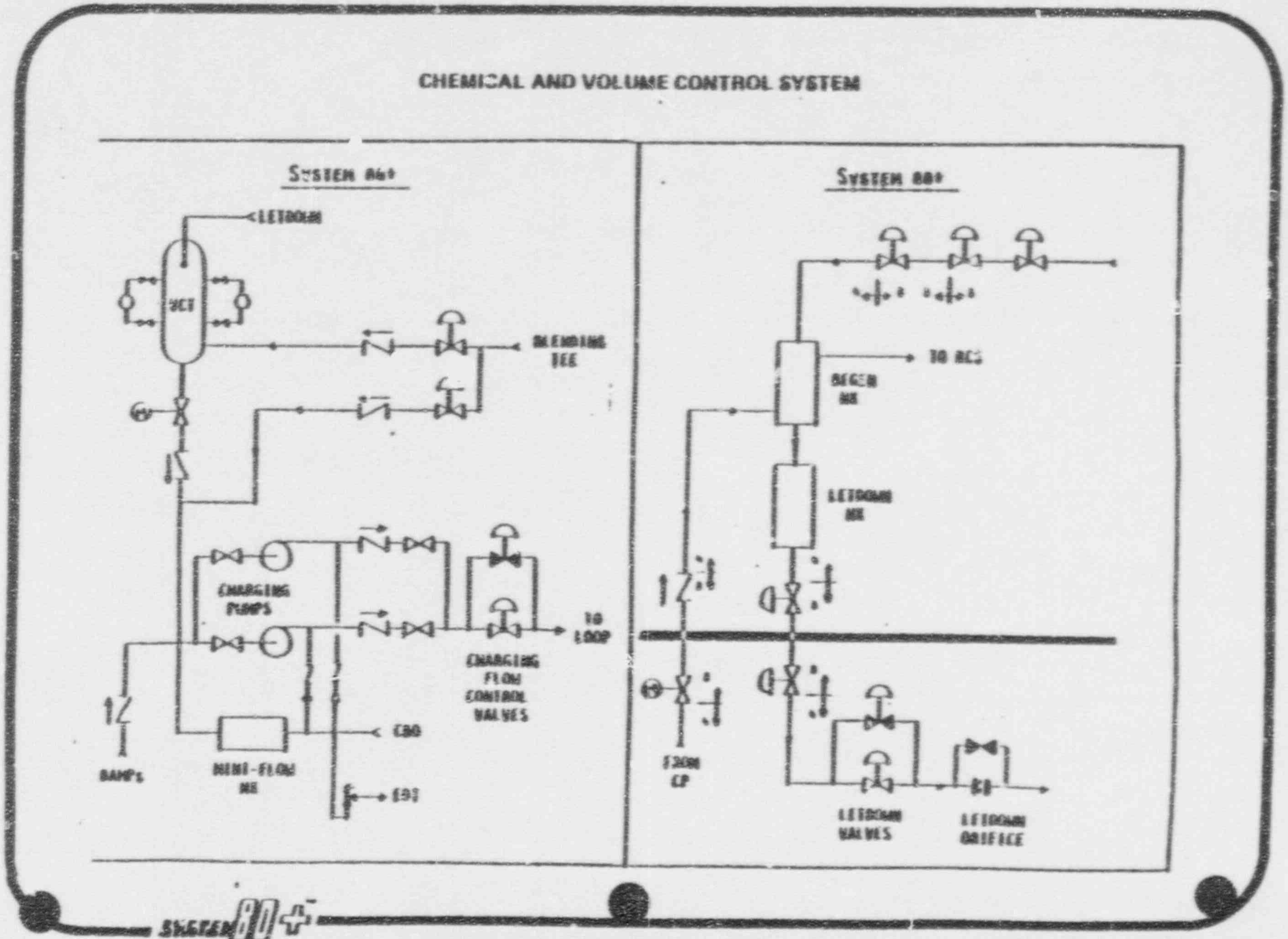
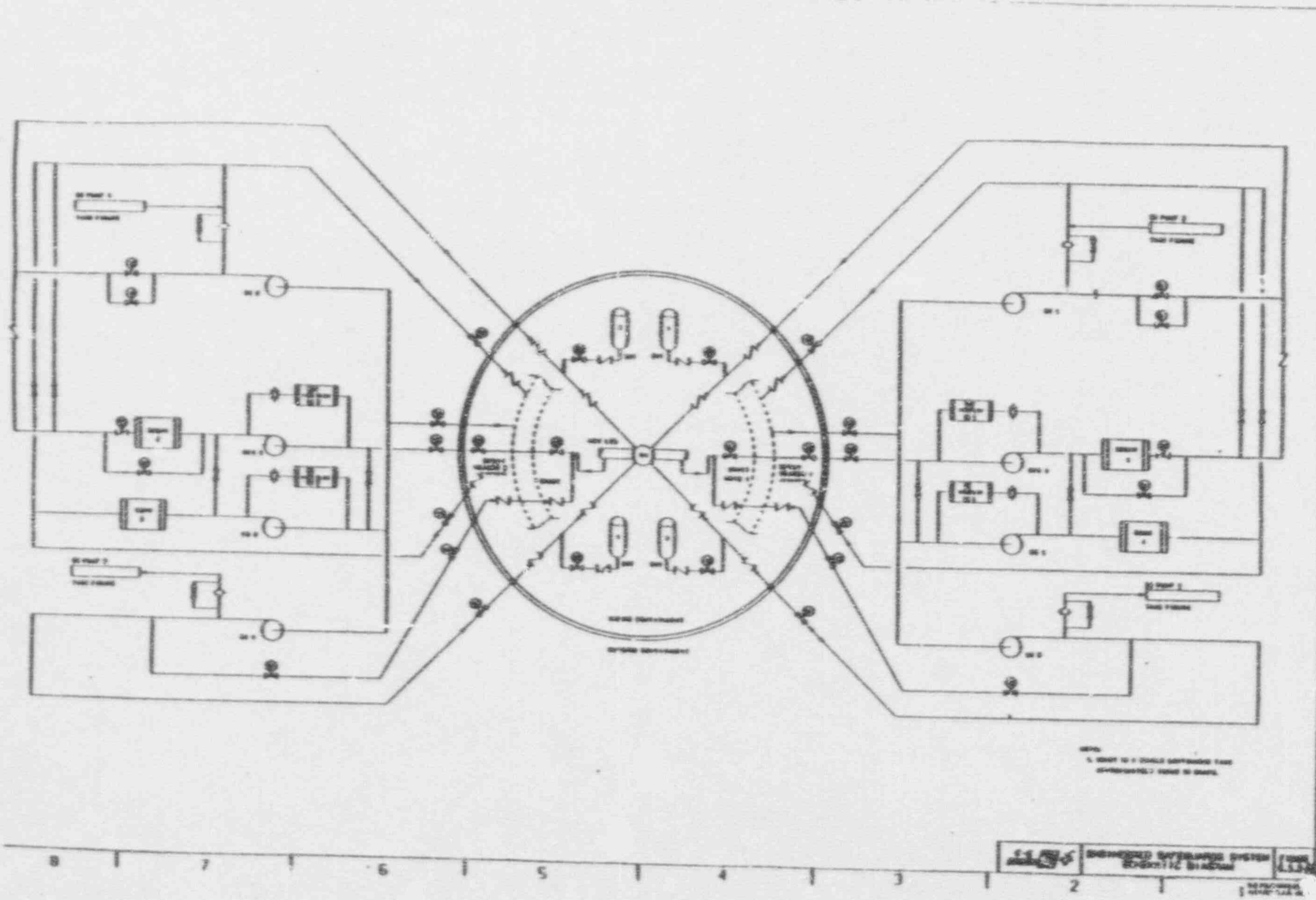

CHEMICAL AND VOLUME CONTROL SYSTEM
SYSTEM 80+
LETDOWN
VCT
BLENDING TEE
CHARGING PUMPS
TO LOOP
CHARGING FLOW CONTROL VALVES
CBO
DAMPs
MINI-FLOW HX
SYSTEM 80+
TO RCS
REGEN HX
LETDOWN HX
FROM CP
LETDOWN VALVES
LETDOWN ORIFICE
SYSTEM 80+

FIGURE A-3



Appendix B

Gross Functions by Event

The contents of this appendix provide the operational sequence descriptions for the NUPLEX 80+ general operations. The sequence descriptions are partitioned by gross function and subfunction for the following events:

Other Events

Abnormal Operations
Auxiliary Systems Operations
Auxiliary or Support Systems Startup
Control Room Inaccessibility
Instrument Maintenance
Loss of Off-Site Power
Low Power Operation
Maintenance
Periodic Functional Testing
Preparations for Refueling
Preparations for Startup
Site Emergency
Site Operations

Nuplex 80 + Functional Analysis
Operational Sequence Description
by Gross Function/Sub-Function

Gross Functions/Sub-Functions	Brief Description of Operations
1.00) Monitor for load changes	Monitor electrical parameters for changes
1.01) Control load changes	Maintain electrical parameters for changes in load
1.02) Maintain Turbine speed	Maintain Turbine speed to established constraints
2.00) Monitor RCS heat removal	Monitor RCS temperature to ensure transient load following parameter characteristics are observed.
2.01) Monitor Core Power	Monitor reactor power to ensure core performance is following expected constrainsts.
2.02) Monitor Core Heat Removal	Monitor core heat production performance to ensure that the RCS can maintain core heat removal.
2.03) Maintain CEA Control	Maintain CEAs above the insertion limits
3.00) Control RCS heat removal	Control to maintain RCS temperatures to power demanded program temperatures.
3.01) Monitor Boron	Monitor boron concentration in RCS for maintaining adequate reactivity to offset core Xenon, Samarium production.
3.02) Control RCS inventory	Maintain control of RCS inventory to within the constraints of the power demanded level program (PLCS)
3.03) Control RCS pressure	Maintain control of RCS pressure, to ensure subcooled liq in the RCS, to within the constraints of the power operating pressure demands (PPCS)
3.04) Maintain RCS chemistry	Monitor and maintain RCS chemistry within the constraints specified by technical specificaitons.
4.00) Maintain SG inventory	Control Feedwater to SG to maintain inventory for steaming SG for heat removal & steam production demands.
4.01) Control Main Feedwater to SGs	Maintain SG level in the normal band to maximize heat removal by controlling main feedwater to SGs to match steam flow from SGs
4.02) Maintain feedwater preheat	Monitor to maintain feedwater preheat by deareator and feedwater heaters
4.03) Maintain condensate inventory	Monitor to maintain inventory in the condensate and feed system to support steam production and condensate cycle for power operation
4.04) Maintain SG chemistry	Sample, Analyze and Adjust SG chemistry as required to maintain SG chemistry within constraints of technical specifications
5.00) Maintain Condenser Vacuum	Monitor turbine and condenser auxiliaries to maintain condenser vacuum within established operating constraints

Nuplex 80 + Functional Analysis
Operational Sequence Description
by Gross Function/Sub-Function

Gross Functions/Sub-Functions	Brief Description of Operations
.00) Maintain equipment cooling	Monitor auxiliaries to maintain cooling of equipment which require removal of operating heat generated (equipment specified later)
7.00) Maintain equipment lubrication	Monitor auxiliaries to maintain equipment lubrication within the established constraints for the equipment's operation

Nuplex 80 + Functional Analysis
Operational Sequence Description
by Gross Function/Sub-Function

Gross Functions/Sub-Functions	Brief Description of Operations
1.00) Authorize Load Changes	Communicate with load dispatcher to get authorization for load changes.
2.00) Control load change	Make electrical load change at rate less than limits to change power from one power level to another.
3.00) Monitor Load change	Monitor the parameters specified for maintaining Steady state power to assess any transient within the transient power constraints.
3.01) Maintain Electrical parameters	Monitor and maintain power (both real & reactive) within established constraints.
3.02) Maintain SG inventory	Monitor to maintain SG inventory for steaming the SG for heat removal within established contraints.
3.03) Control Main Feedwater to SGs	Control Feedwater to SGs to maintain inventory in normal band to maximize heat removal by controlling main feedwater flow to SGs.
3.04) Monitor RCS inventory	Control pressurizer level within the existing contraints for transient operation.
3.05) Monitor Reactor Power	Check information to verify reactor performance conforms to established contraints for transient operation. (i.e. ASI, PPDIL, etc.)
3.06) Monitor RCS pressure	Monitor pressure to verify pressure changes remain within the limits of the PPCS control scheme.
3.07) Monitor (other) auxiliaries	Monitor the auxiliary (to be specified later) that support the primary processes of electrical power production and steam production.

Nuplex 80 + Functional Analysis
Operational Sequence Description
by Gross Function/Sub-Function

Gross Functions/Sub-Functions	Brief Description of Operations
1.00) Maintain RCS heat removal	Maintain the RCS at a constant temperature and pressure.
1.01) Monitor SCS parameters	Monitor SCS heat exchanger parameters to ensure control of RCS temperatures and pressures.
2.00) Monitor Core Power	Monitor startup nuclear channels for power changes.

Nuplex 80 + Functional Analysis
Operational Sequence Description
by Gross Function/Sub-Function

Gross Functions/Sub-Functions	Brief Description of Operations
1.00) Determine S/U Prerequisites complete	Verify that all prerequisites for plant startup from HOT STANDBY to a "startup" condition have been completed.
1.01) Maintain RCS heat removal	Maintain RCS temperature constant in hot standby.
1.02) Maintain SG inventory	Control feedwater to SG to maintain inventory for steaming SG for heat removal.
1.03) Control Main feedwater to SG	Control feedwater flow to maintain SG level constant.
2.00) Control Core Reactivity with CEAs	Withdrawal of CEAs to a desired position is the first method of reactivity control for a startup
2.01) Latch CEA shutdown group A to withdraw	CEA withdrawal is by group sequence as follows A-B-C
2.02) Withdraw CEA group A	Withdraw CEA group to desired position (e.g. periodic stop points to check alignment, final core position, etc.)
2.03) Monitor Core Reactivity	Monitor group motion, nuclear instrumentation, and RCS temperature to verify group stops, expected core performance and CEA alignment.
2.04) Latch CEA shutdown group B to withdraw	CEA withdrawal is by group sequence. Latching the shutdown group CEAs is accomplished prior to withdrawing the group
2.05) Withdraw CEA group B	Withdraw CEA group to desired position (e.g. periodic stop points to check alignment, final core position, etc.)
2.06) Monitor Core Reactivity	Monitor group motion, nuclear instrumentation, and RCS temperature to verify group stops, expected core performance and CEA alignment
2.07) Latch CEA shutdown group C to withdraw	CEA withdrawal is by group sequence. Latching is the first element of CEA withdrawal
2.08) Withdraw CEA group C	Withdraw CEA group to desired position (e.g. periodic stop points to check alignment, final core position, etc.)
2.09) Monitor core reactivity	Monitor group motion, nuclear instrumentation, and RCS temperature to verify group stops, expected core performance and CEA alignment.
3.00) Control Core Reactivity with Boron	After the shutdown CEAs are at a desired position - dilute the RCS to the predicted critical concentration as the method to control reactivity
3.01) Dilute RCS	After shutdown CEAs are at desired position - dilute the RCS to the predicted critical concentration (record specific parameters for physics calc.)
3.02) Monitor Core Reactivity	Monitor nuclear instrumentation, RCS temperature, and boron concentration to verify expected core performance.

Nuplex 80 + Functional Analysis
Operational Sequence Description
by Gross Function/Sub-Function

Gross Functions/Sub-Functions	Brief Description of Operations
4.00) Control Core Reactivity with CEAs	CEA regulating groups are withdrawn to take the reactor critical.
4.01) Determine CEA group positions	CEA withdrawal is by group sequence as follows 1-2-3-4-5-6. Establish estimates of CEA group position.
4.02) Latch CEA regulating group 1	CEA withdrawal is by group sequence as follows 1-2-3-4-5-6.
4.03) Withdraw CEA regulating group 1	Withdraw CEA regulating groups to desired (off-bottom) position to verify availability.
4.04) Latch CEA regulating group 2	CEA withdrawal is by group sequence. Latching is the first element of CEA withdrawal.
4.05) Withdraw CEA regulating group 2	Withdraw CEA regulating group to the desired (off-bottom) position to verify availablity.
4.06) Latch CEA regulating group 3	CEA withdrawal is by group sequence. Latching is the first element of CEA withdrawal.
4.07) Withdraw CEA regulating group 3	Withdraw CEA regulating groups to the desired (off-bottom) position to verify availablity.
4.08) Latch CEA regulating group 4	CEA withdrawal is by group sequence. Latching is the first element of CEA withdrawal.
4.09) Withdraw CEA regulating group 4	Withdraw CEA regulating group to the desired (off-bottom) position to verify availablity.
4.10) Latch CEA regulating group 5	CEA withdrawal is by group sequence. Latching is the first element of CEA withdrawal.
4.11) Withdraw CEA regulating group 5	Withdraw CEA regulating group to the desired (off-bottom) position to verify availablity.
4.12) Latch CEA regulating group 6	CEA withdrawal is by group sequence. Latching is the first element of CEA withdrawal.
4.13) Withdraw CEA regulating group 6	Withdraw CEA regulating group to the desired (off-bottom) position to verify availability.
4.14) Select Manual Sequential Control Mode	Select mode of sequential control to withdraw CEA regulating groups to criticality.
4.15) Withdraw CEAs to critical position	Withdraw CEA regulating groups to critical position estimated by calculations in preplanned increments.
5.00) Monitor for Criticality	Monitor for indications of criticality
5.01) Announce Criticality	Report to other operations people when condition of "criticality" is reached.

Nuplex 80 + Functional Analysis
Operational Sequence Description
by Gross Function/Sub-Function

Gross Functions/Sub-Functions	Brief Description of Operations
6.00) Raise power to 10E-4% and stabilize	Raise power to 10E-4% (a point below the POAH and above criticality) to record specific information for physics calculations/confirmations.
6.01) Withdraw CEA	Withdraw CEA regulating groups to raise core power.
6.02) Monitor Reactor Power	Monitor reactor power during CEA withdrawal to control rate of power ascension.
6.03) Control to stabilize reactor power	Insert/Withdraw CEA to stabilize reactor power at a zero dpm rate.
6.04) Record measure data	Record CEA positions, boron concentration, and coolant temperature for core physics check.
7.00) Control Core Reactivity	If boron concentration is to high a positive moderator temperature coefficient may exist. CEA and moderator control of reactivity affected
7.01) Withdraw CEAs	Withdraw CEA regulating group to raise core power.
7.02) Check moderator temperature coefficient	At POAH a positive moderator temperature coefficient may exist. CEA and moderator control of Reactivity will be affected differently
8.00) Raise power to 3 - 5% and stabilize	Power transition point for transfering reactivity control of core to steam plant sensitivities.
8.01) Withdraw CEAs	Adjust CEAs to raise temperature to permit moderator/load following control of reactor.
8.02) Control reactor power to stabilize	Transition point for control of reactor power (or core reactivity) from CEA dominance to Moderator/load following dominance
9.00) Determine TG startup prerequisites done	The prerequisites for turbine startup and generator synchronization must be complete to go from startup (3-5%) to 15% of full power
9.01) Check generator auxiliaries	Generator auxiliaries : hydrogen and stator cooling must be operable and available
10.00) Ensure Control of Main Steam flow	(turbine generator operations description LATER)
10.01) Check turbine control (EHC) status	(later)
10.02) Startup EHC oil system	(later)
10.03) Startup Moisture Separator Reheater	(later)
10.04) Startup Extraction Steam System	(later)

Nuplex 80 + Functional Analysis
Operational Sequence Description
by Gross Function/Sub-Function

Gross Functions/Sub-Functions	Brief Description of Operations
10.05) Reset turbine trip systems	(later)
10.06) Warm up Steam Chest	(later)
11.00) Maintain SG inventory	Control SG inventory using main feedwater flow control (via main feedwater pumps)
11.01) Control Main Feedwater to SGs	Control feedwater flow to maintain SG level constant.
11.02) Ensure main feedwater preheating	Monitor to determine adequacy of feedwater preheat by deaerator and feedwater heaters. Adjust feedwater preheat as required.
11.03) Ensure condensate makeup	Monitor hotwell level and condensate reserves to determine and maintain an adequate supply of condensate during the startup.
12.00) Test Roll turbine	Based on turbine temperature the turbine may be rolled at different warmup/test rates
12.01) Check turbine	Check turbine while rolling at low speed for mechanical vibration, proper oil flow, and lubrication to avoid damage at higher speeds
12.02) Check Turbine Auxiliaries	(later)
13.00) Startup turbine	(later)
13.01) Admit steam to turbine	Admit steam to turbine for full power capability as demanded by turbine control systems
14.00) Test turbine trip	(later)
14.01) Raise turbine speed to 1800 rpm	Raise turbine speed to loading speed to check for normal turbine parameters and operation.
14.02) Mechanical Trip Test	Test mechanical trip of turbine prior to declaring turbine available for loading.
14.03) Reset turbine to 1800 rpm	Reset turbine trip and restore control of turbine at 1800 rpm.
15.00) Startup generator	(later)
15.01) Check generator off-line and available	Check generator output breakers open and disconnects closed
15.02) Establish generator excitation	(later)
15.03) Regulate generator voltage	Establish control of Generator voltage and set voltage to approximately normal values.
15.04) Establish generator control	(load limit or other turbine control scheme here) Later

Nuplex 80 + Functional Analysis
Operational Sequence Description
by Gross Function/Sub-Function

Gross Functions/Sub-Functions	Brief Description of Operations
16.00) Synchronize and close generator b- i bkr	(later)
17.00) Load generator	Load generator with some load (approx. 15% of full power)
17.01) Monitor turbine	Monitor turbine temperature and cooling systems are adequately maintaining the turbine and generator under low load conditions
18.00) Load Dispatch authorization	Communicate with Load Dispatch to obtain loading information and load authorization.
19.00) Raise load	(later)
20.00) Maintain SG inventory	Control SG inventory using main feedwater to compensate for changes in inventory due to up power transients
20.01) Control Main Feedwater to SG	Control feedwater flow to maintain SG level constant.
20.02) Ensure main feedwater preheating	Monitor to determine adequacy of feedwater preheat by deaerator and feedwater. Adjust feedwater preheating as required.
20.03) Ensure condensate makeup	Monitor hotwell level and condensate reserves to determine and maintain an adequate supply of condensate during startup.
21.00) Ensure core reactivity control	At 15% power, proper protection responses are to verified adequate.
21.01) Check Thermal/NI power equivalence	At 15% power for proper protection responses NI power and calculated thermal power must be compared before elevating power to higher values.

Nuplex 80 + Functional Analysis
Operational Sequence Description
by Gross Function/Sub-Function

Gross Function / Functions	Brief Description of Operations
1.00) Authorize Load Change	Communicate with Plant manager or authorized representative to get authorization for shutdown. Also Communicate with load dispatcher to change load
2.00) Control load change	Control load reduction at rate less than limits for changing power. Load change within 100% to 15% via a ramped power change.
3.00) Monitor Load Change	Monitor the parameters specified to assess whether the transient is within transient power constraints.
3.01) Maintain Electrical parameters	Monitor and maintain frequency, voltage, and power (both real and reactive) within established constraints.
3.02) Maintain SG inventory	Monitor to maintain SG inventory in the normal band for steaming the SGs for heat removal. Observing any established constraints.
3.03) Control Main Feedwater to SGs	Monitor the control of main feedwater to maintain SG level in the normal band to maximize heat removal.
3.04) Monitor RCS inventory	Monitor to Control pressurizer level within the existing constraints for power operation.
3.05) Monitor Reactor Power	Check information to verify reactor performance conforms to established constraints for transient power operation (i.e., ASI, PPDIL, etc.)
3.06) Monitor RCS pressure	Monitor to control pressurizer pressure within within the existing contraints for power operation.
4.00) Control TBS flow to condenser	Bypass steam to condenser to maintain power in hot standby. This is a prerequisite to shutting down the turbine.
4.01) Monitor Reactor Power	Check information to verify reactor performance is within transient power constraints (i.e., startup rate, ASI PPDIL, etc.).
4.02) Control reactivity to reduce power	Insert CEAs to lower RCS temperature and power to within the limits of the power control contraints for these variables.
5.00) Shutdown the Turbine Generator	Reduce the turbine load to "light" or "no" load condition just before shutdown.
5.01) Shutdown the Turbine	At 15% power (as controlled by the TBS) with the turbine running with a "light" or "no" load condition, trip the turbine.
5.02) Unload the generator	After the turbine has been tripped, trip the turbine output breakers (an operational backup to the automatic reverse power trip on the generator)

Nuplex 80 + Functional Analysis
Operational Sequence Description
by Gross Function/Sub-Function

Gross Functions/Sub-Functions	Brief Description of Operations
5.03) Shutdown Extraction Steam	After the turbine has been tripped shutdown the extraction steam lineups.
6.00) Shutdown the reactor	Control insertion of CEAs to shutdown the reactor.
6.01) Insert regulating group 6 CEAs	Assuming the regulating group is Group 6. Insert the CEAs for this group to the bottom unlatch point.
6.02) Insert regulating group 5 CEAs	Select the next group (group 5) and insert the group's CEAs to the bottom unlatch point.
6.03) Insert regulating group 4 CEAs	Select the next group (group 4) and insert the group's CEAs to the bottom unlatch point.
6.04) Insert regulating group 3 CEAs	Select the next group (group 3) and insert the group's CEAs to the bottom unlatch point.
6.05) Insert regulating group 2 CEAs	Select the next group (group 2) and insert the group's CEAs to the bottom unlatch point.
6.06) Insert regulating group 1 CEAs	Select the next group (group 1) and insert the group's CEAs to the bottom unlatch point.
6.07) Borate the RCS	Align to add boric acid to the RCS to raise the Boron Concentration in the RCS to the desired shutdown concentration. Add boron.
6.08) Insert Shutdown group C CEAs	While borating, Select shutdown group C for motion. Insert the group's CEAs to the bottom unlatch point.
6.09) Insert Shutdown group B CEAs	While borating, Select shutdown group B for motion. Insert the group's CEAs to the bottom unlatch point.
6.10) Insert Shutdown Group A CEAs	While borating, Select shutdown group A for motion. Insert the group's CEAs to the bottom unlatch point.
6.11) Unlatch ("Trip") CEAs	Once all rods are at the unlatch point, de-energize the CEAs so that they may drop into the core. Boration may still be taking place
6.12) Monitor Reactor Power	Check information to verify and monitor reactor performance conforms to expected shutdown behaviors.
7.00) Monitor (other) auxiliaries	Monitor the auxiliaries (to be specified later) that support the primary processes of electrical power production and steam production.

Nuplex 80 + Functional Analysis
Operational Sequence Description
by Gross Function/Sub-function

Gross Functions/Sub-Functions	Brief Description of Operations
1.00) Standard Post Trip Actions	Specific set of operator responses to ensure all "safety functions" have been checked. Established a consistent baseline for emergencies.
1.01) Ensure Reactor Shutdown	Check for indications for reactor shutdown and follow up to ensure CEAs are bottomed
1.02) Ensure plant electrical power available	Trip turbine generator and align plant electrical power to a source of power. Eithe off-site through Xformers or Diesel generators
1.03) Control RCS inventory	Check Level to ensure the automatic control capabilities are controlling Pressurizer level
1.04) Control RCS pressure	Check pressure to ensure automatic pressure control features are controlling RCS pressure
1.05) Control Core Heat Removal	Check for operation of RCPs
1.06) Control RCS heat removal	Check SG parameters for steaming and feeding to exist or the capability to steam and feed a SG
1.07) Maintain Containment Integrity	Check containment atmosphere for signs that additional containment integrity measures may need to be taken
1.08) Control Containment Atmosphere	Check containment atmosphere for signs that additional containment cooling measures may need to be taken
1.09) Control Containment Combustible Gases	Check for the presence of combustible gases in containment
2.00) Diagnosis of event	Evaluate information collected during SPTA to determine event
3.00) Ensure SPTA performed	Confirm Standard Post Trip Actions have been performed.
4.00) Confirm diagnosis of event	Evaluate information collected to confirm SPTA and determine event
5.00) Control RCS inventory	Control Pressurizer level within indicating range
6.00) Control RCS pressure	Control Pressurizer pressure to normal control bands so that NPSH for RCP operation is adequate, Subcooling exists, etc. with heaters and spray control
7.00) Control RCS heat removal	Control steaming of SG to limit heatup or cooldown of plant after the Reactor trip
8.00) Maintain SG inventory	Control feedwater to SG to maintain adequate inventory for steaming SG for heat removal
8.01) Control Main Feedwater to SGs	Maintain SG level in normal band to maximize heat removal by controlling main feedwater flow to SGs

Nuplex 80 + Functional Analysis
Operational Sequence Description
By Gross Function/Sub-Function

Gross Function/Sub-Functions	Brief Description of Operations
8.02) Control Emergency Feedwater to SGs	Maintain SG level in normal band to maximize heat removal by controlling Emergency Feedwater flow to SGs
9.00) Evaluate need for a cooldown	Evaluate plant conditions to determine if a cooldown is needed to place the plant in a safe condition for repair and recovery
9.01) Ensure condensate reserves adequate	To continue to provide a source for the secondary heat sink condensate inventories need to be monitored and replenished as necessary
9.02) Control RCS pressure	To continue to operate in hot standby the ability to maintain pressure must be considered to determine whether to cooldown or not
10.00) Maintain RCS parameters	Check RCS parameters to maintain RCS fluid in state for heat removal, (control pressure, inventory, RCP operation)
10.01) Control RCS inventory	Maintain adequate inventory of RCS fluid to maintain a state of heat removal
10.02) Control RCS pressure	Control pressure to normal control bands so that NPSH for RCP operation is adequate, Subcooling exists, etc. with heaters and spray control
10.03) Monitor RCS parameters for Forced Circ.	Monitor RCS parameters to continue RCP operation

Nuplex 80 + Functional Analysis
Operational Sequence Description
by Gross Function/Sub-Function

Gross Functions/Sub-Functions	Brief Description of Operations
1.00) Standard Post Trip Actions	Specific set of operator responses to ensure all "safety functions" have been checked. Establish a consistent baseline for emergencies.
1.01) Ensure Reactor Shutdown	Check for indications for reactor shutdown and follow up to ensure CEAs are bottomed
1.02) Ensure plant electrical power available	Trip Turbine generator and align plant electrical power to a source of power. Eith off-site through Xformers or Diesel generators
1.03) Maintain RCS inventory	Check level to ensure the automatic control capabilities are controlling Pressurizer level.
1.04) Maintain RCS pressure	Check pressure to ensure automatic pressure control features are controlling RCS pressure
1.05) Maintain Core heat removal	Check for operation of RCPs
1.06) Maintain RCS heat removal	Check SG parameters for steaming and feeding to exist or the capability to steam and feed a SG
1.07) Maintain Containment Integrity	Check containment atmosphere for signs that additional containment integrity measures may need to be taken
1.08) Control Containment Atmosphere	Check containment atmosphere for signs that additional containment cooling measures may need to be taken
1.09) Control Containment Combustible Gases	Check for the presence of combustible gases in containment
2.00) Diagnosis of event	Evaluate information collected during SPTA to determine event
3.00) Ensure SPTA performed	Confirm Standard Post Trip Actions have been performed
4.00) Confirm diagnosis of event	Evaluate information collected to confirm SPTA and determine event
5.00) Control RCS depressurization	RCS inventory loss causes a resultant depressurization of the RCS. Automatic RCS makeup (Safety Injection) is checked or ensured
5.01) Ensure High Pressure Safety Injection	Control of RCS depressurization due to losses of RCS fluid is to be check by automatic Safety Injection at a setpoint, if it is not - manually do so.
6.00) Maximize Safety Injection	RCS fluid is being loss, all practical RCS makeup lineups should be operating. Maximize the makeup flow
6.01) Maximize Charging flow	Makeup by CVCS charging flow must be maximized
6.02) Start idle SI Pumps	Makeup from SI must be maximized. Use SIS flow characteristic curves to verify maximum flow

Nuplex 80 + Functional Analysis
Operational Sequence Description
by Gross Function/Sub-Function

Gross Functions/Sub-Functions	Brief Description of Operations
6.03) Ensure electrical power to SI components	If flow can not be maximized ensure that components have power available
6.04) Ensure valve alignments	If flow can not be maximized ensure valve alignments to send makeup to RCS are correct
6.05) Ensure necessary auxiliaries operating	If flow can not be maximized ensure that any necessary auxiliaries for electrical power or valve operators are availiable (e.g. Compres Air)
7.00) Control RCS depressurization	If RCS makeup methods are not adequate to control RCS depressurization, then Stop all RCPs at a [pressure]. Otherwise continue operating.
7.01) Stop all RCPs	Prolonged operation of RCPs during worse case events will result in an increased severity of the LOCA with greater loss out the break
7.02) Monitor RCP operating limits	If RCP operation is continued, monitor RCP parameters to ensure that the reduced-pressure operation is within RCP operating limitations.
8.00) Record Time	Establish an event baseline for the event and subsequent operations that may need to be performed
9.00) Isolate the LOCA	To minimize RCS inventory losses potential sources of leakage can be checked isolated or isolated
9.01) Isolate Letdown	To preclude loss of RCS inventory to the CVCS
9.02) Isolate RCS sampling	All sampling lines should be isolated to minimize RCS inventory loss AND minimize the possibility of inadvertent personnel exposure
9.03) Isolate RCS to CCW leakage	If CCW surge tank level increases there may by RCS to CCW in-leakage. Locate and isolate the leak.
9.04) Isolate any other sources of leakage	If other sources of leakage are possible isolate them to minimize RCS inventory losses to possibly isolate the break
9.05) Isolate PORVs (see note)	PORVs are not expected to open during a LOCA. If necessary close the block valve to maintain RCS inventory (note: PORVs are still a design issue)
10.00) Verify LOCA radiological containment	Verify LOCA is NOT outside containment, then verify containment integrity
10.01) Monitor Auxiliary Building	Verify LOCA is NOT outside of containment by checking the auxiliary building radiation and sump levels
10.02) Isolate LOCA outside containment	If the LOCA is occuring outside containment attempt to isolate the leak and isolate the auxiliary building

Nuplex 80 + Functional Analysis
Operational Sequence Description
by Gross Function/Sub-Function

Gross Functions/Sub-Functions	Brief Description of Operations
10.03) Maintain Containment Integrity	Check containment atmosphere for rise in pressure above automatic containment isolation setpoint. Verify automatic isolation.
10.04) Ensure Containment Isolation	If containment atmospheric pressure is above setpoint verify automatic isolation. If no isolation occurs, then manually initiate isolation.
11.00) Control Containment Atmosphere	If containment atmosphere is heating up and pressurizing implement containment cooling methods.
11.01) Control Containment Fan Cooling	Establish containment cooling using emergency fan coolers, normal containment cooling, and air recirculation systems to reduce temp & pressure.
11.02) Control Containment Spray Cooling	If pressure is [excessive] ensure automatic spray cooling of containment. If not actuated automatically manually do so to reduce temp & pressure.
12.00) Control Containment Pressurization	If pressure becomes [excessive] the operator must take steps to maintain Containment pressure below design pressure
12.01) Control Containment Spray Cooling	If pressure is [excessive] ensure automatic containment spray cooling. If not actuated automatically do so manually to reduce pressure.
12.02) Align External H2 Recombiners	At [excessive] containment pressures the affects of hydrogen burns are more severe. If plant design has an external H2 recombiner, align it for use.
13.00) Monitor for Hydrogen in Containment	Place H2 monitors in service to determine presence and concentration of Hydrogen in containment
14.00) Control Containment Hydrogen	If containment hydrogen is present use approved method to remove it.
14.01) Operate Hydrogen Recombiners	If containment hydrogen is present operate the H2 recombiner to remove the hydrogen.
14.02) Operate Hydrogen Purge	If containment hydrogen is present and approval to operate H2 purge is obtained, operate the Hydrogen Purge system to remove hydrogen
15.00) Monitor Environmental Impacts	If the hydrogen purge is operated, monitor for radiological releases. The plant tech support center should be assessing impact.
16.00) Isolated? No...	Strategy branches for an isolated leak and non-isolated leak Start of Branch ...Isolated? No....
17.00) Perform a rapid cooldown	Rapidly cooldown the RCS within limits so that a RCS depressurization may be performed to reduce RCS inventory losses.

Nuplex 80 + Functional Analysis
Operational Sequence Description
by Gross Function/Sub-Function

Gross Functions/Sub-Functions	Brief Description of Operations
17.01) Control cooldown w/Turbine Bypass Sys.	If the condenser is available, cooldown the RCS by steaming the Steam Generators using the Turbine Bypass system
17.02) Control cooldown w/Atmospheric Dumps	If condenser is not available, control the cooldown by steaming the Steam Generators with the Atmospheric Dump Valves
18.00) Maintain SG inventory	To support the cooldown SG inventory must be maintained
18.01) Control Main Feedwater to SGs	Maintain SG level in normal band to maximize heat removal by controlling Main Feedwater flow to SGs
18.02) Control Emergency Feedwater to SGs	Maintain SG level in normal band to maximize heat removal by controlling Emergency Feedwater flow to SGs
19.00) Ensure condensate reserves adequate	To continue to provide a source for the secondary heat sink condensate inventories need to be monitored and replenished as necessary
20.00) Ensure proper charging and letdown	Once RCS inventory has been stabilized ensure makeup and letdown are controlled to compensate for RCS shrinkage, SI makeup, and Pzr saturation.
21.00) Control RCS Depressurization	Depressurize the RCS to reduce the leakrate of RCS inventory losses
21.01) Depressurization Method 1	Depressurize RCS using pressurizer spray (main or auxiliary)
21.02) Depressurization Method 2	Depressurize RCS by control of charging and letdown pressure
21.03) Depressurization Method 3	Depressurize RCS by operating/throttling SI pumps
22.00) Ensure vessel P-T limits maintained	Thoughout the cooldown and depressurization monitor for violations of P-T limits. If appear to be violated Stop cooldown and restore P-T.
22.01) Monitor RCS for P-T violations	Monitor RCS parameters and compare to Technical Specs to determine whether P-T limits have been violated.
22.02) Stop the Cooldown	If P-T limits appear to be violated, then stop the cooldown by reducing the steaming of the SGs
22.03) Control RCS pressure (method 1)	Operate main spray to reduce pressure to within P-T limits
22.04) Control RCS pressure (method 2)	Operate auxiliary spray to reduce pressure to within P-T limits.
22.05) Control RCS pressure (method 3)	If overpressure condition is caused by SI or charging flow, then throttle or stop SI or chargingingand letdown excess makeup to within P-T.

Nuplex 80 + Functional Analysis
Operational Sequence Description
by Gross Function/Sub-Function

Gross Functions/Sub-Functions	Brief Description of Operations
22.06) Maintain SG inventory	To support any cooldown, SG inventory must be maintained
22.07) Control Main feedwater to SGs	Maintain SG level in normal band to maximize heat removal by controlling Main feedwater to SGs
22.08) Control Emergency feedwater to SGs	Maintain SG level in normal band to maximize heat removal by controlling Emergency feedwater flow to SGs
23.00) Determine need for forced cooling	Before RCPs may be started, the need for forced circulation must be assessed and balanced against the risk of damage to the RCP seals
23.01) Determine present heat removal adequacy	Evaluate RCS and core heat removal under the existing natural circulation conditions and determine if current heat removal is inadequate
23.02) Monitor RCS parameters	Assess current RCS pressure and temperature, if close to hot standby conditions, then it may be more desirable to do a forced circ. cooldown.
23.03) Determine need for Main Pzr spray	If auxiliary spray is not providing the desired depressurization rate, having the capability for main spray may be desired
24.00) Determine if conditions permit RCP start	If RCP restart is to be attempted, then be ensure restart criteria are met.
24.01) Ensure electrical power to RCPs	Ensure before closing RCP breakers to start RCPs that electrical power is available from a reliable source
24.02) Maintain SG inventory	Starting RCPs may cause a thermal transient & SG, monitor SG level and make adjustments as needed to maintain inventory
24.03) Maintain RCS inventory	Starting RCPs may cause a thermal transient or collapse any voiding that may exist, monitor pressurizer level to ensure RCS inventory is maintained
24.04) Monitor core heat removal	To ensure that forced circulation is being directed through the core, monitor core temperatures and core subcooling to determine core heat removal
25.00) Restart RCPs	Select two RCPs (in opposite loops), then start RCPs one at a time.
25.01) Maintain RCS inventory	Ensure makeup flow available to compensate for shinkage after RCP is started (shrinkage may be due to void collapse) using charging & SI flow
25.02) Start RCP	Start RCPs in opposite loops ,one at a time until two are running

System 80 + Functional Analysis
Operational Sequence Description
by Gross Function/Sub-Function

Gross Functions/Sub-functions	Brief Description of Operations
25.03) Monitor RCS parameters for Forced Circ.	Restarting RCPs may cause a transient due to loop shrinkage and/or steam void condensation. Monitor RCS parameters to continue RCP operation.
26.00) Control RCS and Core heat removal	If RCPs are NOT operating, verify natural circulation conditions are established for heat removal via at least one steam generator
26.01) Monitor RCS parameters for Natural Circ.	Approx [5 - 15 minutes] after RCPs are tripped, natural circulation conditions should be observed.
27.00) Control RCS and Core heat removal	Alternatives during LOCA for the natural circulation process may be required. Two phase natural circulations may need to be established
27.01) Control core heat removal (method 1)	Reflux cooling: two phase liquid exists in the RCS hot leg and is condensed by steaming the SGs cooling the SG "U" tube bundle with flow back to core.
27.02) Control Core heat removal (method 2)	Two phase NC: steam from the core goes past the "U" tube bend and is condensed via SG steaming on the cold leg side with flow to the core
27.03) Control Core heat removal (method 3)	Two phase NC with flow through break: using SI and charging alignments and steaming SGs direct RCS condensate and makeup through core then out break
28.00) Control RCS inventory	Monitor the operation of Safety Injection and terminate or throttle its operation if RCS inventory is under control (See specific criteria)
28.01) Monitor for Termination Criteria	Monitor RCS parameters to determine if termination criteria have been met.
28.02) Throttle or Stop SI	If termination criteria are satisfied throttle or stop SI flow to the RCS as appropriate
28.03) Confirm RCS inventory control	Throttling or Stopping SI flow may cause a transient on the RCS. Adjust or Stop SI flow as necessary.
29.00) Control RCS inventory	Reinitiate Full Safety Injection flow if the termination criteria can not be maintained.
29.01) Monitor RCS parameters	Monitor RCS parameters to confirm SI termination criteria are still being met.
29.02) Reinitate Full SI flow	Start SI pumps or open valves to reinitate full SI flow
29.03) Confirm RCS inventory control	Monitor RCS parameters to determine that reinitation of full flow is controlling RCS inventory.
30.00) Monitor inventory sources	Monitor IRWT level and containment sump level to verify corresponding responses (RWT decreasing, Sump increasing)

Nuplex 80 + Functional Analysis
Operational Sequence Description
by Gross Function/Sub-Function

Gross Functions/Sub-Functions	Brief Description of Operations
31.00) Control RCS inventory recirculation	If break is inside containment verify recirculation is auto initated when IRWT level is [low], other manually do so.
31.01) Monitor RCS inventory recirculation	(later)
31.02) Control HPSI flow during recirc.	(later)
32.00) Maintain Control of RCS heat removal	Block automatic initation of MSIS as the cooldown and depressurization proceeds.
32.01) Block Automatic initation of MSIS	(later)
33.00) Maintain Control of RCS pressure	After RCS is depressurized to less than Safety Injection Tank pressure, isolate, vent, or drain SI tank to prevent repressurization
33.01) Control RCS pressure (method 1)	Isolate Safety injection tanks
33.02) Control RCS pressure (method 2)	Vent Safety injection tanks to maintain SI tank pressure lower than RCS pressure
33.03) Control RCS pressure (method 3)	Drain Safety injection tanks to lower SI tank pressure below RCS pressure.
34.00) Maintain Control of RCS pressure	Establish Low Temperature Overpressure Protection
35.00) Control Core heat removal	If shutdown cooling operation cannot be initiated, then use simultaneous hot and cold SI to maintain core cooling
36.00) Control RCS heat removal	When Shutdown cooling system entry conditions are established initate SCS operation.
37.00) Monitor/Control RCS Voiding	Monitor for the presence of voids. If voiding is present and inhibits depressurization, then eliminate the void.
37.01) Monitor RCS inventory	Monitor RCS temperature & pressures, Pzr level, charging & letdown to detect the presence of voiding.
37.02) Isolate letdown	If voiding is to be eliminated, letdown is isolated to minimize any further inventory loss.
37.03) Control RCS pressure	Stop any further depressurization to prevent any further growth of void.
37.04) Collapse RCS voids	To eliminate void, pressurize and depressurize the RCS w/in P-T limits to put cooler fluid in void region when void is compressed to condense void
38.00) Isolated? Yes...	Strategy branches for an isolated leak and non-isolated leak Start of Branch ....Isolated? Yes....
39.00) Control RCS inventory	Monitor the operation of Safety Injection and terminate or throttle its operation if RCS inventory is under control (See specific criteria)

Nuplex 80 + Functional Analysis
Operational Sequence Description
by Gross Function/Sub-Function

Gross Functions/Sub-Functions	Brief Description of Operations
39.01) Monitor for Termination Criteria	Monitor RCS parameters to determine if termination criteria have been met.
39.02) Throttle or Stop SI	If termination criteria are satisfied throttle or stop SI flow to the RCS as appropriate.
39.03) Confirm RCS inventory control	Throttling or Stopping SI flow may cause a transient on the RCS. Adjust or Stop SI flow as necessary.
40.00) Control RCS inventory	Reinitiate Full Safety Injection flow if the termination criteria can not be maintained.
40.01) Monitor RCS parameters	Monitor RCS parameters to confirm SI termination criteria are still being met.
40.02) Reinitate Full SI flow	Start SI pumps or open valves to reinitate full SI flow
40.03) Confirm RCS inventory control	Monitor RCS parameters to determine that reinitation of full flow is controlling RCS inventory.
41.00) Ensure proper charging and letdown	Once RCS inventory has been stabilized ensure makeup and letdown are controlled to compensate for changes in RCS inventory.
42.00) Control RCS Pressure	Depressurize the RCS to Shutdown Cooling entry pressure
42.01) Depressurization Method 1	Depressurize RCS using pressurizer spray (main or auxiliary)
42.02) Depressurization Method 2	Depressurize RCS by control of charging and letdown flows
42.03) Depressurization Method 3	Depressurize RCS by operating/throttling SI pumps
43.00) Ensure vessel P-T limits maintained	Thoughout the depressurization monitor for violations of P-T limits. If appear to be violated Stop any RCS cooldown and restore P-T.
43.01) Monitor RCS for P-T violations	Monitor RCS parameters and compare to Technical Specs. to determine whether P-T limits have been violated.
43.02) Stop the Cooldown	If P-T limits appear to be violated, then stop any cooldown of the RCS by reducing the steaming of SGs.
43.03) Control RCS pressure (method 1)	Operate main spray to reduce pressure to with P-T limits
43.04) Control RCS pressure (method 2)	Operate auxiliary spray to reduce pressure to within P-T limits.
43.05) Control RCS pressure (method 3)	If overpressure condition is caused by SI or charging flow, then throttle or stop SI or charging and letdown excess makeup to within P-T
44.00) Maintain SG inventory	To support any cooldown, SG inventory must be maintained

Nuplex 80 + Functional Analysis
Operational Sequence Description
by Gross Function/Sub-Function

Gross Functions/Sub-Functions	Brief Description of Operations
44.01) Control Main Feedwater to SGs	Maintain SG level in normal band to maximize heat removal by controlling Main Feedwater flow to SGs
44.02) Control Emergency Feedwater to SGs	Maintain SG level in normal band to maximize heat removal by controlling Emergency Feedwater flow to SGs
45.00) Ensure condensate reserves adequate	To continue to provide a source for the secondary heat sink condensate inventories need to be monitored and replenished as necessary
46.00) Control Reactivity	Borate the RCS to maintain shutdown margin in accordance with Technical Specifications
46.01) Borate the RCS	Borate the RCS using charging and letdown to add borated water and letdown excess inventory.
46.02) Prevent dilution (method 1)	Borate the entire RCS (including the mass of the Pzr) to cold shutdown conditions.
46.03) Prevent dilution (method 2)	Use main or auxiliary spray to increase or mix to maintain Pressurizer boron concentration within [50 ppm] of RCS boron concentration
47.00) Perform a controlled cooldown	Cooldown the plant in accordance with Technical Specs.
47.01) Control cooldown w/Turbine Bypass Sys.	If the condenser is available, cooldown the RCS by steaming the Steam Generators using the Turbine Bypass system
47.02) Control cooldown w/Atmospheric Dumps	If the condenser is not available, control the cooldown by steaming the Steam Generators with the Atmospheric Dump valves
48.00) Determine need for forced cooling	Before RCPs may be started, the need for forced circulation must be assessed and balanced against the risk of damage to the RCP seals
48.01) Determine present heat removal adequacy	Evaluate RCS and core heat removal under the existing natural circulation conditions and determine if current heat removal is inadequate
48.02) Monitor RCS parameters	Assess current RCS pressure and temperature, if close to hot standby conditions, then it may be more desirable to do a forced circ. cooldown.
48.03) Determine need for Main Pzr spray	If auxiliary spray is not providing the desired depressurization rate, having the capability for main spray may be desired.
49.00) Determine if conditions permit RCP start	If RCP restart is to be attempted, then ensure restart criteria are met.
50.00) Restart RCPs	Select two RCPs (in opposite loops), then start RCPs one at a time.

Nuplex 80 + Functional Analysis
Operational Sequence Description
by Gross Function/Sub-Function

Gross Functions/Sub-Functions	Brief Description of Operations
50.01) Control RCS inventory	Ensure makeup flow available to compensate for shrinkage after RCP is started (shrinkage may be due to void collapse) using charging & SI flow
50.02) Start RCP	Start RCPs in opposite loops, one at a time until two are running
50.03) Monitor RCS parameters for Forced Circ.	Restarting RCPs may cause a transient due to loop shrinkage and/or steam void condensation. Monitor RCS parameters to continue RCP operation.
51.00) Control RCS and Core heat removal	If RCPs are NOT operating, verify natural circulation conditions are established for heat removal via at least one steam generator.
51.01) Monitor RCS parameters for Natural Circ.	Approx [5 - 15 minutes] after RCPs are tripped, natural circulation conditions should be observed.
52.00) Control RCS heat removal and pressure	Block automatic initiation of MSIS, CIAS, CSAS, and SIAS as the cooldown and depressurization proceeds.
52.01) Block Automatic initiation of MSIS	(later)
52.02) Block Automatic initiation of SIAS	(later)
53.00) Control RCS pressure	After RCS is depressurized to less than Safety Injection Tank pressure, isolate, vent, or drain SI tank to prevent repressurization.
53.01) Control RCS pressure (method 1)	Isolate Safety Injection tanks
53.02) Control RCS pressure (method 2)	Vent Safety Injection tanks to maintain SI tank pressure lower than RCS pressure
53.03) Control RCS pressure (method 3)	Drain Safety Injection tanks to lower SI tank pressure below RCS pressure.
54.00) Control RCS pressure	Establish Low Temperature Overpressure Protection
55.00) Control RCS heat removal	When Shutdown cooling system entry conditions are established initiate SCS operation.
56.00) Monitor/Control RCS Voiding	Monitor for the presence of voids. If voiding is present and it inhibits depressurization, then eliminate the void.
56.01) Monitor RCS inventory	Monitor RCS temperature & pressures, Pzr level, charging & letdown to detect the presence of voiding.
56.02) Isolate Letdown	If voiding is to be eliminated, Letdown is isolated to minimize any further inventory loss.
56.03) Control RCS pressure	Stop any further depressurization to prevent any further growth of the void.

Nuplex 80 + Functional Analysis
Operational Sequence Description
by Gross Function/Sub-Function

Gross Functions/Sub-Functions	Brief Description of Operations
56.04) Collapse RCS voids	To eliminate voids, Pressurize and depressurize the RCS w/in P-T limits to put cooler fluid in the void region when void is compressed to condense void

Nuplex 80 + Functional Analysis
Operational Sequence Description
by Gross Function/Sub-Function

Gross Functions/Sub-Functions	Brief Description of Operations
1.00) Standard Post Trip Actions	Set of standard responses following any reactor trip
1.01) Ensure Reactor Shutdown	Check for indications for reactor shutdown and follow up to ensure CEAs are bottomed.
1.02) Ensure plant electrical power available	Trip Turbine generator and observe plant electrical buses align to a source of power. Either off-site thru Xformers or Diesel generators
1.03) Control RCS inventory	Check Pzr Level to ensure that automatic control capability is controlling Level or take manual control
1.04) Control RCS Pressure	Check Pressure to ensure automatic pressure control features are controlling RCS pressure or take manual control
1.05) Control Core Heat Removal	Check for operation of RCPs
1.06) Control RCS heat removal	Check SG parameters for steaming and feeding to exist or the capability to steam and feed a SG
1.07) Maintain Containment Integrity	Check containment atmosphere for signs that additional containment integrity measures may need to be taken
1.08) Control Containment Atmosphere	Check containment atmosphere for signs that additional containment cooling measures may need to be taken
1.09) Control Containment Combustible Gases	Check for the presence of a combustible gas in containment.
2.00) Diagnosis of event	Review key parameters to make a diagnosis of the event
3.00) Ensure SPTA performed	Confirm Standard Post Trip Actions have been performed
4.00) Confirm diagnosis of event	Review key parameters to confirm diagnosis of a steam generator tube rupture event
5.00) Determine SG Radioactivity	Sample both steam generators for radioactivity
6.00) Control RCS depressurization	RCS inventory losses due to leakage in SG has resultant depressurization of RCS. Automatic RCS makeup checked (SI makeup required?).
6.01) Ensure Safety Injection	Control of RCS depressurization due to losses of RCS fluid is to be checked by automatic Safety Injection at a setpoint If is is not - manually do so.
7.00) Maximize Safety Injection	Loss of RCS inventory requires that safety injection be maximized to ensure other functions can be performed (e.g. core cooling)
7.01) Maximize Charging flow	Makeup by CVCS charging flow must be maximized
7.02) Start idle SI pumps	Makeup from SI must be maximized. Use SIS flow characteristic curves to verify maximum flow

Nuplex 80 + Functional Analysis
Operational Sequence Description
by Gross Function/Sub-Function

Gross Functions/Sub-Functions	Brief Description of Operations
7.03) Ensure electrical power to SI components	If flow can not be maximized ensure that components have power available
7.04) Ensure valve alignments	If flow can not be maximized ensure valve alignments to send makeup to the RCS are correct
7.05) Ensure necessary auxiliaries operating	If flow can not be maximized ensure that any necessary auxiliaries for electrical power or valve operators are available (e.g. Compres Air)
8.00) Control RCS depressurization	Monitor Pzr pressure and RCP operation to avoid equipment failure.
8.01) Stop two RCPs	As part of the Trip 2/Leave 2 strategy two RCPs may be stop Check CEN-152
8.02) Monitor RCP operating limits	If RCP operation is continued, monitor RCP parameters to ensure that the reduced-pressure operation is within RCP operating limitations.
8.03) Stop all RCPs	If RCP operating limitations can not be met, Stop all pumps
9.00) Control SG pressure	The operator must control SG pressure to avoid later lifting SG safeties and releasing radioactive steam to the environment.
9.01) Control RCS heat removal	To control isolated SG pressure, prior to isolating the SG, verify or reduce RCS temperature first to less than safety saturation pressure. [545degF]
9.02) Maintain SG inventory	To support cooldown of the RCS, SG inventory must be maintained preferrably in the normal level band (tubes covered).
9.03) Control Main Feedwater to SGs	Maintain SG level in normal band to maximize heat removal by controlling main feedwater flow to the SGs.
9.04) Control Emergency Feedwater to SGs	Maintain SG level in normal band to maximize heat removal by controlling Emergency feedwater flow to SGs
10.00) Isolate the most affected SG	Isolate the steam generator selected as most affected. Close steam valves and feedwater valves when RCS temperature conditions are achieved.
10.01) Determine Affected Steam Generator	Monitor Steam generator parameters to determine the affected SG by comparing the two SG's parameters.
10.02) Monitor SG inventory	To detect which SG is affected, monitor both SGs for differences in inventory to determine which SG has RCS ingress

Nuplex 80 + Functional Analysis
Operational Sequence Description
by Gross Function/Sub-Function

Gross Functions/Sub-Functions	Brief Description of Operations
10.03) Determine SG radioactivity	Sample both SG and determine which SG has the higher radioactivity
11.00) Confirm correct SG isolated	Monitor parameters of both Steam Generator to determine if the correct steam generator was isolated.
11.01) Monitor SG inventory	Monitor SG pressure and level in the isolated and unisolated SG to determine if correct SG was isolated.
11.02) Monitor RCS heat removal	Monitor RCS temperatures, the isolated SG loop will stablize at the hot leg temperature indicating no heat removal - an indication of a isolated SG.
12.00) Maintain isolated SG parameters	Maintain the isolated steam generator level within displays. SG Blowdown draining will prevent overpressurizing SG, lifting safeties and rad releases.
12.01) Maintain isolated SG inventory	Maintain SG level in normal band using blowdown
12.02) Maintain SG pressure	Maintain isolated SG pressure less than safety valve setting by cooling RCS and blowdown
12.03) Maintain isolated SG pressure w/TBS	Reduce SG pressure and level by steaming to the condenser
12.04) Maintain isolated SG pressure W/ADVs	Reduce SG pressure and level by steaming to the atmosphere
13.00) Maintain unisolated SG parameters normal	Maintain unisolated steam generator level in the normal band using emergency feedwater to have a RCS heat removal method available.
13.01) Maintain SG inventory	To support the cooldown SG inventory must be maintained preferrably in the normal level band for most effective RCS heat removal
13.02) Control Main Feedwater to SGs	Maintain SG level in normal band to maximize heat removal by controlling main feedwater flow to the unisolated SG
13.03) Control Emergency Feedwater to SGs	Maintain SG level in normal band to maximize heat removal by controlling Emergency feedwater flow to unisolated SG
14.00) Monitor and Control Response of SI	Check RCS inventory parameters to determine when SI makeup can be throttled or stopped.
14.01) Monitor for Termination Criteria	Monitor RCS parameters to determine if termination criteria have been met.
14.02) Throttle or Stop SI	If termination criteria are satisfied throttle or stop SI flow to the RCS as appropriate
14.03) Confirm RCS inventory control	Throttling or Stopping SI flow may cause a transient on the RCS. Adjust or Stop SI flow as necessary.

Nuplex 80 + Functional Analysis
Operational Sequence Description
by Gross Function/Sub-Function

Gross Functions/Sub-Functions	Brief Description of Operations
15.00) Reinitiate Full SI flow if required	If core cooling, RCS inventory, and RCS heat removal cannot be restored when SI flow is terminated, then reinitiate full SI flow
15.01) Monitor RCS parameters	Monitor RCS parameters to confirm SI termination criteria are still being met.
15.02) Reinitate Full SI flow	Start SI pumps or open valves to reinitate full SI flow
15.03) Confirm RCS inventory control	Monitor RCS parameters to determine that reinitation of full flow is controlling RCS inventory
16.00) Ensure proper charging and letdown	When pressurizer level is present, then ensure that charging and letdown (and SI flow if operating) are maintaining RCS inventory.
17.00) Ensure core/vessel material integrity	Maintain the RCS pressure within acceptable Post Accident Pressure-Temperature limits. Control to minimize further stresses on materials.
17.01) Monitor RCS for P-T violations	Monitor RCS parameters and compare to Technical Specs to determine whether P-T limits have been violated
17.02) Stop the Cooldown	If P-T limits appear to be violated, then stop any cooldown of the RCS by reducing the steaming of the unaffected SG.
17.03) Control RCS pressure (method 1)	Operate main spray to reduce pressure to within P-T limits
17.04) Control RCS pressure (method 2)	Operate auxiliary spray to reduce pressure to within P-T limits.
17.05) Control RCS pressure (method 3)	If overpressure condition is caused by HPSI or charging flow, then throttle or stop HPSI or charging and letdown excess makeup to within P-T.
17.06) Maintain SG inventory	To support any changes in the cooldown, changes to maintain SG inventory will also be required.
17.07) Control Main Feedwater to SGs	Maintain SG level in normal band to maximize heat removal by controlling main feedwater to SGs
17.08) Control Emergency Feedwater to SGs	Maintain SG level in normal band to maximize heat removal by controlling Emergency feedwater flow to SGs
18.00) Determine need for forced cooling	If the RCPs are not operating, then determine the need to restart to ensure core heat removal.
18.01) Determine present heat removal adequacy	Evaluate RCS and core heat removal under the existing natural circulation conditions and determine if current heat removal is inadequate.

Nuplex 80 + Functional Analysis
Operational Sequence Description
by Gross Function/Sub-Function

Gross Functions/Sub-Functions	Brief Description of Operations
18.02) Monitor RCS parameters	Assess current RCS pressure and temperature, if close to hot standby conditions, then it may be more desirable to do a forced circ. cooldown.
18.03) Determine need for Main Pzr spray	If auxiliary spray is not providing the desired depressurization rate, having the capability for main spray may be desired.
19.00) Determine if conditions permit RCP start	Determine whether conditions permit the restart of RCPs
19.01) Ensure electrical power to RCPs	Ensure before closing RCP breakers to start RCPs that electrical power is available from a reliable source
19.02) Maintain SG inventory	Starting RCPs may cause a thermal transient in a SG, monitor SG level and make adjustments as needed to maintain inventory
19.03) Maintain RCS inventory	Starting RCPs may cause a RCS transient or collapse any voiding that may exist, monitor pressurizer level to ensure inventory is maintained
19.04) Monitor core heat removal	To ensure that forced circulation is being directed through the core, monitor core temperature and core subcooling to determine core heat removal
20.00) Restart RCPs	Operations to restart RCPs after RCS depressurization event which warranted the pumps to be stopped.
20.01) Maintain RCS inventory	Ensure makeup flow available to compensate for shinkage after RCP is started (shrinkage may be due to void collapse) using charging & HPSI flow
20.02) Start RCP	Start RCPs in opposite loops, one at a time until two are running
20.03) Monitor RCS parameters for Forced Circ.	Restarting RCPs may cause a transient due to loop shrinkage and/or steam void condensation. Monitor RCS parameters to continue RCP operation.
21.00) Verify Natural Circulation cooling	If no RCPs are operating, then verify natural circulation flow is cooling the core adequately.
21.01) Monitor RCS parameters for Natural Circ.	Approx (5 - 15 minutes) after RCPs are tripped, natural circulation conditions should be observed.
22.00) Control Reactivity	Borate the RCS to maintain shutdown margin in accordance with Technical specifications for a cooldown. Note: decrease temp adds + reactivity to core
22.01) Borate the RCS	Borate the RCS using charging and letdown to add borated water and letdown excess inventory.

Nuplex 80 + Functional Analysis
Operational Sequence Description
by Gross Function/Sub-Function

Gross Functions/Sub-Functions	Brief Description of Operations
22.02) Prevent dilution (method 1)	Borate the entire RCS (including the mass of the Pzr) to cold shutdown conditions.
22.03) Prevent dilution (method 2)	Use main or auxiliary spray to increase or mix to maintain Pressurizer boron concentration within [illegible]0 ppm of RCS boron concentration
23.00) Perform a controlled cooldown	Perform a controlled cooldown using forced or natural circ. to reduce RCS temperatures to SDC entry conditions.
23.01) Control cooldown w/Turbine Bypass Sys	If the condenser is available, cooldown the RCS by steaming the least affected Steam Generator using the Turbine Bypass system.
23.02) Control cooldown w/Atmospheric Dumps	If the condenser is not available, control t[illegible] steaming the unaffected steam generator w[illegible] Dump valves
24.00) Compensate for RCS shrinkage	During the cooldown RCS inventory [illegible] charging and letdown and SI (v[illegible] criteria met) to maintain lvl
25.00) Ensure vessel P-T limits maintained	Maintain the RCS pressure with acce[illegible] limits during the cooldown. Control to minimize further stresses on materials.
25.01) Monitor RCS for P-T violations	Monitor RCS parameters and compare to Technical Specs to determine whether P-T limits have been violated.
25.02) Stop the Cooldown	If P-T limits appear to be violated, then stop any cooldown of the RCS by reducing the steaming of the unaffected SG.
25.03) Control RCS pressure (method 1)	Operate main spray to reduce pressure to within P-T limits.
25.04) Control RCS pressure (method 2)	Operate auxiliary spray to reduce pressure to within P-T limits.
25.05) Control RCS pressure (method 3)	If overpressure condition is caused by SI or charging flow, then throttle or stop SI or charging and letdown excess makeup to within P-T.
26.00) Control unisolated SG inventory	Maintain unisolated SG level in the normal band throughout the cooldown using main or emergency feedwater.
26.01) Maintain SG inventory	To support any changes in the cooldown, changes to maintain SG inventory will also be required.
26.02) Control Main Feedwater to SGs	Maintain SG level in normal band to maximize heat removal by controlling main feedwater flow to unisolated SG.
26.03) Control Emergency Feedwater to SGs	Maintain SG level in normal band to maximize heat removal by controlling Emergency feedwater flow to unisolated SG.

Nuplex 80 + Functional Analysis
Operational Sequence Description
by Gross Function/Sub-Function

Gross Functions/Sub-Functions	Brief Description of Operations
27.00) Ensure condensate reserves adequate	Monitor condensate inventory reserves to ensure adequate inventory is available to makeup the shrinkage and support the steaming during cooldown.
28.00) Cool & Depressurize Isolated SG	The isolated SG steam space will remain at high temps. due to thermal stratification and if not depressurized will hold up RCS depressurization
28.01) Control cooldown w/SG blowdown	With radioactive liquids and materials in the SG, control isolated SG cooldown by bleeding SG using Blowdown system and feeding SG with feed sys.
28.02) Control cooldown w/Turbine Bypass Sys	If the condenser is available and Techical Support Center concurrence is provided, cooldown the SG by steaming with the Turbine Bypass Sys.
28.03) Control cooldown w/Atmospheric Dumps	If the condenser is not available and Technical Support Center concurrence is provided, steam the SG to cool it using Atmospheric Dump valves
28.04) Maintain SG inventory	To support the cooling of the isolated SG, maintain SG inventory in normal band.
28.05) Control Main Feedwater to SGs	Maintain SG level in normal band to maintain control of SG pressure during cooling process.
28.06) Control Emergency Feedwater to SGs	Maintain SG level in normal band to maintain control of SG pressure during cooling process.
28.07) Maintain Isolated SG pressure	Maintain during the cooldown process or RCS pressure and SG pressure within + or - 50 psi
29.00) Check for potential Radiological release	Sampling the condensate and other connecting systems, including building sumps for activity provides an idea on radiological releases
30.00) Maintain Control of RCS pressure	During a cooldown normal power operation protection which is automatic must be "blocked", or inhibitied to avoid pressurization cold.
30.01) Block Automatic initiation of MSIS	(later)
30.02) Block Automatic initiation of SIAS	(later)
31.00) Maintain Control of RCS pressure	When RCS pressure reaches the pressure maintained in the safety injection tanks, the tanks need to isolated, vented or drained to avoid re-press.
31.01) Control RCS pressure (method 1)	Isolate Safety injection tanks.
31.02) Control RCS pressure (method 2)	Vent Safety Injection tanks to maintain SI tank pressure lower than RCS pressure

Nuplex 80 + Function Analysis
Operational Sequence Description
by Gross Function/Sub-Function

Gross Functions/Sub-Functions	Brief Description of Operations
31.03) Control RCS pressure (method 3)	Drain Safety injection tanks to lower SI tank pressure below RCS pressure.
32.00) Maintain Control of RCS pressure (LTOP)	At low RCS temperatures overpressurization transients are a concern. Establish protection to avoid the condition or its consequences
33.00) Control RCS heat removal	Determine at what point the cooldown may be stopped and SDC entry may be established. Monitor RCS parameter to determine this point.
34.00) Monitor/Control RCS voiding	If voiding in the RV head prevents depressurizing the RCS then determine whether a void does exist and remove it by pressurizing & depressurizing.
34.01) Monitor RCS inventory	Monitor RCS temperatures and pressure, Pzr level, charging and letdown to detect the presence of voiding in the RCS.
34.02) Isolate letdown	If voiding is to be eliminated, letdown is isolated to minimize any further inventory loss.
34.03) Control RCS pressure	Stop any further depressurization to prevent any further growth of void.
34.04) Collapse RCS void	To eliminate void, pressurize and depressurize the RCS, w/in P-T limits, to put cooler fluid in void region when void is compressed to condense void.

Nuplex 80 + Functional Analysis
Operational Sequence Description
by Gross Function/Sub-Function

Gross Functions/Sub-Functions	Brief Description of Operations
1.00) Standard Post Trip Actions	Specific set of operator responses to ensure all "safety functions" have been checked. Established a consistant baseline for emergencies.
1.01) Ensure Reactor Shutdown	Check for indications for reactor shutdown and follow up to ensure CEAs are bottomed.
1.02) Ensure plant electrical power available	Trip Turbine generator and align plant electrical power to a source of power. Either off-site through Xformers or Diesel generators.
1.03) Maintain RCS inventory	Check level to ensure automatic control capabilities are controlling Pressurizer level.
1.04) Maintain RCS pressure	Check pressure to ensure automatic pressure control features are controlling RCS pressure.
1.05) Maintain Core heat removal	Check for operation of RCPs.
1.06) Maintain RCS heat removal	Check SG parameters for steaming and feeding to exist or the capability to steam and feed a SG
1.07) Maintain Containment Integrity	Check containment atmosphere for signs that additional containment integrity measures may need to be taken.
1.08) Control Containment Atmosphere	Check containment atmosphere for signs that additional containment cooling measures may need to be taken.
1.09) Control Containment Combustible Gases	Check for the presence of combustible gases in containment.
2.00) Diagnosis of event	Evaluate information collected during SPTA to determine the event.
3.00) Ensure SPTA performed	Confirm Standard Post Trip Actions have been performed.
4.00) Ensure proper diagnosis of event	Evaluate information collected to confirm SPTA and determine the event.
5.00) Control RCS depressurization	RCS shrinkage causes a resultant depressurization of the RCS Automatic RCS makeup (Safety Injection) is checked or ensured.
5.01) Ensure Safety Injection	Control of RCS depressurization due to contractionof RCS fluid is to be check by automatic Safety injection at a setpoint if not manually do so
6.00) Maximize Safety Injeciton	RCS fluid is shrinking, all practical RCS makeup lineups should be operating, maximize the makeup flow.
6.01) Maximize Charging flow	Makeup by CVCS charging flow must bw maximized.
6.02) Start idle SI Pumps	Makeup from SI must be maximized. Use SIS flow characteristic curves to verify maximum flow.

Nuplex 80 + Functional Analysis
Operational Sequence Description
by Gross Function/Sub-Function

Gross Functions/Sub-Functions	Brief Description of Operations
6.03) Ensure electrical power to SI components	If flow can not be maximized ensure that component have power available.
6.04) Ensure va ·e aligments	If flow can not be maximized ensure valve ailengments to send makeup to RCS are correct.
6.05) Ensure necessary auxiliaries operating	If flow can not be maximized ensure that any necessary auxiliaries for electrical power or valve operators are available (e.g. Compres Air)
7.00) Control RCS depressurization	If RCS makeup methods are not adequate to control RCS depressurization, then stop two RCPs at a [pressure] Otherwise continue operation.
7.01) Stop two RCPs	As part of the Trip2/Leave2 strategy two RCPs may be stopped
7.02) Monitor RCP operating limits	If RCP operation is continued, monitor RCP parameters to ensure that the reduced-pressure operation is within RCP operating limitations.
8.00) Determine Affected Steam Generator	Monitor Steam generator parameters and RCS temperature to determine the affected SG by comparing the two SG's parameters.
8.01) Monitor SG inventory	To detect which SG is affected, monitor both SGs for defferences in inventory to determine which SG has the break.
8.02) Isolate the most affected SG	Isolate the steam generator selected as most affected. Close steam valves and feedwater valves when RCS temperature conditions are achieved.
9.00) Confirm correct SG isolated	Monitor parameters of both Steam Generators to determine if the correct steam generator was isolated.
9.01) Monitor SG inventory	Monitor SG pressure and level in the isolated and unisolated SG to determine if correct SG was isolated.
9.02) Monitor RCS heat removal	Monitor RCS temperatures, the isolated SG loop will identify whether the break is upstream or downstream of the SG isolation valves.
10.00) Maintain unisolated SG parameters normal	Maintain unisolated steam generator level in the normal band using emergency feedwater to have a RCS heat removal method available if necessary.
10.01) Maintain SG inventory	To support the cooldown SG inventory must be maintained perferrably in the normal level band for most effective RCS heat removal.
10.02) Control Main Feedwater to SGs	Maintain SG level in normal band to maximize heat removal by controlling main feedwater flow to the unisolated SG

Nuplex 80 + Functional Analysis
Operational Sequence Description
by Gross Function/Sub-Function

Gross Functions/Sub-Functions	Brief Description of Operations
10.03) Control Emergency Feedwater to SGs	Maintain SG level in normal band to maximize heat removal by controlling emergency feedwater to the unisolated SG.
10.04) Control steaming of SG w/TBS	Control to stabilize RCS temperature and pressures.
10.04) Control coodown SG w/Atmospheric Dumps	Control to stabilize RCS temperatures and pressures.
11.00) Monitor and Control Response of SI	Check RCS inventory parameters to determine when SI makeup can be throttled or stopped.
11.01) Monitor for Termination Criteria	Monitor RCS parameters to determine if termination criteria have been met.
11.02) Throttle or Stop SI	If termination criteria are satisfied throttle or stop SI flow to the RCS as appropriate.
11.03) Confirm RCS inventory control	Throttling or stopping SI flow may cause a transient on the RCS. Adjust or stop SI flow as necessary.
12.00) Reinitiate Full SI flow if required	If core cooling, RCS inventory, and RCS heat removal cannot be restored when SI flow is terminated, then reinitiate full SI flow.
12.01) Monitor RCS parameters	Monitor RCS parameters to confirm SI termination criteria are still being met.
12.02) Reinitate full SI flow	Start SI pumps or open valves to reinitate full SI flow.
12.03) Confirm RCS inventory control	Monitor RCS parameters to determine that reinitation of full flow is controlling RCS inventory.
13.00) Ensure proper charging and letdown	When pressurizer level is present, then ensure that charging and letdown (and SI flow if operating) are maintaining RCS inventory.
14.00) Ensure core/vessel material integrity	Maintain the RCS pressure within acceptable Post Accident Pressure-Temperature limits. Control to minimize further stresses on materials.
14.01) Monitor RCS for P-T violations	Monitor RCS parameters and compare to Technical Specs to determine whether P-T limits have been violated.
14.02) Stop the cooldown	If P-T limits appear to be violated, then stop any cooldown of the RCS by reducing the steaming of the unaffected SG.
14.03) Control RCS pressure (method 1)	Operate main spray to reduce pressure to within P-T limits
14.04) Control RCS pressure (method 2)	Operate auxiliary spray to reduce pressure to within P-T limits.
14.05) Control RCS pressure (method 3)	If overpressure condition is caused by SI or charging flow, then throttle or stop SI or charging and letdown excess makeup to within P-T.

Nuplex 80 + Functional Analysis
Operational Sequence Description
by Gross Function/Sub-Function

Gross Functions/Sub-Functions	Brief Description of Operations
14.06) Maintain SG inventory	To support any changes in the cooldown, changes to maintain SG inventory will also be required.
14.07) Control Main Feedwater to SGs	Maintain SG level in normal band to maximize heat removal by controlling main feedwater to SGs
14.08) Control Emergency Feedwater to SGs	Maintain SG level in normal band to maximize heat removal by controlling emergency feedwater to SGs.
15.00) Maintain Containment Integrity	Check containment atmosphere for rise in pressure above the automatic containment isolation setpoint. Verify automatic isolation.
15.01) Ensure Containment Isolation	If containment atmospheric pressure is above setpoint verify automatic isolation. If no isolation occurs, then manually initiate isolation.
16.00) Control Containment Atmosphere	If containment atmosphere is heating up and pressurizing implement containment cooling methods.
16.01) Control Containment Fan Cooling	Establish containment cooling using emergency fan coolers, normal containment cooling, and air recirculation systems to reduce temp & pressure.
16.02) Control Containment Spray Cooling	If pressure is [excessive] ensure automatic spray cooling of containment. If not actuated automatically manually do so to reduce temp & pressure.
17.00) Control Containment Pressurization	If pressure becomes [excessive] the operator must take steps to maintain containment pressure below design pressure.
17.01) Control Containment Spray Cooling	If pressure is [excessive] ensure automatic containment spray cooling. If not actuated automatically do so manually to reduce pressure.
17.02) Aliagn External H2 Recombiners	At [excessive] contianment pressures the affects of hydrogen burns are more severe. If plant design has an external H2 recombiner, align it for use.
18.00) Monitor for Hydrogen in Containment	Place H2 monitor is service to determine presence and concentration of hydrogen in containment.
19.00) Control Containment hydrogen	If containment hydrogen is present use approved methods to remove it.
19.01) Operate Hydrogen Recombiners	If containment hydrogen is present operate the H2 recombiner to remove the hydrogen.
19.02) Operate Hydrogen Purge	If containment hydrogen is present and approval to operate H2 purge system is obtained, operate the hydrogen purge system to remove hydrogen.

Nuplex 80 + Functional Analysis
Operational Sequence Description
by Gross Function/Sub-Function

Gross Functions/Sub-Functions	Brief Description of Operations
20.00) Determine need for forced cooling	If the RCPs are not operating, then determine the need to restart to ensure core heat removal.
20.01) Determine present heat removal adequacy	Evaluate RCS and core heat removal under the existing natural circulation condition and determine if current heat removal is inadequate.
20.02) Monitor RCS parameters	Assess current RCS pressure and temperature, if close to hot standby conditions, then it may be more desireable to do a forced circ. cooldown.
20.03) Determine need for Main Pzr spray	If auxiliary spray is not provideing the desired depressurization rate, having the capability for main spray may be desired.
21.00) Determine if conditions permit RCP start	Determine whether conditions permit the restart of RCPs
21.01) Ensure electrical power to RCPs	Ensure before closing RCP breakers to start RCPs that electrical power is available from a reliable source.
21.02) Maintain SG inventory	Starting RCPs may cause a thermal transient in a SG, monitor SG level and make adjustments as needed to maintain inventory.
21.03) Maintain RCS inventory	Starting RCPs may cause a RCS transient or collapse any voiding that may exist, monitor pressurizer level to ensure inventory is maintained.
21.04) Monitor core heat removal	To ensure that forced circulation is being directed through the core, monitor core temperature and core subcooling to determine core heat removal
22.00) Restart RCPs	Operations to restart RCPs after RCS depressurization event which warranted the pumps to be stopped.
22.00) Verify Natural Circulation cooling	If no RCPs are operating, the verify natural circulation flow is cooling the core adequately.
22.01) Maintain RCS inventory	Ensure makeup flow available to compensate for shrinkage after RCP is started (shrinkage may be due to void collapse) using charging & SI flow
22.02) Start RCP	Start RCPs in opposite loops, one at a time until two are running
23.00) Verify Natural Circulation cooling	If no RCPs are operatin, then verify natural circulation flow is cooling the core adequately.
23.01) Monitor RCS parameters for Natural Circ.	Approx [5 -15 minutes] after RCPs are tripped, natural circulation conditions should be observed.
24.00) Evaluate need for a cooldown	Evaluate plant conditions to determine if a cooldown is needed to place the plant in a safe condition for repair and recovery.

Nuplex 80 + Functional Analysis
Operational Sequence Description
by Gross Function/Sub-Function

Gross Functions/Sub-Functions	Brief Description of Operations
24.01) Ensure condensate reserves adequate	To continue to provide a source for the secondary heat sink condensate inventories need to be monitored and replenished as necessary.
24.02) Control RCS pressure	To continue to operate in hot standby the ability to maintain pressure must be considered to determine whether to cooldown or not.
25.00) Control Reactivity	Borate the RCS to maintian shutdown margin in accordance with Technical specifications for a cooldown. Note: decrease temp adds + reactivity to core
25.01) Borate the RCS	Borate the RCS using charging and letdown to add boreted water and letdown excess inventory.
25.02) Prevent dilution (method 1)	Borate the entire RCS (including the mass of the Pzr) to cold shutdown conditions.
25.03) Prevent dilution (method 2)	Use main or auxiliary spray to increase or mix to maintain Pressurizer boron concentration within [50 ppm] of RCS boron concentration.
26.00) Perform a controlled cooldown	Cooldown the plant in accordance with Technical Specs.
26.01) Control cooldown w/Turbine Bypass Sys.	If condenser is available, perform a controlled cooldown using the Turbine Bypass System and either forced or natural circ. to SCS conditions.
26.02) Control cooldown w/Atmospheric Dumps	If the condenser is not available, control the cooldown by steaming the Steam Generators with the Atmospheric Dump Valves.
27.00) Ensure proper charging and letdown	Once RCS inventoyr has been stabilized ensure makeup and letdown are controlled to compensate for [RCS shrinkage, SI makeup, and Pzr saturation.
28.00) Ensure vessel P-T limits maintained	Throughout the cooldown and depressurization monitor for violations of P-T limits. If appear to be violated stop cooldown and restore P-T.
28.01) Monitor RCS for P-T violations	Monitor RCS parameters and compare to Technical Specs to determine whether P-T limits have been violated.
28.02) Stop the Cooldown	If P-T limits appear to be violated, then stop the cooldwon by reducing the steaming of the SGs.
28.03) Control RCS pressure (method 1)	Operate main spray to reduce pressure to within P-T limits.
28.04) Control RCS pressure (method 2)	Operate auxiliary spray to reduce pressure to within P-T limits.
28.05) Control RCS pressure (method 3)	If overpressure condition is caused by SI or charging flow, then throttle or stop SI or charging and letdown excess makeup to within P-T.

Nuplex 80 + Functional Analysis
Operational Sequence Description
by Gross Function/Sub-Function

Gross Functions/Sub-Functions	Brief Description of Operations
28.06) Maintain SG inventory	To support any cooldown, SG inventory must be maintained.
28.07) Control Main Feedwater to SGs	Maintain SG level in normal band to maximize heat removal by controlling main feedwater to SGs.
28.08) Control Emergency Feedwater to SGs	Maintain SG level in normal band to maximize heat removal by controlling Emergency Feedwater flow to SGs.
29.00) Maintain isolated SG parameters	Maintain the isolated steam generator level within displays. SG blowdown due to the break
29.01) Maintain isolated SG inventory	If the Break is isolable, maintain the isolated SG inventory in the normal band.
30.00) Ensure condensate reserves adequate	To continue to provide a source for the secondary heat sink condensate inventories need to be monitored and replenished as necessary.
31.00) Maintain Control of RCS heat removal	Block automatic initiation of MSIS as the cooldown and depressurization proceeds.
31.01) Block Automatic initation of MSIS	(later)
32.00) Maintain Control of RCS pressure	After RCS is depressurized to less than Safety Injection Tank pressure, isolate, vent or drain SI tank to prevent repressurization.
32.01) Control RCS pressure (method 1)	Isolate Safety Injection tanks
32.02) Control RCS pressure (method 2)	Vent Safety Injection tanks to maintain SI tank pressure lower than RCS pressure.
32.03) Control RCS pressure (method 3)	Drain Safety Injection tanks to lower SI tank pressure below RCS pressure.
33.00) Maintain Control of RCS pressure	Establish Low Temperature Overpressure protection.
34.00) Control Core heat removal	If shutdown cooling operation cannot be initiated, then use simultaneous hot and cold SI to maintain core cooling.
35.00) Control RCS heat removal	When shutdown cooling system entry conditions are established initiate SCS operation.
36.00) Monitor/Control RCS Voiding	Monitor for the presence of voids. If voiding is present and inhibits depressurization, then eliminate the void.
36.01) Monitor RCS inventory	Monitor RCS temperature & pressures, Pzr level, charging & letdown to detect the presence of voiding.
36.02) Isolate letdown	If voiding is to be eliminated, letdown is isolated to minimize any further inventory loss.

Nuplex 80 + Functional Analysis
Operational Sequence Description
by Gross Function/Sub-Function

Gross Functions/Sub-Functions	Brief Description of Operations
36.03) Control RCS pressure	Stop any further depressurization to prevent any further growth of void.
36.04) Collapse RCS voids	To eliminate void, pressurize and depressurize the RCS w/in P-T limits to put cooler fluid in void region when void is compressed to condense void.

Nuplex 80 + Functional Analysis
Operational Sequence Description
by Gross Function/Sub-Function

Gross Functions/Sub-Functions	Brief Description of Operations
1.00) Standard Post Trip Actions	Specific set of operator responses to ensure all "safety functions" have been checked. Establish a consistent baseline for emergencies.
1.01) Ensure Reactor Shutdown	Check for indications for reactor shutdown and follow up to ensure CEAs are bottomed.
1.02) Ensure plant electrical power available	Trip Turbine generator and align plant electrical power to a source of power. Either off-site through Xformers or Diesel generators
1.03) Control RCS inventory	Check level to ensure the automatic control capabilities are controlling Pressurizer level.
1.04) Control RCS Pressure	Check pressure to ensure automatic pressure control features are controlling RCS pressure.
1.05) Control Core Heat Removal	Check for operation of RCPs.
1.06) Control RCS Heat Removal	Check SG parameters for steaming and feeding to exist or the capability to steam and feed a SG.
1.07) Maintain Containment Integrity	Check containment atmosphere for signs that additional containment integrity measures may need to be taken.
1.08) Control Containment Atmosphere	Check containment atmosphere for signs that additional containment cooling measures may need to be taken.
1.09) Control Containment Combustible Gases	Check for the presence of combustible gases in containment.
2.00) Diagnosis of event	Evaluate information collected during SPTA to determine event.
3.00) Ensure SPTA performed	Confirm Standard Post Trip Actions have been performed.
4.00) Confirm diagnosis of event	Evaluate information collected to confirm SPTA and determine event.
5.00) Control RCS heat input	With the ability to remove heat from the RCS reduced, heat input is to be minimized.
5.01) Stop all RCPs	Tripping all RCPs minimizes heat input. Natural circulation heat removal is then used to remove the core decay heat.
6.00) Determine cause of event	Evaluate information collected and determine if cause is due to a feed line break.
6.01) Isolate the Feedwater break	If suspect a feed line break, then isolate the break.
6.02) Monitor SG inventory	Monitor SG inventory to determine if the break is isolated. If the break is unisolable from the SG exit to the ESDE strategy.

Nuplex 80 + Functional Analysis
Operational Sequence Description
by Gross Function/Sub-Function

Gross Functions/Sub-Functions	Brief Description of Operations
7.00) Restored? No	Strategy branches for feedwater not restored, and feedwater restored. This Branch Feedwater not restored.
8.00) Control RCS heat removal	Attempt to restore either main and/or emergency feedwater to regain control of RCS heat removal via SG.
8.01) Ensure Main Feedwater to SGs	Restor main feedwater to maintain SG level in normal band to maximize heat removal by establishing and controlling flow.
8.02) Ensure Emergency Feedwater to SGs	Restore emergency feedwater to maintain SG in normal band to maximize heat removal by establishing and controlling flow.
9.00) Isolate non-vital sources of SG losses	Without feedwater restored reduce SG inventory loss by isolating any non-vital secondary discharges.
9.01) Isolate SG blowdown	SG blowdown is a source of inventory loss to be isolated.
9.02) Isolate SG sampling	SG sampling is an inventory loss to be isolated.
9.03) Isolate (other) SG discharges	Isolate any other SG discharges which are considered non-vital resulting in a loss of SG inventory.
10.00) Control SG depressurization	Depressurize the SG in order to establish the availability to use alternate low pressure feed sources.
10.01) Ensure condensate to SGs	(later)
10.02) Ensure Firepump to SGs	(later)
11.00) Monitor RCS heat removal	Monitor SG parameters and RCS temperature to determine adequacy of heat removal.
12.00) Restored? Yes	Strategy branches for feedwater not restored and feedwater restored. This branch is for feedwater restored.
12.01) Control Main Feedwater Flow to SGs	Restore feedwater and prevent feed ring damage by limiting the rate of feedwater flow to restore and maintain level.
12.02) Maintain SG inventory	To support any changes in heat removal, controlled changes in SG inventory will also be required.
13.00) Control RCS heat removal	Control steaming of SG to limit heatup or cooldown of the plant after the reactor trip
13.01) Control cooldown w/Turbine Bypass Sys.	If the condenser is available, control RCS heat removal by steaming the SGs using the Turbine Bypass System
13.02) Control cooldown w/Atmospheric Dumps	If condenser is not available, control the cooldown by steaming the SGs with the Atmospheric Dump Valves
13.03) Maintain SG inventory	To support any changes in the cooldown, controlled changes in SG inventory will also be required.

Nuplex 80 + Functional Analysis
Operational Sequence Description
by Gross Function/Sub-Function

Gross Functions/Sub-Functions	Brief Description of Operations
14.00) Ensure condensate reserves adequate	To continue to provide a source of the secondary heat sink condensate inventories need to be monitored and replenished as necessary.
15.00) Ensure proper charging and letdown	Once RCS inventory has been stabilized ensure makeup and letdown are controlled to compensate for RCS leakage, expansion, and Pzr saturation.
16.00) Ensure vessel P-T limits maintained.	Throughout the event monitor for violations of P-T limits. If appear to be violated stop any RCS cooldown and restore P-T.
16.01) Monitor RCS for P-T violations	Monitor RCS parameters and compare to Technical Specs. to determine whether P-T limits have been violated.
16.02) Stop the cooldown	If P-T limits appear to be violated, then stop any cooldown of the RCS by reducing the steaming of SGs.
16.03) Control RCS pressure (method 1)	Operate auxiliary spray to reduce pressure to within P-T limits.
16.04) Control RCS pressure (method 2)	If overpressure condition is caused by SI or charging flow. Then throttle or stop SI or charging and letdown excess makeup to within P-T
17.00) Control RCS and core heat removal	With RCPs not operating, verify natural circulation conditions are established for heat removal via at least steam generator.
17.01) Monitor RCS parameter for Natural Circ.	Approx. (5-15 minutes) after RCPs are tripped, natural circulation conditions should be observed.
18.00) Determine need for forced cooling	Before RCPs may be started the need for forced circulation must be assessed and balanced against the risk of damage to the RCP seals.
18.01) Determine present heat removal adequate	Evaluate RCS and core heat removal under the existing natural circulation conditions and determine if current heat removal is inadequate.
18.02) Monitor RCS parameters	Assess current RCS pressure and temperatures, if close to hot standby conditions, then it may be more desirable to do a forced circ. cooldown.
18.03) Determine need for main Pzr spray	If auxiliary spray is not providing the desired depressurization rate, having the capability for main spray may be desired.
19.00) Determine if conditions permit RCP start	If RCP restart is to be attempted, then ensure restart criteria are met.
20.00) Restart RCPs	Select two RCPs (in opposite loops), then start RCPs, on at a time as follows:

Nuplex 80 + Functional Analysis
Operational Sequence Description
by Gross Function/Sub-Function

Gross Functions/Sub-Functions	Brief Description of Operations
20.01) Control RCS inventory	Ensure makeup flow available to compensate for shrinkage after RCP is started (shrinkage may be due to void collapse) using charging and SI flow.
20.02) Start RCP	Start RCPs in opposite loops, one at a time until two are running.
20.03) Monitor RCS parameters for Forced Circ.	Restarting RCPs may cause a treinsient due to loop shrinkage and/or steam voil condensation. Monitor RCS parameters to continue RCS operation.
21.00) Control RCS inventory	If operating, monitor the operation of safety injeciton and terminate or throttle its operation if RCS inventory is under control (See criterion)
21.01) Monitor for Termination criteria	Monitor RCS parameters to determine if termination criteria have been met.
21.02) Throttle or Stop SI	If termination criteria are satisfied throttle or stop SI flow to the RCS as appropriate.
21.03) Confirm RCS inventory control	Throttling or stopping SI flow may cause a transient on the RCS. Adjust or stop SI flow as necessary.
22.00) Control RCS inventory	Reinitiate full safety injection flow if the termination criteria can not be maintained.
22.01) Monitor RCS parameters	Monitor RCS parameters to confirm SI termination criteria are still being met.
22.02) Reinitate full SI flow	Start SI pumps or open valves to reinitate full SI flow.
22.03) Confirm RCS inventory flow	Monitor RCS parameters to determine that reinitaion of full flow is controlling RCS inventory.
23.00) Evaluate need for a cooldown\	Evaluate plant conditions to determine if a cooldown is needed to place the plant in a safe condition for repair and recovery.
23.01) Ensure condensate reserves adequate	To continue to provide a source for the secondary heat sink condensate inventories need to be monitored and replenished as necessary.
23.02) Control RCS pressure	To continue to operate in hot standby the ability to maintain pressure must be considered to determine whether to cooldown or not.
24.00) Control reactivity	Borate the RCS to maintain shutdown margin in accordance with Technical Specifications.
24.01) Borate the RCS	Borate the RCS using charging and letdown to add borated water and letdown excess inventory.

Nuplex 80 + Functional Analysis
Operational Sequence Description
by Gross Function/Sub-Function

Gross Functions/Sub-functions	Brief Description of Operations
25.00) Control RCS heat removal and pressure	Block automatic initiation of MSIS, CIAS, CSAS, and SIAS as the cooldown and depressurization proceeds.
25.01) Block Automatic initiation of MSIS	(later)
25.02) Block Automatic initiation of SIAS	(later)
26.00) Control RCS pressure	After RCS is depressurized to less than Safety Injection Tank pressure, isolate, vent, or drain SI tank to prevent repressurization.
26.01) Control RCS pressure (method 1)	Isolate Safety Injection tanks
26.02) Control RCS pressure (method 2)	Vent Safety Injection tanks to maintain SI tank pressure lower than RCS pressure.
26.03) Control RCS pressure (method 3)	Drain Safety Injection tanks to lower SI tank pressure below RCS pressure.
27.00) Control RCS pressure	Establish Low Temperature Overpressure Protection.
28.00) Control RCS heat removal	When shutdown cooling system entry conditions are established initiate SCS operation.
29.00) Monitor/Control RCS voiding	Monitor for the presence of voids. If voiding is present and it inhibits depressurization, then eliminate the void.
29.01) Monitor RCS inventory	Monitor RCS temperature & pressures, Pzr level, charging & letdown to detect the presence of voiding.
29.02) Isolate Letdown	If voiding is to be eliminated, letdown is isolated to minimize any further inventory loss.
29.03) Control RCS pressure	Stop any further depressurization to prevent any further growth of the void.
29.04) Collapse RCS voids	To eliminate voids, pressurize and depressurize the RCS w/in P-T limits to put cooler fluid in the void region when void is compressed to condense void

Nuplex 80 + Functional Analysis
Operational Sequence Description
by Gross Function/Sub-Function

Gross Functions/Sub-Functions	Brief Description of Operations
1.00) Standard Post Trip Actions	Specific set of operator responses to ensure all "Safety functions" have been checked. Established a consistent baseline for emergencies.
1.01) Ensure Reactor Shutdown	Check for indications for reactor shutdown and follow up to ensure CEAs are bottomed.
1.02) Ensure plant electrical power available	Trip Turbine generator and allign plant electrical power to a source of power. Either off-site through Xformers or Diesel generators.
1.03) Control RCS inventory	Check level to ensure the automatic control capabilities are controlling Pressurizer Level
1.04) Control RCS pressure	Check pressure to ensure automatic pressure control features are controlling RCS pressure.
1.05) Control Core Heat Removal	Check for operation of RCPs.
1.06) Control RCS heat removal	Check SG parameters for steaming and feeding to exist or the capability to steam and feed a SG
1.07) Maintian Containment Integrity	Check containment atmosphere for signs that additional containment integrity measures may need to be taken
1.08) Control Containment Atmosphere	Check containment atmosphere for signs that additional containment cooling measures may need to be taken
1.09) Control Containment Combustible Gases	Check for the presence of combustible gases in containment
2.00) Diagnosis of event	Evaluate information collected during SPTA to determine event
3.00) Ensure SPTA performed	Confirm Standard Post Trip Actions have been performed.
4.00) Confirm diagnosis to event	Evaluate information collected to confirm SPTA and determine event.
5.00) Control RCS heat removal	Control steaming and feeding of SG to limit heatup or cooldown or the plant after a Reactor trip.
5.01) Maintain SG inventory	Control feedwater to SG to maintain adequate inventory for steaming SG for heat removal.
5.02) Control Emergency Feedwater to SGs	Restore or Maintain SG level in normal ban to maximize heat removal capability of SG.
5.03) Control SG pressure (method 1)	If the condenser is available, control the steaming of the SGs with the Turbine Bypass system to control RCS heat removal and SG pressure.
5.04) Control SG pressure (method 2)	If the condenser is not available, control the steaming of the SGs with the atmospheric dump valves to control RCS heat removal and SG pressure

Nuplex 80 + Functional Analysis
Operational Sequence Description
by Gross Function/Sub-Function

Gross Functions/Sub-Functions	Brief Description of Operations
6.00) Ensure status of plant electrical buses	In event that electrical AC is recovered, this action protects sources having limited load capabilities and controls restoration.
7.00) Control plant electrical distribution	If electrical AC power is available, restore power to designated vital buses then non-vital buses.
7.01) Ensure emergency AC power available	Communicate with plant security and operators to restore a source of electrical AC power (e.g. Diesel Generator) locally as required.
7.02) Control DC battery drain	Communicate with plant security and operators to open bkrs to designated loads determined to be "unnecessary" to conserve DC power.
8.00) Control RCS inventory	Communicate with plant security and operators (as necessary) to reduce RCS leakage by ensuring non-essential losses are isolated.
8.01) Isolate Letdown	To preclude a loss of RCS inventory to the CVCS.
8.02) Isolate SCS RCS suction valves	To preclude a loss of RCS inventory through the SCS lines.
8.03) Isolate RCP controlled bleedoff	To preclude a loss of RCS inventory through the RCP seals and controlled bleedoff lines.
8.04) Isolate RCS charging	To preclude loss of RCS inventory to the CVCS
8.05) Isolate RCS sample lines	All sampling lines should be isolated to minimize RCS inventory loss.
9.00) Control RCS and core heat removal	If no RCPs are operating, then verify natural circulation flow is cooling the core adequately.
9.01) Monitor RCS parameters for Natural Circ.	Approx. [5 - 15 minutes] after RCPs are tripped, natural circulation conditions should be observed.
9.02) Control SG steaming w/Atmospheric Dumps	Communicate with plant security and operators as needed to support any SG steaming.
9.03) Control Emergency Feedwater to SGs	To remove heat from the RCS SG inventory must also be maintained. Communicate with plant security and operators as needed to do this.
10.00) Maintain core heat removal	Maintain subcooling based on CET temperatures if necessary ensure two phase Natural circulation is established.
10.01) Control core heat removal (method 1)	Reflux cooling: two phase liquid may exist in the hot leg and is condensed by steaming the SG "U" tube bundle with flow back to the core.
10.02) Control core heat removal (method 2)	Two phase NC: steam from core goes past the "U" tube bend and is condensed via SG steaming on the cold leg side with flow to the core.

Nuplex 80 + Functional Analysis
Operational Sequence Description
by Gross Function/Sub-Function

Gross Functions/Sub-Functions	Brief Description of Operations
11.00) Control RCS heat removal and pressure	As the plant cools off, block automatic initiation of MSIS, CIAS, CSAS, and SIAS as the cooldown and depressurization proceeds.
11.01) Block automatic initiation of MSIS	(later)
11.02) Block Automatic initiation of SIAS	(later)
12.00) Control plant electrical distribution	When power is restored then ensure that vital equipment is supplied and the station batteries capacity is being restored, DC loads have power.
12.01) Ensure availability of vital AC electric	When AC power is restored ensure vital AC equipment have power to restore pertinent success paths (list equipment)
12.02) Ensure DC electric loads restored	Recharge the station battery and maintain DC loads.
13.00) Control reactivity	Once power is restored equipment can be made available to borate the plant to shutdown margin technical specifications
13.01) Align to borate the RCS	Once power is restored unisolate isolated systems (charging, letdown, and sampling) and energize equipment for boration.
14.00) Control RCS inventory	Monitor RCS and core parameters to ensure adequate inventory for core cooling.
14.01) Ensure proper charging and letdown	Once RCS inventory has stabilized ensure makeup an letdown are controlled to compensate for changes in RCS inventory.
14.02) Control SI and charging flow	If RCS inventory control can not be established, ensure all available charging and SI pumps are injecting water into the core.
15.00) Ensure vessel P-T limits maintained.	Maintain RCS parameters within acceptable P-T limits during the cooldown. Control to minimize further stresses on materials.
15.01) Monitor RCS for P-T violations	Monitor RCS parameters and compare to Technical Specs. to determine whether P-T limits have been violated.
15.02) Stop the Cooldown	If P-T limits appear to be violated, then stop any cooldown of the RCS by reducing the steaming of the unaffected SG.
15.03) Control RCS pressure (method 1)	Operate main spray to reduce pressure to within P-T limits.
15.04) Control RCS pressure (method 2)	Operate auxiliary spray to reduce pressure to within P-T limits.
15.05) Control RCS pressure (method 3)	If overpressure condition is caused by SI or charging flow, then throttle or stop SI or charging and letdown excess makeup to with P-T limits.

Nuplex 80 + Functional Analysis
Operational Sequence Description
by Gross Function/Sub-Function

Gross Functions/Sub-Functions	Brief Description of Operations
16.00) Monitor for Termination Criteria	Monitor RCS parameters to determine if termination criteria have been met.
16.01) Throttle or Stop SI	If termination criteria are satisfied throttle or stop SI flow to the RCS as appropriate.
16.03) Confirm RCS inventory control	Throttling or Stopping SI flow may cause a transient on the RCS. Adjust or stop SI flow as necessary.
17.00) Control RCS inventory	Reinitiate full Safety injection flow if the termination criteria can not be maintained.
17.01) Monitor RCS parameters	Monitor RCS parameters to confirm SI termination criteria are still being met.
17.02) Reinitiate Full SI flow	Start SI pumps or open valves to reinitate full SI flow.
17.03) Confirm RCS inventory control	Monitor RCS parameters to determine that reinitation of full flow is controlling RCS inventory.
18.00) Ensure cooling systems restored	(later)
18.01) Control UHS cooling flow	Ensure the Ultimate heat sink cooling flow is restored e.g. Saltwater, spray pond, etc.
18.02) Control Component Cooling Water flow	(later)
18.03) Control Site Service Water flow	(later)
19.00) Maintain containment atmosphere	(later)
20.00) Maintain control room atmosphere	(later)
21.00) Maintain Auxiliary building atmosphere	(later)

Nuplex 80 + Functional Analysis
Operational Sequence Description
by Gross Function/Sub-Function

Gross Functions/Sub-Functions	Brief Description of Operations
1.00) Maintain RCS heat removal	Maintain the RCS in a refueling shutdown condition. Use the SCS to maintain temperature between 70 degF and 130 degF and pressure at 0 psig.
2.00) Monitor Core Power	Monitor startup nuclear channels for power changes
3.00) Preparations for Refueling	Refer to # 3.01 to 3.05
3.01) Ensure crane operational	Communicate with Reactor Cavity area to verify that the (polar or overhead) crane has been mechanically check out to be operational
3.02) Control Containment Atmosphere	Communicate with Reactor Cavity area to monitor and maintain the ventalation within containment.
3.03) Ensure emergency lighting available	Monitor to verify that emergency lighting is operational and available to be used if required during the refueling
3.04) Monitor Containment Atmosphere	Monitor continuously the air within containment for radioactive particulate.
3.05) Lift/Move missle shield	Use crane to lift and move missle shield to storage location
4.00) Monitor IRWST boron concentration	Sample IRWST for boron concentration to ensure technical specifications are met.
5.00) Prepare Reactor Vessel Head for Removal	Communicate with Reactor Cavity area to coordinate for the removal of the reactor vessel head.
5.01) Uncouple CRDM	Communicate with the Reactor Cavity area to monitor and coordinate the uncoupling of the CRDMs
5.02) Disconnect CRDM cables	Communicate with Reactor Cavity area to monitor and coordinate the removal of the CRDM cables.
5.03) Remove in-core instrumentation	Communicate with the Reactor Cavity area to monitor and coordinate the removal to the in-core instrumentation and instrument cable disconnect
5.04) Disconnect CRDM cooling ducts	Communicate wtih the Reactor Cavity area to monitor and coordinate the removal of the CRDM cooling ducts
5.05) Remove vessel head insulation	Communciate with the Reactor Cavity area to monitor and coordinate the removal of the reactor vessel head insulation.
5.06) Maintain Clean Vessel head area	Communicate with the Reactor Cavity area to monitor and coordinate maintaining the cleaniness of the reactor vessel head area.
5.07) Remove vessel head nuts & studs	Communicate with the Reactor Cavity area to monitor and coordinate the removal of the Reactor Vessel head nuts & studs.

Nuplex 80 + Functional Analysis
Operational Sequence Description
by Gross Function/Sub-Function

Gross functions/Sub-Functions	Brief Description of Operations
5.08) Install Plugs	Communicate with the Reactor Cavity area to monitor and coordinate the installation of plugs to prevent the ingress pool water into the vessel.
6.00) Control RCS inventory	Communicate with Reactor Cavity area to lower reactor vessel level below the reactor vessel flange.
7.00) Install refueling pool seal	Communicate with the Reactor Cavity area to monitor and coordinate the installation of the refueling pool seal
7.01) Leak test refueling pool seal	Communicate with the Reactor Cavity area to monitor and coordinate the leak testing of the refueling pool seal
8.00) Install Reactor Vessel Lift Rig	Communicate with Reactor Cavity area to install reactor head lifting rig.
8.01) Lift/Move reactor vessel head	Communicate with Reactor Cavity area to lift and move reactor head to storage area. Ensure during lift that CEAs are uncoupled.
9.00) Prepare for fuel transfer	Prepare the transfer tube for fuel transfer
9.01) Remove transfer tube flange	Communicate with Reactor Cavity area to remove transfer tube flange.
9.02) Control RCS inventory	Communicate with Reactor Cavity area to fill refueling pool.
9.03) Align fuel transfer tube for refueling	Communicate with Reactor Cavity area to monitor and coordinate manually opening fuel transfer tube valve.
10.00) Install Guide Structure lift rig	Communicate with Reactor Cavity area to install upper guide structure lift rig.
10.01) Lift/Move guide structure	Communicate with Reactor Cavity area to monitor the lifting and moving of the upper guide structure to a storage location.
11.00) Ensure Refueling machine operational	Communicate with Refueling machine operator to verify mechanical checkout of refueling machine and checkout of the close circuit T.V.
11.01) Install refueling machine hoist	Communicate with Refueling machine operator to monitor the installation of the refueling machine hoist equipment
12.00) Remove and reload fuel	Refer to # 12.01 to 12.04
12.01) Remove Spent fuel from core	Communicate with Refueling machine operator to monitor and coordinate the removal of spent fuel from the core.
12.02) Transport spent fuel to storage	Communicate with the Refueling operator to monitor the transfer to spent fuel through the transfer tube to the storage racks

Nuplex 80 + Functional Analysis
Operational Sequence Description
by Gross Function/Sub-Function

Gross Functions/Sub-Functions	Brief Description of Operations
12.03) Transport of new fuel to core	Communicate with Refueling machine operator to monitor the transport of new fuel through the transfer tube to the core
12.04) Install new fuel in core	Communicate with the Refueling machine operator to monitor and coordinate the installation of new fuel into the core.
13.00) Monitor fuel pool parameters	Monitor fuel pool cooling, purification, and boron concentration for any changes.
13.01) Monitor RCS parameters	Monitor RCS temperature, pressure, and vessel level for changes
13.02) Monitor core power	Monitor nuclear instrumentation for changes in core power
14.00) Align fuel transfer tube for removal	Communicate with Reactor Cavity area to monitor and coordinate the manual closure of the fuel transfer tube valve.
15.00) Install Upper Guide Structure	Communicate with Reactor Cavity area to lift and install the upper guide structure, drive shaft extensions, and CEAs into the vessel.
16.00) Control RCS inventory	Communicate with the Reactor Cavity area to monitor and lower the water level in the refueling pool to below the reactor vessel flange.
17.00) Install Reactor head	Communicate with the Reactor Cavity area to monitor and coordinate the lifting and installation of the Reactor vessel head
17.01) Install Studs and bolt down head	Communicate with the Reactor Cavity area to monitor and coordinate the installation of head studs and bolts.
18.00) Install Transfer tube blind flange.	Communicate with the Reactor Cavity area to monitor and coordinate the installation of the transfer tube blind flange.
18.01) Remove the refueling pool seal	Communicate with the Reactor Cavity area to monitor the removal of the refueling pool seal.
19.00) Install Reactor Vessel Head insulation	Communicate with the Reactor Cavity area to monitor the installation of the Vessel head insulation.
20.00) Install in-core instrumentation	Communicate with the Reactor Cavity area to monitor and coordinate the installation of the in-core instrumentation and reconnect to their cables.
21.00) Install CEDM cabling	Communicate with the Reactor Cavity area to monitor and coordinate the reconnection of the CEDM cabling.
21.01) Install CEDM cooling ducts	Communicate with the Reactor Cavity area to monitor and coordinate the reconnection of the cooling water ducts for the CEDMs.

Nuplex 80 + Functional Analysis
Operational Sequence Description
by Gross Function/Sub-Function

Gross Functions/Sub-Functions	Brief Description of Operations
21.02) Install Reactor Vent piping	Communicate with the Reactor cavity area to monitor and coordinate the installation of the reactor vent piping
22.00) Install missle shield	Communicate with the Reactor Cavity area to monitor and coordinate the installation of the missle shield.

Appendix C

Task Listings by Event

The contents of this appendix provide the task statement listings, with the System Functions identified, for the NUPLEX 80+ general operations. The task listings are partitioned by gross function and subfunction for the following events:

* Task statements not detailed: Gross Functions similar to LOCA and SGTR events.

Nuplex 80 + Functional Analysis
Task Listing by Operation Sequence
and Gross/Sub-Functions

Gross Function /Sub-Functions	Task Statement	Task derived from System Function (System & Function #)
1.00) Monitor for load changes		
	Colle·* TG output information	ELEC
	Compare to previous information for changes	
1.01) Control load changes		
	Collect TG output information	ELEC
	Collect Generator Power information	ELEC
1.02) Maintain turbine speed		
	Collect TG speed information	TG
	Analyze & determine if TG speed constant	TG
	Collect MSS pressure information	MSS 1
	Analyze & determine if MSS pressure adequate	MSS 1
2.00) Monitor RCS heat removal		
	Collect SG parameter information	SG 3
	Collect RCS parameter informatin	RCS 1
	Collect MSS flow information	MSS 4
	Collect FCS flow information	FCS 1
	Compare to match MSS to FCS flow information	
	Analyze & determine adequacy of heat removal	
2.01) Monitor Core power		
	Collect NI information	RX 1
	Collect RCS parameter information	RCS 1
	Compare to previous information for changes	
2.02) Monitor Core Heat Removal		
	Collect CET temperature information	RX 1
	Collect RCS temperature information	RCS 1
	Compare temperatures	RX 1
2.03) Monitor CEA control		
	Collect RCS temperature information	RX 4
	Collect CEA position	RX 4
	Analyze & determine position above limits	RX 4
3.00) Control RCS heat removal		
	Collect RCS temperature information	RCS 1
	Collect SG parameter information	SG 1
	Analyze & determine heat removal adequate	RCS 1
3.01) Monitor Boron		
	Collect Boron information	RX 4
	Analyze & determine if within limits	RX 4

Nuplex 80 + Functional Analysis
Task Listing by Operation Sequence
and Gross/Sub-Functions

Gross Function /Sub-Functions	Task Statement	Task derived from System Function (System & Function #)
3.02) Control RCS inventory		
	Collect Pzr parameter information	PZR 2,4
	Compare with power program for Pzr level	PZR 2
	Analyze & determine if within limits	PZR 2
3.03) Control RCS pressure		
	Collect Pzr parameter information	RCS 3
	Analyze & determine if within limits	RCS 3
3.04) Maintain RCS chemistry		
	Communicate with chemist to sample RCS	COMM
	Analyze & determine if within limits	
	Communicate with chemist to adjust chemistry	COMM
4.00) Maintain SG inventory		
	Collect SG parameter information	SG 3
	Adjust feed rate to maintain level	FCS 1/SG 3
4.01) Control Main Feedwater to SGs		
	Collect MSS parameter information	MSS 1,6
	Collect FCS parameter information	FCS 1
	Compare to match steam & feed mass flows	SG 3
	Adjust feed flow to match steam flow	FCS 1
4.02) Maintain feedwater preheat		
	Collect Deaerator parameter information	FCS 1
	Collect Feedheater parameter information	FCS 1
	Analyze & determine if preheat within limits	FCS 1
4.03) Maintain condensate inventory		
	Collect Condenser hotwell information	FCS 1
	Analyze & determine inventory adequate	FCS 1
4.04) Maintain SG Chemistry		
	Communicate with Chemist to sample SGs	COMM
	Analyze chemist's results	SG
	Determine if changes in SG chemistry needed	SG
5.00) Maintain Condenser Vacuum		
	Collect Condenser parameter information	FCS 1
	Analyze and determine if vacuum adequate	FCS 1

Nuplex 80 + Functional Analysis
Task Listing by Operation Sequence
and Gross/Sub-Functions

Gross Function /Sub-Functions	Task Statement	Task derived from System Function (System & Function #)
6.00) Maintain equipment cooling		
	Collect (various)equipment cooling parameters	
	Analyze & determine if cooling changes needed	
7.00) Maintain equipment lubrication		
	Collect (various)equipment lube parameters	
	Analyze & determine if changes needed	

Nuplex 80 + Functional Analysis
Task Listing by Operation Sequence
and Gross/Sub-Functions

Gross Function /Sub-Functions	Task Statement	Task derived from System Function (System & Function #)
1.00) Authorize Load Changes		
	Communicate with Load Dispatcher	COMM
	Collect Authorization of load change	COMM
2.00) Control Load Change		
	Collect generator power parameters	ELEC
	Collect NI information	RX 1
	Collect RCS temperature information	RCS 1
	Decide rate of load change	TG
	Raise(or lower) turbine speed or load control	TG
	Analyze & determine if rate change w/in limit	
3.00) Monitor Load Change		
	Collect NI information	RX 4
	Collect RCS parameter information	RCS 1,3,7
	Collect MSS parameter information	MSS 1,2,3
	Collect SG parameter information	SG 1,3
	Collect FCS parameter information	FCS 1
	Compare with expected transient performance	
3.01) Maintain Electrical parameters		
	Collect generator parameter information	ELEC
	Analyze & determine if within tolerances	ELEC
3.02) Maintain SG inventory		
	Collect SG parameter information	SG 3
	Collect MSS parameter information	MSS 1,6
	Collect FCS parameter information	FCS 1
	Compare to match steam & feed mass flows	
	Adjust feed flow to match steam flow	FCS 1
3.03) Control Main Feedwater to SGs		
	Collect FCS parameter information	FCS 1
	Adjust feed rate to match steam flow	FCS 1
3.04) Monitor RCS inventory		
	Collect Pzr level information	PZR 2,4
	Compare with power program for Pzr level	PZR 2
3.05) Monitor Reactor Power		
	Collect NI information	RX 4
	Collect generator power information	ELEC
	Compare power information for load following	RX 1,4
	Analyze & determine core power w/in limits	RX 1,4

Nuplex 80 + Functional Analysis
Task Listing by Operation Sequence
and Gross/Sub-Functions

Gross Function /Sub-Functions	Task Statement	Task derived from System Function (System & Function #)
3.06) Monitor RCS pressure		
	Collect Pzr pressure information	PZR
	Analyze & determine if w/in control limits	
3.07) Monitor (other) auxiliaries		
	Collect (other) auxiliaries information	
	Compare with expected performance information	

Nuplex 80 + Functional Analysis
Task Listing by Operation Sequence
and Gross/Sub-Functions

Gross Function /Sub-Functions	Task Statement	Task derived from System Function (System & Function #)
1.00) Maintain RCS heat removal		
	Collect RCS temperature information	RCS 1
	Compare heat in/removal demands	RHR 3
	Analyze & determine if need to adjust HR	RHR 3
	Control RCS flow through heat exchanger	RHR 3
1.01) Monitor SCS parameters		
	Collect SCS parameter information	RHR 3
	Compare heat in/removal demands	RHR 3
	Evaluate information for changes	RHR 3
2.00) Monitor core power		
	Collect NI information	RX 1
	Evaluate information for changes	RX 4

Nuplex 80 + Functional Analysis
Task Listing by Operation Sequence
and Gross/Sub-Functions

Gross Function /Sub-Functions	Task Statement	Task derived from System Function (System & Function #)
1.00) Determine S/U Prerequisites complete		
	Collect Pre-startup checklist	
	Evaluate checklist for completeness	
	Decide if prerequisites completed	
1.01) Maintain RCS heat removal		
	Collect SG parameter information	SG 1,5
	Collect MSS flow information	MSS 4,5
	Collect RCS temperature information	RCS 1
1.02) Maintain SG inventory		
	Collect SG parameter information	SG 1,3
1.03) Control Main feedwater to SG		
	Collect FCS parameter information	FCS 1
2.00) Control Core Reactivity with CEAs		
	Refer to # 2.01 to 2.09	
2.01) Latch CEA shutdown group A to withdraw		
	Select CEA shutdown group	CEA4/FUEL3
	Confirm selection	CEA 4
	Latch CEAs	CEA 3
2.02) Withdraw CEA group A		
	Collect CEA position information	CEA 4
	Decide on position to stop at	FUEL 3
	Start CEA withdrawal	CEA 1,4
	Stop CEA withdrawal at planned position	CEA 1,4
	Confirm CEA position	CEA 4
2.03) Monitor core reactivity		
	Collect NI information	RX 1
	Collect RCS temperature information	RCS 1/RX 3
	Evaluate information	RX 4
	Decide whether to continue	FUEL 3
2.04) Latch CEA shutdown group B to withdraw		
	Select CEA shutdown group	CEA4/FUEL3
	Confirm selection	CEA 4
	Latch CEAs	CEA 3

Nuplex 80 + Functional Analysis
Task Listing by Operation Sequence
and Gross/Sub-Functions

Gross Function /Sub-Functions	Task Statement	Task derived from System Function (System & Function #)
2.05) Withdraw CEA group B		
	Collect CEA position information	CEA 4
	Decide on position to stop at	FUEL 3
	Start CEA withdrawal	CEA 1,4
	Stop CEA withdrawal at planned position	CEA 1,4
	Confirm CEA position	CEA 4
2.06) Monitor core reactivity		
	Collect NI information	RX 1
	Collect RCS temperatrue information	RCS 1/RX 3
	Evaluate information for changes	RX 4
	Decide whether to continue	FUEL 3
2.07) Latch CEA shutdown group C to withdraw		
	Select CEA shutdown group	CEA4/FUEL3
	Confirm selection	CEA 4
	Latch CEAs	CEA 3
2.08) Withdraw CEA group C		
	Collect CEA position information	CEA 4
	Decide on position to stop at	FUEL 3
	Start CEA withdrawal	CEA 1,4
	Stop CEA withdrawal at planned position	CEA 1,4
	Confirm CEA position	CEA 4
2.09) Monitor core reactivity		
	Collect NI information	RX 1
	Collect RCS temperature information	RCS 1/RX 3
	Evaluate information for changes	RX 4
	Decide whether to continue	FUEL 3
3.00) Control Core Reactivity with boron		
	Refer to # 3.01 to 3.02	
3.01) Dilute RCS		
	Decide on diluted boron concentration	FUEL 3
	Collect boron concentration information	CVCS 4
	Add dilute makeup	CVCS 4
	Letdown to maintain RCS inventory	CVCS 1
	Evaluate boron concentration (periodically)	CVCS 4
	Decide when to stop dilution	FUEL 3
3.02) Monitor core reactivity		
	Collect NI information	RX 1
	Collect RCS parameter information	RCS 1/RX 3
	Decide whether to continue	

Nuplex 80 + Functional Analysis
Task Listing by Operation Sequence
and Gross/Sub-Functions

Gross Function /Sub-Functions	Task Statement	Task derived from System Function (System & Function #)
4.00) Control Core Reactivity with CEAs		
	Refer to # 4.01 to 4.05	
4.01) Determine CEA group positions		
	Calculate CEA position	FUEL 3
4.02) Latch CEA regulating group 1		
	Select CEA regulating group	CEA4/FUEL3
	Confirm selection	CEA 4
	Latch CEAs	CEA 3
4.03) Withdraw CEA regulating group 1		
	Collect CEA position information	CEA 1,4
	Decide on position to stup	FUEL 3
	Start CEA withdrawal	CEA 1,4
	Stop CEA withdrawal at planned position	CEA 1,4
	Confirm CEA position	CEA 4
4.04) Latch CEA regulating group 2		
	Select CEA regulating group	CEA4/FUEL3
	Confirm selection	CEA 4
	Latch CEAs	CEA 3
4.05) Withdraw CEA regulating group 2		
	Collect CEA position information	CEA 1,4
	Decide on position to stop at	FUEL 3
	Start CEA withdrawal	CEA 1,4
	Stop CEA withdrawal at planned position	CEA 1,4
	Confirm CEA position	CEA 4
4.06) Latch CEA regulating group 3		
	Select CEA regulating group	CEA4/FUEL3
	Confirm selection	CEA 4
	Latch CEAs	CEA 3
4.07) Withdraw CEA regulating group 3		
	Collect CEA position information	CEA 1,4
	Decide on position to stop at	FUEL 3
	Start CEA withdrawal	CEA 1,4
	Stop CEA withdrawal at planned position	CEA 1,4
	Confirm CEA position	CEA 4
4.08) Latch CEA regulating group 4		
	Select CEA regulating group	CEA4/FUEL3
	Confirm selection	CEA 4
	Latch CEAs	CEA 3

Nuplex 80 + Functional Analysis
Task Listing by Operation Sequence
and Gross/Sub-Functions

Gross Function /Sub-Functions	Task Statement	Task derived from System Function (System & Function #)
4.09) Withdraw CEA regulating group 4		
	Collect CEA position information	CEA 1,4
	Decide on position to stop	FUEL 3
	Start CEA withdrawal	CEA 1,4
	Stop CEA withdrawal at planned position	CEA 1,4
	Confirm CEA position	CEA 4
4.10) Latch CEA regulating group 5		
	Select CEA regulating group	CEA4/FUEL3
	Confirm selection	CEA 4
	Latch CEAs	CEA 3
4.11) Withdraw CEA regulating group 5		
	Collect CEA position information	CEA 1,4
	Decide on position to stop at	FUEL 3
	Start CEA withdrawal	CEA 1,4
	Stop CEA withdrawal at planned position	CEA 1,4
	Confirm CEA position	CEA 4
4.12) Latch CEA regulating group 6		
	Select CEA regulating group	CEA4/FUEL3
	Confirm selection	CEA 4
	Latch CEAs	CEA 3
4.13) Withdraw CEA regulating group 6		
	Collect CEA position information	CEA 1,4
	Decide on position to stop	FUEL 3
	Start CEA withdrawal	CEA 1,4
	Stop CEA withdrawal at planned position	CEA 1,4
	Confirm CEA position	CEA 4
4.14) Select Manual Sequential Control Mode		
	Select Manual Sequential Control Mode	CEA4/FUEL3
	Confirm Selection	CEA 1,4
4.15) Withdraw CEAs to critical position		
	Collect CEA position information	CEA 4
	Decide on position to stop at	FUEL 3
	Start CEA withdrawal	CEA 1,4
	Stop CEA withdrawal at planned position	CEA 1,4
	Confirm CEA position	CEA 4
5.00) Monitor for Criticality		
	Collect NI information	RX 1
	Collect RCS temperature information	RCS 1/RX 3
	Evaluate information	RX 4
	Decide if reactor "critical"	FUEL 3

Nuplex 80 + Functional Analysis
Task Listing by Operation Sequence
and Gross/Sub-Functions

Gross Function /Sub-Functions	Task Statement	Task derived from System Function (System & Function #)
5.01) Announce Criticality		
	Report (communicate) startup results	
6.00) Raise power to 10E-4% and stabilize		
	Collect NI information	RX 1
	Collect RCS parameter information	RCS 1
	Collect boron concentration information	CVCS 4
	Withdraw CEAs	CEA 4
	Insert CEAs	CEA 4
	Evaluate "stable" power point	FUEL 3
6.01) Withdraw CEAs		
	Withdraw CEAs	CEA 4
	Confirm CEA position	CEA 4
6.02) Monitor Reactor Power		
	Collect NI information	RX 1
6.03) Control Reactor power to stabilize		
	Insert CEAs	CEA 4
	Confirm CEA position	CEA 4
	Confirm NI expected responses	RX 1
	Decide if at "stable" power point	FUEL 3
6.04) Record measure data		
	Collect NI information	RX 1
	Collect CEA position information	CEA 4
	Collect RCS parameter information	RCS 1/RX 3
7.00) Control core reactivity		
	Refer to # 7.01 to 7.02	
7.01) Withdraw CEAs		
	Withdraw CEAs	CEA 4
	Confirm CEA position	CEA 4
7.02) Check moderator temperature coefficient		
	Collect NI information	FUEL 3
	Collect RCS temperature information	RCS 1
	Evaluate information	FUEL 3
	Decide on reactivity control method at POAH	FUEL 3
	If positive MTC: Insert CEAs to turn power	FUEL 3
	If negative MTC: Monitor temp to turn power	FUEL 3

Nuplex 80 + Functional Analysis
Task Listing by Operation Sequence
and Gross/Sub-Functions

Gross Function /Sub-Functions	Task Statement	Task derived from System Function (System & Function #)
8.00) Raise power to 3 - 5% and stabilize		
	Collect NI information	FUEL 3
	Collect RCS parameter information	RCS 1
8.01) Withdraw CEAs		
	Withdraw CEAs	CEA 4
	Confirm CEA position information	CEA 4
8.02) Control reactor power to stabilize		
	Insert CEAs	CEA 4
	Confirm CEs position information	CEA 4
	Evaluate "stable" power point	FUEL 3
9.00) Determine TG startup prerequisites done		
	Collect turbine generator pre-startup checks	TG
	Evaluate checklist for completeness	TG
	Decide if prerequisites completed	TG
9.01) Check generator auxiliaries		
	Collect generator H2 parameter information	TG
	Collect Stator cooling parameter information	TG
	Evaluate information	TG
	Decide on adjustments needed	TG
	Adjust parameters for startup	TG
	Confirm adjustments	TG
10.00) Ensure control of main steam flow		
	Refer to # 10.01 to 10.06	
10.01) Check turbine control (EHC) status		
	Collect information	TG
	Evaluate information	TG
10.02) Startup EHC oil system		
	Collect TG parameter information	TG
	Start EHC oil pump	TG
	Collect EHC parameter information	TG
	Evaluate information	TG
10.03) Startup Moisture Separator Reheater		
	Open valves (list)	MSR
	Close valves (list)	MSR
	Confirm valve position	MSR

Nuplex 80 + Functional Analysis
Task Listing by Operation Sequence
and Gross/Sub-Functions

Gross Function /Sub-Functions	Task Statement	Task derived from System Function (System & Function #)
10.04) Startup Extraction Steam		
	Open (list)	MSS
	Close (list)	MSS
	Confirm valve positions	MSS
10.05) Reset turbine trip systems		
	Reset turbine trip system	TG
	Confirm reset	TG
10.06) Warm up Steam Chest		
	Open valve at specific rate (slowly)	MSS
	Collect Steam Chest parameter information	TG
	Evaluate information	TG
	Decide rate of opening valve(s)	MSS
	Decide rate of Chest warm up	TG
11.00) Maintain SG inventory		
	Collect SG parameter information	SG 3
	Collect MSS flow information	MSS 4,5
	Evaluate demand for SG makeup	SG 3
	Decide feed rate to maintain inventory	SG 3
11.01) Control main feedwater to SGs		
	Control main feedwater flow to SG	FCS 1
	Collect FCS flow information	FCS 1
	Evaluate against demand for SG makeup	SG 3
	Confirm control responses	SG 3
11.02) Ensure main feedwater preheating		
	Collect FCS parameter information	FCS
11.03) Ensure condensate makeup		
	Collect condensate reserve parameter info.	NUPS 1,2
	Collect condensate parameter information	FCS 1
	Evaluate against demand for makeup	FCS 1
12.00) Test Roll turbine		
	Collect TG parameter information	TG
	Evaluate TG parameter information	TG
	Decide on rate of roll	TG
	Start roll of TG	TG
12.01) Check turbine		
	Collect TG parameter information	TG
	Evaluate information	TG
	Decide if performance of TG acceptable	TG

Nuplex 80 + Functional Analysis
Task Listing by Operation Sequence
and Gross/Sub-Functions

Gross Function /Sub-Functions	Task Statement	Task derived from System Function (System & Function #)
12.02) Check Turbine Auxiliaries		
	Collect TG cooling parameter information	TG
	Evaluate information	TG
13.00) Startup Turbine		
	Collect Turning Gear status	TG
	Evaluate information	TG
13.01) Admit steam to turbine		
	Collect NI information	RX 1
	Evaluate information	RX 4
	Decide when ready to admit steam to turbine	FUEL 3
	Open valve(s) (list)	MSS
	Confirm valve positions	MSS
14.00) Test turbine trip		
	Refer to # 14.01 to 14.03	
14.01) Raise turbine speed to 1800 rpm		
	Collect TG parameter information	TG
	Raise TG speed to 1800 rpm at planned rate	TG
	Confirm speed	TG
	Collect TG parameter information	TG
	Evaluate performance of TG	TG
14.02) Mechanical Trip Test		
	Trip turbine (mechanical trip)	TG
	Collect information	TG
	Evaluate information	TG
14.03) Reset turbine to 1800 rpm		
	Reset turbine trip system	TG
	Confirm reset	TG
	Collect TG parameter information	TG
	Evaluate return to 1800 rpm performance	TG
15.00) Startup generator		
	Refer to # 15.01 to 15.04	
15.01) Check generator off-line and available		
	Collect Breaker/Disconnect information	ELEC
	Evaluate information	ELEC

Nuplex 80 + Functional Analysis
Task Listing by Operation Sequence
and Gross/Sub-Functions

Gross Function /Sub-Functions	Task Statement	Task derived from System Function (System & Function #)
15.02) Establish generator excitation		
	Start generator excitation	TG
	Collect generator information	TG
	Test Adjust Voltage regulator control	TG
	Evaluate information	TG
15.03) Regulate generator voltage		
	Adjust Voltage Regulator control	TG
	Confirm adjustments	TG
	Select "auto" voltage control	TG
	Adjust turbine speed	TG
	Collect generator parameter information	TG
	Confirm adjustments	TG
04) Establish generator control		
	Collect load limit information	TG
	Evaluate information	TG
	Decide value for load limit of TG	TG
	Raise load limit to planned limit	TG
16.00) Synchronize and close generator bus bkr		
	Collect Electrical parameter information	ELEC
	Evaluate information	ELEC
	Decide type of sychoronization :MAN or AUTO	ELEC
	Match voltages	ELEC
	Monitor synchroscope / Adjust turbine speed	TG
	Close bkr at planned synchroscope position	ELEC
17.00) Load generator		
	Decide rate of load pickup	ELEC
	Decide amount of load to pickup	ELEC
	Raise TG speed at planned rate to plan value	TG
	Adjust generator voltage regulator	TG
	Collect generator information	TG
	Confirm loading and TG speed	TG
17.01) Monitor Turbine		
	Collect TG cooling parameter information	TG
	Evaluate information	TG
18.00) Load Dispatch authorization		
	Report (communicate) request for TG loading	
	Collect authorization	
	Evaluate discussions, limitations, etc.	

Nuplex 80 + Functional Analysis
Task Listing by Operation Sequence
and Gross/Sub-Functions

Gross Function /Sub-Functions	Task Statement	Task derived from System Function (System & Function #)
19.00) Raise load		
	Decide on rate of load increase	TG
	Decide on load value	TG
	Raise "load" to planned value	TG
	Collect generator parameter information	TG
	Evaluate information	TG
20.00) Maintain SG inventory		
	Collect SG parameter information	SG
	Collect MSS parameter information	MSS
	Collect FCS parameter information	FCS
	Evaluate information	SG
	Decide on feedwater flow to SG	SG
20.01) Control main feedwater to SG		
	Control Main feedwater flow to SG	FCS 1
	Collect FCS flow information	FCS 1
	Evaluate against demand for SG makeup	SG 3
20.02) Ensure main feedwater preheating		
	Collect FCS parameter information	FCS
20.03) Ensure condensate makeup		
	Collect condensate reserve parameter info	MUPS 1,2
	Collect condensate parameter information	FCS 1
	Evaluate against demand for makeup	
21.00) Ensure core reactivity control		
	Refer to # 21.01	
21.01) Check Thermal/NI power equivalence		
	Collect RCS temperature information	RCS 1
	Collect NI information	RX 1
	Evaluate information	RX 4
	Decide whether thermal/NI power equivalent	RX 1
	IF NOT: goto corrective actions	RX 1
	IF OK: continue	RX 1

Nuplex 80 + Functional Analysis
Task Listing by Operation Sequence
and Gross/Sub-Functions

Gross Function /Sub-Functions	Task Statement	Task derived from System Function (System & Function #)
1.00) Authorize Load Change		
	Communicate with Load Dispatcher	COMM
	Collect Authorization of load change	COMM
2.00) Control load change		
	Collect generator power parameters	ELEC
	Collect NI information	RX 1
	Collect RCS temperature information	RCS 1
	Decide rate of load change	TG
	L[illegible] turbine speed or load control	TG
	[illegible] & determine if rate change w/in limit	RX
3.00) Monitor Load Change		
	Collect NI information	RX 4
	Collect RCS parameter information	RCS 1,3,7
	Collect MSS parameter information	MSS 1,2,3
	Collect SG parameter information	SG 1,3
	Collect FCS parameter information	FCS 1
	Compare with expected transient performance	
3.01) Maintain Electrical parameters		
	Collect generator parameter information	ELEC
	Analyze & determine if within tolerances	ELEC
3.02) Maintain SG inventory		
	Collect SG parameter information	SG 3
	Collect MSS parameter information	MSS 1,6
	Collect FCS parameter information	FCS 1
	Compare to match steam & feed mass flows	
	Adjust feed rate to match steaming rate	FCS 1
3.03) Control Main Feedwater to SGs		
	Collect FCS parameter information	FCS 1
	Adjust feed rate to match steaming rate	FCS 1
3.04) Monitor RCS inventory		
	Collect Pzr level information	PZR 2,4
	Compare with power program for Pzr level	PZR 2
	Collect CVCS flow to and from RCS	CVCS 1,11
	Compare with previous information for changes	
3.05) Monitor Reactor Power		
	Collect NI information	RX 4
	Collect generator power information	ELEC
	Compare power information for load following	RX 1,4
	Analyze & determine core power w/in limits	RX 1,4

Kupiex 80 + Functional Analysis
Task Listing by Operation Sequen--
and Gross/Sub-Functions

Gross Function /Sub-Functions	Task Statement	Task derived from System Function (System & Function #)
3.06) Monitor RCS pressure		
	Collect Pzr pressure information	PZR
	Analyze & determine if w/in control limits	
4.00) Control TBS flow to condenser		
	Collect condenser parameter information	FCS 1
	Control TBS rate of steaming	MSS 5
	Control condenser hotwell level & vacuum	FCS 1
	Decide rate of steaming using TBS	MSS 5
	Compare with previous information for changes	
4.01) Monitor Reactor Power		
	Collect NI information	RX 4
	Compare with previous information for changes	
4.02) Control CEA position to reduce power		
	Collect RCS temperature information	RCS 1
4.03) Maintain RCS temperature		
	Collect RCS temperature	RCS 1
	Collect TBS parameter information	MSS 5
	Control TBS flow to condenser	MSS 5
	Compare with previous information for changes	
4.04) Control Main Feedwater to SGs		
	Stop second feed pump	FCS 1
	Confirm feed pump stopped	FCS 1
	Collect FCS parameter information	FCS 1
5.00) Shutdown the Turbine Generator		
	Refer to # * 01 to 5.02	
5.01) Shutdown the Turbine		
	Trip the turbine	TG
	Collect TG parameter information	TG
	Analyze & determine if turbine shutdown	TG
5.02) Unload the Generator		
	Open Generator Output Breakers	ELEC
	Collect TG output information	TG
	Collect generator power parameters	TG

Nuplex 80 + Functional Analysis
Task Listing by Operation Sequence
and Gross/Sub-Functions

Gross Function /Sub-Functions	Task Statement	Task derived from System Function (System & Function #)
5.03) Shutdown Extraction Steam		
6.00) Shutdown the Reactor		
	Refer to # 6.01 to 6.12	
6.01) Insert regulating group 6 CEAs		
	Collect CEA position information	CEA 4
	Start CEA insertion	CEA 1,4
	Stop CEA insertion at planned position	CEA 1,4
	Confirm CEA position	CEA 4
6.02) Insert regulating group 5 CEAs		
	Select CEA regulating group	CEA 4
	Confirm selection	
	Collect CEA position information	CEA 4
	Start CEA insertion	CEA 1,4
	Stop CEA insertion at planned position	CEA 1,4
	Confirm CEA position	CEA 4
6.03) Insert regulating group 4 CEAs		
	Select CEA regulating group	CEA 4
	Confirm selection	
	Collect CEA position information	CEA 4
	Start CEA insertion	CEA 1,4
	Stop CEA insertion at planned position	CEA 1,4
	Confirm CEA position	CEA 4
6.04) Insert regulating group 3 CEAs		
	Select CEA regulating group	CEA 4
	Confirm selection	
	Collect CEA position information	CEA 4
	Start CEA insertion	CEA 1,4
	Stop CEA insertion at planned position	CEA 1,4
	Confirm CEA position	CEA 4
6.05) Insert regulating group 2 CEAs		
	Select CEA regulating group	CEA 4
	Confirm selection	
	Collect CEA position information	CEA 4
	Start CEA insertion	CEA 1,4
	Stop CEA insertion at planned position	CEA 1,4
	Confirm CEA position	CEA 4

Nuplex 80 + Functional Analysis
Task Listing by Operation Sequence
and Gross/Sub-Functions

Gross Function /Sub-Functions	Task Statement	Task derived from System Function (System & Function #)
6.06) Insert regulating group 1 CEAs		
	Select CEA regulating group	CEA 4
	Confirm selection	
	Collect CEA position information	CEA 4
	Start CEA insertion	CEA 1,4
	Stop CEA insertion at planned position	CEA 1,4
	Confirm selection	CEA 4
6.07) Borate the RCS		
	Collect RCS Boron Conc. information	RX 4
	Compare RCS Boron Conc. to tech specs	RX 4
	Collect Boron Addition Tank Conc. information	CVCS 4,8
	Analyze & determine borated water to add	CVCS 4
	Control letdown to m[illegible]tain inventory	PZR 2
6.08) Insert Shutdown group C CEAs		
	Select CEA shutdown group A	CEA 1
	Collect CEA position information	CEA 4
	Start CEA insertion	CEA 1,4
	Stop CEA insertion at planned position	CEA 1,4
	Confirm CEA position	CEA 4
6.09) Insert Shutdown Group B CEAs		
	Select CEA shutdown group	CEA 4
	Confirm selection	
	Collect CEA position information	CEA 4
	Start CEA insertion	CEA 1,4
	Stop CEA insertion at planned position	CEA 1,4
	Confirm CEA position	CEA 4
6.10) Insert Shutdown Group A CEAs		
	Select CEA shutdown group	CEA 4
	Confirm selection	
	Collect CEA position information	CEA 4
	Start CEA insertion	CEA 1,4
	Stop CEA insertion	CEA [illegible]
	Confirm CEA position	CEA 4
6.11) Unlatch ("Trip") CEAs		
	Collect CEA position	CEA 4
	Trip (Reactor) CEAs	CEA
	Confirm CEA position	CEA 4
6.12) Monitor Reactor Power		
	Collect NI information	RX 4
	Compare with previous information for changes	

Nuplex 80 + Functional Analysis
Task Listing by Operation Sequence
and Gross/Sub-Functions

Gross Function /Sub-Functions	Task Statement	Task derived from System Function (System & Function #)
7.00) Monitor (other) auxiliaries		
	(later)	

Nuplex 80 + Functional Analysis
Task Listing by Operation Sequence
and Gross/Sub-Functions

Gross Function /Sub-Functions	Task Statement	Task derived from System Function (System & Function #)
1.00) Standard Post Trip Actions		
	Refer to # 1.01 to 1.09	
1.01) Ensure Reactor Shutdown		
	Collect K: information	RX 1
	Collect CEA position information	CEA 4
	Evaluate information	RX 4
1.02) Ensure plant electrical power available		
	Collect TG output information	ELEC
	Collect Bus feeder information	ELEC
	Evaluate information	ELEC
	Collect Diesel Generator Output information	ELEC
	Evaluate need for Diesel	ELEC
	Start Diesel	ELEC
1.03) Control RCS inventory		
	Collect Pzr parameter information	PZR 1,2,4
	Collect CVCS flow to and from RCS	CVCS 1,11
	Evaluate demands for CVCS flows	CVCS 1,11
1.04) Control RCS pressure		
	Collect RCS pressure information	RCS 3
	Evaluate against control limits	PZR 5,6
1.05) Control Core Heat Removal		
	Collect RCP information	RCS 1
	Decide if RCPs are operating	RCS 1
1.06) Control RCS heat removal		
	Collect SG parameter information	SG 3,5,6
	Collect MSS flow information	MSS 4,5,6
	Collect FCS flow information	FCS 1
	Decide SG availability for heat removal	RCS 1
1.07) Maintain Containment Integrity		
	Collect Containment parameter information	CNTMT 1
	Decide if isolation is required	CNTMT 1
1.08) Control Containment Atmosphere		
	Collect Containment parameter information	CNTMT 1
	Decide if additional cooling is needed	CSS 1

Nuplex 80 + Functional Analysis
Task Listing by Operation Sequence
and Gross/Sub-Functions

Gross Function /Sub-Functions	Task Statement	Task derived from System Function (System & Function #)
1.09) Control Containment Combustible Gases		
	Collect Containment H2 parameter information	CGC 3
	Decide if H2 exists	CGC 3
2.00) Diagnosis of event		
	Review collected info # 1.01 to 1.09	
	Decide event	
3.00) Ensure SPTA performed		
	Review collected information # 1.01 to 1.09	
	Decide if SPTA performed	CDP
	Perform outstanding actions	
4.00) Confirm diagnosis of event		
	Review collected information # 1.01 to 1.09	
	Decide event diagnosis is confirmed	
5.00) Control RCS inventory		
	Collect Pzr parameter information	PZR 1,2,4
	Collect CVCS flow to and from RCS	CVCS 1,11
	Evaluate demand for CVCS flows	CVCS 1,11
6.00) Control RCS pressure		
	Collect RCS pressure information	RCS 3
	Evaluate against control limits	PZR 5,6
7.00) Control RCS heat removal		
	Collect MSS flow information	MSS 5,6
	Collect SG pressure information	SG 1
	Collect RCS temperature information	RCS 1
	Control TBS rate of steaming	MSS 5
8.00) Maintain SG inventory		
	Collect SG parameter information	SG 3,4
	Collect MSS flow information	MSS 4,5,6
	Evaluate demand for SG makeup	SG 3
	Decide rate of feeding SG	SG 3
	Decide method of feeding Steam generator	SG 3
	Refer to either # 8.01 or 8.02	
8.01) Control Main Feedwater to SGs		
	Control Main feedwater flow to SG	FCS 1
	Collect FCS flow information	FCS 1
	Evaluate against demand for SG makeup	SG 3

Nuplex 80 + Functional Analysis
Task Listing by Operation Sequence
and Gross/Sub-Functions

Gross Function /Sub-Functions	Task Statement	Task derived from System Function (System & Function #)
8.02) Control Emergency Feedwater to SGs		
	Control Emergency Feedwater to SG	EFW 1
	Collect Emergency Feedwater flow information	EFW 1
	Evaluate against demand for SG makeup	SG 3
9.00) Evaluate need for a cooldown		
	Refer to # 9.01 to 9.02	
9.01) Ensure condensate reserves adequate		
	Collect condensate reserve parameter info.	NUPS 1,2
	Evaluate parameters against specified limits	RCS 1/SG 3
	Decide adequacy of reserve	
9.02) Control RCS pressure		
	Collect RCS pressure information	RCS 3
	Evaluate against control limits	PZR 5,6
10.00) Maintain RCS parameters		
	Refer to # 10.01 to 10.03	
10.01) Control RCS inventory		
	Collect Pzr parameter information	PZR 1,2,4
	Collect CVCS flow to and from RCS	CVCS 1,11
	Evaluate demands for CVCS flows	CVCS 1,11
10.02) Control RCS pressure		
	Collect RCS pressure information	RCS 3
	Evaluate against control limits	PZR 5,6
10.03) Monitor RCS parameters for Forced Circ.		
	Collect RCP parameter information	RCS 4
	Collect RCS parameter information	RCS 1
	Evaluate against specified limits for ops	RCS 4

Nuplex 80 + Functional Analysis
Task Listing by Operation Sequence
and Gross/Sub-Functions

Gross Function /Sub-Functions	Task Statement	Task derived from System Function (System & Function #)
1.00) Standard Post Trip Actions		
	Refer to # 1.01 to 1.09	
1.01) Ensure Reactor Shutdown		
	Collect NI information	RX 1
	Collect CEA position information	CEA 4
	Analyze & Determine reactor is shutdown	RX 4
1.02) Ensure plant electrical power available		
	Collect TG output information	ELEC
	Collect Bus feeder information	ELEC
	Analyze & determine power available	ELEC
	Collect Diesel Generator Output information	ELEC
	Analyze & determine need for Diesel	ELEC
	Start Diesel	ELEC
1.03) Maintain RCS inventory		
	Collect Pzr parameter information	PZR 1,2,3
	Collect CVCS flow to and from RCS	CVCS 1,11
	Collect RCS subcooling information	RCS 1
	Analyze & determine makeup demands	RCS 7
	Compare demands to CVCS flows	CVCS 1,11
1.04) Maintain RCS pressure		
	Collect RCS pressure information	RCS 3
	Analyze & determine if w/in control limits	PZR 5,6
1.05) Maintain Core heat removal		
	Collect RCP information	RCS 1
	Collect RCS parameter information	RCS 1
	Analyze & determine if RCPs are operating	RCS 1
1.06) Maintain RCS heat removal		
	Collect SG parameter information	SG 3,5,6
	Collect MSS flow information	MSS 4,5,6
	Collect FCS flow information	FCS 1
	Collect RCS parmeter information	RCS 1
	Analyze & determine SG availability for HR	RCS 1
1.07) Maintain Containment Integrity		
	Collect Containment parameter information	CNTMT 1
	Analyze & determine if isolation is required	CNTMT 1

Nuplex 80 + Functional Analysis
Task Listing by Operation Sequence
and Gross/Sub-Functions

Gross Function /Sub-Functions	Task Statement	Task derived from System Function (System & Function #)
1.08) Control Containment Atmosphere		
	Collect Containment parameter information	CNTMT 1
	Analyze & determine if added cooling needed	CSS 1
	Start Emergency Fans	
	Start Air Recirculation Fans	
	Confirm Air Recirculation	
1.09) Control Containment Combustible Gases		
	Collect Containment parameter information	CGC 3
	Analyze for H2 generating condition present	CGC 3
2.00) Diagnosis of event		
	Review collected info # 1.01 to 1.09	
	Collect Containment parameter information	CNTMT 1
	Collect Pzr parameter information	RCS 1,7
	Analyze & determine event	
3.00) Ensure SPTA performed		
	Review collected information # 1.01 to 1.09	
	Analyze & determine if SPTA performed	CDP
	Perform outstanding actions	
4.00) Confirm diagnosis of event		
	Review collected information # 1.01 to 1.09	
	Analyze & determine event diagnosis confirmed	
5.00) Control RCS depressurization		
	Collect RCS pressure information	RCS 3
	Analyze & determine:	
	if safety injection makeup required?	RCS 7
	if normal makeup adequate?	CVCS 1,11
	Establish SI makeup (path & flow) # 5.01	
5.01) Ensure Safety Injection		
	Collect SI parameter information	SI 1
	Analyze & determine if SI to RCS makeup OK	SI 1
	Start Automatic safety injection (SIAS)	SI 1
	Start SI pumps	SI 1
	Align SI to RCS	SI 1
	Confirm SI flow to RCS	SI 1
6.00) Maximize Safety Injection		
	Collect SI & charging flow to RCS	SI 1
	Analyze & determine if SI maximized	SI 1

Nuplex 80 + Functional Analysis
Task Listing by Operation Sequence
and Gross/Sub-Functions

Gross Function /Sub-Functions	Task Statement	Task derived from System Function (System & Function #)
6.01) Maximize Charging flow		
	Start idle charging pumps	CVCS 11
	Confirm all charging pumps operating	CVCS 11
6.02) Start idle SI Pumps		
	Start SI pumps	SI 1
	Confirm SI pumps operating	SI 1
6.03) Ensure electrical power to SI components		
	Compare flows to determine if SI maximized	SI 1
	Collect power available info. of components	ELEC
	Align power to component	ELEC
6.04) Ensure valve alignments		
	Align charging to RCS	CVCS 11
	Confirm alignment of charging to RCS	CVCS 11
	Align HPSI to RCS	SI 1
	Confirm alignment of HPSI to RCS	SI 1
6.05) Ensure necessary auxiliaries operating		
	Analyze & determine "auxiliaries" needed	AIR ELEC
	Confirm "auxiliaries" are operating	AIR ELEC
7.00) Control RCS depressurization		
	Collect RCS pressure information	RCS 3
	Evaluate RCP ops against specified limits	RCS 4
	Analyze & determine whether to stop RCPs	RCS 1,4
7.01) Stop all RCPs		
	Stop RCPs	RCS 4
	Confirm RCPs stopped	RCS 4
7.02) Monitor RCP operating limits		
	Collect RCS process parameter information	RCS 4
	Analyze & determine if to continue RCP ops	RCS 4
8.00) Record Time		
	Collect time of day information	
	Compile for later use	
9.00) Isolate the LOCA		
	Refer to # 9.01 to 9.05 for valve closures	
	Collect Pzr parameter information	RCS 1,7
	Analyze & determine if LOCA is isolated	RCS 1

Nuplex 80 + Functional Analysis
Task Listing by Operation Sequence
and Gross/Sub-Functions

Gross Function /Sub-Functions	Task Statement	Task derived from System Function (System & Function #)
9.01) Isolate Letdown		
	Close letdown isolation valve	CNTMT 1
	Confirm valve closure	CNTMT 1
9.02) Isolate RCS sampling		
	Close RCS hot leg sample isolation valve	CNTMT 1
	Close Pzr vapor sample isolation valve	CNTMT 1
	Close Pzr liquid sample isolation valve	CNTMT 1
	Confirm valve closures	CNTMT 1
9.03) Isolate RCS to CCW leakage		
	Close (find valve)	CNTMT 1
	Confirm valve closures	CNTMT 1
	Collect CCW parameter information	CCW
9.04) Isolate any other sources of leakage		
	Close (find additional valves)	
	Confirm valve closures	
9.05) Isolate PORVs (see note)		
	Close PORV block valve (see note)	
	Confirm block valve closure	
10.00) Verify LOCA radiological containment		
	Refer to # 10.01 to 10.04	
10.01) Monitor Auxiliary Building		
	Collect auxiliary building area radiation	BLDG 1
10.02) Isolate LOCA outside containment		
	Close (find valves)	
	Confirm valve closures	
10.03) Maintain Containment Integrity		
	Collect containment parameter information	CNTMT 1
	Analyze & determine if added isolation needed	CNTMT 1
10.04) Ensure Containment Isolation		
	Confirm Containment Isolation valves closed	CNTMT 1
	Close outstanding CI designated valves	CNTMT 1

Nuplex 80 + Functional Analysis
Task Listing by Operation Sequence
and Gross/Sub-Functions

Gross Function /Sub-Functions	Task Statement	Task derived from System Function (System & Function #)
11.00) Control Containment Atmosphere		
	Collect Containment parameter information	CNTMT 1
	Analyze & determine if added cooling needed	CSS 1
11.01) Control Containment Fan Cooling		
	Collect Containment fan operating parameters	CNTMT
11.02) Control Containment Spray Cooling		
	Collect Containment Spray parameters	CSS 1
12.00) Control Containment Pressurization		
	Collect Containment Atmosphere information	CNTMT 1
	Analyze & determine if to actuate Cntmt Spray	CSS 1
12.01) Control Containment Spray Cooling		
	Collect Containment Spray information	CSS 1
	Start Containment Spray pumps	CSS 1
	Align Containment Spray to Containment	CSS 1
	Confirm Spray flow reducing CNTMT pressure	CSS 1
12.02) Align External H2 Recombiners		
	Analyze & determine need for recombiner	
	Collect External H2 Recombiner Availability	
	Align external H2 Recombiner to containment	CGC
	Confirm containment integrity	CNTMT 1
	Confirm H2 Recombiner alignment	CGC
13.00) Monitor for Hydrogen in Containment		
	Collect Containment H2 information	CGC 1
	Analyze & determine if H2 exists	CGC 1
14.00) Control Containment Hydrogen		
	Refer to # 14.01 to 14.02	
14.01) Operate Hydrogen Recombiners		
	Collect H2 Recombiner parameters	CGC
	Align power to H2 Recombiner	ELEC
	Control power (or temperature) of Recombiner	CGC
	Collect Containment H2 information	CNTMT
	Confirm reduction of H2 in containment	CGC
14.02) Operate Hydrogen Purge		
	Collect Containment Atmosphere information	CNTMT 1
	Collect Containment H2 information	CGC 1
	Collect authorization to use H2 purge	
	Open H2 purge valves	
	Collect purge flow information	
	Confirm reduction of H2 in containment	

Nuplex 80 + Functional Analysis
Task Listing by Operation Sequence
and Gross/Sub-Functions

Gross Function /Sub-Functions	Task Statement	Task derived from System Function (System & Function #)
15.00) Monitor Environmental impacts		
	Collect Containment radiation information	
	Communicate to report information to EP team	
16.00) Isolated? No...		
	Refer to # 17.00 to 37.00	
17.00) Perform a rapid cooldown		
	Collect Condenser parameter information	FCS 1
	Analyze & determine method for cooldown	
	Refer to either # 17.01 or 17.02	
17.01) Control cooldown w/Turbine Bypass Sys.		
	Collect Condenser parameter information	FCS 1
	Control TBS rate of steaming	MSS 5
	Control condenser hotwell level & vacuum	FCS 1
	Control condenser cooling	
	Collect RCS temperature information	RCS 1
	Decide rate of steaming using TBS	MSS 5
17.02) Control cooldown w/Atmospheric Dumps		
	Control ADV rate of steaming	MSS 6
	Collect RCS temperature information	RCS 1
	Decide rate of steaming using ADVs	MSS 6
18.00) Maintain SG inventory		
	Collect SG parameter information	SG 3,4
	Collect MSS flow information	MSS 4,5,6
	Analyze & determine demand for SG makeup	SG 3
	Analyze & determine method for feeding SG	
	Decide rate of feeding steam generator	SG 3
	For methods: refer to either # 18.01 or 18.02	
18.01) Control Main Feedwater to SGs		
	Control Main feedwater flow to SG	FCS 1
	Collect FCS flow information	FCS 1
	Analyze & determine demand for SG makeup	SG 3
18.02) Control Emergency Feedwater to SGs		
	Control Emergency Feedwater to SG	EFW 1
	Collect Emergency Feedwater flow information	EFW 1
	Analyze & determine demand for SG makeup	SG 3

Nuplex 80 + Functional Analysis
Task Listing by Operation Sequence
and Gross/Sub-Functions

Gross Function /Sub-Functions	Task Statement	Task derived from System Function (System & function #)
19.00) Ensure condensate reserves adequate		
	Collect condensate reserve parameter info	NUPS 1,2
	Analyze & determine reserve capacity	NUPS 1,2
	Compute adequacy of reserves	RCS 1/SG 3
20.00) Ensure proper charging and letdown		
	Collect Pzr parameter information	PZR 1,2,4
	Collect CVCS flows to and from RCS	CVCS 1,11
	Compare demand to CVCS flows	CVCS 1,11
	Control Charging flow	CVCS 1,11
	Control Letdown flow	CVCS 1
	Open Letdown isolation valve	CVCS 1
21.00) Control RCS Depressurization		
	Collect RCS pressure information	RCS 3
	Analyze & determine method to depressurize	RCS 3
	For methods: refer to 321.01 to 21.03	
21.01) Depressurization Method 1		
	Open Pressurizer Main spray valves	PZR 6
	Control Pressurizer Main spray flow	PZR 6
	Open Pressurizer Aux spray flow	CVCS 2
	Confirm depressurization	RCS 3
21.02) Depressurization Method 2		
	Collect CVCS flows to and from RCS	CVCS 1,11
	Control (to reduce) charging flow	CVCS 1
	Control (to increase as practical) letdown	CVCS 11
	Confirm depressurization	RCS 3
21.03) Depressurization Method 3		
	Collect SI flow to RCS	SI 1
	Collect RCS parameter information	RCS 3,7,1
	Analyze & determine amount of SI makeup	RCS 7
	Control SI flow to RCS	SI 1
	Stop SI pumps	SI 1
22.00) Ensure vessel P-T limits maintained		
	Refer to # 22.01 to 22.08	
22.01) Monitor RCS for P-T violations		
	Collect RCS temperature information	RCS 1
	Collect RCS pressure information	RCS 2,3
	Analyze & determine if violation exists	RPV 1
	Analyze & determine pressure control method	RCS 2,3

Nuplex 80 + Functional Analysis
Task Listing by Operation Sequence
and Gross/Sub-Functions

Gross Function /Sub-Functions	Task Statement	Task derived from System Function (System & Function #)
22.02) Stop the Cooldown		
	Throttle TBS steaming rate	MSS 5
	Confirm rate of RCS cooldown reduced to 0	RCS 1
22.03) Control RCS pressure (method 1)		
	Decide main spray valve position to open to	PZR 6
	Open main pressurizer spray valves	PZR 6
	Confirm depressurization	RCS 3
	Decide when to close valves	RCS 3
	Close main pressurizer spray valves	PZR 3
	Confirm valves closed	RCS 3 PZR6
22.04) Control RCS pressure (method 2)		
	Align charging to auxiliary spray header	CVCS 2
	Confirm charging pumps operating	CVCS 2
	Start charging pumps	CVCS 2
	Open Auxiliary spray valve	CVCS 2
	Confirm depressurization	RCS 3
	Close Auxiliary spray valve	CVCS 2
22.05) Control RCS pressure (method 3)		
	Control SI flow to RCS	SI 1
	Collect RCS parameter information	RCS 3,7,1
	Analyze & determine amount of SI makeup	RCS 7
	Control SI flow to RCS	SI 1
	Confirm depressurization	RCS 3
22.06) Maintain SG inventory		
	Collect SG parameter information	SG 3,4
	Collect MSS flow information	MSS 4,5,6
	Analyze & determine demand of SG makeup	SG 3
	Decide rate of feeding SG	SG 3
	Analyze & determine method (# 22.07 or 22.08)	
22.07) Control Main Feedwater to SGs		
	Control main feedwater flow to SG	FCS 1
	Collect FCS flow information	FCS 1
	Analyze & determine demand for SG makeup	SG 3
	Decide rate of feeding SG	SG 3
22.08) Control Emergency Feedwater to SGs		
	Control Emergency Feedwater flow to SG	EFW 1
	Collect Emergency Feedwater flow information	EFW 1
	Analyze & determine demand of SG makeup	SG 3
	Decide rate of feeding SG	SG 3

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Task Listing by Operation Sequence
and Gross/Sub-Functions

Gross Function /Sub-Functions	Task Statement	Task derived from System Function (System & Function #)
23.00) Determine need for forced cooling		
	Refer to # 23.01 to 23.03 to evaluate needs	
	Analyze & determine if forced circ. needed	
23.01) Determine present heat removal adequacy		
	Collect RCS parameter information	RCS 1
	Collect core parameter information	RX 3
	Analyze & determine adequacy of heat removal	RCS 1
23.02) Monitor RCS parameters		
	Collect RCS parameter information	RCS 1
	Collect RCP parameter information	RCS 4
	Compute duration of RCP seal cooling loss	RCS 4
23.03) Determine need for Main Pzr spray		
	Collect RCS pressure information	RCS 3
	Collect PZR parameter information	PZR 2
	Analyze & determine adequacy of aux. spray	
	Analyze & determine need for Main spray	
24.00) Determine if conditions permit RCP start		
	Refer to # 24.01 to 24.04 for conditions	
	Analyze & determine if RCP restart permitted	RCS 4
24.01) Ensure electrical pow[illegible] to RCPs		
	Collec[illegible] ele[illegible]ric power available information	ELEC
	Close [illegible] kV RCP bus supply breaker	ELEC
24.02) Maintain SG inventory		
	Collect SG parameter information	SG 3
	Collect MSS parameter information	MSS 5
	Collect Main feedwater information	FCS 1
	Collect Emergency feedwater information	EFW 1
	Analyze & determine if SG inventory adequate	SG 3
24.03) Control RCS inventory		
	Collect Pzr parameter information	PZR 2
	Analyze & determine if RCS inventory adequate	RCS 1,7
24.04) Monitor core heat removal		
	Collect core temperature information	RX 3
	Collect RCS pressure information	RCS 3
	Analyze & determine core cooling adequate	RX 3

Nuplex 80 + Functional Analysis
Task Listing by Operation Sequence
and Gross/Sub-Functions

Gross Function /Sub-Functions	Task Statement	Task derived from System Function (System & Function #)
25.00) Restart RCPs		
	Decide which pumps to start	RCS 4
	Refer to # 25.01 to 25.02	
25.01) Ensure RCS inventory		
	Start all charging pumps	CVCS 1,11
	Collect RCS parameter information	RCS 1
	Start all SI pumps	SI 1
25.02) Start RCP		
	Start RCP	RCS 4
	Collect RCS parameter information	RCS 1
	Confirm RCPs started	RCS 4
	Collect RCP bus amperage information	ELEC
25.03) Monitor RCS parameters for Forced Circ.		
	Collect RCP parameter information	RCS 4
	Collect RCS parameter information	RCS 1
	Analyze & determine if forced circ. adequate	RCS 1,4
26.00) Control RCS and Core heat removal		
	Collect RCP parameter information	RCS 4
	Analyze & determine if RCPs are operating	RCS 4
	Refer to # 26.01	
26.01) Monitor RCS parameters for Natural Circ.		
	Collect SG parameter information	SG 3
	Collect MSS flow information	MSS 5,6
	Collect RCS temperature information	RCS 1
	Compute time since loss of forced circ.	RCS 1
	Analyze & determine if Natural circ. exists	RCS 5
27.00) Control RCS and Core heat removal		
	Collect RCS parameter information	RCS 1
	Collect core parameter information	RX 3
	Decide if two phase conditions exist in RCS	RCS 1
	Refer to # 27.01 to 27.03	
27.01) Control core heat removal (method 1)		
	Collect RCS hot leg temperature information	RCS 1
	Collect SG parameter information	SG 3
	Collect MSS flow information	MSS 5,6
	Collect Core temperature information	RX 3
	Decide if reflux cooling exists	RCS 1
	Confirm core is being cooled	RX 3

System 80 + Functional Analysis
Task Listing by Operation Sequence
and Gross/Sub-Functions

Gross Function /Sub-Functions	Task Statement	Task derived from System Function (System & Function #)
27.02) Control Core heat removal (method 2)		
	Collect SG parameter information	SG 3
	Collect MSS flow information	MSS 4,5
	Collect RCS cold leg temperature information	RCS 1
	Collect core temperature information	RX 3
	Decide if two phase natural circulation exist	RCS 1
	Confirm core is being cooled	RX 3
27.03) Control Core heat removal (method 3)		
	Decide where break is	RCS 1
	Control TBS (or ADVs) flow from SG	MSS 5,6
	Monitor reflux flow to core # 27.01,27.02	RCS 1
	Confirm core is being cooled	RX 3
28.00) Control RCS inventory		
	Collect Pzr parameter information	PZR
	Collect RCS parameter information	RCS 1,3,7
	Analyze & determine inventory control needs	RCS 7
28.01) Monitor for Termination Criteria		
	Review collected information # 28.00	RCS 1,3,7
	Analyze & determine amount of SI makeup	RCS 1,3,7
	Decide whether to throttle or stop SI to RCS	RCS 1,3,7
28.02) Throttle or Stop SI		
	Throttle SI flow to RCS	SI 1
	Stop SI pump	SI 1
	Confirm reduced SI flow to RCS	RCS 7
28.03) Confirm RCS inventory control		
	Collect Pzr parameter information	PZR
	Collect RCS parameter information	RCS 7
	Confirm RCS inventory has stabilized	RCS 7
29.00) Control RCS inventory		
	Collect Pzr parameter information	PZR 2
	Analyze & determine inventory control needs	
	Refer to # 29.01 to 29.03	
29.01) Monitor RCS parameters		
	Collect RCS parameter information	RCS 1,7
	Analyze & determine whether to reinitiate SI	RCS 7

Nuplex 80 + Functional Analysis
Task Listing by Operation Sequence
and Gross/Sub-Functions

Gross Function /Sub-Functions	Task Statement	Task derived from System Function (System & Function #)
29.02) Reinitate Full SI flow		
	Open SI valves	SI 1
	Start SI valves	SI 1
	Confirm full SI flow	RCS 7
29.03) Confirm RCS inventory control		
	Collect Pzr parameter information	PZR 2
	Collect RCS parameter information	RCS 7
	Confirm RCS inventory being maintained	RCS 7
30.00) Monitor inventory sources		
	Collect IRWT inventory information	NUPS
	Collect containment sump information	NUPS
	Analyze & determine inventory control correct	NUPS
	Compute adequacy of inventory sources	NUPS
31.00) Control RCS inventory recirculation		
	Review information collect # 30.00	NUPS
	Analyze & determine if break is inside Cntmt	
	Refer to # 31.01 to 31.02	
31.01) Monitor RCS inventory recirculation		
	Collect IRWT inventory information	NUPS
	Analyze & determine whether to start recirc.	NUPS
31.02) Control SI flow during recirc.		
	Confirm sump valves open on recirculati...	NUPS
	Open containment sump valves	NUPS
	Throttle SI flow to RCS	SI 1
	Collect containment sump information	NUPS
	Analyze & determine adequacy of recirc.	SI 1
	Confirm core is being cooled	RX 3
32.00) Control RCS heat removal		
	Collect SG parameter information	SG 1
	Analyze & determine when to block MSIS	SG 1
32.01) Block Automatic initation of MSIS		
	Block MSIS automatic initiation	SG 1
	Confirm MSIS is blocked	SG 1
33.00) Control RCS pressure		
	Collect RCS pressure information	RCP 3
	Analyze & determine impact of SI tanks	SI 1
	Analyze & decide method # 33.01, 33.02, 33.03	

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Task Listing by Operation Sequence
and Gross/Sub-Functions

Gross Function /Sub-Functions	Task Statement	Task derived from System Function (System & Function #)
33.01) Control RCS pressure (method 1)		
	Close SI tank isolation valve	SI 5
	Confirm SI tank isolated	RCS 3
33.02) Control RCS pressure (method 2)		
	Collect RCS pressure information	RCS 3
	Close SI tank nitrogen pressure valve	SI 1
	Open SI tank vent valve	SI 1
	Confirm SI tank depressurized	SI 1
33.03) Control RCS pressure (method 3)		
	Collect RCS pressure information	RCS 3
	Close SI tank nitrogen pressure valve	SI 1
	Open SI tank drain valve	SI 1
	Confirm SI tank depressurization	SI 1
34.00) Control RCS pressure		
	Collect RCS parameter information	RCS 1,3
	Align LTOP	RCS 1,3
	Confirm LTOP	RCS 1,3
35.00) Control Core heat removal		
	Compute time since start of event	CDP
	Collect RCS pressure information	RCS 3
	Compute when entry into SCS is possible	RCS 1,3
	Align for Direct Vessel Injection (DVI) SI	SI 5
36.00) Control RCS heat removal		
	Collect RCS parameter information	RCS 1,3
	Analyze & determine entry into SCS	RCS 1,3
37.00) Control RCS Voiding		
	Collect RCS parameter information	RCS 1,3
	Decide if voiding exists	RCS 1,3,7
38.00) Isolated? Yes...		
	Refer to 39.00 to 56.00	
39.00) Control RCS inventory		
	Collect Pzr parameter information	PZR 2
	Collect RCS parameter information	RCS 1,3,7
	Analyze & determine inventory control needs	RCS 7

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Task Listing by Operation Sequence
and Gross/Sub-Functions

Gross Function /Sub-Functions	Task Statement	Task derived from System Function (System & Function #)
39.01) Monitor for Termination Criteria		
	Review collected information # 39.00	RCS 1,3,7
	Analyze & determine amount of SI makeup	RCS 1,3,7
	Analyze & determine: whether to throttle or stop SI to RCS	RCS 1,3,7
39.02) Throttle or Stop SI		
	Throttle SI flow to RCS	SI 1
	Stop SI pump	SI 1
	Confirm reduced SI flow to RCS	RCS 7
39.03) Confirm RCS inventory control		
	Collect Pzr parameter information	PZR 2
	Collect RCS parameter information	RCS 7
	Confirm RCS inventory has stabilized	RCS 7
40.00) Control RCS inventory		
	Collect Pzr parameter information	PZR 2
	Analyze & determine inventory control needs	RCS 7
	Refer to # 29.01 to 29.03	
40.01) Monitor RCS parameters		
	Collect RCS parameter information	RCS 1,7
	Analyze & determine whether to reinitate SI	RCS 7
40.02) Reinitate Full SI flow		
	Open SI valves	SI 1
	Start SI pumps	SI 1
	Confirm full SI flow	RCS 7
40.03) Confirm RCS inventory control		
	Collect Pzr parameter information	PZR 2
	Collect RCS parameter information	RCS 7
	Confirm RCS inventory being maintained	RCS 7
41.00) Ensure proper charging and letdown		
	Collect Pzr parameter information	PZR 1,2,4
	Collect charging and letdown flow information	CVCS 1,11
	Compare demand to CVCS flows	CVCS 1,11
	Control charging flow	CVCS 1,11
	Control letdown flow	CVCS 1
	Open letdown isolation valve	CVCS 1

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Task Listing by Operation Sequence
and Gross/Sub-Functions

Gross Function /Sub-Functions	Task Statement	Task derived from System Function (System & Function #)
42.00) Control RCS Pressure		
	Collect RCS pressure information	RCS 3
	Analyze & determine method: # 42.01 to 42.03	
42.01) Depressurization Method 1		
	Open Pressurizer main spray valves	PZR 6
	Control Pressurizer main spray flow	PZR 6
	Open Pressurzier Auxiliary spray valves	CVCS 2
	Control Auxiliary spray flow	CVCS 2
	Confirm RCS depressurization	RCS 3
42.02) Depressurization Method 2		
	Collect charging and letdown flow information	CVCS 1,11
	Control (to reduce) charging flow	CVCS 1
	Control (to increase as practical) letdown	CVCS 11
	Confirm RCS depressurization	RCS 3
42.03) Depressurization Method 3		
	Collect SI flow information	SI 1
	Collect RCS parameter information	RCS 3,7,1
	Analyze & determine amount of SI makeup	RCS 7
	Control SI flow to RCS	SI 1
	Stop SI pumps	SI 1
43.00) Ensure vessel P-T limits maintained		
	Refer to # 43.01 to 43.05	
43.01) Monitor RCS for P-T violations		
	Collect RCS temperature information	RCS 1
	Collect RCS pressure information	RCS 2,3
	Analyze & determine if violation exists	RPV 1
	Analyze & determine method: # 43.03 to 43.05	
43.02) Stop the Cooldown		
	Throttle TBS steaming rate	MSS 5
	Confirm rate of RCS cooldown reduced to 0	RCS 1
43.03) Control RCS pressure (method 1)		
	Decide main spray valve position to open to	PZR 6
	Open main pressurizer spray valves	PZR 6
	Confirm RCS depressurization	RCS 3
	Decide when to close valves	RCS 3
	Close main pressurizer spray valves	PZR 6
	Confirm valves closed	PZR 6/RCS3

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Task Listing by Operation Sequence
and Gross/Sub-Functions

Gross Function /Sub-Functions	Task Statement	Task derived from System Function (System & Function #)
43.04) Control RCS pressure (method 2)		
	Align charging to auxiliary spray header	CVCS 2
	Confirm charging pumps operating	CVCS 2
	Start charging pumps	CVCS 2
	Open auxiliary spray valve	CVCS 2
	Confirm RCS depressurization	RCS 3
	Close auxiliary spray valve	CVCS 2
43.05) Control RCS pressure (method 3)		
	Control SI flow to RCS	SI 1
	Collect RCS parameter information	RCS 3,7,1
	Analyze & determine amount of SI makeup	RCS 7
	Control SI flow to RCS	SI 1
	Confirm RCS depressurization	RCS 3
44.00) Maintain SG inventory		
	Collect SG parameter information	SG 3,4
	Collect MSS flow information	MSS 4,5,6
	Analyze & determine demand for SG makeup	SG 3
	Decide rate of feeding SG	SG 3
	Analyze & determine method # 44.01 or 44.02	
44.01) Control Main Feedwater to SGs		
	Control main feedwater flow to SG	FCS 1
	Collect FCS flow information	FCS 1
	Analyze & determine demand for SG makeup	SG 3
	Decide rate of feeding SG	SG 3
44.02) Control Emergency Feedwater to SGs		
	Control Emergency feedwater flow to SG	EFW 1
	Collect Emergency feedwater flow information	EFW 1
	Analyze & determine demand for SG makeup	SG 3
	Decide rate of feeding SG	SG 3
45.00) Ensure condensate reserves adequate		
	Collect condensate reserve parameter info.	MUPS 1,2
	Analyze & determine reserve capacity	MUPS 1,2
	Compute adequacy of reserves	RCS 1/SG 3
46.00) Control reactivity		
	Refer to # 46.01 to 46.03	
46.01) Borate the RCS		
	Collect RCS Boron Conc. information	RX 4
	Compare RCS Boron Conc. to tech specs	RX 4
	Collect Boron Addition Tank Conc. information	CVCS 4,8
	Analyze & determine borated water to add	CVCS 4
	Control letdown to maintain inventory	PZR 2
	Analyze & determine prevent dilution method	RX 4

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Task Listing by Operation Sequence
and Gross/Sub-Functions

Gross Function /Sub-Functions	Task Statement	Task derived from System Function (System & Function #)
46.02) Prevent dilution (method 1)		
	Analyze & determine if RCPs are operating	RCS 4
	Communicate with Chemist to sample Pzr	COMM
	Open Pzr liquid sample isolation valve	PZR
	Collect Pzr Boron Concentration information	PZR 2
	Analyze & determine Pzr dilution impact	RX 4
	Control Pzr spray to mix boron	CVCS 2
46.03) Prevent dilution (method 2)		
	Analyze & determine if RCPs are NOT operating	RCS 4
	Communicate with Chemist to sample Pzr	COMM
	Open Pzr liquid sample isolation valve	PZR
	Collect Pzr Boron Concentration information	PZR 2
	Compute additional boron required to offset	RX 4
	Analyze & determine Pzr dilution impact	RX 4
47.00) Perform a controlled cooldown		
	Collect condenser parameter information	FCS 1
	Analyze & determine method for cooldown	
	Refer to either # 47.01 or 47.02	
47.01) Control cooldown w/Turbine Bypass Sys.		
	Collect condenser parameter information	FCS 1
	Control TBS rate of steaming	NSS 5
	Control condenser hotwell level & vacuum	FCS 1
	Control condenser cooling	
	Collect RCS temperature information	RCS 1
	Decide rate of steaming using TBS	NSS 5
47.02) Control cooldown w/Atmospheric Dumps		
	Control ADV rate of steaming	NSS
	Collect RCS temperature information	RCS 1
	Decide rate of steaming using ADVs	NSS
48.00) Determine need for forced cooling		
	Refer to # 48.01 to 48.03 to evaluate needs	
	Analyze & determine if need exists	
48.01) Determine present heat removal adequacy		
	Collect RCS parameter information	RCS 1
	Analyze & determine adequacy of heat removal	RCS 1
48.02) Monitor RCS parameters		
	Collect RCS parameter information	RCS 1
	Collect RCP parameter information	RCS 4
	Compute duration of RCP seal cooling loss	RCS 4

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Task Listing by Operation Sequence
and Gross/Sub-Functions

Gross Function /Sub-Functions	Task Statement	Task derived from System Function (System & Function #)
48.03) Determine need for Main Pzr spray		
	Collect RCS pressure information	RCS 3
	Collect PZR parameter information	PZR 2
	Analyze & determine adequacy of aux. spray	
	Analyze & determine need for main spray	
49.00) Determine if conditions permit RCP start		
	Collect RCS parameter information	RCS 1
	Collect PZR parameter information	PZR 2
	Collect SG parameter information	SG 3
	Analyze & determine if RCP restart permitted	RCS 4
	Collect electric power available information	ELEC
50.00) Restart RCPs		
	Decide which pumps to start	RCS 4
	Refer to # 50.01 to 50.02	
50.01) Ensure RCS inventory		
	Start all charging pumps	CVCS 1,[illegible]
	Collect RCS parameter information	RCS 1
	Start all SI pumps	SI 1
50.02) Start RCP		
	Start RCP	RCS 4
	Collect RCS parameter information	RCS 1
	Confirm RCPs started	RCS 4
	Collect RCP bus amperage information	ELEC
50.03) Monitor RCS parameters for Forced Circ.		
	Collect RCP parameter information	RCS 4
	Collect RCS parameter information	RCS 1
	Analyze & determine adequacy of heat removal	RCS 4
51.00) Control RCS and Core heat removal		
	Collect RCP parameter information	RCS 4
	Analyze & determine if RCPs are operating	RCS 4
	Refer to # 51.01	
51.01) Monitor RCS parameters for Natural Circ.		
	Collect SG parameter information	SG 3
	Collect MSS flow information	MSS 5,6
	Collect RCS temperature information	RCS 1
	Analyze & determine if natural circ. exists	RCS 5
	Compute time since loss of forced circ.	RCS 1

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Task Listing by Operation Sequence
and Gross/Sub-Functions

Gross Function /Sub-Functions	Task Statement	Task derived from System Function (System & Function #)
52.00) Control RCS heat removal and pressure		
	Collect RCS pressure information	RCS 3
	Compare for approach to safety sys auto start	RCS 1,3
	Refer to # 52.01 to 52.04	
52.01) Block automatic initiation of MSIS		
	Collect SG pressure information	SG 1
	Compare to MSIS Block enable	SG 1
	Block MSIS train A	SG 1
	Block MSIS train B	SG 1
	Confirm MSIS trains are blocked	SG 1
52.02) Block Automatic initiation of SIAS		
	Collect Pressurizer pressure	PZR
	Compare to SIAS block enable	
	Block SIAS train A	
	Block SIAS train B	
	Confirm SIAS trains are blocked	
53.00) Control RCS pressure		
	Collect RCS pressure information	RCS 3
	Analyze & determine SI tank impact .	SI 1
	Decide method: # 53.01, 53.02, or 53.03	
53.01) Control RCS pressure (method 1)		
	Close SI tank isolation valve	SI 5
	Confirm SI tank isolated	RCS 3
53.02) Control RCS pressure (method 2)		
	Collect RCS pressure information	RCS 3
	Close SI tank nitrogen pressure valve	SI 1
	Open SI tank vent valve	SI 1
	Confirm SI tank depressurized	SI 1
53.03) Control RCS pressure (method 3)		
	Collect RCS pressure information	RCS 3
	Close SI tank nitrogen pressure valve	SI 1
	Open SI tank drain valve	SI 1
	Confirm SI tank depressurized	SI 1
54.00) Control RCS pressure		
	Collect RCS parameter information	RCS 1,3
	Align LTOP	RCS 1,3
	Confirm LTOP	RCS 1,3

Nuplex 80 + Functional Analysis
Task Listing by Operation Sequence
and Gross/Sub-Functions

Gross Function /Sub-Functions	Task Statement	Task derived from System Function (System & Function #)
55.00) Control RCS heat removal		
	Collect RCS parameter information	RCS 1,3
	Analyze & determine entry into SCS possible	RCS 1,3
56.00) Control RCS Voiding		
	Collect RCS parameter information	RCS 1,3
	Decide if voiding exists	RCS 1,3,7

Nuplex 80 + Functional Analysis
Task Listing by Operation Sequence
and Gross/Sub-Functions

Gross Function /Sub-Functions	Task Statement	Task derived from System Function (System & Function #)
1.00) Standard Post Trip Actions		
	Perform Standard Post Trip Actions	CDP 1,2,3
1.01) Ensure Reactor Shutdown		
	Collect NI information	RX 1
	Collect CEA position information	CEA 4
	Analyze & determine reactor is shutdown	RX 4
1.02) Ensure plant electrical power available		
	Collect TG output information	ELEC
	Collect Bus feeder information	ELEC
	Analyze & determine power available	ELEC
	Collect Diesel Generator Output information	ELEC
	Analyze & determine need for Diesel	ELEC
	Start Diesel	ELEC
1.03) Maintain RCS inventory		
	Collect Pzr parameter information	PZR 1,2,3
	Collect CVCS flow to and from RCS	CVCS 1,11
	Collect RCS subcooling information	RCS 1
	Analyze & determine makeup demands	RCS 7
	Compare demands to CVCS flow	CVCS 1,11
1.04) Maintain RCS pressure		
	Collect RCS pressure information	RCS 3
	Analyze & determine if w/in control limits	PZR 5,6
1.05) Maintain Core heat Removal		
	Collect RCP information	RCS 1
	Collect RCS parameter information	RCS 1
	Analyze & determine if RCPs are operating	RCS 1
1.06) Maintain RCS heat removal		
	Collect SG parameter information	SG 3,5,6
	Collect MSS flow information	MSS 4,5,6
	Collect FCS flow information	FCS 1
	Analyze & determine SG availablity for HR	RCS 1
1.07) Maintain Containment Integrity		
	Collect Containment parameter information	CNTMT 1
	Analyze & determine if isolation is required	CNTMT 1
1.08) Control Containment Atmosphere		
	Collect Containment parameter information	CNTMT 1
	Analyze added cooling needed	CSS 1
	Start Emergency Fans	
	Start Air Recirculation Fans	
	Confirm Air Recirculation	

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Task Listing by Operation Sequence
and Gross/Sub-Functions

Gross Function /Sub-Functions	Task Statement	Task derived from System Function (System & Function #)
1.09) Control Containment Combustible Gases		
	Collect Containment parameter information	CGC 3
	Analyze for H2 generating condition present	CGC 3
2.00) Diagnosis of event		
	Review collected information # 1.01 to 1.09	
	Analyze & determine event	
3.00) Ensure SPTA performed		
	Review collected information # 1.01 to 1.09	
	Analyze & determine if SPTA performed	CDP
	Perform outstanding actions	
4.00) Confirm Diagnosis of event		
	Review collect information # 1.01 to 1.09	
	Analyze & determine event diagnosis confirmed	
5.00) Determine SG Radioactivity		
	Collect representative sample of SG liquids	PSS 1
	Evaluate sample	PSS 1
	Communicate results of evaluation	COMM
6.00) Control RCS depressurization		
	Collect RCS pressure information	RCS 3
	Analyze & determine:	
	if safety injection makeup required?	RCS 3,7
	if normal makeup adequate?	CVCS 1,11
	Establish SI makeup (path and flow) # 6.01	
6.01) Ensure Safety Injection		
	Collect SI parameter information	SI 1
	Analyze & determine if SI to RCS makeup OK	SI 1
	Start Automatic safety injection (SIAS)	SI 1
	Start SI pumps	SI 1
	Align SI to RCS	SI 1
	Confirm SI flow to RCS	SI 1
7.00) Maximize Safety Injection		
	Collect SI & charging flow to RCS information	SI 1
	Analyze & determine if SI flow maximized	SI 1
7.01) Maximize charging flow		
	Start idle charging pumps	CVCS 11
	Confirm all charging pumps operating	CVCS 11

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Task Listing by Operation Sequence
and Gross/Sub-Functions

Gross Function /Sub-Functions	Task Statement	Task derived from System Function (System & Function #)
7.02) Start idle SI pumps		
	Start SI pumps	SI 1
	Confirm SI pumps operating	SI 1
7.03) Ensure electrical power to SI components		
	Compare flows to determine if SI maximized	SI 1
	Collect power available info of components	ELEC
	Align power to component	ELEC
7.04) Ensure valve alignments		
	Align charging to RCS	CVCS 11
	Confirm alignment of charging to RCS	CVCS 11
	Align SI to RCS	SI 1
	Confirm alignment of SI to RCS	SI 1
7.05) Ensure necessary auxiliaries operating		
	Analyze & determine "auxiliaries" needed	AIR ELEC
	Confirm "auxiliaries" are operating	AIR ELEC
8.00) Control RCS depressurization		
	Collect RCS pressure information	RCS 1
	Analyze & determine if RCPs ops within limits	RCS 1
	Compare RCP ops against event strategy	RCS 1,4
	Decide whether to stop 4,2,or no RCPs	RCS 4
8.01) Stop two RCPs		
	Decide which two RCPs will be stopped	RCS 4
	Stop RCPs	RCS 4
	Confirm RCPs stopped	RCS 4
8.02) Monitor RCP operating limits		
	Collect RCS process parameter information	RCS 1,4
	Analyze & determine if to continue RCP ops	RCS 4
8.03) Stop all RCPs		
	Stop RCPs	RCS 4
	Confirm RCPs stopped	RCS 4
9.00) Control SG pressure		
	Refer to # 9.01 to 9.04	
9.01) Control RCS heat removal		
	Collect RCS temperature information	RCS 1
	Collect MSS flow information	MSS 4,5,6
	Decide rate of steaming using TBS	MSS 5
	Control TBS rate of steaming	MSS 5

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Task Listing by Operation Sequence
and Gross/Sub-Functions

Gross Function /Sub-Functions	Task Statement	Task derived from System Function (System & Function #)
9.02) Maintain SG inventory		
	Collect SG parameter information	SG 3,4
	Collect MSS flow information	MSS 4,5,6
	Analyze & determine demand for SG makeup	SG 3
	Decide rate of feeding SG	SG 3
	Analyze & determine method of feeding SG	FCS 1/EFW
	Refer to # 9.03 to 9.04	
9.03) Control Main Feedwater to SGs		
	Control Main feedwater flow to SG	FCS 1
	Collect FCS flow information	FCS 1
	Analyze & determine demand for SG makeup	SG 3
	Decide rate of feeding SG	SG 3
9.04) Control Emergency Feedwater to SGs		
	Control Emergency Feedwater to SG	EFW 1
	Collect Emergency Feedwater flow information	EFW 1
	Analyze & determine demand for SG makeup	SG 3
	Decide rate of feeding SG	SG 3
10.00) Isolate the most effected SG		
	Close SG MSIVs and bypasses	MSS 8
	Close Feedwater Isolation Valves	FCS 1
	Close Emergency Feedwater Isolation Valves	EFW 1
	Close vents, drains, and exhausts	MSS 8
10.01) Determine Affected Steam Generator		
	Collect SG parameter information	SG 3,4
	Compare two SG responses	SG 3
	Analyze & determine effected SG	
10.02) Monitor SG inventory		
	Collect SG parameter information	SG 3,4
	Decide rate of RCS ingress	
10.03) Determine SG radioactivity		
	Collect representative sample of SG liquids	PSS 1
	Analyze sample for radioactivity	PSS 1
	Communicate results of analysis	COMM
11.00) Confirm correct SG isolated		
	Collect SG parameter information	SG 3,4
	Compare two SG responses	SG 4
	Refer to # 11.01 to 11.02	

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Task Listing by Operation Sequence
and Gross/Sub-Functions

Gross Function /Sub-Functions	Task Statement	Task derived from System Function (System & Function #)
11.01) Monitor SG inventory		
	Compare SG parameter information	SG 3,4
	Decide rate of RCS ingress	
11.02) Monitor RCS heat removal		
	Collect RCS temperature information	RCS 1
	Analyze & determine if heat removal adequate	
12.00) Maintain isolated SG parameters		
	Refer to # 12.01 to 12.02	
12.01) Maintain isolated SG inventory		
	Collect SG parameter information	SG 3,4
	Analyze & determine whether to blowdown SG	SG 6
	Perform SG blowdown draining	SG 6
12.02) Maintain SG pressure		
	Collect RCS temperature information	RCS 1
	Collect SG pressure information	SG 4
	Compare for condition of overpressurization	SG 4
13.00) Maintain unisolated SG parameters normal		
	Refer to # 13.01 to 13.03	
13.01) Maintain SG inventory		
	Collect SG parameter information	SG 3,4
	Collect MSS flow information	MSS 4,5,6
	Analyze & determine demand for SG makeup	SG 3
	Decide rate of feeding SG	
	Analyze & determine method for feeding SG	FCS 1/EFW1
	Refer to # 13.02 or 13.03	
13.02) Control Main Feedwater to SGs		
	Control Main feedwater flow to SG	FCS 1
	Collect FCS flow information	FCS 1
	Analyze & determine demand for SG makeup	SG 3
	Decide rate of feeding SG	SG 3
13.03) Control Emergency Feedwater to SGs		
	Control Emergency feedwater to SG	EFW 1
	Collect Emergency feedwater flow information	EFW 1
	Analyze & determine demand for SG makeup	SG 3
	Decide rate of feeding SG	SG 3

Nuplex 80 + Functional Analysis
Task Listing by Operation Sequence
and Gross/Sub-Functions

Gross Function /Sub-Functions	Task Statement	Task derived from System Function (System & Function #)
14.00) Control RCS inventory		
	Collect Pzr parameter information	PZR
	Collect RCS parameter information	RCS 1,3,7
	Analyze & determine inventory change needed	RCS 7
14.01) Monitor for Termination Criteria		
	Review informaiton collected @ 14.00	RCS 1,3,7
	Analyze & determine amount of SI makeup	RCS 7
	Decide whether to throttle or stop SI to RCS	RCS 1,3,7
14.02) Throttle or Stop SI		
	Throttle SI flow to RCS	SI 1
	Stop SI pump	SI 1
	Confirm reduced SI flow to RCS	RCS 7
14.03) Confirm RCS inventory control		
	Collect Pzr parameter information	PZR
	Collect RCS parameter information	RCS 7
	Confirm RCS inventory has stabilized	RCS 7
15.00) Control RCS inventory		
	Collect PZR parameter information	PZR 2
	Collect RCS parameter information	RCS 7
	Analyze & determine inventory change needed	SI 1
	Refer to @ 15.01 to 15.03	SI 1
15.01) Monitor RCS parameters		
	Collect RCS parameter information	RCS 1,7
	Analyze & determine whether to reinitate SI	RCS 7
15.02) Reinitate Full SI flow		
	Open SI valves	SI 1
	Start SI pumps	SI 1
	Confirm full SI flow	RCS 7
15.03) Confirm RCS inventory control		
	Collect Pzr parameter information	PZR 2
	Collect RCS parameter information	RCS 7
	Confirm RCS inventory being maintained	RCS 7
16.00) Ensure proper charging and letdown		
	Collect PZR parameter information	PZR 1,2,4
	Collect CVCS flows to and from RCS	CVCS 1,11
	Analyze & determine makeup demands	RCS 7
	Compare demand to CVCS flows	CVCS 1,11
	Control Letdown flow	CVCS 1
	Control Charging flow	CVCS 1,11

Nuplex 80 + Functional Analysis
Task Listing by Operation Sequence
and Gross/Sub-Functions

Gross Function /Sub-Functions	Task Statement	Task derived from System Function (System & Function #)
17.00) Ensure vessel P-T limits maintained		
	Refer to # 17.01 to 17.08	
17.01) Monitor RCS for P-T violations		
	Collect RCS temperature information	RCS 1
	Collect RCS pressure information	RCS 2,3
	Analyze & determine if violation exists	RPV 1
	Analyze & determine pressure control method	RCS 2,3
17.02) Stop the Cooldown		
	Throttle TBS steaming rate	MSS 5
	Confirm rate of RCS cooldown reduced to 0	RCS 1
17.03) Control RCS pressure (method 1)		
	Decide main spray valve position to open to	PZR 6
	Open main pressurizer spray valves	PZR 6
	Confirm depressurization	RCS 3
	Decide when to close valves	RCS 3
	Close main pressurizer spray valves	PZR 6
	Confirm valves closed	RCS 3/PZR6
17.04) Control RCS pressure (method 2)		
	Align charging to auxiliary spray header	CVCS 2
	Confirm charging pumps operating	CVCS 2
	Start charging pumps	CVCS 2
	Open Auxiliary spray valve	CVCS 2
	Confirm depressurization	RCS 3
	Close Auxiliary spray valve	CVCS 2
17.05) Control RCS pressure (method 3)		
	Control SI flow to RCS	SI 1
	Collect RCS parameter information	RCS 1,3,7
	Analyze & determine amount of SI makeup	RCS 7
	Control SI flow to RCS	SI 1
	Confirm depressurization	RCS 3
17.06) Maintain SG inventory		
	Collect SG parameter information	SG 3,4
	Collect MSS flow information	MSS 4,5,6
	Analyze & determine demand of SG makeup	SG 3
	Analyze & determine method: (#17.07 or 17.08)	SG 3
17.07) Control Main Feedwater to SGs		
	Control main feedwater flow to SG	FCS 1
	Collect FCS flow information	FCS 1
	Analyze & determine demand for SG makeup	SG 3
	Decide rate of feeding SG	SG 3

Nuplex 80 + Functional Analysis
Task Listing by Operation Sequence
and Gross/Sub-Functions

Gross Function /Sub-Functions	Task Statement	Task derived from System Function (System & Function #)
17.08) Control Emergency Feedwater to SGs		
	Control Emergency feedwater flow to SG	EFW 1
	Collect Emergency feedwater flow information	EFW 1
	Analyze & determine demand of SG makeup	SG 3
	Decide rate of feeding SG	SG 3
18.00) Determine need for forced cooling		
	Refer to # 18.01 to 18.03 to evaluate needs	
	Analyze & determine if force circ. needed	RCS 1,4
18.01) Determine present heat removal adequacy		
	Collect RCS parameter information	RCS 1
	Collect core parameter information	RX 3
	Analyze & determine adequacy of heat removal	RCS 1
18.02) Monitor RCS parameters		
	Collect RCS parameter information	RCS 1
	Collect RCP parameter information	RCS 4
	Compute duration of RCP seal cooling !	RCS 4
18.03) Determine need for Main Pzr spray		
	Collect RCS pressure information	RCS 1
	Collect PZR parameter information	PZR 2
	Analyze & determine adequacy of aux. spray	RCS 3
	Analyze & determine need for main spray	RCS 3
19.00) Determine if conditions permit RCP start		
	Refer to # 19.01 to 19.04	
	Analyze & determine if RCP restart permitted	RCS 4
19.01) Ensure electrical power to RCPs		
	Collect electric power available information	ELEC
	Close 13.8 kV RCP bus supply breaker	ELEC
19.02) Maintain SG inventory		
	Collect Sg parameter information	SG 3
	Collect MSS parameter information	MSS 5
	Collect main feedwater information	FCS 1
	Collect Emergency feedwater information	EFW 1
	Analyze & determine if SG inventory adequate	SG 3
19.03) Maintain RCS inventory		
	Collect Pzr parameter information	PZR 2
	Analyze & determine if RCS inventory adequate	RCS 1,7

Nuplex 80 + Functional Analysis
Task Listing by Operation Sequence
and Gross/Sub-Functions

Gross Function /Sub-Functions	Task Statement	Task derived from System Function (System & Function #)
19.04) Monitor core heat removal		
	Collect core temperature information	RX 3
	Collect RCS pressure information	RCS 3
	Analyze & determine core cooling adequate	RX 3
20.00) Restart RCPs		
	Decide which pumps to start	RCS 4
	Refer to # 25.01 to 25.03	
20.01) Ensure RCS inventory		
	Start all charging pumps	CVCS 1,11
	Collect RCS parameter information	RCS 1
	Start all SI pumps	SI 1
20.02) Start RCP		
	Start RCP	RCS 4
	Collect RCS parameter information	RCS 1
	Confirm RCPs started	RCS 4
	Collect RCP bus amperage information	ELEC
20.03) Monitor RCS parameters for Forced Circ.		
	Collect RCP parameter information	RCS 4
	Collect RCS parameter information	RCS 1
	Analyze & determine if forced circ. adequate	RCS 1,4
21.00) Control RCS and Core heat removal		
	Collect RCP parameter information	RCS 4
	Analyze & determine if RCPs are operating	RCS 4
	Refer to # 21.01	
21.01) Monitor RCS parameters for Natural Circ.		
	Collect SG parameter information	SG 3
	Collect MSS flow information	MSS 5,6
	Collect RCS temperature information	RCS 1
	Compute time since loss of forced circ.	RCS 1
	Analyze & determine if Natural circ. exists	RCS 5
22.00) Control Reactivity		
	Refer to # 22.01 to 22.03	
22.01) Borate The RCS		
	Collect RCS Boron Conc. information	RX 4
	Compare RCS Boron Conc. to tech specs	RX 4
	Collect Boron Addition Tank Conc. information	CVCS 4,8
	Analyze & determine borated water to add	CVCS 4
	Control letdown to maintain inventory	PZR 2
	Analyze & determine prevent dilution method	RX 4

Nuplex 80 + Functional Analysis
Task Listing by Operation Sequence
and Gross/Sub-Functions

Gross Function /Sub-Functions	Task Statement	Task derived from System Function (System & Function #)
22.02) Prevent dilution (method 1)		
	Analyze & determine if RCPs are operating	RCS 4
	Collect Pzr Boron Conc. information	PZR 2
	Analyze & determine Pzr dilution impact	RX 4
	Control Pzr spray to mix boron	CVCS 2
	Open Pzr liquid sample isolation valve	PZR
22.03) Prevent dilution (method 2)		
	Analyze & determine if RCPs are NOT operating	RCS 4
	Collect Pzr Boron Conc. information	PZR 2
	Analyze & determine Pzr dilution impact	RX 4
	Compute additional boron required to offset	RX 4
	Open Pzr liquid sample isolation valve	PZR
23.00) Perform a controlled cooldown		
	Collect condenser parameter information	FCS 1
	Analyze & determine method for cooldown	
	Refer to either # 23.01 or 23.02	
23.01) Control cooldown w/Turbine Bypass Sys		
	Collect condenser parameter information	FCS 1
	Control TBS rate of steaming	MSS 5
	Control condenser hotwell level & pressure	FCS 1
	Control condenser cooling	
	Collect RCS temperature information	RCS 1
	Decide rate of steaming using TBS	MSS 5
23.02) Control cooldown w/Atmospheric Dumps		
	Control ADV rate of steaming	MSS
	Collect RCS temperature information	RCS 1
	Decide rate of steaming using ADVs	MSS
24.00) Compensate for RCS shrinkage		
	Collect RCS parameter information	RCS 7
	Evaluate demand for RCS makeup	PZR 1,2
	Control Charging flow to RCS	CVCS 1,11
	Start idle Charging pumps	CVCS 11
	Control SI flow to RCS	SI
	Start idle SI pumps	SI
25.00) Ensure vessel P-T limits maintained		
	Refer to # 25.01 to 25.05	
25.01) Monitor RCS for P-T violations		
	Collect RCS temperature information	RCS 1
	Collect RCS pressure information	RCS 2,3
	Analyze & determine if violation exists	RPV 1
	Analyze & determine method:# 25.03 to 25.05	

Nuplex 80 + Functional Analysis
Task Listing by Operation Sequence
and Gross/Sub-Functions

Gross Function /Sub-Functions	Task Statement	Task derived from System Function (System & Function #)
25.02) Stop the Cooldown		
	Throttle TBS steaming rate	MSS 5
	Confirm rate of RCS cooldown reduced to 0	RCS 1
25.03) Control RCS pressure (method 1)		
	Decide main spray valve position to open to	PZR 6
	Open main pressurizer spray valves	PZR 6
	Confirm RCS depressurization	RCS 3
	Decide when to close valves	RCS 3
	Close main pressurizer spray valves	PZR 6
	Confirm valves closed	PZR 6/RCS3
25.04) Control RCS pressure (method 2)		
	Align charging to auxiliary spray header	CVCS 2
	Confirm charging pumps operating	CVCS 2
	Start charging pumps	CVCS 2
	Open auxiliary spray valve	CVCS 2
	Confirm RCS depressurization	RCS 3
	Close auxiliary spray valve	CVCS 2
25.05) Control RCS pressure (method 3)		
	Control SI flow to RCS	SI 1
	Collect RCS parameter information	RCS 1,3,7
	Analyze & determine amount of SI makeup	RCS 7
	Control SI flow to RCS	SI 1
	Confirm RCS depressurization	RCS 3
26.00) Control unisolated SG inventory		
	Collect SG parameter information	SG 3,4
	Refer to # 26.01 to 26.03	
26.01) Maintain SG inventory		
	Collect SG parameter information	SG 3,4
	Collect MSS flow information	MSS 4,5,6
	Analyze & determine demand for SG makeup	SG 3
	Analyze & determine method # 26.02 or 26.03	FCS 1/EFW1
26.02) Control Main Feedwater to SGs		
	Control main feedwater flow to SG	FCS 1
	Collect FCS flow information	FCS 1
	Analyze & determine demand for SG makeup	SG 3
	Decide rate of feeding SG	SG 3
26.03) Control Emergency Feedwater to SGs		
	Control Emergency feedwater flow to SG	EFW 1
	Collect Emergency feedwater flow information	EFW 1
	Analyze & determine demand for SG makeup	SG 3
	Decide rate of feeding SG	SG 3

Nuplex 80 + Functional Analysis
Task Listing by Operation Sequence
and Gross/Sub-Functions

Gross Function /Sub-Functions	Task Statement	Task derived from System Function (System & Function #)
27.00) Ensure condensate reserves adequate		
	Collect condensate reserve parameter info	NUPS 1,2
	Analyze & determine reserve capacity	NUPS 1,2
	Compute adequacy of reserves	RCS 1/SG 3
28.00) Cool & Depressurize Isolated SG		
	Collect representative sample of SG liquids	PSS 1
	Analyze sample	PSS 1
	Communicate analysis results	COMM
	Analyze & determine method of SG cooldown	SG 5
	Refer to # 28.01 to 28.06	
28.01) Control cooldown w/ SG blowdown		
	Collect SG parameter information	SG 3,4
	Collect SG pressure information	SG 4
	Perform SG blowdown draining	SG 6
	Confirm draining	SG 6
28.02) Control cooldown w/Turbine Bypass Sys		
	Collect condenser parameter information	FCS 1
	Control TBS rate of steaming	MSS 5
	Control condenser hotwell level & pressure	FCS 1
	Monitor condensate & air ejector radiation	
	Collect RCS temperature information	RCS 1
	Decide rate of steaming using TBS	MSS 5
28.03) Control cooldown w/Atmospheric Dumps		
	Control ADV rate of steaming	MSS
	Collect RCS temperature information	RCS 1
	Collect SG pressure information	SG 4
	Monitor SG steam radioactivity	
	Decide rate of steaming using ADVs	MSS
28.04) Maintain SG inventory		
	Collect SG parameter information	SG 3,4
	Collect MSS flow information	MSS 4,5,6
	Analyze & determine demand for SG makeup	SG 3
	Analyze & determine method # 28.05 or 28.06	
28.05) Control Main Feedwater to SGs		
	Control main feedwater flow to SG	FCS 1
	Collect FCS flow information	FCS 1
	Analyze & determine demand for SG makeup	SG 3
	Decide rate of feeding SG	SG 3

Nuplex 80 + Functional Analysis
Task Listing by Operation Sequence
and Gross/Sub-Functions

Gross Function /Sub-Functions	Task Statement	Task derived from System Function (System & Function #)
28.06) Control Emergency Feedwater to SGs		
	Control Emergency feedwater flow to SG	EFW 1
	Collect Emergency feedwater flow information	EFW 1
	Analyze & determine demand for SG makeup	SG 3
	Decide rate of feeding SG	SG 3
29.00) Check for potential Radiological release		
	Collect representative sample of condensate	FCS 1
	Analyze liquid samples	FCS 1
	Collect representative sample of Building air	BLDG 1
	Analyze air samples	BLDG 1
	Communicate results of analysis	
30.00) Maintain control of RCS pressure		
	Collect RCS pressure information	RCS 3
	Compare for approach to safety sys auto start	RCS 1,3
	Refer to # 30.01 to 30.02	
30.01) Block Automatic initiation of MSIS		
	Block MSIS	
	Confirm MSIS blocked	
30.02) Block Automatic initiation of SIAS		
	Block SIAS	
	Confirm SIAS blocked	
31.00) Maintain control of RCS pressure		
	Collect RCS pressure information	RCS 3
	Analyze & determine SI tank impact	SI 1
	Decide method: # 31.01, 31.02, or 31.03	
31.01) Control RCS pressure (method 1)		
	Close SI tank isolation valve	SI 5
	Confirm SI tank isolated	RCS 3
31.02) Control RCS pressure (method 2)		
	Collect RCS pressure information	RCS 3
	Close SI tank nitrogen pressure valve	SI 1
	Open SI tank vent valve	SI 1
	Confirm SI tank depressurized	SI 1
31.03) Control RCS pressure (method 3)		
	Collect RCS pressure information	RCS 3
	Close SI tank nitrogen pressure valve	SI 1
	Open SI tank drain valve	SI 1
	Confirm SI tank depressurized	SI 1

Nuplex 80 + Functional Analysis
Task Listing by Operation Sequence
and Gross/Sub-Functions

Gross Function /Sub-Functions	Task Statement	Task derived from System Function (System & Function #)
32.00) Maintain control of RCS pressure (LTOP)		
	Compare RCS parameter information to LTOP	RCS 1,3
	Align LTOP	RCS 1,3
	Confirm LTOP	RCS 1,3
	Collect RCS parameter information	RCS 1,3
33.00) Control RCS heat removal		
	Collect RCS parameter information	RCS 1,3
	Analyze & determine entry into SCS possible	RCS 1,3
34.00) Monitor/Control RCS Voiding		
	Refer to # 34.01 to 34.04	
34.01) Monitor RCS inventory		
	Collect Pzr parameter information	PZR 2
	Collect RV parameter information	RX
	Collect RCS parameter information	RCS 1,3
	Analyze & determine if void conditions exist	RCS 1,3,7
	Analyze & determine void correction needed	RCS 1,3
34.02) Isolate letdown		
	Close letdown isolation valve	CVCS 1
	Confirm letdown isolated	CVCS 1
34.03) Control RCS pressure		
	Collect RCS pressure information	RCS 3
	Close main spray valve	RCS 3
	Close auxiliary spray valve	RCS 3
	Confirm depressurization stopped	RCS 3
34.04) Collapse RCS void		
	Collect RCS parameter information	RCS 1,3,7
	Control Pzr heaters & spray	PZR 2
	Control charging flow to RCS	CVCS 1,11
	Confirm pressurization & void collapse	RCS 3
	Open Auxiliary spray valve	CVCS 2
	Confirm depressurization & void collapse	RCS 3

Nuplex 80 + Functional Analysis
Task Listing by Operation Sequence
and Gross/Sub-Functions

Gross Function /Sub-Functions	Task Statement	Task derived from System Function (System & Function #)
1.00) Standard Post Trip Actions		
	(later)	
1.01) Ensure Reactor Shutdown		
	(later)	
1.02) Ensure plant electrical power available		
	(later)	
1.03) Maintain RCS inventory		
	(later)	
1.04) Maintain RCS pressure		
	(later)	
1.05) Maintain Core heat removal		
	(later)	
1.06) Maintain RCS heat removal		
	(later)	
1.07) Maintain Containment Integrity		
	(later)	
1.08) Control Containment Atmosphere		
	(later)	
1.09) Control Containment Combustible Gases		
	(later)	
2.00) Diagnosis of event		
	(later)	
3.00) Ensure SPTA performed		
	(later)	
4.00) Ensure proper diagnosis of event		
	(later)	

Nuplex 80 + Functional Analysis
Task Listing by Operation Sequence
and Gross/Sub-Functions

Gross Function /Sub-Functions	Task Statement	Task derived from System Function (System & Function #)
5.00) Control RCS depressurization		
	(later)	
5.01) Ensure Safety injection		
	(later)	
6.00) Maximize Safety Injeciton		
	(later)	
6.01) Maximize Charging flow		
	(later)	
6.02) Start idle SI Pumps		
	(later)	
6.03) Ensure electrical power to SI components		
	(later)	
6.04) Ensure valve alignments		
	(later)	
6.05) Ensure necessary auxiliaries operating		
	(later)	
7.00) Control RCS depressurization		
	(later)	
7.01) Stop two RCPs		
	(later)	
7.02) Monitor RCP operating limits		
	(later)	
8.00) Determine Affected Steam Generator		
	(later)	
8.01) Monitor SG inventory		
	(later)	

Nuplex 80 + Functional Analysis
Task Listing by Operation Sequence
and Gross/Sub-Functions

Gross Function /Sub-Functions	Task Statement	Task derived from System Function (System & Function #)
8.02) Isolate the most affected SG		
	(later)	
9.00) Confirm correct SG isolated		
	(later)	
9.01) Monitor SG inventory		
	(later)	
9.02) Monitor RCS heat removal		
	(later)	
10.00) Maintain unisolated SG parameters normal		
	(later)	
10.01) Maintain SG inventory		
	(later)	
10.02) Control Main Feedwater to SGs		
	(later)	
10.03) Control Emergency Feedwater to SGs		
	(later)	
10.04) Control steaming of SG w/TBS		
	(later)	
10.04) Control coodown SG w/Atmospheric Dumps		
	(later)	
11.00) Monitor and Control Response of SI		
	(later)	
11.01) Monitor for Termination Criteria		
	(later)	
11.02) Throttle or Stop SI		
	(later)	

Nuplex 80 + Functional Analysis
Task Listing by Operation Sequence
and Gross/Sub-Functions

Gross Function /Sub-Functions	Task Statement	Task derived from System Function (System & Function #)
11.03) Confirm RCS inventory control		
	(later)	
12.00) Reinitiate Full SI flow if required		
	(later)	
12.01) Monitor RCS parameters		
	(later)	
12.02) Reinitiate full SI flow		
	(later)	
12.03) Confirm RCS inventory control		
	(later)	
13.00) Ensure proper charging and letdown		
	(later)	
14.00) Ensure core/vessel material integrity		
	(later)	
14.01) Monitor RCS for P-T violations		
	(later)	
14.02) Stop the cooldown		
	(later)	
14.03) Control RCS pressure (method 1)		
	(later)	
14.04) Control RCS pressure (method 2)		
	(later)	
14.05) Control RCS pressure (method 3)		
	(later)	
14.06) Maintain SG inventory		
	(later)	

Nuplex 80 + Functional Analysis
Task Listing by Operation Sequence
and Gross/Sub-Functions

Gross Function /Sub-Functions	Task Statement	Task derived from System Function (System & Function #)
14.07) Control Main Feedwater to SGs		
	(later)	
14.08) Control Emergency Feedwater to SGs		
	(later)	
15.00) Maintain Containment Integrity		
	(later)	
15.01) Ensure Containment Isolation		
	(later)	
16.00) Control Containment Atmosphere		
	(later)	
16.01) Control Containment Fan Cooling		
	(later)	
16.[illegible]) Control Containment Spray Cooling		
	(later)	
17.00) Control Containment Pressurization		
	(later)	
17.01) Control Contaiment Spray Cooling		
	(later)	
17.02) Aliagn External H2 Recombiners		
	(later)	
18.00) Monitor for Hydrogen in Containment		
	(later)	
19.00) Control Containment Hydrogen		
	(later)	
19.01) Operate Hydrogen Recombiners		
	(later)	

Nuplex 80 + Functional Analysis
Task Listing by Operation Sequence
and Gross/Sub-Functions

Gross Function /Sub-Functions	Task Statement	Task derived from System Function (System & Function #)
19.02) Operate Hydrogen Purge		
	(later)	
20.00) Determine need for forced cooling		
	(later)	
20.01) Determine present heat removal adequacy		
	(later)	
20.02) Monitor RCS parameters		
	(later)	
20.03) Determine need for Main Pzr spray		
	(later)	
21.00) Determine if conditions permit RCP start		
	(later)	
21.01) Ensure electrical power to RCPs		
	(later)	
21.02) Maintain SG inventory		
	(later)	
21.03) Maintain RCS inventory		
	(later)	
21.04) Monitor core heat removal		
	(later)	
22.00) Restart RCPs		
	(later)	
22.00) Verify Natural Circulation cooling		
	(later)	
22.01) Maintain RCS inventory		
	(later)	

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Task Listing by Operation Sequence
and Gross/Sub-Functions

Gross Function /Sub-Functions	Task Statement	Task derived from System Function (System & Function #)
22.02) Start RCP		
	(later)	
23.00) Verify Natural Circulation cooling		
	(later)	
23.01) Monitor RCS parameters for Natural Circ.		
	(later)	
24.00) Evaluate need for a cooldown		
	(later)	
24.01) Ensure condensate reserves adequate		
	(later)	
24.02) Control RCS pressure		
	(later)	
25.00) Control Reactivity		
	(later)	
25.01) Borate the RCS		
	(later)	
25.02) Prevent dilution (method 1)		
	(later)	
25.03) Prevent dilution (method 2)		
	(later)	
26.00) Perform a controlled cooldown		
	(later)	
26.01) Control cooldown w/Turbine Bypass Sys.		
	(later)	
26.02) Control cooldown w/Atmospheric Dumps		
	(later)	

Nuplex 80 + Functional Analysis
Task Listing by Operation Sequence
and Gross/Sub-Functions

Gross Function /Sub-Functions	Task Statement	Task derived from System Function (System & Function #)
27.00) Ensure proper charging and letdown		
	(later)	
28.00) Ensure vessel P-T limits maintained		
	(later)	
28.01) Monitor RCS for P-T violations		
	(later)	
28.02) Stop the Cooldown		
	(later)	
28.03) Control RCS pressure (method 1)		
	(later)	
28.04) Control RCS pressure (method 2)		
	(later)	
28.05) Control RCS pressure (method 3)		
	(later)	
28.06) Maintain SG inventory		
	(later)	
28.07) Control Main Feedwater to SGs		
	(later)	
28.08) Control Emergency Feedwater to SGs		
	(later)	
29.00) Maintain isolated SG parameters		
	(later)	
29.01) Maintain isolated SG inventory		
	(later)	
30.00) Ensure condensate reserves adequate		
	(later)	

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Task Listing by Operation Sequence
and Gross/Sub-Functions

Gross Function /Sub-Functions	Task Statement	Task derived from System Function (System & Function #)
31.00) Maintain Control of RCS heat removal		
	(later)	
31.01) Block Automatic initation of MSIS		
	(later)	
32.00) Maintain Control of RCS pressure		
	(later)	
32.01) Control RCS pressure (method 1)		
	(later)	
32.02) Control RCS pressure (method 2)		
	(later)	
32.03) Control RCS pressure (method 3)		
	(later)	
33.00) Maintain Control of RCS pressure		
	(later)	
34.00) Control Core heat removal		
	(later)	
35.00) Control RCS heat removal		
	(later)	
36.00) Monitor/Control RCS Voiding		
	(later)	
36.01) Monitor RCS inventory		
	(later)	
36.02) Isolate letdown		
	(later)	
36.03) Control RCS pressure		
	(later)	

Nuplex 80 + Functional Analysis
Task Listing by Operation Sequence
and Gross/Sub-Functions

Gross Function /Sub-Functions	Task Statement	Task Derived from System Function (System & Function #)
3o.C. Collapse RCS voids		
	(later)	

Nuplex 80 + Functional Analysis
Task Listing by Operation Sequence
and Gross/Sub-Functions

Gross Function /Sub-Functions	Task Statement	Task derived from System Function (System & Function #)
1.00) Standard Post Trip Actions		
	(later)	
1.01) Ensure Reactor Shutdown		
	(later)	
1.02) Ensure plant electrical power available		
	(later)	
1.03) Control RCS inventory		
	(later)	
1.04) Control RCS Pressure		
	(later)	
1.05) Control Core Heat Removal		
	(later)	
1.06) Control RCS Heat Removal		
	(later)	
1.07) Maintain Containment Integrity		
	(later)	
1.08) Control Containment Atmosphere		
	(later)	
1.09) Control Containment Combustible Gases		
	(later)	
2.00) Diagnosis of event		
	(later)	
3.00) Ensure SPTA performed		
	(later)	
4.00) Confirm diagnosis of event		
	(later)	

Nuplex 80 + Functional Analysis
Task Listing by Operation Sequence
and Gross/Sub-Functions

Gross Function /Sub-Functions	Task Statement	Task derived from System Function (System & Function #)
5.00) Control RCS heat input		
	(later)	
5.01) Stop all RCPs		
	(later)	
6.00) Determine cause of event		
	(later)	
6.01) Isolate the Feedwater break		
	(later)	
6.02) Monitor SG inventory		
	(later)	
7.00) Restored? No		
	(later)	
8.00) Control RCS heat removal		
	(later)	
8.01) Ensure Main Feedwater to SGs		
	(later)	
8.02) Ensure Emergency Feedwater to SGs		
	(later)	
9.00) Isolate non-vital sources of SG losses		
	(later)	
9.01) Isolate SG blowdown		
	(later)	
9.02) Isolate SG sampling		
	(later)	
9.03) Isolate (other) SG discharges		
	(later)	

Nuplex 80 + Functional Analysis
Task Listing w/ Operation Sequence
and Gross/Sub-Functions

Gross Function /Sub-Functions	Task Statement	Task derived from System Function (System & Function #)
10.00) Control SG depressurization		
	(later)	
10.01) Ensure condensate to SGs		
	(later)	
10.02) Ensure Firepump to SGs		
	(later)	
11.00) Monitor RCS heat removal		
	(later)	
12.00) Restored? Yes		
	(later)	
12.01) Control Main Feedwater Flow to SGs		
	(later)	
12.02) Maintain SG inventory		
	(later)	
13.00) Control RCS heat removal		
	(later)	
13.01) Control cooldown w/Turbine Bypass Sys.		
	(later)	
13.02) Control cooldown w/Atmospheric Dumps		
	(later)	
13.03) Maintain SG inventory		
	(later)	
14.00) Ensure condensate reserves adequate		
	(later)	
15.00) Ensure proper charging and letdown		
	(later)	

Nuplex 80 + Functional Analysis
Task Listing by Operation Sequence
and Gross/Sub-Functions

Gross Function /Sub-Functions	Task Statement	Task derived from System Function (System & Function #)
16.00) Ensure vessel P-T limits maintained.		
	(later)	
16.01) Monitor RCS for P-T violations		
	(later)	
16.02) Stop the cooldown		
	(later)	
16.03) Control RCS pressure (method 1)		
	(later)	
16.04) Control RCS pressure (method 2)		
	(later)	
17.00) Control RCS and core heat removal		
	(later)	
17.01) Monitor RCS parameter for Natural Circ.		
	(later)	
18.00) Determine need for forced cooling		
	(later)	
18.01) Determine present heat removal adequate		
	(later)	
18.02) Monitor RCS parameters		
	(later)	
18.03) Determine need for main Pzr spray		
	(later)	
19.00) Determine if conditions permit RCP start		
	(later)	
20.00) Restart RCPs		
	(later)	

Nuplex 80 + Functional Analysis
Task Listing by Operation Sequence
and Gross/Sub-Functions

Gross Function /Sub-Functions	Task Statement	Task derived from System Function (System & Function #)
20.01) Control RCS inventory		
	(later)	
20.02) Start RCP		
	(later)	
20.03) Monitor RCS parameters for Forced Circ.		
	(later)	
21.00) Control RCS inventory		
	(later)	
21.01) Monitor for Termination criteria		
	(later)	
21.02) Throttle or Stop SI		
	(later)	
21.03) Confirm RCS inventory control		
	(later)	
22.00) Control RCS inventory		
	(later)	
22.01) Monitor RCS parameters		
	(later)	
22.02) Reinitate full SI flow		
	(later)	
22.03) Confirm RCS inventory flow		
	(later)	
23.00) Evaluate need for a cooldown\		
	(later)	
23.01) Ensure condensate reserves adequate		
	(later)	

Nuplex 80 + Functional Analysis
Task Listing by Operation Sequence
and Gross/Sub-Functions

Gross Function /Sub-Functions	Task Statement	Task derived from System Function (System & Function #)
23.02) Control RCS pressure		
	(later)	
24.00) Control reactivity		
	(later)	
24.01) Borate the RCS		
	(later)	
25.00) Control RCS heat removal and pressure		
	(later)	
25.01) Block Automatic initiation of MSIS		
	(later)	
25.02) Block Automatic initiation of SIAS		
	(later)	
26.00) Control RCS pressure		
	(later)	
26.01) Control RCS pressure (method 1)		
	(later)	
26.02) Control RCS pressure (method 2)		
	(later)	
26.03) Control RCS pressure (method 3)		
	(later)	
27.00) Control RCS pressure		
	(later)	
28.00) Control RCS heat removal		
	(later)	
29.00) Monitor/Control RCS voiding		
	(later)	

Nuplex 80 + Functional Analysis
Task Listing by Operation Sequence
and Gross/Sub-Functions

Gross Function /Sub-Functions	Task Statement	Task derived from System Function (System & Function #)
29.01) Monitor RCS inventory		
	(later)	
29.02) Isolate Letdown		
	(later)	
29.03) Control RCS pressure		
	(later)	
29.04) Collapse RCS voids		
	(later)	

Nuplex 80 + Functional Analysis
Task Listing by Operation Sequence
and Gross/Sub-Functions

Gross Function /Sub-Functions	Task Statement	Task derived from System Function (System & Function #)
1.00) Standard Post Trip Actions		
	(later)	
1.01) Ensure Reactor Shutdown		
	(later)	
1.02) Ensure plant electrical power available		
	(later)	
1.03) Control RCS inventory		
	(later)	
1.04) Control RCS pressure		
	(later)	
1.05) Control Core Heat Removal		
	(later)	
1.06) Control RCS heat removal		
	(later)	
1.07) Maintian Containment Integrity		
	(later)	
1.08) Control Containment Atmosphere		
	(later)	
1.09) Control Containment Combustible Gases		
	(later)	
2.00) Diagnosis of event		
	(later)	
3.00) Ensure SPTA performed		
	(later)	
4.00) Confirm diagnosis fo event		
	(later)	

Nuplex 80 + Functional Analysis
Task Listing by Operation Sequence
and Gross/Sub-Functions

Gross Function /Sub-Functions	Task Statement	Task derived from System Function (System & Function #)
5.00) Control RCS heat removal		
	(later)	
5.01) Maintain SG inventory		
	(later)	
5.02) Control Emergency feedwater to SGs		
	(later)	
5.03) Control SG pressure (method 1)		
	(later)	
5.04) Control SG pressure (method 2)		
	(later)	
6.00) Ensure status of plant electrical buses		
	(later)	
7.00) Control plant electrical distribution		
	(later)	
7.01) Ensure emergency AC power available		
	(later)	
7.02) Control DC battery drain		
	(later)	
8.00) Control RCS inventory		
	(later)	
8.01) Isolate Letdown		
	(later)	
8.02) Isolate SCS RCS suction valves		
	(later)	
8.03) Isolate RCP controlled bleedoff		
	(later)	

Nuplex 80 + Functional Analysis
Task Listing by Operation Sequence
and Gross/Sub-Functions

Gross Function /Sub-Functions	Task Statement	Task derived from System Function (System & Function #)
8.04) Isolate RCS charging		
	(later)	
8.05) Isolate RCS sample lines		
	(later)	
9.00) Control RCS and core heat removal		
	(later)	
9.01) Monitor RCS parameters for Natural Circ.		
	(later)	
9.02) Control SG steaming w/Atmospheric Dumps		
	(later)	
9.03) Control Emergency Feedwater to SGs		
	(later)	
10.00) Maintain core heat removal		
	(later)	
10.01) Control core heat removal (method 1)		
	(later)	
10.02) Control core heat removal (method 2)		
	(later)	
11.00) Control RCS heat removal and pressure		
	(later)	
11.01) Block Automatic initiation of MSIS		
	(later)	
11.02) Block Automatic initiation of SIAS		
	(later)	
12.00) Control plant electrical distribution		
	(later)	

Nuplex 80 + Functional Analysis
Task Listing by Operation Sequence
and Gross/Sub-Functions

Gross Function /Sub-Functions	Task Statement	Task derived from System Function (System & Function #)
12.01) Ensure availability of vital AC electric		
	(later)	
12.02) Ensure DC electric loads restored		
	(later)	
13.00) Control reactivity		
	(later)	
13.01) Align to borate the RCS		
	(later)	
14.00) Control RCS inventory		
	(later)	
14.01) Ensure proper charging and letdown		
	(later)	
14.02) Control SI and charging flow		
	(later)	
15.00) Ensure vessel P-T limits maintained.		
	(later)	
15.01) Monitor RCS for P-T violations		
	(later)	
15.02) Stop the Cooldown		
	(later)	
15.03) Control RCS pressure (method 1)		
	(later)	
15.04) Control RCS pressure (method 2)		
	(later)	
15.05) Control RCS pressure (method 3)		
	(later)	

Nuplex 80 + Functional Analysis
Task Listing by Operation Sequence
and Gross/Sub-Functions

Gross Function /Sub-Functions	Task Statement	Task derived from System Function (System & Function #)
16.00) Monitor for Termination Criteria		
	(later)	
16.01) Throttle or Stop SI		
	(later)	
16.03) Confirm RCS inventory control		
	(later)	
17.00) Control RCS inventory		
	(later)	
17.01) Monitor RCS parameters		
	(later)	
17.02) Reinitiate full SI flow		
	(later)	
17.03) Confirm RCS inventory control		
	(later)	
18.00) Ensure cooling systems restored		
	(later)	
18.01) Control UHS cooling flow		
	(later)	
18.02) Control Component Cooling Water flow		
	(later)	
18.03) Control Site Service Water flow		
	(later)	
19.00) Maintain containment atmosphere		
	(later)	
20.00) Maintain control room atmosphere		
	(later)	

Nuplex 80 + Functional Analysis
Task Listing by Operation Sequence
and Gross/Sub-Functions

Gross Function /Sub-Functions	Task Statement	Task derived from System Function (System & Function #)
21.00) Maintain Auxiliary building atmosphere		
	(later)	

Nuplex 80 + Functional Analysis
Task Listing by Operation Sequence
and Gross/Sub-Functions

Gross Function /Sub-Functions	Task Statement	Task derived from System Function (System & Function #)
1.00) Maintain RCS heat removal		
	Collect SCS parameter information	RHR 3
	Collect RCS temperature information	RHR 3
	Compare heat in/removal demands	RHR 3
	Analyze & determine if need to adjust HR	RHR 3
	Control SCS flow through heat exchanger	RHR 3
2.00) Monitor Core Power		
	Collect NI information	RX 1
	Analyze & determine reactor is shutdown	RX 4
3.00) Preparations for Refueling		
	Refer to # 3.01 to 3.05	
3.01) Ensure Crane operational		
	Communicate with Reactor Cavity Area	COMM
	Assess whether crane is operational	
3.02) Control Containment Atmosphere		
	Communicate with Reactor Cavity Area	COMM
	Collect Containment Temperature information	CNTMT 1
	Analyze & determine if added cooling needed	
	Start Air Recirculation Fans	
3.03) Ensure emergency lighting available		
	Communicate with Reactor Cavity Area	COMM
	Analyze & determine that emerg. lighting OK	CNTMT
3.04) Monitor Containment Atmosphere		
	Communicate with Reactor Cavity Area	COMM
	Analyze & determine air particulate to limits	CNTMT
3.05) Lift/Move missile shield		
	Communicate with Reactor Cavity Area	COMM
	Coordinate movement of crane to lift shield	
	Coordinate movement of missile shield to store	
4.00) Monitor IRWST boron concentration		
	Communicate with Chemist to Sample IRWST	COMM
	Evaluate boron level in IRWST	RX 4
	Analyze & determine if added boron needed	RX 4

Nuplex 80 + Functional Analysis
Task Listing by Operation Sequence
and Gross/Sub-Functions

Gross Function /Sub-Functions	Task Statement	Task derived from System Function (System & Function #)
5.00) Prepare Reactor Vessel Head for Removal		
	Refer to # 5.01 to 5.08	
5.01) Uncouple CRDM		
	Communicate with Reactor Cavity Area Coordinate uncoupling of CRDMs	COMM
5.02) Disconnect CRDM cables		
	Communicate with Reactor Cavity Area Coordinate disconnecting of CRDM cables	COMM
5.03) Remove in-core instrumentation		
	Communicate with Reactor Cavity Area Coordinate removal of in-core instruments Coordinate "tag out" of power supplies	COMM
5.04) Disconnect CRDM cooling ducts		
	Communciate with Reactor Cavity Area Coordinate removal of CRDM cooling ducts Coordinate "tag out" of CRDM cooling	COMM
5.05) Remove vessel head insulation		
	Communicate with Reactor Cavity Area Coordinate removal of vessel head insulation	COMM
5.06) Maintain Clean Vessel head area		
	Communicate with Reactor Cavity Area Coordinate for loose contamination with HP Coordinate to clean vessel head area	COMM
5.07) Remove vessel head nuts & studs		
	Communicate with Reactor Cavity Area Coordinate to detension head bolts Coordinate to remove head nuts & studs	COMM
5.08) Install Plugs		
	Communicate with Reactor Cavity Area Coordinate to install plugs	COMM
6.00) Control RCS inventory		
	Communicate with Reactor Cavity Area Coordinate to lower vessel level Control letdown to lower vessel level	COMM

Nuplex 80 + Functional Analysis
Task Listing by Operation Sequence
and Gross/Sub-Functions

Gross Function /Sub-Functions	Task Statement	Task derived from System Function (System & Function #)
7.00) Install refueling pool seal		
	Communicate with Reactor Cavity Area	COMM
	Coordinate installation of pool seal	
7.01) Leak test refueling pool seal		
	Communicate with Reactor Cavity Area	COMM
	Coordinate to leak test pool seal	
	What is done to leak test pool seal????	
8.00) Install Reactor Vessel Lift Rig		
	Communicate with Reactor Cavity Area	COMM
	Coordinate to install head lifting rig	
8.01) Lift/Move reactor vessel head		
	Communicate with Reactor Cavity Area	COMM
	Coordinate to lift head/inspect uncoupled CEA	
	Coordinate to move head to storage	
	Coordinate movement of crane	
9.00) Prepare for fuel transfer		
	Refer to # 9.01 to 9.03	
9.01) Remove transfer tube flange		
	Communicate with Reactor Cavity Area	COMM
	Coordinate removal of tranfer tube flange	
9.02) Control RCS inventory		
	Communicate with Reactor Cavity Area	COMM
	Coordinate water level in refueling pool	RHR 5
	Control borated water flow to RCS	RHR 5
9.03) Align fuel transfer tube for refueling		
	Communicate with Reactor Cavity Area	COMM
	Coordinate opening fuel transfer tube valve	
10.00) Install Guide Structure lift rig		
	Communicate with Reactor Cavity Area	COMM
	Coordinate guide structure lift rig setup	
10.01) Lift/Move guide structure		
	Communicate with Reactor Cavity Area	COMM
	Coordinate lift of guide structure	
	Coordinate movement of guide struc. to store	
	Coordinate movement of crane	

Nuplex 80 + Functional Analysis
Task Listing by Operation Sequence
and Gross/Sub-Functions

Gross Function /Sub-Functions	Task Statement	Task derived from System Function (System & Function #)
11.00) Ensure Refueling machine operational		
	Communicate with Refueling machine operator	COMM
	Coordinate checkout of refueling machine	
	Coordinate checkout of Video equipment	
11.01) Install refueling machine hoist		
	Communicate with Refueling machine operator	COMM
	Coordinate installation of refueling machine	
12.00) Remove and reload fuel		
	Refer to # 12.01 to 12.04	
12.01) Remove Spent fuel from core		
	Communicate with Refueling machine operator	COMM
	Coordinate removal to spent fuel from core	RX 4
	Copy or Map location of fuel removed	RX 4
	Collect NI information	RX 1
12.02) Transport spent fuel to storage		
	Communicate with Refueling machine operator	COMM
	Coordinate transfer of spent fuel thru tube	
	Coordinate placement of spent fuel in racks	
12.03) Transport of new fuel to core		
	Communicate with Refueling machine operator	COMM
	Coordinate transport of new fuel thru tube	
12.04) Install new fuel in core		
	Communicate with Refueling machine operator	COMM
	Coordinate install of new fuel	RX 4
	Copy or Map location of new fuel	RX 4
	Monitor NI information	RX 4
	Compare with previous NI information	RX 4
	Assess/Evaluate core power differences	RX 4
13.00) Monitor fuel pool parameters		
	Communicate with Chemist to sample fuel pool	COMM
	Analyze sample results	RX 4
13.01) Monitor RCS parameters		
	Collect RCS parameter information	RCS 1
	Compare with previous information for changes	RHR 3

Nuplex 80 + Functional Analysis
Task Listing by Operation Sequence
and Gross/Sub-Functions

Gross Function /Sub-Functions	Task Statement	Task derived from System Function (System & Function #)
13.03) Monitor Core power		
	Collect NI information	RX 1
	Compare with previous information for changes	RX 4
14.00) Align fuel transfer tube for removal		
	Communicate with Reactor Cavity area	COMM
	Coordinate close of fuel transfer tube valve	
15.00) Install Upper Guide Structure		
	Communicate with Reactor Cavity area	COMM
	Coordinate lift of guide structure	
	Coordinate movement of crane	
	Coordinate movement into vessel	
16.00) Control RCS inventory		
	Communicate with Reactor Cavity Area	COMM
	Coordinate to lower vessel level	RHR 5
	Transfer water from refueling cavity	RHR 5
17.00) Install Reactor Vessel head		
	Communicate with Reactor Cavity Area	COMM
	Coordinate lifting of Vessel head	
	Coordinate movement of crane	
	Coordinate movement/installation of head	
17.01) Install Studs and bolt down head		
	Communicate with Reactor Cavity Area	COMM
	Coordinate installing studs	
	Coordinate head bolt down	
18.00) Install Transfer tube blind flange		
	Communicate with Reactor Cavity Area	COMM
	Coordinate installation of tube blind flange	
19.00) Install Reactor Vessel Head insulation		
	Communicate with Reactor Cavity Area	COMM
	Coordinate installation of head insulation	
20.00) Install in-core instrumentation		
	Communicate with Reactor Cavity Area	COMM
	Coordinate installing of in-core instruments	
	Coordiante removal of in-core "tag out"	

Nuplex 80 + Functional Analysis
Task Listing by Operation Sequence
and Group/Sub-Functions

Group Function / Sub-Functions	Task Statement	Task derived from System Function (System & Function #)
21.00) Install CEDM cabling		
	Communicate with Reactor Cavity area	COMM
	Coordinate connection of CEDM cabling	
	Coordinate removal of CEDM "tag out"	
21.01) Install CEDM cooling ducts		
	Communicate with Reactor Cavity Area	COMM
	Coordinate connection of CEDM cooling ducts	
	Coordinate removal of CEDM cooling "tag out"	
21.02) Install Reactor Vent piping		
	Communicate with Reactor Cavity Area	COMM
	Coordinate connecting reactor vent piping	
22.00) Install missle shield		
	Communicate with Reactor Cavity Area	COMM
	Coordinate lift of missle shield	
	Coordinate movement of crane	
	Coordinate movement/placing of missle shield	

Appendix D

Task Element Listings by Event

The contents of this appendix provide the task element information for the task statement listings, for specifically the RCS System Functions used in NUPLEX 80+ general operations. Other (collect) task element information has been included, however the detail of this information is not intended to be completed for this analysis's scope. The task listings are partitioned by gross function and subfunction for the following events:

Nuplex 80 + Functional Analysis
Derivation of Event Specific Tasks
and Summary of Parameters Used

Gross Function /Sub-Functions	Task Statement	Task derived from System Function (System & Function #)	Parameter(s) to Observe (for details see Appendix F)
1.00) Monitor for load changes			
	Collect TG output information	ELEC	Generator Power (VA)
	Compare to previous information for changes		Generator Power (Watts)
			Generator output frequency
			Generator output voltage
1.01) Control load changes			
	Collect TG output information	ELEC	Generator Output Voltage
	Collect Generator Power information	ELEC	Generator Power (VA)
			Generator Power (Watts)
			Generator output frequency
1.02) Maintain turbine speed			
	Collect TG speed information	TG	Main Steam Pressure
	Analyze & determine if TG speed constant	TG	Turbine Chest Pressure
	Collect MSS pressure information	MSS 1	Turbine Speed
	Analyze & determine if MSS pressure adequate	MSS 1	
2.00) Monitor RCS heat removal			
	Collect SG parameter information	SG 3	Main Feedwater Flow
	Collect RCS parameter informatin	RCS 1	Main Steam flow
	Collect MSS flow information	MSS 4	RCS average temperature
	Collect FCS flow information	FCS 1	RCS cold leg temperatrue
	Compare to match MSS to FCS flow information		RCS hot leg temperature
	Analyze & determine adequacy of heat removal		
			Steam Generator Level
2.01) Monitor Core power			
	Collect NI information	RX 1	RCS average temperature
	Collect RCS parameter information	RCS 1	Reactor Power (NI)
	Compare to previous information for changes		
2.02) Monitor Core Heat Removal			
	Collect CET temperature information	RX 1	CET temperature
	Collect RCS temperature information	RCS 1	RCS Cold leg Temperature
	Compare temperatures	RX 1	RCS hot leg temperature
2.03) Monitor CEA control			
	Collect RCS temperature information	RX 4	CEA position
	Collect CEA position	RX 4	RCS average temperature
	Analyze & determine position above limits	RX 4	
3.00) Control RCS heat removal			
	Collect RCS temperature information	RCS 1	Main Steam Flow
	Collect SG parameter information	SG 1	RCS Average temperature
	Analyze & determine heat removal adequate	RCS 1	RCS average temperature
			RRS reference temperature
			Steam Generator Level
			Turbine 1st stage steam pressure

Nuplex 80 + Functional Analysis
Derivation of Event Specific Tasks
and Summary of Parameters Used

Gross Function /Sub-Functions	Task Statement	Task derived from System Function (System & Function #)	Parameter(s) to Observe	(for details see Appendix F)
3.01) Monitor Boron				
	Collect Boron information	RX 4	Boronometer	
	Analyze & determine if within limits	RX 4		
3.02) Control RCS inventory				
	Collect Pzr parameter information	PZR 2,4	Pressurizer Level	
	Compare with power program for Pzr level	PZR 2		
	Analyze & determine if within limits	PZR 2		
3.03) Control RCS pressure				
	Collect Pzr parameter information	RCS 3	Main Spray flow	
	Analyze & determine if within limits	RCS 3	Pressurizer Pressure	
			Proportional Heater power	
3.04) Maintain RCS chemistry				
	Communicate with chemist to sample RCS	COMM	none	
	Analyze & determine if within limits			
	Communicate with chemist to adjust chemistry	COMM		
4.00) Maintain SG inventory				
	Collect SG parameter information	SG 3	Steam Generator Level	
	Adjust feed rate to maintain level	FCS 1/SG 3		
4.01) Control Main Feedwater to SGs				
	Collect MSS parameter information	MSS 1,6	Main Feed Flow	
	Collect FCS parameter information	FCS 1	Main Steam Flow	
	Compare to match steam & feed mass flows	SG 3		
	Adjust feed flow to match steam flow	FCS 1		
4.02) Maintain Feedwater preheat				
	Collect Dearator parameter information	FCS 1	Dearator pressure	
	Collect Feedheater parameter information	FCS 1	Feedwater temperature	
	Analyze & drtermine if preheat within limits	FCS 1		
4.03) Maintain condensate inventory				
	Collect Condenser hotwell information	FCS 1	Hotwell level	
	Analyze & determine inventory adequate	FCS 1		
4.04) Maintain SG Chemisty				
	Communicate with Chemist to sample SGs	COMM	none	
	Analyze chemist's results	SG		
	Determine if changes in SG chemistry needed	SG		

Nuplex 80 + Functional Analysis
Derivation of Event Specific Tasks
and Summary of Parameters Used

Gross Function /Sub-Functions	Task Statement	Task derived from System Function (System & Function #)	Parameter(s) to Observe	(for details see Appendix F)
5.00) Maintain Condenser Vacuum				
	Collect Condenser parameter information	FCS 1	Condenser Vacuum	
	Analyze and determine if vacuum adequate	FCS 1		
6.00) Maintain equipment cooling				
	Collect (various)equipment cooling parameters		later	
	Analyze & determine if cooling changes needed			
7.00) Maintain equipment lubrication				
	Collect (various)equipment lube parameters		later	
	Analyze & determine if changes needed			

Nuplex 80 + Functional Analysis
Derivation of Event Specific Tasks
and Summary of Parameters Used

Gross Function /Sub-Functions	Task Statement	Task derived from System Function (System & Function #)	Parameter(s) to Observe (for details see Appendix F)
1.00) Authorize Load Changes			
	Communicate with Load Dispatcher	COMM	none
	Collect Authorization of load change	COMM	
2.00) Control Load Change			
	Collect generator power parameters	ELEC	Generator Output Voltage
	Collect NI information	RX 1	Generator Power (VA)
	Collect RCS temperature information	RCS 1	Generator Power (Watts)
	Decide rate of load change	TG	RCS average temperature
	Raise(or lower) turbine speed or load control	TG	Reactor Power (NI)
	Analyze & determine if rate change w/in limit		
3.00) Monitor Load Change			
	Collect NI information	RX 4	Feedwater Flow
	Collect RCS parameter information	RCS 1,3,7	Main feedpump pressure
	Collect MSS parameter information	MSS 1,2,5	Main steam flow
	Collect SG parameter information	SG 1,3	RCS average temperature
	Collect FCS parameter information	FCS 1	Reactor Power (NI)
	Compare with expected transient performance		
			Steam Generator Pressure
3.01) Maintain Electrical parameters			
	Collect generator parameter information	ELEC	Generator Frequency
	Analyze & determine if within tolerances	ELEC	Generator Output Voltage
3.02) Maintain SG inventory			
	Collect SG parameter information	SG 3	Main feedwater flow
	Collect MSS parameter information	MSS 1,6	Main Steam Flow
	Collect FCS parameter information	FCS 1	Steam Generator Level
	Compare to match steam & feed mass flows		Steam Generator Pressure
	Adjust feed flow to match steam flow	FCS 1	
3.03) Control Main Feedwater to SGs			
	Collect FCS parameter information	FCS 1	Main feedpump pressure
	Adjust feed rate to match steam flow	FCS 1	Main Feedwater flow
3.04) Monitor RCS inventory			
	Collect Pzr level information	PZR 2,4	Charging flow
	Compare with power program for Pzr level	PZR 2	Letdown flow
			Pressurizer level
3.05) Monitor Reactor Power			
	Collect NI information	RX 4	Generator Power (Watts)
	Collect generator power information	ELEC	Reactor Power (NI)
	Compare power information for load following	RX 1,4	
	Analyze & determine core power w/in limits	RX 1,4	

Nuplex 80 + Functional Analysis
Derivation of Event Specific Tasks
and Summary of Parameters Used

Gross Function /Sub-Functions	Task Statement	Task derived from System Function (System & Function #)	Parameter(s) to Observe	For details see Appendix F)
3.06) Monitor RCS pressure				
	Collect Pzr pressure information Analyze & determine if w/in control limits	PZR	Pressurizer Pressure Pressurizer Sprey flow	
3.07) Monitor (other) auxiliaries				
	Collect (other) auxiliaries information Compare with expected performance information		later	

Nuplex 80 + Functional Analysis
Derivation of Event Specific Tasks
and Summary of Parameters Used

Gross Function /Sub-Functions	Task Statement	Task derived from System Function (System & Function #)	Parameter(s) to Observe	(for data see Appendix
1.00) Maintain RCS heat removal				
	Collect RCS temperature information	RCS 1	RCS average temperature	
	Compare heat in/removal demands	RHR 3	SDHX CCW flow	
	Analyze & determine if need to adjust HR	RHR 3		
	Control RCS flow through heat exchanger	RHR 3		
1.01) Monitor SCS parameters				
	Collect SCS parameter information	RHR 3	SDHX CCW outlet temperature	
	Compare heat in/removal demands	RHR 3	SDHX CCW inlet temperature	
	Evaluate information for changes	RHR 3	SDHX CCW delta T	
			SCS isolation valve 1	
			SCS isolation valve 2	
			SCS pump 1	
			SCS pump 2	
			CEA position	
			CEA position	
			Reactor Power (NI)	
			Startup Rate (NI)	
2.00) Monitor core power				
	Collect NI information	RX 1		
	Evaluate information for changes	RX 4		

Nuplex 80 + Functional Analysis
Derivation of Event Specific Tasks
and Summary of Parameters Used

Gross Function /Sub-Functions	Task Statement	Task Derived from System Function (System ; Function #)	Parameter(s) to Observe (for details see Appendix F)
1.00) Determine S/U Prerequisites complete			
	Collect Pre-startup checklist		120 V DC Bus A Voltage
	Evaluate checklist for completeness		120 V DC Bus B Voltage
	Decide if prerequisites completed		120 V Inverter Voltage Inst. Bus
			120 V Inverter Voltage Inst. Bus
			120 V Inverter Voltage Inst. Bus
			120 V Inverter Voltage Inst. Bus
			13.8kV (Alt.) RCP Bus Supply Bre
			13.8kV RCP Bus Supply Breaker
			13.8kV Service Bus Supply Breaker
			4160 V A2 Bus Supply Breaker
			4160 V Bus A1 (Emerg.) Supply Bre
			4160 V Bus A1 Supply Breaker
			4160 V Bus A3 Supply Breaker (etc
			4160 V Bus B1 (Emerg.) Supply Bre
			4160 V Bus B1 Supply Breaker
			4160 V Bus B2 Supply Breaker
			4160 V Bus B3 Supply Breaker (etc
			4160 V Transformer A Supply Break
			4160 V Transformer B Supply Break
			480 V Xformer A1A Supply Breaker
			480 V Xformer A1B Supply Breaker
			480 V Xformer A2A Supply Breaker
			480 V Xformer A2B Supply Breaker
			480 V Xformer A3A Supply Breaker
			480 V Xformer A3B Supply Breaker
			480 V Xformer B1A Supply Breaker
			480 V Xformer B1B Supply Breaker
			480 V Xformer B2A Supply Breaker
			480 V Xformer B2B Supply Breaker
			480 V Xformer B3A Supply Breaker (
			480 V Xformer B3B Supply Breaker (
			CEAM power supply energized
			Diesel Gen. A Fuel Storage Tank Le
			Diesel Gen. B Fuel Storage Tank Le
			Diesel Generator A Day Tank Level
			Diesel Generator B Day Tank Level
			Permission or Authorization
			Process Instrumentation Energized
			Protective Systems energized
			RCP 1A supply breaker
			RCP 1B supply breaker
			RCP 2A supply breaker
			RCP 2B supply breaker
			Reactor power
			Refueling Activity
			Regulating Systems energized
			Report of Estimated CEA positions
			Report of Process Instruments Cali
			Report of Protective Inst. Calibra
			Report of RCS boron concentration
			Report of Regulating Systems Calib
			Report of completed maintenance
			Report of last Diesel Gen. testing
			Station Battery Charger A (Ampere
			Station Battery Charger B (Amperes
			Station Battery Voltage A
			Station Battery Voltage B
			Time
			Time of CEA Estimates

Nuplex 80 + Functional Analysis
Derivation of Event Specific Tasks
and Summary of Parameters Used

Gross Function /Sub-Functions	Task Statement	Task derived from System Function (System & Function #)	Parameter(s) to Observe (for details see Appendix F)
1.01) Maintain RCS heat removal			
	Collect SG parameter information	SG 1,5	RCS average temperature
	Collect MSS flow information	MSS 4,5	Steam Generator Pressure
	Collect RCS temperature information	RCS 1	Turbine bypass controller mode
			Turbine bypass pressure control s
1.02) Maintain SG inventory			
	Collect SG parameter information	SG 1,3	Steam Generator Level
1.03) Control Main feedwater to SG			
	Collect FCS parameter information	FCS 1	Main Feedwater Flow
			Main Steam Flow
			Startup Feedpump Status
2.00) Control Core Reactivity with CEAs			
	Refer to # 2.01 to 2.09		
2.01) Latch CEA shutdown group A to withdraw			
	Select CEA shutdown group	CEA4/FUEL3	CEA Group Selection
	Confirm selection	CEA 4	
	Latch CEAs	CEA 3	
2.02) Withdraw CEA group A			
	Collect CEA position information	CEA 4	CEA position
	Decide on position to stop at	FUEL 3	
	Start CEA withdrawal	CEA 1,4	
	Stop CEA withdrawal at planned position	CEA 1,4	
	Confirm CEA position	CEA 4	
2.03) Monitor core reactivity			
	Collect NI information	RX 1	CEA position
	Collect RCS temperature information	RCS 1/RX 3	CEA position
	Evaluate information	RX 4	RCS average temperature
	Decide whether to continue	FUEL 3	Reactor Power (NI)
2.04) Latch CEA shutdown group B to withdraw			
	Select CEA shutdown group	CEA4/FUEL3	CEA Group Selection
	Confirm selection	CEA 4	
	Latch CEAs	CEA 3	
2.05) Withdraw CEA group B			
	Collect CEA position information	CEA 4	CEA position
	Decide on position to stop at	FUEL 3	
	Start CEA withdrawal	CEA 1,4	
	Stop CEA withdrawal at planned position	CEA 1,4	
	Confirm CEA position	CEA 4	

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Derivation of Event Specific Tasks
and Summary of Parameters Used

Gross Function /Sub-Functions	Task Statement	Task derived from System Function (System & Function #)	Parameter(s) to Observe	(for details see Appendix F)
2.06) Monitor core reactivity				
	Collect NI information	RX 1	CEA position	
	Collect RCS temperatrue information	RCS 1/RX 3	CEA position	
	Evaluate information for changes	RX 4	RCS average temperature	
	Decide whether to continue	FUEL 3	Reactor Power (NI)	
2.07) Latch CEA shutdown group C to withdraw				
	Select CEA shutdown group	CEA4/FUEL3	CEA Group Selection	
	Confirm selection	CEA 4		
	Latch CEAs	CEA 3		
2.08) Withdraw CEA group C				
	Collect CEA position information	CEA 4	CEA position	
	Decide on position to stop at	FUEL 3		
	Start CEA withdrawal	CEA 1,4		
	Stop CEA withdrawal at planned position	CEA 1,4		
	Confirm CEA position	CEA 4		
2.09) Monitor core reactivity				
	Collect NI information	RX 1	CEA position	
	Collect RCS temperature information	RCS 1/RX 3	CEA position	
	Evaluate information for changes	RX 4	RCS average temperature	
	Decide whether to continue	FUEL 3	Reactor Power (NI)	
3.00) Control Core Reactivity with boron				
	Refer to # 3.01 to 3.02			
3.01) Dilute RCS				
	Decide on diluted boron concentration	FUEL 3	Charging flow valve alignment	
	Collect boron concentration information	CVCS 4	Letdown flow	
	Add dilute makeup	CVCS 4	Pressurizer Level	
	Letdown to maintain RCS inventory	CVCS 1		
	Evaluate boron concentration (periodically)	CVCS 4		
	Decide when to stop dilution	FUEL 3		
3.02) Monitor core reactivity				
	Collect NI information	RX 1	RCS Boron Concentration	
	Collect RCS parameter information	RCS 1/RX 3	RCS Boron concentration	
	Decide whether to continue			
4.00) Control Core Reactivity with CEAs				
	Refer to # 4.01 to 4.05			

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Derivation of Event Specific Tasks
and Summary of Parameters Used

Gross Function /Sub-Functions	Task Statement	Task derived from System Function (System & Function #)	Parameter(s) to Observe	(for details see Appendix F)
4.01) Determine CEA group positions				
	Calculate CEA position	FUEL 3		
4.02) Latch CEA regulating group 1				
	Select CEA regulating group	CEA4/FUEL3	CEA Group position	
	Confirm selection	CEA 4		
	Latch CEAs	CEA 3		
4.03) Withdraw CEA regulating group 1				
	Collect CEA position information	CEA 1,4	CEA position	
	Decide on position to stop	FUEL 3		
	Start CEA withdrawal	CEA 1,4		
	Stop CEA withdrawal at planned position	CEA 1,4		
	Confirm CEA position	CEA 4		
4.04) Latch CEA regulating group 2				
	Select CEA regulating group	CEA4/FUEL3	CEA Group position	
	Confirm selection	CEA 4		
	Latch CEAs	CEA 3		
4.05) Withdraw CEA regulating group 2				
	Collect CEA position information	CEA 1,4	CEA position	
	Decide on position to stop at	FUEL 3		
	Start CEA withdrawal	CEA 1,4		
	Stop CEA withdrawal at planned position	CEA 1,4		
	Confirm CEA position	CEA 4		
4.06) Latch CEA regulating group 3				
	Select CEA regulating group	CEA4/FUEL3	CEA group position	
	Confirm selection	CEA 4		
	Latch CEAs	CEA 3		
4.07) Withdraw CEA regulating group 3				
	Collect CEA position information	CEA 1,4	CEA position	
	Decide on position to stop at	FUEL 3		
	Start CEA withdrawal	CEA 1,4		
	Stop CEA withdrawal at planned position	CEA 1,4		
	Confirm CEA position	CEA 4		
4.08) Latch CEA regulating group 4				
	Select CEA regulating group	CEA4/FUEL3	CEA Group position	
	Confirm selection	CEA 4		
	Latch CEAs	CEA 3		

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Derivation of Event Specific Tasks
and Summary of Parameters Used

Gross Function /Sub-Functions	Task Statement	Task derived from System Function (System & Function #)	Parameter(s) to Observe	(for details see Appendix F)
4.09) Withdraw CEA regulating group 4				
	Collect CEA position information	CEA 1,4	CEA position	
	Decide on position to stop	FUEL 3		
	Start CEA withdrawal	CEA 1,4		
	Stop CEA withdrawal at planned position	CEA 1,4		
	Confirm CEA position	CEA 4		
4.10) Latch CEA regulating group 5				
	Select CEA regulating group	CEA4/FUEL3	CEA Group position	
	Confirm selection	CEA 4		
	Latch CEAs	CEA 3		
4.11) Withdraw CEA regulating group 5				
	Collect CEA position information	CEA 1,4	CEA position	
	Decide on position to stop at	FUEL 3		
	Start CEA withdrawal	CEA 1,4		
	Stop CEA withdrawal at planned position	CEA 1,4		
	Confirm CEA position	CEA 4		
4.12) Latch CEA regulating group 6				
	Select CEA regulating group	CEA4/FUEL3	CEA Group position	
	Confirm selection	CEA 4		
	Latch CEAs	CEA 3		
4.13) Withdraw CEA regulating group 6				
	Collect CEA position information	CEA 1,4	CEA position	
	Decide on position to stop	FUEL 3		
	Start CEA withdrawal	CEA 1,4		
	Stop CEA withdrawal at planned position	CEA 1,4		
	Confirm CEA position	CEA 4		
4.14) Select Manual Sequential Control Mode				
	Select Manual Sequential Control Mode	CEA4/FUEL3	CEA Sequential Control Mode	
	Confirm Selection	CEA 1,4		
4.15) Withdraw CEAs to critical position				
	Collect CEA position information	CEA 4	CEA position	
	Decide on position to stop at	FUEL 3		
	Start CEA withdrawal	CEA 1,4		
	Stop CEA withdrawal at planned position	CEA 1,4		
	Confirm CEA position	CEA 4		
5.00) Monitor for Criticality				
	Collect NI information	RX 1	RCS average temperature	
	Collect RCS temperature information	RCS 1/RX 3	Reactor Power (NI)	
	Evaluate information	RX 4		
	Decide if reactor "critical"	FUEL 3		

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Derivation of Event Specific Tasks
and Summary of Parameters Used

Gross Function /Sub-Functions	Task Statement	Task derived from System Function (System & Function #)	Parameter(s) to Observe (for details see Appendix F)
5.01) Announce Criticality			
	Report (communicate) startup results		
6.00) Raise power to 10E-4% and stabilize			
	Collect NI information	RX 1	RCS average temperature
	Collect RCS parameter information	RCS 1	RCS boron concentration
	Collect boron concentration information	CVCS 4	Reactor Power (NI)
	Withdraw CEAs	CEA 4	Startup rate (NI)
	Insert CEAs	CEA 4	
	Evaluate "stable" power point	FUEL 3	
6.01) Withdraw CEAs			
	Withdraw CEAs	CEA 4	CEA position
	Confirm CEA position	CEA 4	
6.02) Monitor Reactor Power			
	Collect NI information	RX 1	Reactor Power (NI) Startup rate (NI)
6.03) Control Reactor power to stabilize			
	Insert CEAs	CEA 4	Reactor Power rate of ch
	Confirm CEA position	CEA 4	
	Confirm NI expected responses	RX 1	
	Decide if at "stable" power point	FUEL 3	
6.04) Record measure data			
	Collect NI information	RX 1	Pressurizer Pressure
	Collect CEA position information	CEA 4	RCS Boron concentration
	Collect RCS parameter information	RCS 1/RX 3	RCS average temperature
7.00) Control core reactivity			
	Refer to # 7.01 to 7.02		
7.01) Withdraw CEAs			
	Withdraw CEAs	CEA 4	CEA position
	Confirm CEA position	CEA 4	
7.02) Check moderator temperature coefficient			
	Collect NI information	FUEL 3	RCS hot leg temperature
	Collect RCS temperature information	RCS 1	Reactor Power (NI)
	Evaluate information	FUEL 3	
	Decide on reactivity control method at POAH	FUEL 3	
	If positive MTC: Insert CEAs to turn power	FUEL 3	
	If negative MTC: Monitor temp to turn power	FUEL 3	

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Derivation of Event Specific Tasks
and Summary of Parameters Used

Group Function /Sub-Functions	Task Statement	Task derived from System Function (System & Function #)	Parameter(s) to Observe (for details see Appendix F)
8.00) Raise power to 3 - 5% and stabilize			
	Collect NI information	FUEL 3	RCS average temperature
	Collect RCS parameter information	RCS 1	Reactor Power (NI)
			Startup rate (NI)
8.01) Withdraw CEAs			
	Withdraw CEAs	CEA 4	CEA position
	Confirm CEA position information	CEA 4	
8.02) Control reactor power to stabilize			
	Insert CEAs	CEA 4	CEA position
	Confirm CEa position information	CEA 4	Reactor Power rate of change
	Evaluate "stable" power point	FUEL 3	
9.00) Determine TG startup prerequisites done			
	Collect turbine generator pre-startup ckecks	TG	Condensate pump
	Evaluate checklist for completeness	TG	Condenser Circulating Water Flow
	Decide if prerequisites completed	TG	Condenser Hotwell Level
			Condenser vacuum
			Deaerating Feedwater Storage Tank
			Deaerating Feedwater Storage Tank
			Deerating Feedwater Tank temperat
			LP Turbine exhaust hood temperatu
			Main Feedpump
			Reactor Power (NI)
			Turbine Trip
			Turbine jacking gear
			Turbine rotation
			Unit Transformer cooling water flc
			Unit Transformer cooling water tem
			[Raw or Salt] Cooling Water (list)
			[Service] Cooling Water (list)
9.01) Check generator auxiliaries			
	Collect generator H2 parameter information	TG	Generator H2 pressure
	Collect Stator cooling parameter information	TG	Generator H2 seal oil flow
	Evaluate information	TG	Generator H2 seal oil temperature
	Decide on adjustments needed	TG	H2 cooler inlet temperature
	Adjust parameters for startup	TG	H2 cooler outlet temperature
	Confirm adjustments	TG	
			Stator Liquid cooling pump
			Stator temperature
10.00) Ensure control of main rteam flow			
	Refer to # 10.01 to 10.06		

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Derivation of Event Specific Tasks
and Summary of Parameters Used

Gross Function /Sub-Functions	Task Statement	Task derived from System Function (System & Function #)	Parameter(s) to Observe (for details see Appendix F)
10.01) Check turbine control (EHC) status			
	Collect information	TG	Load limit Set Potentiometer
	Evaluate information	TG	Turbine Trip
			Turbine first stage feedback
10.02) Startup EHC oil system			
	Collect TG parameter information	TG	EHC oil pressure
	Start EHC oil pump	TG	EHC oil temperature
	Collect EHC parameter information	TG	
	Evaluate information	TG	
10.03) Startup Moisture Separator Reheater			
	Open valves (list)	MSR	Bleeder Trip valve control (list)
	Close valves (list)	MSR	Bleeder Trip valve position (list)
	Confirm valve positions	MSR	Heater Drain Dump Valve control (l
			Heater Drain Dump valve control (l
			MSR Steam Supply valve control (li
			MSR Steam Supply valve position
10.04) Startup Extraction Steam System			
	Open valves (list)	MSS	Bleeder Trip Valve control (list)
	Close valves (list)	MSS	Bleeder Trip Valves (list)
	Confirm valve positions	MSS	Heater Drain Dump valve position
			Heater drain tank dump valve contr
			Heater drain tank high level dump v
10.05) Reset turbine trip systems			
	Reset turbine trip system	TG	Turbine Bleeder Trip valves (list)
	Confirm reset	TG	Turbine Stop valves (list)
			Turbine Trip
			Turbine control valves (list)
			Turbine intercept valves (list)
			Turbine intermediate stop valves (l
10.06) Warm up Steam Chest			
	Open valve at specific rate (slowly)	MSS	Chest warmup control
	Collect Steam Chest parameter information	TG	Inner Chest Casing temperature
	Evaluate information	TG	Main Stop Valve Bypass
	Decide rate of opening valve(s)	MSS	Outer Chest casing temperature
	Decide rate of Chest warm up	TG	Steam Chest Pressure
			Time
11.00) Maintain SG inventory			
	Collect SG parameter information	SG 3	Main Steam Flow
	Collect MSS flow information	MSS 4,5	Steam Generator Level
	Evaluate demand for SG makeup	SG 3	
	Decide feed rate to maintain inventory	SG 3	

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Derivation of Event Specific Tasks
and Summary of Parameters Used

Gross Function /Sub-Functions	Task Statement	Task derived from System Function (System & Function #)	Parameter(s) to Observe (for details see Appendix F)
11.01) Control main feedwater to SGs			
	Control main feedwater flow to SG	FCS 1	Feed Regulating Mode control
	Collect FCS flow information	FCS 1	Main Feedwater Flow
	Evaluate against demand for SG makeup	SG 3	Startup Feed Pump
	Confirm control responses	SG 3	
11.02) Ensure main feedwater preheating			
	Collect FCS parameter information	FCS	Feedwater Temperature
11.03) Ensure condensate makeup			
	Collect condensate reserve parameter info.	MUPS 1,2	Condensate Storage Tank Level
	Collect condensate parameter information	FCS 1	Hotwell Level
	Evaluate against demand for makeup	FCS 1	
12.00) Test Roll turbine			
	Collect TG parameter information	TG	Shell and Rotor expansion differen
	Evaluate TG parameter information	TG	Time
	Decide on rate of roll	TG	Time
	Start roll of TG	TG	Time
			Turbine First Stage Shell temperat
			Turbine speed
			Turbine speed rate of change
12.01) Check turbine			
	Collect TG parameter information	TG	Bearing Oil Temperature
	Evaluate information	TG	Exhaust Hood Temperature
	Decide if performance of TG acceptable	TG	First stage shell temperature
			Shell and Rotor expansion differen
			Turbine Bearing oil flow
			Turbine generator rubbing or vibrat
12.02) Check Turbine Auxiliaries			
	Collect TG cooling parameter information	TG	later
	Evaluate information	TG	
13.00) Startup Turbine			
	Collect Turning Gear status	TG	Turning Gear status
	Evaluate information	TG	
13.01) Admit steam to turbine			
	Collect NI information	RX 1	Intercept valve(s) position
	Evaluate information	RX 4	Main Stop Valve position
	Decide when ready to admit steam to turbine	FUEL 3	Reactor Power (NI)
	Open valve(s) (list)	MSS	Reactor Power (NI)
	Confirm valve positions	MSS	Startup rate (NI)
			Turbine Control valve position

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Derivation of Event Specific Tasks
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Gross Function /Sub-Functions	Task Statement	Task derived from System Function (System & Function #)	Parameter(s) to Observe (for details see Appendix F)
14.00) Test turbine trip			
	Refer to # 14.01 to 14.03		
14.01) Raise turbine speed to 1800 rpm			
	Collect TG parameter information	TG	Bearing Header pressure
	Raise TG speed to 1800 rpm at planned rate	TG	Bearing Oil temperature
	Confirm speed	TG	High pressure lift pump status
	Collect TG parameter information	TG	Main Shaft Oil pump discharge pre
	Evaluate performance of TG	TG	Turbine 1st stage pressure
			Turbine Speed
			Turbine speed
			Turning Gear Motor Status
14.02) Mechanical Trip Test			
	Trip turbine (mechanical trip)	TG	Mechanical Trip (TG)
	Collect information	TG	later
	Evaluate information	TG	
14.03) Reset turbine to 1800 rpm			
	Reset turbine trip system	TG	Mechanical Trip (TG)
	Confirm reset	TG	later
	Collect TG parameter information	TG	
	Evaluate return to 1800 rpm performance	TG	
15.00) Startup generator			
	Refer to # 15.01 to 15.04		
15.01) Check generator off-line and available			
	Collect Breaker/Disconnect information	ELEC	Generator Disconnects
	Evaluate information	ELEC	Turbine Generator Breakers
			later
15.02) Establish generator excitation			
	Start generator excitation	TG	Generator exciter field breaker
	Collect generator information	TG	Generator field breaker
	Test Adjust Voltage regulator control	TG	later
	Evaluate information	TG	
15.03) Regulate generator voltage			
	Adjust Voltage Regulator control	TG	Generator Output Voltage
	Confirm adjustments	TG	Generator Voltage Control
	Select "auto" voltage control	TG	Generator Voltage Mode Control
	Adjust turbine speed	TG	Generator Voltage Mode Control
	Collect generator parameter information	TG	Turbine Speed
	Confirm adjustments	TG	
			later

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Derivation of Event Specific Tasks
and Summary of Parameters Used

Gross Function /Sub-Functions	Task Statement	Task derived from System Function (System & Function #)	Parameter(s) to Observe (for details see Appendix F)
15.04) Establish generator control			
	Collect load limit information	TG	Load limit control position
	Evaluate information	TG	later
	Decide value for load limit of TG	TG	
	Raise load limit to planned limit	TG	
16.00) Synchronize and close generator bus bkr			
	Collect Electrical parameter information	ELEC	Generator Voltage
	Evaluate information	ELEC	Grid (running) Voltage
	Decide type of sychoronization :MAN or AUTO	ELEC	Synchroscope
	Match voltages	ELEC	later
	Monitor synchroscope / Adjust turbine speed	TG	
	Close bkr at planned synchroscope position	ELEC	
17.00) Load generator			
	Decide rate of load pickup	ELEC	Generator Voltage
	Decide amount of load to pickup	ELEC	Turbine Generator Power
	Raise TG speed at planned rate to plan value	TG	Turbine Speed
	Adjust generator voltage regulator	TG	later
	Collect generator information	TG	
	Confirm loading and TG speed	TG	
17.01) Monitor Turbine			
	Collect TG cooling parameter information	TG	Turbine Cooling Water Temperature
	Evaluate information	TG	later
18.00) Load Dispatch authorization			
	Report (communicate) request for TG loading		Load Authorization
	Collect authorization		later
	Evaluate discussions,limitations,etc.		
19.00) Raise load			
	Decide on rate of load increase	TG	Generator Frequency
	Decide on load value	TG	Generator Voltage
	Raise "load" to planned value	TG	Turbine Generator Power
	Collect generator parameter information	TG	Turbine Generator Power
	Evaluate information	TG	later
20.00) Maintain SG inventory			
	Collect SG parameter information	SG	Main Feedwater Flow
	Collect MSS parameter information	MSS	Main Steam Flow
	Collect FCS parameter information	FCS	Main feed flow
	Evaluate information	SG	Main steam flow
	Decide on feedwater flow to SG	SG	Steam Generator Level
			Steam Generator Pressure
			Steam Generator level

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Derivation of Event Specific Tasks
and Summary of Parameters Used

Gross Function /Sub-Functions	Task Statement	Task derives from System Function (System & Function #)	Parameter(s) to Observe (for details see Appendix F)
20.01) Control main feedwater to SG			
	Control Main feedwater flow to SG	FCS 1	Main Feedwater Control Valve posi
	Collect FCS flow information	FCS 1	Main feed flow
	Evaluate against demand for SG makeup	SG 3	Steam Generator level
20.02) Ensure main feedwater preheating			
	Collect FCS parameter information	FCS	Deaerator pressure
			Feedwater Temperature
			Feedwater temperature
20.03) Ensure condensate makeup			
	Collect condensate reserve parameter info	NUPS 1,2	Condensate storage tank A level
	Collect condensate parameter information	FCS 1	Condensate storage tank B level
	Evaluate against demand for makeup		Hotwell Level
			Hotwell level
21.00) Ensure core reactivity control			
	Refer to # 21.01		
21.01) Check Thermal/NI power equivalence			
	Collect RCS temperature information	RCS 1	CPC Thermal power
	Collect NI information	RX 1	RCS average temperature
	Evaluate information	RX 4	RCS average temperature
	Decide whether thermal/NI power equivalent	RX 1	RCS cold leg temperature
	IF NOT: goto corrective actions	RX 1	RCS cold leg temperature
	IF OK: continue	RX 1	
			RCS flow
			RCS hot leg temperature
			RCS hot leg temperature
			Reactor Power (CPC)
			Reactor Power (CPC)
			Reactor Power (NI)
			Reactor Power (NI)
			Reactor Power (NI)

EVENT TITLE: Shutdown

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Derivation of Event Specific Tasks
and Summary of Parameters Used

Gross Function /Sub-Functions	Task Statement	Task derived from System Function (System & Function #)	Parameter(s) to Observe (for details see Appendix F)
1.00) Authorize Load Change			
	Communicate with Load Dispatcher	COMM	
	Collect Authorization of load change	COMM	
2.00) Control load change			
	Collect generator power parameters	ELEC	Generator Output Voltage
	Collect NI information	RX 1	Generator Power (VA)
	Collect RCS temperature information	RCS 1	Generator Power (Watts)
	Decide rate of load change	TG	RCS average temperature
	Lower turbine speed or load control	TG	RRS reference temperature
	* Analyze & determine if rate change w/in limit	RX	
			Reactor Power (NI)
3.00) Monitor Load Change			
	Collect NI information	RX 6	Main Feed pump pressure
	Collect RCS parameter information	RCS 1,3,7	Main Feedwater flow
	Collect MSS parameter information	MSS 1,2,3	Main Steam flow
	Collect SG parameter information	SG 1,3	RCS average temperature
	Collect FCS parameter information	FCS 1	Reactor Power (NI)
	Compare with expected transient performance		
			Steam Generator pressure
3.01) Maintain Electrical parameters			
	Collect generator parameter information	ELEC	Generator Output Voltage
	Analyze & determine if within tolerances	ELEC	Generator frequency
3.02) Maintain SG inventory			
	Collect SG parameter information	SG 3	Main Feedwater flow
	Collect MSS parameter information	MSS 1,6	Main Steam Flow
	Collect FCS parameter information	FCS 1	Steam Generator level
	Compare to match steam & feed mass flows		Steam Generator pressure
	Adjust feed rate to match steaming rate	FCS 1	
3.03) Control Main Feedwater to SGs			
	Collect FCS parameter information	FCS 1	Main Feed pump pressure
	Adjust feed rate to match steaming rate	FCS 1	Main Feedwater flow
3.04) Monitor RCS inventory			
	Collect Pzr level information	PZR 2,4	Charging flow
	Compare with power program for Pzr level	PZR 2	Letdown flow
	Collect CVCS flow to or from RCS	CVCS 1,11	Pressurizer level
	Compare with previous information for changes		
3.05) Monitor Reactor Power			
	Collect NI information	RX 6	Generator power (Watts)
	Collect generator power information	ELEC	Reactor Power (NI)
	Compare power information for load following	RX 1,4	
	Analyze & determine core power w/in limits	RX 1,4	

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Derivation of Event Specific Tasks
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Gross Function /Sub-Functions	Task Statement	Task derived from System Function (System & Function #)	Parameter(s) to Observe (for details see Appendix F)
3.06) Monitor RCS pressure			
	Collect Pzr pressure information	PZR	Pressurizer Pressure
	Analyze & determine if w/in control limits		Pressurizer spray flow
4.00) Control TBS flow to condenser			
	Collect condenser parameter information	FCS 1	Condenser vacuum
	Control TBS rate of steaming	MSS 5	Hotwell level
	Control condenser hotwell level & vacuum	FCS 1	Turbine Bypass System flow
	Decide rate of steaming using TBS	MSS 5	
	Compare with previous information for changes		
4.01) Monitor Reactor Power			
	Collect NI information	RX 4	Reactor Power (NI)
	Compare with previous information for changes		
4.02) Control CEA position to reduce power			
	Collect RCS temperature information	RCS 1	RCS average temperature
			RRS reference temperature
4.03) Maintain RCS temperature			
	Collect RCS temperature	RCS 1	RCS average temperature
	Collect TBS parameter information	MSS 5	
	Control TBS flow to condenser	MSS 5	
	Compare with previous information for changes		
4.04) Control Main Feedwater to SGs			
	Stop second feed pump	FCS 1	
	Confirm Feed pump stopped	FCS 1	
	Collect FCS parameter information	FCS 1	
5.00) Shutdown the Turbine Generator			
	Refer to # 5.01 to 5.02		
5.01) Shutdown the Turbine			
	Trip the turbine	TG	Turbine Speed
	Collect TG parameter information	TG	
	Analyze & determine if turbine shutdown	TG	
5.02) Unload the Generator			
	Open Generator Output Breakers	ELEC	Generator Output breaker position
	Collect TG output information	TG	Generator power (Watts)
	Collect generator power parameters	TG	

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Derivation of Event Specific Tasks
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Gross Function /Sub-Functions	Task Statement	Task derived from System Function (System & Function #)	Parameter(s) to Observe (for details see Appendix F)
5.03) Shutdown Extraction Steam			
6.00) Shutdown the Reactor			
	Refer to # 6.01 to 6.12		
6.01) Insert regulating group 6 CEAs			
	Collect CEA position information	CEA 4	CEA group selection
	Start CEA insertion	CEA 1,4	CEA position
	Stop CEA insertion at planned position	CEA 1,4	
	Confirm CEA position	CEA 4	
6.02) Insert regulating group 5 CEAs			
	Select CEA regulating group	CEA 4	CEA group selection
	Confirm selection		CEA position
	Collect CEA position information	CEA 4	
	Start CEA insertion	CEA 1,4	
	Stop CEA insertion at planned position	CEA 1,4	
	Confirm CEA position	CEA 4	
6.03) Insert regulating group 4 CEAs			
	Select CEA regulating group	CEA 4	CEA group selection
	Confirm selection		CEA position
	Collect CEA position information	CEA 4	
	Start CEA insertion	CEA 1,4	
	Stop CEA insertion at planned position	CEA 1,4	
	Confirm CEA position	CEA 4	
6.04) Insert regulating group 3 CEAs			
	Select CEA regulating group	CEA 4	CEA group selection
	Confirm selection		CEA position
	Collect CEA position information	CEA 4	
	Start CEA insertion	CEA 1,4	
	Stop CEA insertion at planned position	CEA 1,4	
	Confirm CEA position	CEA 4	
6.05) Insert regulating group 2 CEAs			
	Select CEA regulating group	CEA 4	CEA group selection
	Confirm selection		CEA position
	Collect CEA position information	CEA 4	
	Start CEA insertion	CEA 1,4	
	Stop CEA insertion at planned position	CEA 1,4	
	Confirm CEA position	CEA 4	

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Gross Function /Sub-Functions	Task Statement	Task derived from System Function (System & Function #)	Parameter(s) to Observe (for details see Appendix F)
6.06) Insert regulating group 1 CEAs			
	Select CEA regulating group	CEA 4	CEA group selection
	Confirm selection		CEA position
	Collect CEA position information	CEA 4	
	Start CEA insertion	CEA 1,4	
	Stop CEA insertion at planned position	CEA 1,4	
	Confirm selection	CEA 4	
6.07) Borate the RCS			
	Collect RCS Boron Conc. information	RX 4	Boric Acid Addition Tank Concentr
	Compare RCS Boron Conc. to tech specs	RX 4	Boric Acid Makeup Valve position
	Collect Boron Addition Tank Conc. information	CVCS 4,8	Charging flow
	Analyze & determine borated water to add	CVCS 4	Letdown flow
	Control letdown to maintain inventory	PZR 2	Pressurizer Level
			RCS boron concentration (letdown)
6.08) Insert Shutdown group C CEAs			
	Select CEA shutdown group A	CEA 1	CEA group selection
	Collect CEA position information	CEA 4	CEA position
	Start CEA insertion	CEA 1,4	
	Stop CEA insertion at planned position	CEA 1,4	
	Confirm CEA position	CEA 4	
6.09) Insert Shutdown Group B CEAs			
	Select CEA shutdown group	CEA 4	CEA group selection
	Confirm selection		CEA position
	Collect CEA position information	CEA 4	
	Start CEA insertion	CEA 1,4	
	Stop CEA insertion at planned position	CEA 1,4	
	Confirm CEA position	CEA 4	
6.10) Insert Shutdown Group A CEAs			
	Select CEA shutdown group	CEA 4	CEA group selection
	Confirm selection		CEA position
	Collect CEA position information	CEA 4	
	Start CEA insertion	CEA 1,4	
	Stop CEA insertion	CEA 1,4	
	Confirm CEA position	CEA 4	
6.11) Unlatch ("Trip") CEAs			
	Collect CEA position	CEA 4	CEA position
	Trip (Reactor) CEAs	CEA	CEA position
	Confirm CEA position	CEA 4	
6.12) Monitor Reactor Power			
	Collect NI information	RX 4	Reactor Power (NI)
	Compare with previous information for changes		

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Gross Function /Sub-Functions	Task Statement	Task derived from System Function (System & Function #)	Parameter(s) to Observe	(for details see Appendix F)
7.00) Monitor (other) auxiliaries				
	(later)		later	

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Derivation of Event Specific Tasks
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Gross Function /Sub-Functions	Task Statement	Task derived from System Function (System & Function #)	Parameter(s) to Observe (for details see Appendix F)
1.00) Standard Post Trip Actions			
	Refer to # 1.01 to 1.09		
1.01) Ensure Reactor Shutdown			
	Collect NI information	RX 1	CEA position
	Collect CEA position information	CEA 4	CEA position
	Evaluate information	RX 4	Reactor Power (NI)
			Startup Rate (NI)
1.02) Ensure plant electrical power available			
	Collect TG output information	ELEC	13.8 kV Services Bus feeder
	Collect Bus feeder information	ELEC	DG output breaker
	Evaluate information	ELEC	DG output breaker
	Collect Diesel Generator Output information	ELEC	DG output frequency
	Evaluate need for Diesel	ELEC	DG output voltage
	Start Diesel	ELEC	
			Turbine Generator Breaker positior
			Turbine Trip
1.03) Control RCS inventory			
	Collect Pzr parameter information	PZR 1,2,4	Charging flow
	Collect CVCS flow to and from RCS	CVCS 1,11	Letdown flow
	Evaluate demands for CVCS flows	CVCS 1,11	PLCS setpoint level
			Pressurizer level
			Pressurizer level
			RCS subcooling
			Time
1.04) Control RCS pressure			
	Collect RCS pressure information	RCS 3	PPCS setpoint pressure
	Evaluate against control limits	PZR 5,6	Pressurizer pressure
			Pressurizer pressure
			Time
1.05) Control Core Heat Removal			
	Collect RCP information	RCS 1	RCP Amperes
	Decide if RCPs are operating	RCS 1	RCP speed
			RCS cold leg temperature
			RCS hot leg temperature
1.06) Control RCS heat removal			
	Collect SG parameter information	SG 3,5,6	Emergency feedwater flow
	Collect MSS flow information	MSS 4,5,6	Main Feed flow
	Collect FCS flow information	FCS 1	Main Feedpump speed
	Decide SG availability for heat removal	RCS 1	Main Feedwater flow
			Main steam flow
			RCS average temperature
			Steam generator level
			Steam generator pressure

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Derivation of Event Specific Tasks
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Gross Fun... /Sub-Functions	Task Statement	Task deri..d from System Function (System & Function #)	Parameter(s) to Observe (for details see Appendix F)
1.07) Maintain Containment Integrity			
	Collect Containment parameter information	CNTMT 1	Containment area radiation
	Decide if isolation is required	CNTMT 1	Containment pressure
			Steam plant radiation
1.08) Control Containment Atmosphere			
	Collect Containment parameter information	CNTMT 1	Containment pressure
	Decide if additional cooling is needed	CSS 1	Containment temperature
1.09) Control Containment Combustible Gases			
	Collect Containment H2 parameter information	CGC 3	Containment pressure
	Decide if H2 exists	CGC 3	Containment temperature
2.00) Diagnosis of event			
	Review collected info # 1.01 to 1.09		Containment pressure
	Decide event		Containment temperature
			Pres urizer level
			Pressurizer pressure
			Steam Generator level
3.00) Ensure SPTA performed			
	Review collected information # 1.01 to 1.09		
	Decide if SPTA performed	CDP	
	Perform outstanding actions		
4.00) Confirm diagnosis of event			
	Review collected information # 1.01 to 1.09		
	Decide event diagnosis is confirmed		
5.00) Control RCS inventory			
	Collect Pzr parameter information	PZR 1,2,6	Pressurizer level
	Collect CVCS flow to and from RCS	CVCS 1,11	
	Evaluate demand for CVCS flows	CVCS 1,11	
6.00) Control RCS pressure			
	Collect RCS pressure information	RCS 3	Pressurizer pressure
	Evaluate against control limits	PZR 5,6	
7.00) Control RCS heat removal			
	Collect MSS flow information	MSS 5,6	Main Steam flow
	Collect SG pressure information	SG 1	RCS average temperature
	Collect RCS temperature information	RCS 1	Steam Generator pressure
	Control TBS rate of steaming	MSS 5	Turbine 1st stage steam pressure

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Derivation of Event Specific Tasks
and Summary of Parameters Used

Gross Function /Sub-Functions	Task Statement	Task derived from System Function (System & Function #)	Parameter(s) to Observe (for details see Appendix F)
8.00) Maintain SG inventory			
	Collect SG parameter information	SG 3,4	Steam generator level
	Collect MSS flow information	MSS 4,5,6	
	Evaluate demand for SG makeup	SG 3	
	Decide rate of feeding SG	SG 3	
	Decide method of feeding Steam generator	SG 3	
	Refer to either # 8.01 or 8.02		
8.01) Control Main Feedwater to SGs			
	Control Main feedwater flow to SG	FCS 1	Main feedwater flow
	Collect FCS flow information	FCS 1	
	Evaluate against demand for SG makeup	SG 3	
8.02) Control Emergency Feedwater to SGs			
	Control Emergency Feedwater to SG	EFW 1	Emergency feedwater flow
	Collect Emergency Feedwater flow information	EFW 1	
	Evaluate against demand for SG makeup	SG 3	
9.00) Evaluate need for a cooldown			
	Refer to # 9.01 to 9.02		
9.01) Ensure condensate reserves adequate			
	Collect condensate reserve parameter info.	NUPS 1,2	Condensate storage tank level
	Evaluate parameters against specified limits	RCS 1/SG 3	IRWT level
	Decide adequacy of reserve		
9.02) Control RCS pressure			
	Collect RCS pressure information	RCS 3	Pressurizer heater power
	Evaluate against control limits	PZR 5,6	Pressurizer pressure
			Pressurizer pressure
10.00) Maintain RCS parameters			
	Refer to # 10.01 to 10.03		
10.01) Control RCS inventory			
	Collect Pzr parameter information	PZR 1,2,4	Pressurizer level
	Collect CVCS flow to and from RCS	CVCS 1,11	
	Evaluate demands for CVCS flows	CVCS 1,11	
10.02) Control RCS pressure			
	Collect RCS pressure information	RCS 3	Pressurizer pressure
	Evaluate against control limits	PZR 5,6	

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Derivation of Event Specific Tasks
and Summary of Parameters Used

Gross Function /Sub-Functions	Task Statement	Task Derived from System Function (System & Function #)	Parameter(s) to Observe	(for details see Appendix F)
10.03) Monitor RCS parameters for Forced Circ.				
	Collect RCP parameter information	RCS 4	RCP speed	
	Collect RCS parameter information	RCS 1	RCS cold leg temperature	
	Evaluate against specified limits for ops	RCS 4	RCS hot leg temperature	

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Gross Function /Sub-Functions	Task Statement	Task derived from System Function (System & Function #)	Parameter(s) to Observe (for detail see Appendix F)
1.00) Standard Post Trip Actions			
	Refer to # 1.01 to 1.09		
1.01) Ensure Reactor Shutdown			
	Collect JI information	RX 1	CEA position
	Collect CEA position information	CEA 4	CEA position
	Analyze & Determine reactor is shutdown	RX 4	Reactor Power (NI)
			Startup Rate (NI)
1.02) Ensure plant electrical power available			
	Collect TG output information	ELEC	13.8 kV Services Bus feeder
	Collect Bus feeder information	ELEC	DG output breaker
	Analyze & determine power available	ELEC	DG output breaker
	Collect Diesel Generator Output informati	ELEC	DG output frequency
	Analyze & determine need for Diesel	ELEC	DG output voltage
	Start Diesel	ELEC	
			Turbine Generator Breaker posit
			Turbine Trip
1.03) Maintain RCS inventory			
	Collect Pzr parameter information	PZR 1,2,3	Charging flow
	Collect CVCS flow to and from RCS	CVCS 1,11	Letdown flow
	Collect RCS subcooling information	RCS 1	PLCS setpoint level
	Analyze & determine makeup demands	RCS 7	Pressurizer level
	Compare demands to CVCS flows	CVCS 1,11	Pressurizer level
			RCS subcooling
			Time
1.04) Maintain RCS pressure			
	Collect RCS pressure information	RCS 3	PPCS setpoint pressure
	Analyze & determine if w/in control limits	PZR 5,6	Pressurizer Pressure
			Pressurizer Pressure
			Time
1.05) Maintain Core heat removal			
	Collect RCP information	RCS 1	RCP operating status
	Collect RCS parameter information	RCS 1	RCS cold leg temperature
	Analyze & determine if RCPs are operating	RCS 1	RCS hot leg temperature
1.06) Maintain RCS heat removal			
	Collect SG parameter information	SG 3,5,6	Emergency feedwater flow
	Collect MSS flow information	MSS 4,5,6	Main Feed Flow
	Collect FCS flow information	FCS 1	Main Feedwater flow
	Collect RCS paramter information	RCS 1	Main Feedwater setpoint flow
	Analyze & determine SG availability for HR	RCS 1	Main Steam Flow
			RCS average temperature
			Steam Generator level
			Steam Generator pressure

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Gross Function /Sub-Functions	Task Statement	Task derived from System Function (System & Function #)	Parameter(s) to Observe	(for deta see Appendix
1.07) Maintain Containment Integrity				
	Collect Containment parameter information	CNTMT 1	Containment a e radiation	
	Analyze & determine if isolation is required	CNTMT 1	Containment pressure	
			Steam plant radiation	
1.08) Control Containment Atmosphere				
	Collect Containment parameter information	CNTMT 1	Containment pressure	
	Analyze & determine if added cooling needed	CSS 1	Containment temperature	
	Start Emergency Fans			
	Start Air Recirculation Fans			
	Confirm Air Recirculation			
1.09) Control Containment Combustible Gases				
	Collect Containment parameter information	CGC 3	Containment pressure	
	Analyze for H2 generating condition present	CGC 3	Containment temperature	
2.00) Diagnosis of event				
	Review collected info # 1.01 to 1.09		Containment pressure	
	Collect Containment parameter information	CNTMT 1	Containment temperature	
	Collect Pzr parameter information	RCS 1,7	Pressurizer level	
	Analyze & determine event		Pressurizer level	
			Pressurizer pressure	
3.00) Ensure SPTA performed				
	Review collected information # 1.01 to 1.09			
	Analyze & determine if SPTA performed	CDP		
	Perform outstanding actions			
4.00) Confirm diagnosis of event				
	Review collected information # 1.01 to 1.09			
	Analyze & determine event diagnosis confirmed			
5.00) Control RCS depressurization				
	Collect RCS pressure information	RCS 3	Pressurizer Pressure	
	Analyze & determine:		Pressurizer pressure	
	if safety injection makeup required?	RCS 7	Time	
	if normal makeup adequate?	CVCS 1,11		
	Establish SI makeup (path & flow) # 5.01			
5.01) Ensure Safety Injection				
	Collect SI parameter information	SI 1	SI pressure	
	Analyze & determine if SI to RCS makeup OK	SI 1	Safety injection flow	
	Start Automatic safety injection (SIAS)	SI 1		
	Start SI pumps	SI 1		
	Align SI to RCS	SI 1		
	Confirm SI flow to RCS	SI 1		

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Gross Function /Sub-Functions	Task Statement	Task derived from System Function (System & Function #)	Parameter(s) to Observe (for detail see Appendix F)
6.00) Maximize Safety Injection			
	Collect SI & charging flow to RCS	SI 1	SI pressure
	Analyze & determine if SI maximized	SI 1	Safety injection flow
6.01) Maximize Charging flow			
	Start idle charging pumps	CVCS 11	Charging pump flow
	Confirm all charging pumps operating	CVCS 11	Charging pump status
6.02) Start idle SI Pumps			
	Start SI pumps	SI 1	SI pump 1 status
	Confirm SI pumps operating	SI 1	SI pump 2 status
			SI pump 3 status
			SI pump 4 status
6.03) Ensure electrical power to SI components			
	Compare flows to determine if SI maximized	SI 1	SI pump power available
	Collect power available info. of components	ELEC	
	Align power to component	ELEC	
6.04) Ensure valve alignments			
	Align charging to RCS	CVCS 11	Charging isolation valve position
	Confirm alignment of charging to RCS	CVCS 11	SI isolation valve position
	Align HPSI to RCS	SI 1	
	Confirm alignment of HPSI to RCS	SI 1	
6.05) Ensure necessary auxiliaries operating			
	Analyze & determine "auxiliaries" needed	AIR ELEC	later
	Confirm "auxiliaries" are operating	AIR ELEC	
7.00) Control RCS depressurization			
	Collect RCS pressure information	RCS 3	Pressurizer Pressure
	Evaluate RCP ops against specified limits	RCS 4	
	Analyze & determine whether to stop RCPs	RCS 1,4	
7.01) Stop all RCPs			
	Stop RCPs	RCS 4	RCP 1A status
	Confirm RCPs stopped	RCS 4	RCP 1B status
			RCP 2A status
			RCP 2B status
7.02) Monitor RCP operating limits			
	Collect RCS process parameter information	RCS 4	Pressurizer Pressure
	Analyze & determine if to continue RCP ops	RCS 4	

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Gross Function /Sub-Functions	Task Statement	Task derived from System Function (System & Function #)	Parameter(s) to Observe	(for detai see Appendix F
8.00) Record Time				
	Collect time of day information		Time	
	Compile for later use			
9.00) Isolate the LOCA				
	Refer to # 9.01 to 9.05 for valve closures		Pressurizer Level	
	Collect Pzr parameter information	RCS 1,7	Pressurizer Pressure	
	Analyze & determine if LOCA is isolated	RCS 1	Pressurizer pressure	
9.01) Isolate Letdown				
	Close letdown isolation valve	CNTMT 1	Letdown isolation valve positi	
	Confirm valve closure	CNTMT 1		
9.02) Isolate RCS sampling				
	Close RCS hot leg sample isolation valve	CNTMT 1	Pzr liquid sample isol. valve	
	Close Pzr vapor sample isolation valve	CNTMT 1	Pzr vapor sample isol. valve p	
	Close Pzr liquid sample isolation valve	CNTMT 1	RCS hot leg sample valve posit	
	Confirm valve closures	CNTMT 1		
9.03) Isolate RCS to CCW leakage				
	Close (find valve)	CNTMT 1	CCW return isolation valve pos	
	Confirm valve closures	CNTMT 1	CCW supply isolation valve pos	
	Collect CCW parameter information	CCW	CCW temperature	
9.04) Isolate any other sources of leakage				
	Close (find additional valves)		other valves	
	Confirm valve closures			
9.05) Isolate PORVs (see note)				
	Close PORV block valve (see note)		PORV block valve position (see	
	Confirm block valve closure			
10.00) Verify LOCA radiological containment				
	Refer to # 10.01 to 10.04			
10.01) Monitor Auxiliary Building				
	Collect auxiliary building area radiation	BLDG 1	Aux building area radiation	
			Aux building sump level	
10.02) Isolate LOCA outside containment				
	Close (find valves)		other valve positions??	
	Confirm valve closures			

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Gross Function /Sub-Functions	Task Statement	Task derived from System Function (System & Function #)	Parameter(s) to Observe	(for detai see Appendix F
10.03) ~aintain Containment Integrity				
	Collect containment parameter information	CNTMT 1	later	
	Analyze & determine if added isolation needed	CNTMT 1		
10.04) Ensure Containment Isolation				
	Confirm Containment isolation valves closed	CNTMT 1	later	
	Close outstanding CI designated valves	CNTMT 1		
11.00) Control Containment Atmosphere				
	Collect Containment parameter information	CNTMT 1	Containment pressure	
	Analyze & determine if added cooling needed	CSS 1	Containment temperature	
11.01) Control Containment fan Cooling				
	Collect Conta'nment fan operating parameters	CNTMT	Containment fan status	
11.02) Control Containment Spray Cooling				
	Collect Containment Spray parameters	CSS 1	Containment air recirculation	
			Containment equipment cooling	
12.00) Control Containment Pressurization				
	Collect Containment Atmosphere information	CNTMT 1	Containment pressure	
	Analyze & determine if to actuate Cntmt Spray	CSS 1	Containment temperature	
12.01) Control Containment Spray Cooling				
	Collect Containment Spray information	CSS 1	Containment Spray header pressu	
	Start Containment Spray pumps	CSS 1	Containment pressure	
	Align Containment Spray to Containment	CSS 1	Containment spray flow	
	Confirm Spray flow reducing CNTMT pressure	CSS 1	Time	
12.02) Align External H2 Recombiners				
	Analyze & determine need for recombiner		later	
	Collect External H2 Recombiner Availability			
	Align external H2 Recombiner to containment	CGC		
	Confirm containment integrity	CNTMT 1		
	Confirm H2 Recombiner alignment	CGC		
13.00) Monitor for Hydrogen in Containment				
	Collect Containment H2 information	CGC 1	Containment Hydrogen	
	Analyze & determine if H2 exists	CGC 1		
14.00) Control Containment Hydrogen				
	Refer to # 14.01 to 14.02			

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Gross Function /Sub-Functions	Task Statement	Task derived from System Function (System & Function #)	Parameter(s) to Observe	(for detai see Appendix F
14.01) Operate Hydrogen Recombiners				
	Collect H2 Recombiner parameters	CGC	Hydrogen recombiner power	
	Align power to H2 Recombiner	ELEC	Hydrogen recombiner temperatu	
	Control power (or temperature) of Recombiner	CGC		
	Collect Containment H2 information	CNTMT		
	Confirm reduction of H2 in containment	CGC		
14.02) Operate Hydrogen Purge				
	Collect Containment Atmosphere information	CNTMT 1	Containment air particulate	
	Collect Containment H2 information	CGC 1	Containment area radiation	
	Collect authorization to use H2 purge		Containment hydrogen	
	Open H2 purge valves		Containment pressure	
	Collect purge flow information		Containment temperature	
	Confirm reduction of H2 in containment			
15.00) Monitor Environmental impacts				
	Collect Containment radiation information		Meterogical data	
	Communicate to report information to ER team			
16.00) Isolated? No...				
	Refer to # 17.00 to 37.00			
17.00) Perform a rapid cooldown				
	Collect Condenser parameter information	FCS 1	Condenser cooling water flow	
	Analyze & determine method for cooldown		Condenser cooling water temper	
	Refer to either # 17.01 or 17.02		Condenser pressure	
			Turbine exhaust temperature	
17.01) Control cooldown w/Turbine Bypass Sys.				
	Collect Condenser parameter information	FCS 1	Condenser cooling water flow	
	Control TBS rate of steaming	MSS 5	Condenser cooling water tempera	
	Control condenser hotwell level & vacuum	FCS 1	Condenser hotwell level	
	Control condenser cooling		Condenser pressure	
	Collect RCS temperature information	RCS 1	RCS average temperature	
	Decide rate of steaming using TBS	MSS		
			Time	
			Turbine exhaust temperature	
17.02) Control cooldown w/Atmospheric Dumps				
	Control ADV rate of steaming	MSS 6	RCS average temperature	
	Collect RCS temperature information	RCS 1	RCS average temperature	
	Decide rate of steaming using ADVs	MSS 6	Steam Generator pressure	
			Time	

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Gross Function /Sub-Functions	Task Statement	Task derived from System Function (System & Function #)	Parameter(s) to Observe	(for deta see Appendix
18.00) Maintain SG inventory				
	Collect SG parameter information	SG 3,4	Main steam flow	
	Collect MSS flow information	MSS 4,5,6	Steam Generator level	
	Analyze & determine demand for SG makeup	SG 3		
	Analyze & determine method for feeding SG			
	Decide rate of feeding steam generator	SG 3		
	For methods: refer to either # 18.01 or 18.02			
18.01) Control Main Feedwater to SGs				
	Control Main feedwater flow to SG	FCS 1	Main feedwater flow	
	Collect FCS flow information	FCS 1		
	Analyze & determine demand for SG makeup	SG 3		
18.02) Control Emergency Feedwater to SGs				
	Control Emergency Feedwater to SG	EFW 1	Emergency feedwater flow	
	Collect Emergency Feedwater flow information	EFW 1		
	Analyze & determine demand for SG makeup	SG 3		
19.00) Ensure condensate reserves adequate				
	Collect condensate reserve parameter info	MUPS 1,2	Condensate storage tank level	
	Analyze & determine reserve capacity	MUPS 1,2	IRWT level	
	Compute adequacy of reserves	RCS 1/SG 3		
20.00) Ensure proper charging and letdown				
	Collect Pzr parameter information	PZR 1,2,4	Charging flow	
	Collect CVCS flows to and from RCS	CVCS 1,11	Charging isolation valve posi	
	Compare demand to CVCS flows	CVCS 1,11	Letdown flow	
	Control Charging flow	CVCS 1,11	Letdown isolation valve posit	
	Control Letdown flow	CVCS 1	Pressurizer level	
	Open Letdown isolation valve	CVCS 1		
			Pressurizer pressure	
21.00) Control RCS Depressurization				
	Collect RCS pressure information	RCS 3	Pressurizer pressure	
	Analyze & determine method to depressurize	RCS 3	Pressurizer pressure	
	For methods: refer to #21.01 to 21.03		Time	
21.01) Depressurization Method 1				
	Open Pressurizer Main spray valves	PZR 6	SI header pressure	
	Control Pressurizer Main spray flow	PZR 6	Pressurizer Pressure	
	Open Pressurizer Aux spray flow	CVCS 2	Pressurizer pressure	
	Confirm depressurization	RCS 3		
21.02) Depressurization Method 2				
	Collect CVCS flows to and from RCS	CVCS 1,11	Charging flow	
	Control (to reduce) charging flow	CVCS 1	Charging pump pressure	
	Control (to increase as practical) letdown	CVCS 11	Letdown flow	
	Confirm depressurization	RCS 3	Pressurizer Pressure	
			Pressurizer level	

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Gross Function /Sub-Functions	Task Statement	Task derived from System Function (System & Function #)	Parameter(s) to Observe (for detail see Appendix F)
21.03) Depressurization Method 3			
	Collect SI flow to RCS	SI 1	CET temperature
	Collect RCS parameter information	RCS 3,7,1	Pressurizer level
	Analyze & determine amount of SI makeup	RCS 7	Pressurizer pressure
	Control SI flow to RCS	SI 1	RCS hot leg temperature
	Stop SI pumps	SI 1	SI flow
22.00) Ensure vessel P-T limits maintained			
	Refer to # 22.01 to 22.08		
22.01) Monitor RCS for P-T violations			
	Collect RCS temperature information	RCS 1	Pressurizer pressure
	Collect RCS pressure information	RCS 2,3	RCS average temperature
	Analyze & determine if violation exists	RPV 1	RCS cold leg temperature
	Analyze & determine pressure control method	RCS 2,3	RCS hot leg temperature
22.02) Stop the Cooldown			
	Throttle TBS steaming rate	MSS 5	Main steam flow
	Confirm rate of RCS cooldown reduced to 0	RCS 1	Pressurizer pressure
			RCS average temperature
			Time
22.03) Control RCS pressure (method 1)			
	Decide main spray valve position to open to	PZR 6	Main spray valve position
	Open main pressurizer spray valves	PZR 6	
	Confirm depressurization	RCS 3	
	Decide when to close valves	RCS 3	
	Close main pressurizer spray valves	PZR 6	
	Confirm valves closed	RCS 3 PZR6	
22.04) Control RCS pressure (method 2)			
	Align charging to auxiliary spray header	CVCS 2	Auxiliary spray valve position
	Confirm charging pumps operating	CVCS 2	Charging pump status
	Start charging pumps	CVCS 2	Pursaurizer pressure
	Open Auxiliary spray valve	CVCS 2	
	Confirm depressurization	RCS 3	
	Close Auxiliary spray valve	CVCS 2	
22.05) Control RCS pressure (method 3)			
	Control SI flow to RCS	SI 1	SI header pressure
	Collect RCS parameter information	RCS 3,7,1	Pressurizer Pressure
	Analyze & determine amount of SI makeup	RCS 7	Pressurizer pressure
	Control SI flow to RCS	SI 1	
	Confirm depressurization	RCS 3	

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Gross Function /Sub-Functions	Task Statement	Task derived from System Function (System & Function #)	Parameter(s) to Observe (for detail see Appendix F)
22.06) Maintain SG inventory			
	Collect SG parameter information	SG 3,4	Main steam flow
	Collect MSS flow information	MSS 4,5,6	Steam generator level
	Analyze & determine demand of SG makeup	SG 3	
	Decide rate of feeding SG	SG 3	
	Analyze & determine method (# 22.07 or 22.08)		
22.07) Control Main Feedwater to SGs			
	Control main feedwater flow to SG	FCS 1	Main feedwater flow
	Collect FCS flow information	FCS 1	
	Analyze & determine demand for SG makeup	SG 3	
	Decide rate of feeding SG	SG 3	
22.08) Control Emergency Feedwater to SGs			
	Control Emergency Feedwater flow to SG	EFW 1	Emergency feedwater flow
	Collect Emergency Feedwater flow information	EFW 1	
	Analyze & determine demand of SG makeup	SG 3	
	Decide rate of feeding SG	SG 3	
23.00) Determine need for forced cooling			
	Refer to # 23.0 to 23.03 to evaluate needs		
	Analyze & determine if forced circ. needed		
23.01) Determine present heat removal adequacy			
	Collect RCS parameter information	RCS 1	CET temperatures
	Collect core parameter information	RX 5	RCS hot leg temperature
	Analyze & determine adequacy of heat removal	RCS 1	
23.02) Monitor RCS parameters			
	Collect RCS parameter information	RCS 1	Pressurizer pressure
	Collect RCP parameter information	RCS 4	RCS [illegible] temperature
	Compute duration of RCP seal cooling loss	RCS 4	
23.03) Determine need for Main Pzr spray			
	Collect RCS pressure information	RCS 3	Auxiliary spray valve position
	Collect PZR parameter information	PZR 2	Charging flow
	Analyze & determine adequacy of aux. spray		Pressurizer pressure
	Analyze & determine need for Main spray		Pressurizer pressure
			RCS average temperature
			Time
24.00) Determine if conditions permit RCP start			
	Refer to # 24.01 to 24.04 for conditions		
	Analyze & determine if RCP restart permitted	RCS 4	

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Gross Function /Sub-Functions	Task Statement	Task derived from System Function (System & Function #)	Parameter(s) to observe (for details see Appendix F)
24.01) Ensure electrical power to RCPs			
	Collect electric power available information	ELEC	13.8 kV RCP bus supply breaker
	Close 13.8 kV RCP bus supply breaker	ELEC	13.8kV RCP Bus voltage
24.02) Maintain SG inventory			
	Collect SG parameter information	SG 3	Emergency feedwater flow
	Collect MSS parameter information	MSS 5	Main Feedwater flow
	Collect Main feedwater information	FCS 1	Main Feedwater setpoint flow
	Collect Emergency feedwater information	EFW 1	Main Steam Flow
	Analyze & determine if SG inventory adequate	SG 3	Main feedwater flow
			RCS average temperature
			Steam Generator pressure
			Steam generator level
24.03) Control RCS inventory			
	Collect Pzr parameter information	PZR 2	Pressurizer level
	Analyze & determine if RCS inventory adequate	RCS 1,7	
24.04) Monitor core heat removal			
	Collect core temperature information	RX 3	CET temperature
	Collect RCS pressure information	RCS 3	Pressurizer pressure
	Analyze & determine core cooling adequate	RX 3	
25.00) Restart RCPs			
	Decide which pumps to start	RCS 4	
	Refer to # 25.01 to 25.02		
25.01) Ensure RCS inventory			
	Start all charging pumps	CVCS 1,11	Charging pump operating status
	Collect RCS parameter information	RCS 1	SI pump operating status
	Start all SI pumps	SI 1	Pressurizer pressure
25.02) Start RCP			
	Start RCP	RCS 4	13.8kV RCP Bus amperes
	Collect RCS parameter information	RCS 1	Pressurizer pressure
	Confirm RCPs started	RCS 4	RCS cold leg temperature
	Collect RCP bus amperage information	ELEC	RCS hot leg temperature
25.03) Monitor RCS parameters for Forced Circ.			
	Collect RCP parameter information	RCS 4	Pressurizer level
	Collect RCS parameter information	RCS 1	Pressurizer pressure
	Analyze & determine if forced circ. adequate	RCS 1,4	RCP 1A differential pressure
			RCP 1A speed
			RCP 1B differential pressure
			RCP 1B speed
			RCP 2A differential pressure
			RCP 2A speed
			RCP 2B differential pressure
			RCP 2B speed

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Gross Function /Sub-Functions	Task Statement	Task derived from System Function (System & Function #)	Parameter(s) to Observe (for detail see Appendix F)
26.00) Control RCS and Core heat removal			
	Collect RCP parameter information	RCS 4	RCP 1A differential pressure
	Analyze & determine if RCPs are operating	RCS 4	RCP 1B differential pressure
	Refer to # 26.01		RCP 1B speed
			RCP 2A differential pressure
			RCP 2A speed
			RCP 2B differential pressure
			RCP 2B speed
			RCP 1A speed
26.01) Monitor RCS parameters for Natural Circ.			
	Collect SG parameter information	SG 3	RCS cold leg temperature
	Collect MSS flow information	MSS 5,6	RCS hot leg temperature
	Collect RCS temperature information	RCS 1	Steam generator pressure
	Compute time since loss of forced circ.	RCS 1	Time
	Analyze & determine if Natural circ. exists	RCS 5	
27.00) Control RCS and Core heat removal			
	Collect RCS parameter information	RCS 1	CET temperature
	Collect core parameter information	RX 3	RCS subcooling
	Decide if two phase conditions exist in RCS	RCS 1	Steam Generator level
	Refer to # 27.01 to 27.03		
27.01) Control core heat removal (method 1)			
	Collect RCS hot leg temperature information	RCS 1	CET temperature
	Collect SG parameter information	SG 3	Main steam flow
	Collect MSS flow information	MSS 5,6	RCS hot leg temperature
	Collect Core temperature information	RX 3	RCS hot leg temperature
	Decide if reflux cooling exists	RCS 1	Steam generator level
	Confirm core is being cooled	RX 3	
27.02) Control Core heat removal (method 2)			
	Collect SG parameter information	SG 3	CET temperature
	Collect MSS flow information	MSS 4,5	Main steam flow
	Collect RCS cold leg temperature information	RCS 1	RCS cold leg temperature
	Collect core temperature information	RX 3	Steam generator level
	Decide if two phase natural circulation exist	RCS 1	
	Confirm core is being cooled	RX 3	
27.03) Control Core heat removal (method 3)			
	Decide where break is	RCS 1	CET temperature
	Control TBS (or ADVs) flow from SG	MSS 5,6	Charging isolation valve positic
	Monitor reflux flow to core # 27.01,27.02	RCS 1	SI isolation valve position
	Confirm core is being cooled	RX 3	

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Gross Function /Sub-Functions	Task Statement	Task derived from System Function (System & Function #)	Parameter(s) to Observe (for detail see Appendix F)
28.00) Control RCS inventory			
	Collect Pzr parameter information	PZR	Pressurizer level
	Collect RCS parameter information	RCS 1,3,7	RCS hot leg temperature
	Analyze & determine inventory control needs	RCS 7	
28.01) Monitor for Termination Criteria			
	Review collected information # 28.00	RCS 1,3,7	CET temperature
	Analyze & determine amount of SI makeup	RCS 1,3,7	Pressurizer level
	Decide whether to throttle or stop SI to RCS	RCS 1,3,7	Pressurizer pressure
			RCS subcooling
28.02) Throttle or Stop SI			
	Throttle SI flow to RCS	SI 1	SI pump 1 status
	Stop SI pump	SI 1	SI isolation valve 1 position
	Confirm reduced SI flow to RCS	RCS 7	SI pump 2 status
			SI pump 3 status
			SI pump 4 status
			SI isolation valve 2 position
			SI isolation valve 3 position
			SI isolation valve 4 position
28.03) Confirm RCS inventory control			
	Collect Pzr parameter information	PZR	SI pump 1 status
	Collect RCS parameter information	RCS 7	Pressurizer level
	Confirm RCS inventory has stabilized	RCS 7	Pressurizer pressure
			SI isolation valve 1 position
			SI pump 2 status
			SI pump 3 status
			SI pump 4 status
			SI isolation valve 2 position
			SI isolation valve 3 position
			SI isolation valve 4 position
29.00) Control RCS inventory			
	Collect Pzr parameter information	PZR 2	Pressurizer level
	Analyze & determine inventory control needs		Pressurizer pressure
	Return to # 29.01 to 29.03		
29.01) Monitor RCS parameters			
	Collect RCS parameter information	RCS 1,7	CET temperature
	Analyze & determine whether to reinitate SI	RCS 7	Pressurizer level
			Pressurizer pressure
			Pressurizer pressure
			RCS subcooling

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Gross Function /Sub-Functions	Task Statement	Task derived from System Function (System & Function #)	Parameter(s) to Observe	(for data see Appendix ...
29.02) Reinitiate Full SI flow				
	Open SI valves	SI 1	SI isolation valve 1 position	
	Start SI valves	SI 1	SI pump 1 status	
	Confirm full SI flow	RCS 7	SI pump 2 status	
			SI pump 3 status	
			SI pump 4 status	
			SI isolation valve 2 position	
			SI isolation valve 3 position	
			SI isolation valve 4 position	
29.03) Confirm RCS inventory control				
	Collect Pzr parameter information	PZR 2	SI pump 1 status	
	Collect RCS parameter information	RCS 7	Pressurizer level	
	Confirm RCS inventory being maintained	RCS 7	Pressurizer pressure	
			SI isolation valve 1 position	
			SI pump 2 status	
			SI pump 3 status	
			SI pump 4 status	
			SI isolation valve 2 position	
			SI isolation valve 3 position	
			SI isolation valve 4 position	
30.00) Monitor inventory sources				
	Collect IRWT inventory information	NUPS	Containment sump	
	Collect containment sump information	NUPS	IRWT level	
	Analyze & determine inventory control correct	NUPS		
	Compute adequacy of inventory sources	NUPS		
31.00) Control RCS inventory recirculation				
	Review information collect @ 30.00	NUPS		
	Analyze & determine if break is inside Cntmt			
	Refer to # 31.01 to 31.02			
31.01) Monitor RCS inventory recirculation				
	Collect IRWT inventory information	NUPS	IRWT level	
	Analyze & determine whether to start recirc.	NUPS	Recirculation isolation valve	
			Recirculation pump status	
31.02) Control SI flow during recirc.				
	Confirm sump valves open on recirculation	NUPS	Containment sump level	
	Open containment sump valves	NUPS		
	Throttle SI flow to RCS	SI 1		
	Collect containment sump information	NUPS		
	Analyze & determine adequacy of recirc.	SI 1		
	Confirm core is being cooled	RX 3		

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Gross Function /Sub-Functions	Task Statement	Task derived from System Function (System & Function #)	Parameter(s) to Observe (for detail see Appendix F)
32.(0) Control RCS heat removal			
	Collect SG parameter information	SG 1	Steam generator pressure
	Analyze & determine when to block MSIS	SG 1	
32.01) Block Automatic initation of MSIS			
	Block MSIS automatic initiation	SG 1	MSIS blocked status
	Confirm MSIS is blocked	SG 1	
33.00) Control RCS pressure			
	Collect RCS pressure information	RCS 3	Pressurizer pressure
	Analyze & determine impact of SI tanks	SI 1	
	Analyze & decide method # 33.01, 33.02, 33.03		
33.01) Control RCS pressure (method 1)			
	Close SI tank isolation valve	SI 5	SI tank 2 isolation valve
	Confirm SI tank isolated	RCS 3	SI tank 3 isolation valve
			SI tank 4 isolation valve
			SI tank isolation 1 valve
33.02) Control RCS pressure (method 2)			
	Collect RCS pressure information	RCS 3	Pressurizer pressure
	Close SI tank nitrogen pressure valve	SI 1	SI tank 1 vent valve position
	Open SI tank vent valve	SI 1	SI tank 2 vent valve position
	Confirm SI tank depressurized	SI 1	SI tank 3 vent valve position
			SI tank 4 vent valve position
33.03) Control RCS pressure (method 3)			
	Collect RCS pressure information	RCS 3	Pressurizer pressure
	Close SI tank nitrogen pressure valve	SI 1	SI tank 1 drain valve position
	Open SI tank drain valve	SI 1	SI tank 2 drain valve position
	Confirm SI tank depressurization	SI 1	SI tank 3 drain valve position
			SI tank 4 drain valve position
34.00) Control RCS pressure			
	Collect RCS parameter information	RCS 1,3	Pressurizer pressure
	Align LTOP	RCS 1,3	RCS average temperature
	Confirm LTOP	RCS 1,3	
35.00) Control Core heat removal			
	Compute time since start of event	CDP	CET temperatures
	Collect RCS pressure information	RCS 3	SI flow header 1
	Compute when entry into UGS is possible	RCS 1,3	SI flow header 2
	Align for Direct Vessel Injection (DVI) SI	SI 5	Pressurizer pressure
			SI flow header 3
			SI flow header 4

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Gross Function /Sub-Functions	Task Statement	Task derived from System Function (System & Function #)	Parameter(s) to Observe	(for detai see Appendix F
36.00) Control RCS heat removal				
	Collect RCS parameter information	RCS 1,3	Pressurizer level	
	Analyze & determine entry into SCS	RCS 1,3	Pressurizer pressure	
			RCS average temperature	
			RCS subcooling	
37.00) Control RCS Voiding				
	Collect RCS parameter information	RCS 1,3	Pressurizer pressure	
	Decide if voiding exists	RCS 1,3,7		
38.00) Isolated? Yes...				
	Refer to 39.00 to 56.00			
39.00) Control RCS inventory				
	Collect Pzr parameter information	PZR 2	Pressurizer level	
	Collect RCS parameter information	RCS 1,3,7	RCS hot leg temperature	
	Analyze & determine inventory control needs	RCS 7		
39.01) Monitor for Termination Criteria				
	Review collected information # 39.00	RCS 1,3,7	CET temperature	
	Analyze & determine amount of SI makeup	RCS 1,3,7	Pressurizer Pressure	
	Analyze & determine:		Pressurizer level	
	whether to throttle or stop SI to RCS	RCS 1,3,7	RCS subcooling	
39.02) Throttle or Stop SI				
	Throttle SI flow to RCS	SI 1	SI pump 1 status	
	Stop SI pump	SI 1	SI isolation valve position	
	Confirm reduced SI flow to RCS	RCS 7	SI pump 2 status	
			SI pump 3 status	
			SI pump 4 status	
39.03) Confirm RCS inventory control				
	Collect Pzr parameter information	PZR 2	SI pump 1 status	
	Collect RCS parameter information	RCS 7	Pressurizer level	
	Confirm RCS inventory has stabilized	RCS 7	Pressurizer pressure	
			SI isolation valve position	
			SI pump 2 status	
			SI pump 3 status	
			SI pump 4 status	
40.00) Control RCS inventory				
	Collect Pzr parameter information	PZR 2	Pressurizer level	
	Analyze & determine inventory control needs	RCS 7	Pressurizer pressure	
	Refer to # 29.01 to 29.03			

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Gross Function /Sub-Functions	Task Statement	Task derived from System Function (System & Function #)	Parameter(s) to Observe (for detail see Appendix F)
40.01) Monitor RCS parameters			
	Collect RCS parameter information	RCS 1,7	CET temperature
	Analyze & determine whether to reinitate SI	RCS 7	Pressurizer level
			Pressurizer pressure
			RCS subcooling
40.02) Reinitiate Full SI flow			
	Open SI valves	SI 1	SI pump 1 status
	Start SI pumps	SI 1	SI isolation valve 1 position
	Confirm full SI flow	RCS 7	SI pump 2 status
			SI pump 3 status
			SI pump 4 status
			SI isolation valve 2 position
			SI isolation valve 3 position
			SI isolation valve 4 position
40.03) Confirm RCS inventory control			
	Collect Pzr parameter information	PZR 2	SI pump 1 status
	Collect RCS parameter information	RCS 7	Pressurizer level
	Confirm RCS inventory being maintained	RCS 7	Pressurizer pressure
			SI isolation valve 1 position
			SI pump 2 status
			SI pump 3 status
			SI pump 4 status
			SI isolation valve 2 position
			SI isolation valve 3 position
			SI isolation valve 4 position
41.00) Ensure proper charging and letdown			
	Collect Pzr parameter information	PZR 1,2,4	Charging flow
	Collect charging and letdown flow information	CVCS 1,11	Charging isolation valve positi
	Compare demand to CVCS flows	CVCS 1,11	Letdown flow
	Control charging flow	CVCS 1,11	Letdown isolation valve positio
	Control letdown flow	CVCS 1	Pressurizer level
	Open letdown isolation valve	CVCS 1	
			Pressurizer pressure
42.00) Control RCS Pressure			
	Collect RCS pressure information	RCS 3	Pressurizer pressure
	Analyze & determine method: # 42.01 to 42.03		RCP 1A differential pressure
			RCP 1B differential pressure
42.01) Depressurization Method 1			
	Open Pressurizer main spray valves	PZR 6	Pressurizer pressure
	Control Pressurizer main spray flow	PZR 6	Time
	Open Presrurzier Auxiliary spray valves	CVCS 2	
	Control Auxiliary spray flow	CVCS 2	
	Confirm RCS depressurization	RCS 3	

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Gross Function /Sub-Functions	Task Statement	Task derived from System Function (System & Function #)	Parameter(s) to Observe	(for details see Appendix F
42.02) Depressurization Method 2				
	Collect charging and letdown flow information	CVCS 1,11	Charging flow	
	Control (to reduce) charging flow	CVCS 1	Charging pump pressure	
	Control (to increase as practical) letdown	CVCS 11	Letdown flow	
	Confirm RCS depressurization	RCS 3	Pressurizer level	
			Pressurizer pressure	
42.03) Depressurization Method 3				
	Collect SI flow information	SI 1	SI header pressure	
	Collect RCS parameter information	RCS 3,7,1	Pressurizer pressure	
	Analyze & determine amount of SI makeup	RCS 7	Pressurizer pressure	
	Control SI flow to RCS	SI 1		
	Stop SI pumps	SI 1		
43.00) Ensure vessel P-T limits maintained				
	Refer to # 43.01 to 43.05			
43.01) Monitor RCS for P-T violations				
	Collect RCS temperature information	RCS 1	Pressurizer pressure	
	Collect RCS pressure information	RCS 2,3	RCS average temperature	
	Analyze & determine if violation exists	RPV 1	RCS cold leg temperature	
	Analyze & determine method: # 43.03 to 43.05		RCS hot leg temperature	
43.02) Stop the Cooldown				
	Throttle TBS steaming rate	MSS 5	Main Steam flow	
	Confirm rate of RCS cooldown reduced to 0	RCS 1	Pressurizer pressure	
			RCS average temperature	
			Time	
43.03) Control RCS pressure (method 1)				
	Decide main spray valve position to open to	PZR 6	Main Spray valve position	
	Open main pressurizer spray valves	PZR 6		
	Confirm RCS depressurization	RCS 3		
	Decide when to close valves	RCS 3		
	Close main pressurizer spray valves	PZR 6		
	Confirm valves closed	PZR 6/RCS3		
43.04) Control RCS pressure (method 2)				
	Align charging to auxiliary spray header	CVCS 2	Auxiliary spray valve position	
	Confirm charging pumps operating	CVCS 2	Charging pump status	
	Start charging pumps	CVCS 2	Pressurizer pressure	
	Open auxiliary spray valve	CVCS 2		
	Confirm RCS depressurization	RCS 3		
	Close auxiliary spray valve	CVCS 2		

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Gross Function /Sub-Functions	Task Statement	Task derived from System Function (System & Function #)	Parameter(s) to Observe (for detail see Appendix F)
43.05) Control RCS pressure (method 3)			
	Control SI flow to RCS	SI 1	SI header pressure
	Collect RCS parameter information	RCS 3,7,1	Pressurizer pressure
	Analyze & determine amount of SI makeup	RCS 7	Pressurizer pressure
	Control SI flow to RCS	SI 1	
	Confirm RCS depressurization	RCS 3	
44.00) Maintain SG inventory			
	Collect SG parameter information	SG 3,4	Main Steam flow
	Collect MSS flow information	MSS 4,5,6	Steam generator level
	Analyze & determine demand for SG makeup	SG 3	
	Decide rate of feeding SG	SG 3	
	Analyze & determine method # 44.01 or 44.02		
44.01) Control Main Feedwater to SGs			
	Control main feedwater flow to SG	FCS 1	Main feedwater flow
	Collect FCS flow information	FCS 1	
	Analyze & determine demand for SG makeup	SG 3	
	Decide rate of feeding SG	SG 3	
44.02) Control Emergency Feedwater to SGs			
	Control Emergency feedwater flow to SG	EFW 1	Emergency feedwater flow
	Collect Emergency feedwater flow information	EFW 1	
	Analyze & determine demand for SG makeup	SG 3	
	Decide rate of feeding SG	SG 3	
45.00) Ensure condensate reserves adequate			
	Collect condensate reserve parameter info.	NUPS 1,2	Condensate storage tank level
	Analyze & determine reserve capacity	NUPS 1,2	IRWT level
	Compute adequacy of reserves	RCS 1/SG 3	
46.00) Control reactivity			
	Refer to # 46.01 to 46.03		
46.01) Borate the RCS			
	Collect RCS Boron Conc. information	RX 4	BAM tank boron concentration
	Compare RCS Boron Conc. to tech specs	RX 4	RCS boron concentration
	Collect Boron Addition Tank Conc. information	CVCS 4,8	RCS hot leg sample valve positic
	Analyze & determine borated water to add	CVCS 4	
	Control letdown to maintain inventory	PZR 2	
	Analyze & determine prevent dilution method	RX 4	
46.02) Prevent dilution (method 1)			
	Analyze & determine if RCPs are operating	RCS 4	Pressurizer boron concentration
	Communicate with Chemist to sample Pzr	COMM	Pzr liquid sample valve position
	Open Pzr liquid sample isolation valve	PZR	RCP operating status
	Collect Pzr Boron Concentration information	PZR 2	
	Analyze & determine Pzr dilution impact	RX 4	
	Control Pzr spray to mix boron	CVCS 2	

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Gross Function /Sub-Functions	Task Statement	Task derived from System Function (System & Function #)	Parameter(s) to Observe (for details see Appendix F)
46.03) Prevent dilution (method 2)			
	Analyze & determine if RCPs are NOT operating	RCS 4	Pressurizer boron concentration
	Communicate with Chemist to sample Pzr	COMM	Pzr liquid sample valve position
	Open Pzr liquid sample isolation valve	PZR	RCP operating status
	Collect Pzr Boron Concentration information	PZR 2	
	Compute additional boron required to offset	RX 4	
	Analyze & determine Pzr dilution impact	RX 4	
47.00) Perform a controlled cooldown			
	Collect condenser parameter information	FCS 1	Condenser cooling water flow
	Analyze & determine method for cooldown		Condenser cooling water temperature
	Refer to either # 47.01 or 47.02		Condenser pressure
			Turbine exhaust temperature
47.01) Control cooldown w/Turbine Bypass Sys.			
	Collect condenser parameter information	FCS 1	Condenser cooling water flow
	Control TBS rate of steaming	MSS 5	Condenser cooling water temperature
	Control condenser hotwell level & vacuum	FCS 1	Condenser hotwell level
	Control condenser cooling		Condenser pressure
	Collect RCS temperature information	RCS 1	RCS average temperature
	Decide rate of steaming using TBS	MSS 5	
			Time
			Turbine exhaust temperature
47.02) Control cooldown w/Atmospheric Dumps			
	Control ADV rate of steaming	MSS	RCS average temperature
	Collect RCS temperature information	RCS 1	RCS average temperature
	Decide rate of steaming using ADVs	MSS	Steam generator pressure
			Time
48.00) Determine need for forced cooling			
	Refer to # 48.01 to 48.03 to evaluate needs		
	Analyze & determine if need exists		
48.01) Determine present heat removal adequacy			
	Collect RCS parameter information	RCS 1	CET temperatures
	Analyze & determine adequacy of heat removal	RCS 1	RCS cold leg temperature
			RCS hot leg temperature
			RCS hot leg temperature
48.02) Monitor RCS parameters			
	Collect RCS parameter information	RCS 1	Pressurizer pressure
	Collect RCP parameter information	RCS 4	RCS average temperature
	Compute duration of RCP seal cooling loss	RCS 4	

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Gross Function /Sub-Functions	Task Statement	Task derived from System Function (System & Function #)	Parameter(s) to Observe	(for detai see Appendix 7
48.03) Determine need for Main Pzr spray				
	Collect RCS pressure information	RCS 3	Auxiliary spray valve positio	
	Collect PZR parameter information	PZR 2	Charging flow	
	Analyze & determine adequacy of aux. spray		Pressurizer pressure	
	Analyze & determine need for main spray		Pressurizer pressure	
			RCS average temperature	
			Time	
49.00) Determine if conditions permit RCP start				
	Collect RCS parameter information	RCS 1	13.8 kV RCP bus supply breaker	
	Collect PZR parameter information	PZR 2	13.8 kV RCP bus voltage	
	Collect SG parameter information	SG 3	Pressurizer level	
	Analyze & determine if RCP restart permitted	RCS 4	Pressurizer pressure	
	Collect electric power available information	ELEC		
			RCS average temperature	
			RCS cold leg temperature	
			RCS hot leg temperature	
			Steam generator level	
			Steam generator pressure	
50.00) Restart RCPs				
	Decide which pumps to start	RCS 4		
	Refer to # 50.01 to 50.02			
50.01) Ensure RCS inventory				
	Start all charging pumps	CVCS 1,11	Charging pump operating status	
	Collect RCS parameter information	RCS 1	SI pump operating status	
	Start all SI pumps	SI 1	Pressurizer pressure	
50.02) Start RCP				
	Start RCP	RCS 4	13.8kV RCP bus amperes	
	Collect RCS parameter information	RCS 1	Pressurizer pressure	
	Confirm RCPs started	RCS 4	RCS cold leg temperature	
	Collect RCP bus amperage information	ELEC	RCS hot leg temperature	
50.03) Monitor RCS parameters for Forced Circ.				
	Collect RCP parameter information	RCS 4	Pressurizer level	
	Collect RCS parameter information	RCS 1	Pressurizer pressure	
	Analyze & determine adequacy of heat removal	RCS 4	RCP 1A differential pressure	
			RCP 1A speed	
			RCP 1B differential pressure	
			RCP 1B speed	
			RCP 2A differential pressure	
			RCP 2A speed	
			RCP 2B differential pressure	
			RCP 2B speed	

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Gross Function /Sub-Functions	Task Statement	Task derived from System Function (System & Function #)	Parameter(s) to Observe	(for detail see Appendix F
51.00) Control RCS and Core heat removal				
	Collect RCP parameter information	RCS 4	RCP 1A differential pressure	
	Analyze & determine if RCPs are operating	RCS 4	RCP 1B differential pressure	
	Refer to # 51.01		RCP 2A differential pressure	
			RCP 2B differential pressure	
			RCP 1A speed	
			RCP 1B speed	
			RCP 2A speed	
			RCP 2B speed	
51.01) Monitor RCS parameters for Natural Circ.				
	Collect SG parameter information	SG 3	RCS cold leg temperature	
	Collect MSS flow information	MSS 5,6	RCS hot leg temperature	
	Collect RCS temperature information	RCS 1	Steam generator pressure	
	Analyze & determine if natural circ. exists	RCS 5	Time	
	Compute time since loss of forced circ.	RCS 1		
52.00) Control RCS heat removal and pressure				
	Collect RCS pressure information	RCS 3	Pressurizer pressure	
	Compare for approach to safety sys auto start	RCS 1,3	Steam generator pressure	
	Refer to # 52.01 to 52.04			
52.01) Block Automatic initiation of MSIS				
	Collect SG pressure information	SG 1	MSIS blocked status	
	Compare to MSIS Block enable	SG 1	Steam generator pressure	
	Block MSIS train A	SG 1		
	Block MSIS train B	SG 1		
	Confirm MSIS trains are blocked	SG 1		
52.02) Block Automatic initiation of SIAS				
	Collect Pressurizer pressure	PZR	CIAS blocked status	
	Compare to SIAS block enable		Pressurizer pressure	
	Block SIAS train A		SIAS blocked status	
	Block SIAS train B			
	Confirm SIAS trains are blocked			
53.00) Control RCS pressure				
	Collect RCS pressure information	RCS 3	Pressurizer pressure	
	Analyze & determine SI tank impact	SI 1		
	Decide method: # 53.01, 53.02, or 53.03			
53.01) Control RCS pressure (method 1)				
	Close SI tank isolation valve	SI 5	SI tank 1 isolation valve	
	Confirm SI tank isolated	RCS 3	SI tank 2 isolation valve	
			SI tank 3 isolation valve	
			SI tank 4 isolation valve	

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Derivation of Event Specific Tasks
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Gross Function /Sub-Functions	Task Statement	Task derived from System Function (System & Function #)	Parameter(s) to Observe	(for deta see Appendix
53.02) Control RCS pressure (method 2)				
	Collect RCS pressure information	RCS 3	Pressurizer pressure	
	Close SI tank nitrogen pressure valve	SI 1	SI tank 1 pressure	
	Open SI tank vent valve	SI 1	SI tank 2 pressure	
	Confirm SI tank depressurized	SI 1	SI tank 3 pressure	
			SI tank 4 pressure	
			SI tank 1 vent valve positior	
			SI tank 2 vent valve positior	
			SI tank 3 vent valve positior	
			SI tank 4 vent valve positior	
53.03) Control RCS pressure (method 3)				
	Collect RCS pressure information	RCS 3	Pressurizer pressure	
	Close SI tank nitrogen pressure valve	SI 1	SI tank 1 pressure	
	Open SI tank drain valve	SI 1	SI tank 2 pressure	
	Confirm SI tank depressurized	SI 1	SI tank 3 pressure	
			SI tank 4 pressure	
			SI tank 1 drain valve positio	
			SI tank 2 drain valve positio	
			SI tank 3 drain valve positio	
			SI tank 4 drain valve positio	
54.00) Control RCS pressure				
	Collect RCS parameter information	RCS 1,3	Pressurizer pressure	
	Align LTOP	RCS 1,3	RCS average temperature	
	Confirm LTOP	RCS 1,3		
55.00) Control RCS heat removal				
	Collect RCS parameter information	RCS 1,3	Pressurizer level	
	Analyze & determine entry into SCS possible	RCS 1,3	Pressurizer pressure	
			RCS average temperature	
			RCS subcooling	
56.00) Control RCS Voiding				
	Collect RCS parameter information	RCS 1,3	Pressurizer pressure	
	Decide if voiding exists	RCS 1,3,7		

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Gross Function /Sub-Functions	Task Statement	Task derived from System Function (System & Function #)	Parameter(s) to Observe	(for details see Appendix F)
1.00) Standard Post Trip Actions				
	Perform Standard Post Trip Actions	CDP 1,2,3		
1.01) Ensure Reactor Shutdown				
	Collect NI information	RX 1	CEA position	
	Collect CEA position information	CEA 4	CEA position	
	Analyze & determine reactor is shutdown	RX 4	Reactor Power (NI)	
			Startup Rate (NI)	
1.02) Ensure plant electrical power available				
	Collect TG output information	ELEC	13.8 kV Service Bus feeder	
	Collect Bus feeder information	ELEC	DG output breaker	
	Analyze & determine power available	ELEC	DG output breaker	
	Collect Diesel Generator Output information	ELEC	DG output frequency	
	Analyze & determine need for Diesel	ELEC	DG output voltage	
	Start Diesel	ELEC		
			Turbine Generator Breaker position	
			Turbine Trip	
1.03) Maintain RCS inventory				
	Collect Pzr parameter information	PZR 1,2,3	Charging flow	
	Collect CVCS flow to and from RCS	CVCS 1,11	Letdown flow	
	Collect RCS subcooling information	RCS 1	PLCS setpoint level	
	Analyze & determine makeup demands	RCS 7	Pressurizer level	
	Compare demands to CVCS flow	CVCS 1,11	Pressurizer level	
			RCS subcooling	
			Time	
1.04) Maintain RCS pressure				
	Collect RCS pressure information	RCS 3	PPCS setpoint pressure	
	Analyze & determine if w/in control limits	PZR 5,6	Pressurizer Pressure	
			Pressurizer pressure	
			Time	
1.05) Maintain Core heat Removal				
	Collect RCP information	RCS 1	RCP Amperes	
	Collect RCS parameter information	RCS 1	RCP speed	
	Analyze & determine if RCPs are operating	RCS 1	RCS cold leg temperature	
			RCS hot leg temperature	
1.06) Maintain RCS heat removal				
	Collect SG parameter information	SG 3,5,6	Emergency Feedwater flow	
	Collect MSS flow information	MSS 4,5,6	Main Feedpump speed	
	Collect FCS flow information	FCS 1	Main Feedwater flow	
	Analyze & determine SG availability for HR	RCS 1	Main Steam Flow	
			Main feed flow	
			RCS average temperature	
			Steam Generator level	
			Steam Generator pressure	

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Gross Function /Sub-Functions	Task Statement	Task derived from System Function (System & Function #)	Parameter(s) to Observe (for details see Appendix F)
1.07) Maintain Containment Integrity			
	Collect Containment parameter information	CNTMT 1	Containment area radiation
	Analyze & determine if isolation is required	CNTMT 1	Containment pressure
			Steam plant radiation
1.08) Control Containment Atmosphere			
	Collect Containment parameter information	CNTMT 1	Containment pressure
	Analyze added cooling needed	CSF 1	Containment temperature
	Start Emergency Fans		
	Start Air Recirculation Fans		
	Confirm Air Recirculation		
1.09) Control Containment Combustible Gases			
	Collect Containment parameter information	CGC 3	Containment pressure
	Analyze for H2 generating condition present	CGC 3	Containment temperature
2.00) Diagnosis of event			
	Review collected information # 1.01 to 1.09		Air Ejector High Activity
	Analyze & determine event		Air Ejector High Activity
			Pressurizer Level
			Pressurizer Pressure
			SG Blowdown High Activity
			SG level
			Steam Generator Level
			Steam Generator Level
			Time
			Time
3.00) Ensure SPTA performed			
	Review collected information # 1.01 to 1.09		CEA position
	Analyze & determine if SPTA performed	CDP	Electrical power available (list)
	Perform outstanding actions		Pressurizer Level
			Pressurizer Pressure
			RCS subcooling
			Steam Generator Level
4.00) Confirm Diagnosis of event			
	Review collect information # 1.01 to 1.09		Air Ejector High Activity
	Analyze & determine event diagnosis confirmed		SG Blowdown High Activity
			Steam Generator Level
5.00) Determine SG Radioactivity			
	Collect representative sample of SG liquids	PSS 1	SG liquid sample for Boron
	Evaluate sample	PSS 1	SG liquid sample high activity
	Communicate results of evaluation	COMM	

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Gross Function /Sub-Functions	Task Statement	Task derived from System Function (System & Function #)	Parameter(s) to Observe	(for details see Appendix F)
6.00) Control RCS depressurization				
	Collect RCS pressure information	RCS 3	Pressurizer Level	
	Analyze & determine:		Pressurizer Pressure	
	if safety injection makeup required?	RCS 3,7	RCS subcooling	
	if normal makeup adequate?	CVCS 1,11	Time	
	Establish SI makeup (path and flow) # 6.01			
6.01) Ensure Safety Injection				
	Collect SI parameter information	SI 1	SI pressure	
	Analyze & determine if SI to RCS makeup OK	SI 1	Safety injection flow	
	Start Automatic safety injection (SIAS)	SI 1		
	Start SI pumps	SI 1		
	Align SI to RCS	SI 1		
	Confirm SI flow to RCS	SI 1		
7.00) Maximize Safety Injection				
	Collect SI & charging flow to RCS information	SI 1	Charging flow	
	Analyze & determine if SI flow maximized	SI 1	Safety Injection Flow	
7.01) Maximize charging flow				
	Start idle charging pumps	CVCS 11	Charging pump flow	
	Confirm all charging pumps operating	CVCS 11	Charging pump status	
7.02) Start idle SI pumps				
	Start SI pumps	SI 1	SI pump 1 status	
	Confirm SI pumps operating	SI 1	SI pump 2 status	
			SI pump 3 status	
			SI pump 4 status	
7.03) Ensure electrical power to SI components				
	Compare flows to determine if SI maximized	SI 1	SI pump power available	
	Collect power available info of components	ELEC		
	Align power to component	ELEC		
7.04) Ensure valve alignments				
	Align charging to RCS	CVCS 11	Charging isolation valve positio	
	Confirm alignment of charging to RCS	CVCS 11	SI isolation valve position	
	Align SI to RCS	SI 1		
	Confirm alignment of SI to RCS	SI 1		
7.05) Ensure necessary auxiliaries operating				
	Analyze & determine "auxiliaries" needed	AIR ELEC	CCW to HPSI seal & coolers	
	Confirm "auxiliaries" are operating	AIR ELEC		

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Gross Function /Sub-Functions	Task Statement	Task derived from System Function (System & Function #)	Parameter(s) to Observe (for details see Appendix F)
8.00) Control RCS depressurization			
	Collect RCS pressure information	RCS 1	Pressurizer Pressure
	Analyze & determine if RCPs ops within limits	RCS 1	RCP bleedoff flow
	Compare RCP ops against event strategy	RCS 1,4	RCP seal temperature(s)
	Decide whether to stop 4,2,or no RCPs	RCS 4	
8.01) Stop two RCPs			
	Decide which two RCPs will be stopped	RCS 4	RCP Amperes
	Stop RCPs	RCS 4	RCP 1A speed
	Confirm RCPs stopped	RCS 4	RCP 1B speed
			RCP 2A speed
			RCP 2B speed
8.02) Monitor RCP operating limits			
	Collect RCS process parameter information	RCS 1,4	Pressurizer pressure
	Analyze & determine if to continue RCP ops	RCS 4	RCS cold leg temperature
8.03) Stop all RCPs			
	Stop RCPs	RCS 4	RCP Amperes
	Confirm RCPs stopped	RCS 4	RCP 1A speed
			RCP 1B speed
			RCP 2A speed
			RCP 2B speed
9.00) Control SG pressure			
	Refer to # 9.01 to 9.04		
9.01) Control RCS heat removal			
	Collect RCS temperature information	RCS 1	Condenser Vacuum
	Collect MSS flow information	MSS 4,5,6	RCS Hot Leg Temperature
	Decide rate of steaming using TBS	MSS 5	RCS Hot Leg Temperature
	Control TBS rate of steaming	MSS 5	SG Safety valve position
			SG liquid sample results
9.02) Maintain SG inventory			
	Collect SG parameter information	SG 3,4	Main Steam flow
	Collect MSS flow information	MSS 4,5,6	Steam Generator Level
	Analyze & determine demand for SG makeup	SG 3	Steam generator pressure
	Decide rate of feeding SG	SG 3	
	Analyze & determine method of feeding SG	FCS 1/EFW	
	Refer to # 9.03 to 9.04		
9.03) Control Main Feedwater to SGs			
	Control Main feedwater flow to SG	FCS 1	Condensate hotwell level
	Collect FCS flow information	FCS 1	Main feedwater flow
	Analyze & determine demand for SG makeup	SG 3	
	Decide rate of feeding SG	SG 3	

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Gross Function /Sub-Functions	Task Statement	Task derived from System Function (System & Function #)	Parameter(s) to Observe (for details see Appendix F)
9.04) Control Emergency Feedwater to SGs			
	Control Emergency Feedwater to SG	EFW 1	Emergency feedwater flow
	Collect Emergency Feedwater flow information	EFW 1	
	Analyze & determine demand for SG makeup	SG 3	
	Decide rate of feeding SG	SG 3	
10.00) Isolate the most affected SG			
	Close SG MSIVs and bypasses	MSS 6	
	Close Feedwater Isolation Valves	FCS 1	
	Close Emergency Feedwater Isolation Valves	EFW 1	
	Close Vents, drains, and exhausts	MSS 8	
10.01) Determine Affected Steam Generator			
	Collect SG parameter information	SG 3,4	
	Compare two SG responses	SG 3	
	Analyze & determine affected SG		
10.02) Monitor SG inventory			
	Collect SG parameter information	SG 3,4	Steam Generator Level
	Decide rate of RCS ingress		Steam Generator Pressure
10.03) Determine SG radioactivity			
	Collect representative sample of SG liquid	PSS 1	
	Analyze sample for radioactivity	PSS 1	
	Communicate results of analysis	COMM	
11.00) Confirm correct SG isolated			
	Collect SG parameter information	SG 3,4	Steam Generator Level
	Compare two SG responses	SG 4	Steam Generator Pressure
	Refer to # 11.01 to 11.02		
11.01) Monitor SG inventory			
	Compare SG parameter information	SG 3,4	Steam Generator Level
	Decide rate of RCS ingress		Steam Generator Pressure
11.02) Monitor RCS heat removal			
	Collect RCS temperature information	RCS 1	Main Feedwater Flow
	Analyze & determine if heat removal adequate		Main Steam Flow
			RCS average temperature
12.00) Maintain isolated SG parameters			
	Refer to # 12.01 to 12.02		

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Gross Function /Sub-Functions	Task Statement	Task derived from System Function (System & Function #)	Parameter(s) to Observe (for details see Appendix F)
12.01) Maintain isolated SG inventory			
	Collect SG parameter information	SG 3,4	SG blowdown valve position
	Analyze & determine whether to blowdown SG	SG 6	Steam generator blowdown flow
	Perform SG blowdown draining	SG 6	Steam generator level
12.02) Maintain SG pressure			
	Collect RCS temperature information	RCS 1	Pressurizer Pressure
	Collect SG pressure information	SG 4	Steam Generator pressure
	Compare for condition of overpressurization	SG 4	
13.00) Maintain unisolated SG parameters normal			
	Refer to # 13.01 to 13.03		
13.01) Maintain SG inventory			
	Collect SG parameter information	SG 3,4	Main Steam flow
	Collect MSS flow information	MSS 4,5,6	Steam generator level
	Analyze & determine demand for SG makeup	SG 3	
	Decide rate of feeding SG		
	Analyze & determine method for feeding SG	FCS 1/EFW1	
	Refer to # 13.02 or 13.03		
13.02) Control Main Feedwater to SGs			
	Control Main feedwater flow to SG	FCS 1	Condenser hotwell level
	Collect FCS flow information	FCS 1	Main feedflow
	Analyze & determine demand for SG makeup	SG 3	
	Decide rate of feeding SG	SG 3	
13.03) Control Emergency Feedwater to SGs			
	Control Emergency feedwater to SG	EFW 1	Condensate storage tank level
	Collect Emergency feedwater flow information	EFW 1	Emergency feedwater flow
	Analyze & determine demand for SG makeup	SG 3	
	Decide rate of feeding SG	SG 3	
14.00) Control RCS inventory			
	Collect Pzr parameter information	PZR	Core CET temperatures
	Collect RCS parameter information	RCS 1,3,7	Emergency Feedwater Flow
	Analyze & determine inventory change needed	RCS 7	Main Feedwater Flow
			Main Steam Flow
			Pressurizer Level
			Safety Injection Flow
14.01) Monitor for Termination Criteria			
	Review informaiton collected # 14.00	RCS 1,3,7	
	Analyze & determine amount of SI makeup	RCS 7	
	Decide whether to throttle or stop SI to RCS	RCS 1,3,7	

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Gross Function /Sub-Functions	Task Statement	Task derived from System Function (System & Function #)	Parameter(s) to Observe	(for details see Appendix F)
14.02) Throttle or Stop SI				
	Throttle SI flow to RCS	SI 1		
	[illegible] SI pump	SI 1		
	Confirm reduced SI flow to RCS	RCS 7		
14.03) Confirm RCS inventory control				
	Collect Pzr parameter information	PZR	Pressurizer Level	
	Collect RCS parameter information	RCS 7	Pressurizer Pressure	
	Confirm RCS inventory has stabilized	RCS 7		
15.00) Control RCS inventory				
	Collect PZR parameter information	PZR 2	Pressurizer Level	
	Collect RCS parameter information	RCS 7	Pressurizer Pressure	
	Analyze & determine inventory change needed	SI 1		
	Refer to # 15.01 to 15.03	SI 1		
15.01) Monitor RCS parameters				
	Collect RCS parameter information	RCS 1,7	Core CET temperatures	
	Analyze & determine whether to reinitate SI	RCS 7	RCS Subcooling	
15.02) Reinitate Full SI flow				
	Open SI valves	SI 1	Safety injection flow	
	Start SI pumps	SI 1	SI pump 1 status	
	Confirm full SI flow	RCS 7	SI pump 2 status	
			SI pump 3 status	
			SI pump 4 status	
			SI isolation valve 1 position	
			SI isolation valve 2 position	
			SI isolation valve 3 position	
			SI isolation valve 4 position	
15.03) Confirm RCS inventory control				
	Collect Pzr parameter information	PZR 2		
	Collect RCS parameter information	RCS 7		
	Confirm RCS inventory being maintained	RCS 7		
16.00) Ensure proper charging and letdown				
	Collect PZR parameter information	PZR 1,2,4	Charging flow	
	Collect CVCS flows to and from RCS	CVCS 1,11	Letdown Flow	
	Analyze & determine makeup demands	RCS 7	Pressurizer Level	
	Compare demand to CVCS flows	CVCS 1,11	RCS Subcooling	
	Control Letdown flow	CVCS 1		
	Control Charging flow	CVCS 1,11		

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Gross Function /Sub-functions	Task Statement	Task derived from System Function (System & Function #)	Parameter(s) to Observe	(for details see Appendix F)
17.00) Ensure vessel P-T limits maintained				
	Refer to # 17.01 to 17.08			
17.01) Monitor RCS for P-T violations				
	Collect RCS temperature information	RCS 1	Pressurizer Pressure	
	Collect RCS pressure information	RCS 2,3	RCS cold leg temperature	
	Analyze & determine if violation exists	RPV 1		
	Analyze & determine pressure control method	RCS 2,3		
17.02) Stop the Cooldown				
	Throttle TBS steaming rate	MSS 5	RCS average temperature	
	Confirm rate of RCS cooldown reduced to 0	RCS 1		
17.03) Control RCS pressure (method 1)				
	Decide main spray valve position to open to	PZR 6	Pressurizer pressure	
	Open main pressurizer spray valves	PZR 6		
	Confirm depressurization	RCS 3		
	Decide when to close valves	RCS 3		
	Close main pressurizer spray valves	PZR 6		
	Confirm Valves closed	RCS 3/PZR6		
17.04) Control RCS pressure (method 2)				
	Align charging to auxiliary spray header	CVCS 2	Charging pump status	
	Confirm charging pumps operating	CVCS 2	Pressurizer pressure	
	Start charging pumps	CVCS 2		
	Open Auxiliary spray valve	CVCS 2		
	Confirm depressurization	RCS 3		
	Close Auxiliary spray valve	CVCS 2		
17.05) Control RCS pressure (method 3)				
	Control SI flow to RCS	SI 1	Pressurizer pressure	
	Collect RCS parameter information	RCS 1,3,7	SI flow header 1	
	Analyze & determine amount of SI makeup	RCS 7	SI flow header 2	
	Control SI flow to RCS	SI 1	SI flow header 3	
	Confirm depressurization	RCS 3	SI flow header 4	
17.06) Maintain SG inventory				
	Collect SG parameter information	SG 3,4	Main steam flow	
	Collect MSS flow information	MSS 4,5,6	Steam generator level	
	Analyze & determine demand of SG makeup	SG 3		
	Analyze & determine method: (#17.07 or 17.08)	SG 3		
17.07) [illegible] Feedwater to SGs				
	Control Main feedwater flow to SG	FCS 1	Condensate hotwell level	
	Collect FCS flow information	FCS 1	Main feedwater flow	
	Analyze & determine demand for SG makeup	SG 3		
	Decide rate of feeding SG	SG 3		

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Gross Function /Sub-Functions	Task Statement	Task derived from System Function (System & Function #)	Parameter(s) to Observe (for details see Appendix F)
17.08) Control Emergency feedwater to SGs			
	Control Emergency feedwater flow to SG	EFW 1	Condensate storage tank level
	Collect Emergency feedwater flow information	EFW 1	Emergency feedwater flow
	Analyze & determine demand of SG makeup	SG 3	
	Decide rate of feeding SG	SG 3	
18.00) Determine need for forced cooling			
	Refer to # 18.01 to 18.03 to evaluate needs		
	Analyze & determine if force circ. needed	RCS 1,4	
18.01) Determine present heat removal adequacy			
	Collect RCS parameter information	RCS 1	Core CET temperatures
	Collect core parameter information	RX 3	RCS cold leg temperature
	Analyze & determine adequacy of heat removal	RCS 1	RCS hot leg temperature
18.02) Monitor RCS parameters			
	Collect RCS parameter information	RCS 1	RCP seal stage pressure(s)
	Collect RCP parameter information	RCS 4	RCP seal stage temperatures
	Compute duration of RCP seal cooling loss	RCS 4	Time
18.03) Determine need for Main Pzr spray			
	Collect RCS pressure information	RCS 1	Pressurizer Pressure
	Collect PZR parameter information	PZR 2	
	Analyze & determine adequacy of aux. spray	RCS 3	
	Analyze & determine need for main spray	RCS 3	
19.00) Determine if conditions permit RCP start			
	Refer to # 19.01 to 19.06		
	Analyze & determine if RCP restart permitted	RCS 4	
19.01) Ensure electrical power to RCPs			
	Collect electric power available information	ELEC	Electrical power available (list)
	CLose 13.8 kV RCP bus supply breaker	ELEC	
19.02) Maintain SG inventory			
	Collect Sg parameter information	SG 3	Emergency Feedwater Flow
	Collect MSS parameter information	MSS 5	Main Feedwater Flow
	Collect main feedwater information	FCS 1	Main Steam Flow
	Collect Emergency feedwater information	EFW 1	
	Analyze & determine if SG inventory adequate	SG 3	
19.03) Maintain RCS inventory			
	Collect Pzr parameter information	PZR 2	Pressurizer Level
	Analyze & determine if RCS inventory adequate	RCS 1,7	

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Gross Function /Sub-Functions	Task Statement	Task derived from System Function (System & Function #)	Parameter(s) to Observe (for details see Appendix F)
19.04) Monitor core heat removal			
	Collect core temperature information	RX 3	Core CET temperatures
	Collect RCS pressure information	RCS 3	Pressurizer pressure
	Analyze & determine core cooling adequate	RX 3	RCS Subcooling
20.00) Restart RCPs			
	Decide which pumps to start	RCS 4	
	Refer to # 25.01 to 25.03		
20.01) Ensure RCS inventory			
	Start all charging pumps	CVCS 1,11	Pressurizer level
	Collect RCS parameter information	RCS 1	
	Start all SI pumps	SI 1	
20.02) Start RCP			
	Start RCP	RCS 4	RCP amperes
	Collect RCS parameter information	RCS 1	RCP 1A speed
	Confirm RCPs started	RCS 4	RCP 1B speed
	Collect RCP bus amperage information	ELEC	RCP 2A speed
			RCP 2B speed
20.03) Monitor RCS parameters for Forced Circ.			
	Collect RCP parameter information	RCS 4	RCP 1A bleedoff flow
	Collect RCS parameter information	RCS 1	RCP 1A motor temperature
	Analyze & determine if forced circ. adequate	RCS 1,4	RCP 1A seal stage pressure(s)
			RCP 1A seal stage temperatures
			RCP 1B bleedoff flow
			RCP 2A bleedoff flow
			RCP 2B bleedoff flow
			RCP 1B motor temperature
			RCP 2A motor temperature
			RCP 1B seal stage pressure(s)
			RCP 2A seal stage pressure(s)
			RCP 2B seal stage pressure(s)
			RCP 1B seal stage temperatures
			RCP 2A seal stage temperature
			RCP 2B seal stage temperature
21.00) Control RCS and Core heat removal			
	Collect RCP parameter information	RCS 4	RCP 1A speed
	Analyze & determine if RCPs are operating	RCS 4	RCP 1B speed
	Refer to # 21.01		RCP 2A speed
			RCP 2B speed
21.01) Monitor RCS parameters for Natural Circ.			
	Collect SG parameter information	SG 3	Core CET temperatures
	Collect MSS flow information	MSS 5,6	Emergency Feedwater Flow
	Collect RCS temperature information	RCS 1	Main Feedwater Flow
	Compute time since loss of forced circ.	RCS 1	Main Steam Flow
	Analyze & determine if Natural circ. exists	RCS 5	Pressurizer Level
			RCS Subcooling
			RCS cold leg temperature
			RCS hot leg temperature
			Reactor Vessel Level

Nuplex 80 + Functional Analysis
Derivation of Event Specific Tasks
and Summary of Parameters Used

Gross Function /Sub-Functions	Task Statement	Task derived from System Function (System & Function #)	Parameter(s) to Observe (for details see Appendix F)
22.00) Control Reac. ty			
	Refer to # 22.01 to 22.03		RCS Boron Concentration
22.01) Borate The RCS			
	Collect RCS Boron Conc. information	RX 4	RCS hot leg sample valve positior
	Compare RCS Boron Conc. to tech specs	RX 4	
	Collect Boron Addition Tank Conc. information	CVCS 4,5	
	Analyze & determine borated water to add	CVCS 4	
	Control letdown to maintain inventory	PZR 2	
	Analyze & determine prevent dilution method	RX 4	
22.02) Prevent dilution (method 1)			
	Analyze & determine if RCPs are operating	RCS 4	Pressurizer boron concentration
	Collect Pzr Boron Conc. information	PZR 2	Pzr liquid sample valve position
	Analyze & determine Pzr dilution impact	RX 4	RCP 1A speed
	Control Pzr spray to mix boron	CVCS 2	RCP 1B speed
	Open Pzr liquid sample isolation valve	PZR	
22.03) Prevent dilution (method 2)			
	Analyze & determine if RCPs are NOT operating	RCS 4	Pressurizer Boron Concentration
	Collect Pzr Boron Conc. information	PZR 2	Pzr liquid sample valve position
	Analyze & determine Pzr dilution impact	RX 4	RCP 1A speed
	Compute additional boron required to offset	RX 4	RCP 1B speed
	Open Pzr liquid sample isolation valve	PZR	
23.00) Perform a controlled cooldown			
	Collect condenser parameter information	FCS 1	Condenser Circulating Water Flow
	Analyze & determine method for cooldown		Condenser Vacuum
	Refer to either # 23.01 or 23.02		Condenser Circulating water temper
23.01) Control cooldown w/Turbine Bypass Sys			
	Collect condenser parameter information	FCS 1	Condenser Circulating water flow
	Control TBS rate of steaming	MSS 5	Condenser Circulating water temper
	Control condenser hotwell level & pressure	FCS 1	Condenser Vacuum
	Control condenser cooling		Condenser hotwell level
	Collect RCS temperature information	RCS 1	Condenser pressure
	Decide rate of steaming using TBS	MSS 5	
			RCS average temperature
			Time
23.02) Control cooldown w/Atmospheric Dumps			
	Control ADV rate of steaming	MSS	Atmospheric Dump Steam Flow
	Collect RCS temperature information	RCS 1	Atmospheric Dump Valve position
	Decide rate of steaming using ADVs	MSS	RCS cold leg temperature
			RCS cold leg temperature
			Time

Nuplex 80 + Functional Analysis
Derivation of Event Specific Tasks
and Summary of Parameters Used

Gross Function /Sub-Functions	Task Statement	Task derived from System Function (System & Function #)	Parameter(s) to Observe (for details see Appendix F)
24.00) Compensate for RCS shrinkage			
	Collect RCS parameter information	RCS 7	Pressurizer Level
	Evaluate demand for RCS makeup	PZR 1,2	Pressurizer Pressure
	Control Charging flow to RCS	CVCS 1,11	
	Start idle Charging pumps	CVCS 11	
	Control SI flow to RCS	SI	
	Start idle SI pumps	SI	
25.00) Ensure vessel P-T limits maintained			
	Refer to # 25.01 to 25.05		
25.01) Monitor RCS for P-T violations			
	Collect RCS temperature information	RCS 1	Pressurizer Pressure
	Collect RCS pressure information	RCS 2,3	RCS average temperature
	Analyze & determine if violation exists	RPV 1	RCS cold leg temperature
	Analyze & determine method:# 25.03 to 25.05		RCS hot leg temperature
25.02) Stop the Cooldown			
	Throttle TBS steaming rate	MSS 5	Main Steam flow
	Confirm rate of RCS cooldown reduced to 0	RCS 1	Pressurizer pressure
			RCS average temperature
			Time
25.03) Control RCS pressure (method 1)			
	Decide main spray valve position to open to	PZR 6	Main spray valve position
	Open main pressurizer spray valves	PZR 6	
	Confirm RCS depressurization	RCS 3	
	Decide when to close valves	RCS 3	
	Close main pressurizer spray valves	PZR 6	
	Confirm valves closed	PZR 6/RCS3	
25.04) Control RCS pressure (method 2)			
	Align charging to auxiliary spray header	CVCS 2	Charging pump status
	Confirm charging pumps operating	CVCS 2	Pressurizer pressure
	Start charging pumps	CVCS 2	
	Open auxiliary spray valve	CVCS 2	
	Confirm RCS depressurization	RCS 3	
	Close auxiliary spray valve	CVCS 2	
25.05) Control RCS pressure (method 3)			
	Control SI flow to RCS	SI 1	SI header pressure
	Collect RCS parameter information	RCS 1,3,7	Pressurizer pressure
	Analyze & determine amount of SI makeup	RCS 7	Pressurizer pressure
	Control SI flow to RCS	SI 1	
	Confirm RCS depressurization	RCS 3	

Nuplex 80 + Functional Analysis
Derivation of Event Specific Tasks
and Summary of Parameters Used

Gross Function /Sub-Functions	Task Statement	Task derived from System Function (System & Function #)	Parameter(s) to Observe (for details see Appendix F)
26.00) Control unisolated SG inventory			
	Collect SG parameter information	SG 3,4	
	Refer to # 26.01 to 26.03		
26.01) Maintain SG inventory			
	Collect SG parameter information	SG 3,4	Main Steam Flow
	Collect MSS flow information	MSS 4,5,6	Steam Generator Level
	Analyze & determine demand for SG makeup	SG 3	
	Analyze & determine method # 26.02 or 26.03	FCS 1/EFW1	
26.02) Control Main Feedwater to SGs			
	Control main feedwater flow to SG	FCS 1	Main Feedwater Flow
	Collect FCS flow information	FCS 1	
	Analyze & determine demand for SG makeup	SG 3	
	Decide rate of feeding SG	SG 3	
26.03) Control Emergency Feedwater to SGs			
	Control Emergency feedwater flow to SG	EFW 1	Emergency feedwater flow
	Collect Emergency feedwater flow information	EFW 1	
	Analyze & determine demand for SG makeup	SG 3	
	Decide rate of feeding SG	SG 3	
27.00) Ensure condensate reserves adequate			
	Collect condensate reserve parameter info	MUPS 1,2	Ca... ate Storage Tank Level
	Analyze & determine reserve capacity	MUPS 1,2	...ing Feedwater Tank Level
	Compute adequacy of reserves	RCS 1/SG 3	...ndenser Hotwell level
			Refueling Water Tank Level
28.00) Cool & Depressurize Isolated SG			
	Collect representative sample of SG liquids	PSS 1	SG liquid sample high activity
	Analyze sample	PSS 1	
	Communicate analysis results	COMM	
	Analyze & determine method of SG cooldown	SG 5	
	Refer to # 28.01 to 28.06		
28.01) Control cooldown w/ SG blowdown			
	Collect SG parameter information	SG 3,4	Steam Generator Level
	Collect SG pressure information	SG 4	Steam Generator Pressure
	Perform SG blowdown draining	SG 6	Steam Generator Temperature(s)
	Confirm draining	SG 6	
28.02) Control cooldown w/Turbine Bypass Sys			
	Collect condenser parameter information	FCS 1	TBS valve position
	Control TBS rate of steaming	MSS 5	
	Control condenser hotwell level & pressure	FCS 1	
	Monitor condensate & air ejector radiation		
	Collect RCS temperature information	RCS 1	
	Decide rate of steaming using TBS	MSS 5	

Nuplex 80 + Functional Analysis
Derivation of Event Specific Tasks
and Summary of Parameters Used

Gross Function /Sub-Functions	Task Statement	Task derived from System Function (System & Function #)	Parameter(s) to Observe	(for details see Appendix F)
28.03) Control cooldown w/Atmospheric Dumps				
	Control ADV rate of steaming	MSS	ADV position	
	Collect RCS temperature information	RCS 1	RCS average temperature	
	Collect SG pressure information	SG 4		
	Monitor SG steam radioactivity			
	Decide rate of steaming using ADVs	MSS		
28.04) Maintain SG inventory				
	Collect SG parameter information	SG 3,4	Steam Generator Level	
	Collect MFW flow information	MSS 4,5,6		
	Analyze & determine demand for SG makeup	SG 3		
	Analyze & determine method # 28.05 or 28.06			
28.05) Control Main Feedwater to SGs				
	Control main feedwater flow to SG	FCS 1	Main Feedwater Flow	
	Collect FCS flow information	FCS 1		
	Analyze & determine demand for SG makeup	SG 3		
	Decide rate of feeding SG	SG 3		
28.06) Control Emergency Feedwater to SGs				
	Control Emergency feedwater flow to SG	EFW 1	Emergency Feedwater Flow	
	Collect Emergency feedwater flow information	EFW 1		
	Analyze & determine demand for SG makeup	SG 3		
	Decide rate of feeding SG	SG 3		
29.00) Check for potential Radiological release				
	Collect representative sample of condensate	FCS 1	Condensate liquid sample high acti	
	Analyze liquid samples	FCS 1	Other system samples ???	
	Collect representative sample of Building air	BLDG 1	Turbine Building Air Sample	
	Analyze air samples	BLDG 1	Turbine Building Area Sample	
	Communicate results of analysis		Turbine Building Sump liquid sampl	
30.00) Maintain control of RCS pressure				
	Collect RCS pressure information	RCS 3	Pressurizer pressure	
	Compare for approach to safety sys auto start	RCS 1,3	Steam Generator Pressure	
	Refer to # 30.01 to 30.02			
30.01) Block Automatic initiation of MSIS				
	Block MSIS			
	Confirm MSIS blocked			
30.02) Block Automatic initiation of SIAS				
	Block SIAS			
	Confirm SIAS blocked			

Nuplex 80 + Functional Analysis
Derivation of Event Specific Tasks
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Gross Function /Sub-Functions	Task Statement	Task derived from System Function (System & Function #)	Parameter(s) to Observe (for details see Appendix F)
31.00) Maintain control of RCS pressure			
	Collect RCS pressure information	RCS 3	Pressurizer Pressure
	Analyze & determine SI tank impact	SI 1	Safety Injection Tank Pressure
	Decide method: # 31.01, 31.02, or 31.03		
31.01) Control RCS pressure (method 1)			
	Close SI tank isolation valve	SI 5	SI tank 1 isolation valve
	Confirm SI tank isolated	RCS 3	SI tank 2 isolation valve
			SI tank 3 isolation valve
			SI tank 4 isolation valve
31.02) Control RCS pressure (method 2)			
	Collect RCS pressure information	RCS 3	Pressurizer pressure
	Close SI tank nitrogen pressure valve	SI 1	SI tank 1 vent valve
	Open SI tank vent valve	SI 1	SI tank 2 vent valve
	Confirm SI tank depressurized	SI 1	SI tank 3 vent valve
			SI tank 4 vent valve
			SI tank nitrogen isolation valve
31.03) Control RCS pressure (method 3)			
	Collect RCS pressure information	RCS 3	Pressurizer pressure
	Close SI tank nitrogen pressure valve	SI 1	SI tank 1 drain valve
	Open SI tank drain valve	SI 1	SI tank 2 drain valve
	Confirm SI tank depressurized	SI 1	SI tank 3 drain valve
			SI tank 4 drain valve
			SI tank nitrogen isolation valve
32.00) Maintain control of RCS pressure (LTOP)			
	Compare RCS parameter information to LTOP	RCS 1,3	Pressurizer pressure
	Align LTOP	RCS 1,3	RCS cold leg temperature
	Confirm LTOP	RCS 1,3	
	Collect RCS parameter information	RCS 1,3	
33.00) Control RCS heat removal			
	Collect RCS param[illegible]ation	RCS 1,3	Pressurizer Pressure
	Analyze & determin[illegible] to SCS possible	RCS 1,3	RCS cold leg temperature
			Time
34.00) Monitor/Control RCS Voiding			
	Refer to # 34.01 to 34.06		
34.01) Monitor RCS inventory			
	Collect Pzr parameter information	PZR 2	Pressurizer Level
	Collect RV parameter information	RX	Pressurizer pressure
	Collect RCS parameter information	RCS 1,3	RCS cold leg temperature
	Analyze & determine if void conditions exist	RCS 1,3,7	RCS subcooling
	Analyze & determine void correction needed	RCS 1,3	Reactor Vessel Level

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Derivation of Event Specific Tasks
and Summary of Parameters Used

Gross Function /Sub-Functions	Task Statement	Task derived from System Function (System & Function #)	Parameter(s) to Observe (for details see Appendix F)
34.02) Isolate letdown			
	Close letdown isolation valve	CVCS 1	Letdown isolation valve
	Confirm letdown isolated	CVCS 1	
34.03) Control RCS pressure			
	Collect RCS pressure information	RCS 3	Auxiliary spray valve position
	Close main spray valve	RCS 3	Main spray valve position
	Close auxiliary spray valve	RCS 3	Pressurizer pressure
	Confirm depressurization stopped	RCS 3	
34.04) Collapse RCS void			
	Collect RCS parameter information	RCS 1,3,7	
	Control Pzr heaters & spray	PZR 2	
	Control charging flow to RCS	CVCS 1,11	
	Confirm pressurization & void collapse	RCS 3	
	Open Auxiliary spray valve	CVCS 2	
	Confirm depressurization & void collapse	RCS 3	

Nuplex 80 + Functional Analysis
Derivation of Event Specific Tasks
and Summary of Parameters Used

Gross Function / Sub-Functions	Task Statement	Task derived from System Function (System & Function #)	Parameter(s) to Observe (for details see Appendix F)
1.00) Maintain RCS heat removal			
	Collect SCS parameter information	RHR 3	CSS valve position (list)
	Collect RCS temperature information	RHR 3	RCS cold leg temperature
	Compare heat in/removal demands	RHR 3	RHR Heat Exchanger outlet temper.
	Analyze & determine if need to adjust HR	RHR 3	RHR flow
	Control SCS flow through heat exchanger	RHR 3	RHR pump operating status
			RHR valve position (list)
2.00) Monitor Core Power			
	Collect NI information	RX 1	Reactor Power (NI)
	- Analyze & determine reactor is shutdown	RX 4	
3.00) Preparations for Refueling			
	Refer to # 3.01 to 3.05		
3.01) Ensure Crane operational			
	Communicate with Reactor Cavity Area	COMM	
	Assess whether crane is operational		
3.02) Control Containment Atmosphere			
	Communicate with Reactor Cavity Area	COMM	Containment temperature
	Collect Containment Temperature information	CNTMT 1	
	Analyze & determine if added cooling needed		
	Start Air Recirculation Fans		
3.03) Ensure emergency lighting available			
	Communicate with Reactor Cavity Area	COMM	
	Analyze & determine that emerg. lighting OK	CNTMT	
3.04) Monitor Containment Atmosphere			
	Communicate with Reactor Cavity Area	COMM	
	Analyze & determine air particulate to limits	CNTMT	
3.05) Lift/Move missle shield			
	Communicate with Reactor Cavity Area	COMM	
	Coordinate movement of crane to lift shield		
	Coordinate movement of missle shield to store		
4.00) Monitor IRWST boron concentration			
	Communicate with Chemist to Sample IRWST	COMM	
	Evaluate boron level in IRWST	RX 4	
	Analyze & determine if added boron needed	RX 4	

Nuplex 80 + Functional Analysis
Derivation of Event Specific Tasks
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Gross Function /Sub-Functions	Task Statement	Task derived from System Function (System & Function #)	Parameter(s) to Observe	(for details see Appendix F)
5.00) Prepare Reactor Vessel Head for Removal				
	Refer to # 5.01 to 5.08			
5.01) Uncouple CRDM				
	Communicate with Reactor Cavity Area Coordinate uncoupling of CRDMs	COMM		
5.02) Disconnect CRDM cables				
	Communicate with Reactor Cavity Area Coordinate disconnecting of CRDM cables	COMM		
5.03) Remove in-core instrumentation				
	Communicate with Reactor Cavity Area Coordinate removal of in-core instruments Coordinate "tag out" of power supplies	COMM		
5.04) Disconnect CRDM cooling ducts				
	Communciate with Reactor Cavity Area Coordinate removal of CRDM cooling ducts Coordinate "tag out" of CRDM cooling	COMM		
5.05) Remove vessel head insulation				
	Communicate with Reactor Cavity Area Coordinate removal of vessel head insulation	COMM		
5.06) Maintain Clean Vessel head area				
	Communicate with Reactor Cavity Area Coordinate for loose contamination with HP Coordinate to clean vessel head area	COMM		
5.07) Remove vessel head nuts & studs				
	Communicate with Reactor Cavity Area Coordinate to detension head bolts Coordinate to remove head nuts & studs	COMM		
5.08) Install Plugs				
	Communicate with Reactor Cavity Area Coordinate to install plugs	COMM		
6.00) Control RCS inventory				
	Communicate with Reactor Cavity Area Coordinate to lower vessel level Control letdown to lower vessel level	COMM		

Nuplex 80 + Functional Analysis
Derivation of Event Specific Tasks
and Summary of Parameters Used

Gross Function /Sub-Functions	Task Statement	Task derived from System Function (System & Function #)	Parameter(s) to Observe	(for details see Appendix F)
7.00) Install refueling pool seal				
	Communicate with Reactor Cavity Area	COMM		
	Coordinate installation of pool seal			
7.01) Leak test refueling pool seal				
	Communicate with Reactor Cavity Area	COMM		
	Coordinate to leak test pool seal			
	What is done to leak test pool seal????			
8.00) Install Reactor Vessel Lift Rig				
	Communicate with Reactor Cavity Area	COMM		
	Coordinate to install head lifting rig			
8.01) Lift/Move reactor vessel head				
	Communicate with Reactor Cavity Area	COMM		
	Coordinate to lift head/inspect uncoupled CEA			
	Coordinate to move head to storage			
	Coordinate movement of crane			
9.00) Prepare for fuel transfer				
	Refer to # 9.01 to 9.03			
9.01) Remove transfer tube flange				
	Communicate with Reactor Cavity Area	COMM		
	Coordinate removal of tranfer tube flange			
9.02) Control RCS inventory				
	Communicate with Reactor Cavity Area	COMM		
	Coordinate water level in refueling pool	RHR 5		
	Control borated water flow to RCS	RHR 5		
9.03) Align Fuel transfer tube for refueling				
	Communicate with Reactor Cavity Area	COMM		
	Coordinate opening fuel transfer tube valve			
10.00) Install Guide Structure lift rig				
	Communicate with Reactor Cavity Area	COMM		
	Coordinate guide structure lift rig setup			
10.01) Lift/Move guide structure				
	Communicate with Reactor Cavity Area	COMM		
	Coordinate lift of guide structure			
	Coordinate movement of guide struc. to store			
	Coordinate movement of crane			

Nuplex 80 + Functional Analysis
Derivation of Event Specific Tasks
and Summary of Parameters Used

Gross Function /Sub-Functions	Task Statement	Task derived from System Function (System & Function #)	Parameter(s) to Observe	(for details see Appendix F)
11.00) Ensure Refueling machine operational				
	Communicate with Refueling machine operator	COMM		
	Coordinate checkout of refueling machine			
	Coordinate checkout of Video equipment			
11.01) Install refueling machine hoist				
	Communicate with Refueling machine operator	COMM		
	Coordinate installation of refueling machine			
12.00) Remove and reload fuel				
	Refer to # 12.01 to 12.04			
12.01) Remove spent fuel from core				
	Communicate with Refueling machine operator	COMM	Reactor Power (NI)	
	Coordinate removal to spent fuel from core	RX 4		
	Copy or Map location of fuel removed	RX 4		
	Collect NI information	RX 1		
12.02) Transport spent fuel to storage				
	Communicate with Refueling machine operator	COMM		
	Coordinate transfer of spent fuel thru tube			
	Coordinate placement of spent fuel in racks			
12.03) Transport of new fuel to core				
	Communicate with Refueling machine operator	COMM		
	Coordinate transport of new fuel thru tube			
12.04) Install new fuel in core				
	Communicate with Refueling machine operator	COMM	Reactor Power (NI)	
	Coordinate install of new fuel	RX 4		
	Copy or Map location of new fuel	RX 4		
	Monitor NI information	RX 4		
	Compare with previous NI information	RX 4		
	Assess/Evaluate core power differences	RX 4		
13.00) Monitor fuel pool parameters				
	Communicate with Chemist to sample fuel pool	COMM		
	Analyze sample results	RX 4		
13.01) Monitor RCS parameters				
	Collect RCS parameter information	RCS 1	RCS average temperature	
	Compare with previous information for changes	RHR 3		

Nuplex 80 + Functional Analysis
Derivation of Event Specific Tasks
and Summary of Parameters Used

Gross Function /Sub-Functions	Task Statement	Task derived from System Function (System & Function #)	Parameter(s) to Observe	(for details see Appendix F)
13.03) Monitor Core power				
	Collect WI information	RX 1	Reactor Power (WI)	
	Compare with previous information for changes	RX 4		
14.00) Align fuel transfer tube for removal				
	Communicate with Reactor Cavity area	COMM		
	Coordinate close of fuel transfer tube valve			
15.00) Install Upper Guide Structure				
	Communicate with Reactor Cavity area	COMM		
	Coordinate lift of guide structure			
	Coordinate movement of crane			
	Coordinate movement into vessel			
16.00) Control RCS inventory				
	Communicate with Reactor Cavity Area	COMM		
	Coordinate to lower vessel level	RHR 5		
	Transfer water from refueling cavity	RHR 5		
17.00) Install Reactor Vessel head				
	Communicate with Reactor Cavity Area	COMM		
	Coordinate lifting of Vessel head			
	Coordinate movement of crane			
	Coordinate movement/installation of head			
17.01) Install Studs and bolt down head				
	Communicate with Reactor Cavity Area	COMM		
	Coordinate installing studs			
	Coordinate head bolt down			
18.00) Install Transfer tube blind flange				
	Communicate with Reactor Cavity Area	COMM		
	Coordinate installation of tube blind flange			
19.00) Install Reactor Vessel Head insulation				
	Communciate with Reactor Cavity Area	COMM		
	Coordinate installation of head insulation			
20.00) Install in-core instrumentation				
	Communicate with Reactor Cavity Area	COMM		
	Coordinate installing of in-core instruments			
	Coordiante removal of in-core "tag out"			

Nuplex 80 + Functional Analysis
Derivation of Event Specific Tasks
and Summary of Parameters Used

Gross Function /Sub-Functions	Task Statement	Task derived from System Function (System & Function #)	Parameter(s) to Observe	(for details see Appendix F)
21.00) Install CEDM cabling				
	Communicate with Reactor Cavity area	COMM		
	Coordinate connection of CEDM cabling			
	Coordinate removal of CEDM "tag out"			
21.01) Install CEDM cooling ducts				
	Communicate with Reactor Cavity Area	COMM		
	Coordinate connection of CEDM cooling ducts			
	Coordinate removal of CEDM cooling "tag out"			
21.02) Install Reactor Vent piping				
	Communicate with Reactor Cavity Area	COMM		
	Coordinate connecting reactor vent piping			
22.00) Install missile shield				
	Communicate with Reactor Cavity Area	COMM		
	Coordinate lift of missile shield			
	Coordinate movement of crane			
	Coordinate movement/placing of missile shield			

Appendix E

Detailed Usage of 'Collect' Elements by Gross Function

The contents of this appendix provide the observations for the (collect) task element information for NUPLEX 80+ general operations. Other (collect) task element information has been included, however the detail of this information is not intended to be completed for this analysis's scope. The task listings are partitioned by gross function and subfunction for the following events:

Nuplex 80 + Functional Analysis
Breakdown of Information to be Collected

Gross Function No.	Parameter to Observe	Observation to Make	Reference
1.00	Generator Power (VA)	Observe for changes in reactive and real electric load	
1.00	Generator Power (Watts)	Observe for changes in real electric load	
1.00	Generator output frequency	Observe for changes in frequency	
1.00	Generator output voltage	Observe for changes in output voltage	
=>			
1.01	Generator Output Voltage	Observe to monitor changes in output voltage	
1.01	Generator Power (VA)	Observe for changes in reactive and real electric load	
1.01	Generator Power (Watts)	Observe for changes in real electric load	
1.01	Generator output frequency	Observe to monitor for changes in output frequency	
=>			
1.02	Main Steam Pressure	Observe to monitor and compare with minimum operating main steam line pressure	
1.02	Turbine Chest Pressure	Observe to monitor changes in chest pressure	
1.02	Turbine Speed	Observe for changes in turbine speed	
=>			
2.00	Main Feedwater Flow	Observe for changes in flow	
2.00	Main Steam flow	Observe for changes in flow whether the change is effected by SG pressure changes or turbine load changes	
2.00	RCS average temperature	Observe for changes consistent with load demand and RCS heat removal rates and poison buildup & burnout.	
2.00	RCS cold leg temperatrue	Observe for value consistant with power demand program	
2.00	RCS hot leg temperature	Observe for value consistant with power demand program	
2.00	Steam Generator Level	Observe for maintaining a constant value	
=>			

Nuplex 80 + Functional Analysis
Breakdown of Information to be Collected

Gross Function No.	Parameter to Observe	Observation to Make	Reference
2.01	RCS average temperature	Observe for an unexpected change which corresponds to a transient and compare with RCS reference temperature	
2.01	Reactor Power (NI)	Observe for constant value with in core limitations	
=>			
2.02	CET temperature	Observe to monitor for changes	
2.02	RCS Cold leg Temperature	Observe to compare with CET temperatures to determine heat removal from fuel bundles	
2.02	RCS hot leg temperature	Observe to compare with CET temperatures to determine adequacy of heat removal	
=>			
2.03	CEA position	Observe for position above CEA insertion limit	
2.03	RCS average temperature	Observe to monitor for changes	
=>			
3.00	Main Steam Flow	Observe to monitor for changes	
3.00	RCS Average temperature	Observe to monitor for changes	
3.00	RCS average temperature	Observe to compare with RRS reference temperature and monitor for changes	
3.00	RRS reference temperature	Observe for value to evaluate RCS temperatures.	
3.00	Steam Generator Level	Observe to monitor for changes	
3.00	Turbine 1st stage steam pressure	Observe to monitor for constant value within range of values for expected performance at given power level.	
=>			
3.01	Boronometer	Observe to monitor for changes in RCS Boron concentration	
=>			
3.02	Pressurizer Level	Observe for constant value within control limitations as compared with level setpoint (level program @ power)	
=>			
3.03	Main Spray flow	Observe of cyclic opertion to maintain pressure constant	

Nuplex 80 + Functional Analysis
Breakdown of Information to be Collected

Gross Function No.	Parameter to Observe	Observation to Make	Reference
3.03	Pressurizer Pressure	Observe for constant value with control limitations for power operation	
3.03	Proportional Heater power	Observe for cyclic operation to maintain pressure constant	
=>			
3.04	none		
=>			
4.00	Steam Generator Level	Observe to monitor for changes	
=>			
4.01	Main Feed Flow	Observe for constant value simular to main steam flow value	
4.01	Main Steam Flow	Observe for constant value or monitor for changes	
=>			
4.02	Deareator pressure	Observe for constant value within pressure control limits	
4.02	Feedwater temperature	Observe for constant value	
=>			
4.03	Hotwell level	Observe for constant value	
=>			
4.04	none		
=>			
5.00	Condenser Vacuum	Observe for constant value within condenser performance limitations	
=>			
6.00	later	listing of more specific equipment / system descriptions is required for these observations	00
=>			
7.00	later	listing of more specific equipment / system descriptions is required for these observations	00

Nuplex 80 + Functional Analysis
Breakdown of Information to be Collected

Gross Function No.	Parameter to Observe	Observation to Make	Reference No
1.00	none		
=>			
2.00	Generator Output Voltage	Observe to compare with established limitations	14
2.00	Generator Power (VA)	Observe to determine rate of change in electric load to compare with load following limitations of other systems	14
2.00	Generator Power (Watts)	Observe to determine rate of change in electric load to compare with load following limitations of other systems	14
2.00	RCS average temperature	Observe for changes which correspond to expected changes for the transient	14
2.00	Reactor Power (NI)	Observe to determine rate of change and compare with operating limitations and constraints established.	14
=>			
3.00	Feedwater Flow	Observe to compare with steam flow to determine if load following.	14
3.00	Main Feedpump pressure	Observe to determine if feedpump is responding as expected for the transient	
3.00	Main Steam Flow	Observe to determine type of transient	14
3.00	RCS average temperature	Observe to compare transient to expected performance to assess inter-system transient impacts	14
3.00	Reactor Power (NI)	Observe to determine corresponding load following affect on other dependent systems	14
3.00	Steam Generator Pressure	Observe to monitor for changes and confirm parameter is within transient limitations (SG safety's pressure)	14
=>			
3.01	Generator Frequency	Observe to confirm the parameter is within its operating limitations	
3.01	Generator Output Voltage	Observe to confirm the parameter is within its operating limitations	
=>			
3.02	Main Feedwater flow	Observe to determine type of transient	

Nuplex 80 + Functional Analysis
Breakdown of Information to be Collected

Gross Function No.	Parameter to Observe	Observation to Make	Reference No.
3.02	Main Steam Flow	Observe to determine type of transient	
3.02	Steam Generator Level	Observe for "shrink" or "swell" and parameter change is within control limitations of feedwater system	
3.02	Steam Generator Pressure	Observe if within that required to operate the turbine at the required speed to maintain current loading.	
=>			
3.03	Main Feedpump pressure	Observe to monitor control responses on feedpump pressure	
3.03	Main Feedwater flow	Observe to monitor control responses on feed flow to the steam generators	
=>			
3.04	Charging flow	Observe to monitor changes within limitations of PLCS control	14
3.04	Letdown flow	Observe to monitor changes within limitations of PLCS control.	14
3.04	Pressurizer level	Observe to monitor for changes within limitations of PLCS control	
=>			
3.05	Generator Power (Watts)	Observe to compare with reactor power to determine if load following.	
3.05	Reactor Power (NI)	Observe to monitor for changes that follow load.	
=>			
3.06	Pressurizer Pressure	Observe to monitor changes within limits of PPCS control	14
3.06	Pressurizer Spray flow	Observe to monitor for changes within limits of PPCS control.	14
=>			
3.07	later	listing of more specific equipment / system descriptions is required for these observations	00

Nuplex 80 + Functional Analysis
Breakdown of Information to be Collected

Gross Function No.	Parameter to Observe	Observation to Make	Reference No.
1.00	RCS average temperature	Observe for value being maintained	
1.00	SDHX CCW flow	Observe to monitor control responses of flow control valve adjustments	
1.01	SDHX CCW outlet temperature	Observe to monitor value to assess HX performance	
1.01	SDHX CCW inlet temperature	Observe to monitor value to assess HX performance	
1.01	SDHX CCW delta T	Observe to determine performance of HX	
1.01	SCS Isolation valve 1	Observe for open status	
1.01	SCS Isolation valve 2	Observe for open status	
1.01	SCS pump 1	Observe for status consistent with administratively decided operating configuration	
1.01	SCS pump 2	Observe for status consistent with administratively decided operating configuration.	

Nuplex 80 + Functional Analysis
Breakdown of Information to be Collected

Gross Function No.	Parameter to Observe	Observation to Make	Reference No
1.00	120 V DC Bus A Voltage	Observe for adequate value	07
1.00	120 V DC Bus B Voltage	Observe for adequate value	07
1.00	120 V Inverter Voltage Inst. Bus A	Observe for adequate value	07
1.00	120 V Inverter Voltage Inst. Bus B	Observe for adequate value	07
1.00	120 V Inverter Voltage Inst. Bus C	Observe for adequate value	07
1.00	120 V Inverter Voltage Inst. Bus D	Observe for adequate value	07
1.00	13.8kV (Alt.) RCP Bus Supply Breaker	Observe for open or tripped breaker	07
1.00	13.8kV RCP Bus Supply Breaker	Observe for closed breaker	07
1.00	13.8kV Service Bus Supply Breaker	Observe for closed breaker	07
1.00	4160 V A2 Bus Supply Breaker	Observe for closed breaker	07
1.00	4160 V Bus A1 (Emerg.) Supply Breaker	Observe for open or tripped breaker	07
1.00	4160 V Bus A1 Supply Breaker	Observe for closed breaker	07
1.00	4160 V Bus A3 Supply Breaker (etc.)	Observe for closed breaker	
1.00	4160 V Bus B1 (Emerg.) Supply Breaker	Observe for open or tripped breaker	07
1.00	4160 V Bus B1 Supply Breaker	Observe for closed breaker	07
1.00	4160 V Bus B2 Supply Breaker	Observe for closed breaker	07
1.00	4160 V Bus B3 Supply Breaker (etc.)	Observe for closed breaker	07
1.00	4160 V Transformer A Supply Breaker	Observe for closed breaker	07
1.00	4160 V Transformer B Supply Breaker	Observe for closed breaker Note: Find out System 80+ labeling convention	07
1.00	480 V Xformer A1A Supply Breaker	Observe for closed breaker	07
1.00	480 V Xformer A1B Supply Breaker	Observe for closed breaker	07
1.00	480 V Xformer A2A Supply Breaker	Observe for closed breaker	07
1.00	480 V Xformer A2B Supply Breaker	Observe for closed breaker	07
1.00	480 V Xformer A3A Supply Breaker (etc.)	Observe for closed breaker	07
1.00	480 V Xformer A3B Supply Breaker (etc.)	Observe for closed breaker	07

Nuplex 80 + Functional Analysis
Breakdown of Information to be Collected

Gross Function No.	Parameter to Observe	Observation to Make	Reference No
1.00	480 V Xformer B1A Supply Breaker	Observe for closed breaker	07
1.00	480 V Xformer B1B Supply Breaker	Observe for closed breaker	07
1.00	480 V Xformer B2A Supply Breaker	Observe for closed breaker	07
1.00	480 V Xformer B2B Supply Breaker	Observe for closed breaker	07
1.00	480 V Xformer B3A Supply Breaker (etc.)	Observe for closed breaker	07
1.00	480 V Xformer B3B Supply Breaker (etc.)	Observe for closed breaker	07
1.00	CEAM power supply energized	Observe for power available to CEA drive motors	07
1.00	Diesel Gen. A Fuel Storage Tank Level	Observe for adequate level	07
1.00	Diesel Gen. B Fuel Storage Tank Level	Observe for adequate level	07
1.00	Diesel Generator A Day Tank Level	Observe for adequate level	07
1.00	Diesel Generator B Day Tank Level	Observe for adequate level	07
1.00	Permission or Authorization	Observe for the reciept of authorization to prepare for plant startup	07
1.00	Process Instrumentation energized	Observe for all process instrumentation energized	07
1.00	Protective Systems energized	Observe for all protective instruments energized	07
1.00	RCP 1A supply breaker	Observe for closed breaker Note: Find out System 80+ RCP labeling convention	07
1.00	RCP 1B supply breaker	Observe for closed breaker	07
1.00	RCP 2A supply breaker	Observe of closed breaker	07
1.00	RCP 2B supply breaker	Observe for closed breaker	07
1.00	Reactor power	Observe nuclear instrumentation for indication that reactor is shutdown	07
1.00	Refueling Activity	Observe for completion of all refueling activities	07
1.00	Regulating Systems energized	Observe for all regulating systems energized. (e.g. FWCS, RRS, PLCS, CEDMS, PPCS, TGS, TBCS, etc.)	07

Nuplex 80 + Functional Analysis
Breakdown of Information to be Collected

Gross Function No.	Parameter to Observe	Observation to Make	Reference No.
1.00	Report of Estimated CEA positions	Observe to record estimated CEA position	07
1.00	Report of Process Instruments Calibrated	Observe for verification that all process instruments are calibrated	07
1.00	Report of Protective Inst. Calibrated	Observe for verification that all protective instruments are calibrated	07
1.00	Report of RCS boron concentration	Observe for amount of boron in RCS	07
1.00	Report of Regulating Systems Calibrated	Observe for verification that all regulating systems are calibrated	07
1.00	Report of completed maintenance	Observe for verification that all systems which were open for maintenance are restored and tested operational	07
1.00	Report of last Diesel Gen. testing	Observe for time of test, and if test included applicable SIAS and under voltage subchannels.	07
1.00	Station Battery Charger A (Amperes)	Observe for charging	07
1.00	Station Battery Charger B (Amperes)	Observe for charging	07
1.00	Station Battery Voltage A	Observe for adequate value	
1.00	Station Battery Voltage B	Observe for adequate value	07
1.00	Time	Observe to (mentally) record baseline for determining time of past activities	07
1.00	Time of CEA Estimates	Observe for later determination of estimates' validity	07
1.00	number of operators	Observe for adequate number of operators available to perform all tasks to accomplish a plant startup	07
=>			
1.01	RCS average temperature	Observe for temperature maintaining at or above [525] degrees F	07
1.01	Steam Generator Pressure	Observe of pressure approximately equal desired Turbine Bypass control pressure	07
1.01	Turbine bypass controller mode	Observe for AUTO operation	07
=> 1.01	Turbine bypass pressure control setting	Observe for [900] psia setting	07

Nuplex 80 + Functional Analysis
Breakdown of Information to be Collected

Gross Function No.	Parameter to Observe	Observation to Make	Reference No
1.02 =>	Steam Generator Level	Observe for maintaining constant	07
1.03	Main Feedwater Flow	Observe to (mentally) record present feedwater flow to SG	07
1.03	Main Steam Flow	Observe to (mentally) record present steam flow conditions from SG	07
1.03 =>	Startup Feedpump Status	Observe for pump operating status	07
2.01 =>	CEA Group Selection	Observe to confirm selection	08
2.02 =>	CEA position	Observe to determine position of CEA in core/fuel	08
2.03	CEA position	Observe to determine if CEAs pulled are aligned.	08
2.03	CEA position	Observe to verify CEAs stopped moving	08
2.03	RCS average temperature	Observe for changes	08
2.03 =>	Reactor Power (NI)	Observe nuclear instrumentation for changes (specifically increases)	08
2.04 =>	CEA Group Selection	Observe to confirm selection	08
2.05 =>	CEA position	Observe to determine position of CEA in core/fuel	08
2.06	CEA position	Observe to determine if CEAs pulled are in alignment.	08
2.06	CEA position	Observe to verify CEAs stopped moving	08
2.06	RCS average temperature	Observe for changes (none should be observed)	08
2.06 =>	Reactor Power (NI)	Observe nuclear instrumentation for changes (specifically increases)	08
2.07 =>	CEA Group Selection	Observe to confirm selection	08

Nuplex 80 + Functional Analysis
Breakdown of Information to be Collected

Gross Function No.	Parameter to Observe	Observation to Make	Reference No.
2.08 =>	CEA position	Observe to determine position of CEA in core/fuel.	08
2.09	CEA position	Observe to verify CEAs stopped moving	08
2.09	CEA position	Observe to determine if CEAs pulled are in alignment.	08
2.09	RCS average temperature	Observe for changes	08
2.09 =>	Reactor Power (NI)	Observe nuclear instrumentation for changes (specifically increases)	08
3.01	Charging flow valve alignment	Observe for dilute makeup flow to exist	08
3.01	Letdown flow	Observe for compensation responses for changes in charging flow to add dilute makeup	08
3.01 =>	Pressurizer Level	Observe for maintaining level constant	08
3.02	RCS Boron Concentration	Observe to monitor representative Boron concentration of the RCS fluids during dilution (periodically).	08
3.02 =>	RCS Boron concentration	Observe to determine representative Boron concentration at the start of the dilution activity.	08
4.02 =>	CEA Group position	Observe for group selection	08
4.03 =>	CEA position	Observe to determine position of CEA in core/fuel	08
4.04 =>	CEA Group position	Observe for group selection	08
4.05 =>	CEA position	Observe to determine position of CEA in core/fuel	08
4.06 =>	CEA group position	Observe for group position	08
4.07 =>	CEA position	Observe to determine position of CEA in core/fuel	08

Nuplex 80 + Functional Analysis
Breakdown of Information to be Collected

Gross Function No.	Parameter to Observe	Observation to Make	Reference No.
4.08 =>	CEA Group position	Observe for group selection	08
4.09 =>	CEA position	Observe to determine position of CEA in core/fuel	08
4.10 =>	CEA Group position	Observe for group selection	08
4.11 =>	CEA position	Observe to determine position of CEA in core/fuel	08
4.12 =>	CEA Group position	Observe for group selection	08
4.13 =>	CEA position	Observe to determine position of CEA in core/fuel	08
4.14 =>	CEA Sequential Control Mode	Observe to confirm selection	08
4.15 =>	CEA position	Observe to determine position of CEA in core/fuel	08
5.00	RCS average temperature	Observe to record for later calculation of core physics data confirmation	08
5.00 =>	Reactor Power (NI)	Observe for conditions of "criticality"	08
6.00	RCS average temperature	Observe for constant value (monitoring for unexpected MTC affects to reactivity control.	
6.00	RCS boron concentration	Observe for constant value (monitoring for unexpected changes which may adversely affect reactivity control.	
6.00	Reactor Power (NI)	Observe for increasing power to approx. value of 10E-4% then stablizing at value when CEAs moved to turn power.	
6.00 =>	Startup rate (NI)	Observe for slightly positive value for increasing power and zero rate for an indication that power has stablize.	
6.01 =>	CEA position	Observe to confirm CEA position relative to direction of movement	08

Nuplex 80 + Functional Analysis
Breakdown of Information to be Collected

Gross Function No.	Parameter to Observe	Observation to Make	Reference No
6.02	Reactor Power (NI)	Observe nuclear instrumentation to monitor changes	08
6.02	Startup rate (NI)	Observe for slightly positive value for increasing power. An indication of control accession of power	
=>			
6.03	Reactor Power rate of change	Observe to monitor rate of change against established maximum	08
=>			
6.04	Pressurizer Pressure	Observe to record for later calculation of core physics data confirmation	08
6.04	RCS Boron concentration	Observe to record representative Boron concentration of the RCS fluids for later ca[illegible]lation of core physics data	08
6.04	RCS average temperature	Observe to record for later calculation of core physics data confirmation	08
=>			
7.01	CEA position	Observe to verify CEA alignment	08
=>			
7.02	RCS hot leg temperature	Observe for increase at POAH power level	08
7.02	Reactor Power (NI)	Observe nuclear instrumentation to record how change at POAH power level	08
=>			
8.00	RCS average temperature		
8.00	Reactor Power (NI)	Observe nuclear instrumentation to monitor increases in power	08
8.00	Startup rate (NI)		
=>			
8.01	CEA position	Observe to confirm position relative to direction of movement	08
=>			
8.02	CEA position		
8.02	Reactor Power rate of change	Observe to monitor rate of change against established maximum	08
=>			
9.00	Condensate pump	Observe for operating conditions	09

Nuplex 80 + Functional Analysis
Breakdown of Information to be Collected

Gross Function No.	Parameter to Observe	Observation to Make	Reference No.
9.00	Condenser Circulating Water flow	Observe for the existance of flow	09
9.00	Condenser Hotwell Level	Observe for constant or maintaining level	09
9.00	Condenser vacuum	Observe for existance of vacuum at a minimum of [?4 inch Hg]	09
9.00	Deaerating Feedwater Storage Tank Level	Observe for changes	09
9.00	Deaerating Feedwater Storage Tank Level	Observe for existance of level	09
9.00	Dearating Feedwater Tank temperature	Observe to (mentally) record value for operational comparison for condition	09
9.00	LP Turbine exhaust hood temperature	Observe for value less than maximum value	09
9.00	Main Feedpump	Observe for operating condition of one of two pumps	09
9.00	Reactor Power (NI)	Observe for constant or maintaining power	09
9.00	Turbine Trip	Observe for trip condition	09
9.00	Turbine jacking gear	Observe for engaged and operating conditions	09
9.00	Turbine rotation	Observe for existance of rotation	09
9.00	Unit Transformer cooling water flow	Observe for existance of flow	09
9.00	Unit Transformer cooling water temp.	Observe for value less than maximum value	09
9.00	[Raw or Salt] Cooling Water (list)	Observe for system operating conditions	09
9.00	[Service] Cooling Water (list)	Observe for system operating conditions	09
=>			
9.01	Generator H2 pressure	Observe to (mentally) record value	09
9.01	Generator H2 seal oil flow	Observe for existance of oil flow	09
9.01	Generator H2 seal oil temperature	Observe to (mentally) record temperature	09
9.01	H2 cooler inlet temperature	Observe to (mentally) record value	09
9.01	H2 cooler outlet temperature	Observe to (mentally) record valve	09
9.01	Stator Liquid cooling pump	Observe for operating conditions	09

Nuplex 80 + Functional Analysis
Breakdown of Information to be Collected

Gross Function No.	Parameter to Observe	Observation to Make	Reference No
9.01	Stator temperature	Observe to (mentally) record temperature	09
10.01	Load limit Set Potentiometer	Observe set to specified minimum setting. Note: Find out Sys 80+ labelling	09
10.01	Turbine Trip	Observe for mechanical trip tripped condition	09
10.01	Turbine first stage feedback	Observe status Note: determine System 80+ turbine control conventions	09
10.02	EHC oil pressure	Observe to (mentally) record value	09
10.02	EHC oil temperature	Observe to (mentally) record value above warmup minimum	09
10.03	Bleeder Trip valve control (list)	Observe for open position setting	09
10.03	Bleeder Trip valve position (list)	Observe for closed position	09
10.03	Heater Drain Dump Valve control (list)	Observe for "normal" control position	
10.03	Heater Drain Dump valve control (list)	Observe for "normal" position setting	09
10.03	MSR Steam Supply valve control (list)	Observe for open position control	09
10.03	MSR Steam Supply valve position	Observe for open position	09
10.04	Bleeder Trip Valve control (list)	Observe for open position control	09
10.04	Bleeder Trip Valves (list)	Observe for open position	09
10.04	Heater Drain Dump valve position	Observe for "normal" position	09
10.04	Heater drain tank dump valve control	Observe for "to close" position	09
10.04	Heater drain tank high level dump valve	Observe for closed position	09
10.05	Turbine Bleeder Trip valves (list)	Observe for open position	09
10.05	Turbine Stop valves (list)	Observe for closed position	09
10.05	Turbine Trip	Observe for trip reset	09
10.05	Turbine control valves (list)	Observe for closed position	09

Nuplex 80 + Functional Analysis
Breakdown of Information to be Collected

Gross Function No.	Parameter to Observe	Observation to Make	Reference No.
10.05	Turbine intercept valves (list)	Observe for closed position	09
10.05 =>	Turbine intermediate stop valves (list)	Observe for open position	09
10.06	Chest warmup control	Observe to confirm adjustments to control *rate of warmup	09
10.06	Inner Chest Casing temperature	Observe to (mentally) record temperature for later evaluation against warmup limits	09
10.06	Main Stop Valve Bypass	Observe for off closed seat position Steam being admitted slowly to warmup Steam Chest	09
10.06	Outer Chest casing temperature	Observe to (mentally) record temperature for later evaluation against warmup limits	09
10.06	Steam Chest Pressure	Observe for existence of pressure	09
10.06 =>	Time	Record for baseline to determine rate of Chest warmup	09
11.00	Main Steam Flow	Observe to (mentally) record present steam flow conditions from SG	09
11.00 =>	Steam Generator Level	Observe for changes in level	09
11.01	Feed Regulating Mode control	Observe for low power auto control of feedwater regulating valves System 80+ control enhancement (ref ??)	09
11.01	Main Feedwater Flow	Observe to (mentally) record present flow conditions	09
11.01 =>	Startup Feed Pump	Observe for "secured" or off condition	09
11.02 =>	Feedwater Temperature	Observe to confirm preheating.	09
11.03	Condensate Storage Tank Level	Observe to determine if condensate reserves are adequate for up coming power transients.	09
11.03 =>	Hotwell Level	Observe to determine if condensate is adequate for up coming power transient	09

Nuplex 80 + Functional Analysis
Breakdown of Information to be Collected

Gross Function No.	Parameter to Observe	Observation to Make	Reference No.
12.00	Shell and Rotor expansion difference	Observe for value less than specified limit	09
12.00	Time	Observe for rate of temperature change determinations	09
12.00	Time	Observe to determine rate of speed change determinations	09
12.00	Time	Observe to determine duration of time turbine has been on the turning gear.	09
12.00	Turbine First Stage Shell temperature	Observe to (mentally) record temperature for later decision	09
12.00	Turbine speed	Observe for value of turbine speed	09
12.00 =>	Turbine speed rate of change	Observe for rate of speed increase	09
12.01	Bearing Oil Temperature	Observe for value within expected minimum and maximum value	09
12.01	Exhaust Hood Temperature	Observe for value less than expected maximum	09
12.01	First stage shell temperature	Observe for inner and outer surface temperature differentials	09
12.01	Shell and Rotor expansion difference	Observe for value less than specified limit	09
12.01	Turbine Bearing oil flow	Observe for existance of flow	09
12.01 =>	Turbine generator rubbing or vibration	Listen locally for vibrating or rubbing noises	09
12.02 =>	later		
13.00 =>	Turning Gear status	Observe for disengaged turning gear	09
13.01	Intercept valve(s) position	Observe for open position	09
13.01	Main Stop Valve position	Observe for open position	09
13.01	Reactor Power (NI)	Observe nuclear instrumentation to (mentally) record value	09
13.01	Reactor Power (NI)		

Nuplex 80 + Functional Analysis
Breakdown of Information to be Collected

Gross Function No.	Parameter to Observe	Observation to Make	Reference No.
13.01	Startup rate (NI)		
13.01 =>	Turbine Control valve position	Observe for desired open position	09
14.01	Bearing Header pressure	Observe for pressure value greater than [25 psi]	09
14.01	Bearing Oil temperature	Observe for "normal" temperatures	09
14.01	High pressure lift pump status	Observe for "off" status	09
14.01	Main Shaft Oil pump discharge pressure	Observe for pressure above [200 psi]	09
14.01	Turbine 1st stage pressure	Observe to monitor change due to control responses.	
14.01	Turbine Speed	Observe for speed value	09
14.01 =>	Turning Gear Motor Status	Observe for "off" condition	09
14.02	Mechanical Trip (TG)	Observe for trip activated indication	09
14.02 =>	later		
14.03	Mechanical Trip (TG)	Observe for trip reset condition	09
14.03 =>	later		
15.01	Generator Disconnects	Observe for closed condition (locally)	09
15.01	Turbine Generator Breakers	Observe for open position	09
15.01 =>	later		
15.02	Generator exciter field breaker	Observe for closed position confirmation of closing	09
15.02	Generator field breaker	Observe for closed position confirmation of closing	09
15.02 =>	later		
15.03	Generator Output Voltage	Observe for changes corresponding to control changes	09
15.03	Generator Voltage Control	Observe for "minimum" setting	09

Nuplex 80 + Functional Analysis
Breakdown of Information to be Collected

Gross Function No.	Parameter to Observe	Observation to Make	Reference No.
15.03	Generator Voltage Mode Control	Observe for "auto" control	09
15.03	Generator Voltage Mode Control	Observe for Manual Control	09
15.03	Turbine Speed	Observe for changes corresponding to control changes	09
15.03 =>	later		
15.04	Load limit control position	Observe for desired se ing	09
15.04 =>	later		
16.00	Generator Voltage	Observe to match with running voltage	09
16.00	Grid (running) Voltage	Observe to match with generator voltage	09
16.00	Synchroscope	Observe for rotation (phase relations) in Clockwise direction Assume: Circular display being used	09
16.00 =>	later		
17.00	Generator Voltage	Observe for changes	
17.00	Turbine Generator Power	Observe for changes in load	09
17.00	Turbine Speed	Observe for changes	09
17.00 =>	later		
17.01	Turbine Cooling Water Temperature	Observe cooling water system temperature for turbine auxiliaries to ensure stable and not rising.	09
17.01 =>	later		
18.00	Load Authorization	Observe for authorization	09
18.00 =>	later		
19.00	Generator Frequency	Observe for desired value	09
19.00	Generator Voltage	Observe for desired value	09
19.00	Turbine Generator Power	Observe for increase in load	09

Nuplex 80 + Functional Analysis
Breakdown of Information to be Collected

Gross Function No.	Parameter to Observe	Observation to Make	Reference No
19.00	Turbine Generator Power	Observe for desired power value	09
19.00 =>	later		
20.00	Main Feedwater Flow	Observe to (mentally) record present feedwater flow to SG	09
20.00	Main Steam Flow	Observe to (mentally) record present steam flow conditions from SG	09
20.00	Main feed flow	Observe to monitor for changes due to control responses.	
20.00	Main steam flow	Observe to monitor for changes due to control responses.	
20.00	Steam Generator Level	Observe for changes in level	09
20.00 =>	Steam Generator Pressure	Observe for value expected corresponding to load of turbine generator	09
20.01	Main Feedwater Control Valve position	Observe for position changes corresponding to load changes	09
20.01	Main feed flow	Observe to monitor for control responses of control valve adjustments	
20.01 =>	Steam Generator level	Observe to monitor for control responses of control valve adjustments	
20.02	Deaerator pressure	Observe for constant value	
20.02 =>	Feedwater Temperature	Observe for preheating	09
20.03	Condensate storage tank A level	Observe to (mentally) record value. Value will be used to evaluate condensate demands.	
20.03	Condensate storage tank B level	Observe to (mentally) record value. Value will be used to evaluate condensate demands.	
20.03 =>	Hotwell Level	Observe for changes in level not maintained by level control system	09
21.01	CPC Thermal power	Observe for calculated power	09

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Breakdown of Information to be Collected

Gross Function No.	Parameter to Observe	Observation to Make	Reference No
21.01	RCS average temperature	Observe for value to verify calculated power - loop 1	
21.01	RCS average temperature	Observe for value to verify calculated power - loop 2	
21.01	RCS cold leg temperature	Observe for value to calculate power loop 1	09
21.01	RCS cold leg temperature	Observe for value to calculate power loop 2	
21.01	RCS flow	Observe for value to calculate power	09
21.01	RCS hot leg temperature	Observe for value to calculate power loop 1	09
21.01	RCS hot leg temperature	Observe for value to calculate power loop 2	
21.01	Reactor Power (CPC)	Observe for value to compare Channel A CPC Power with nuclear instrumentation.	
21.01	Reactor Power (CPC)	Observe for value to compare Channel B CPC power with nuclear instrumentation.	
21.01	Reactor Power (NI)	Observe for value to compare to thermal power calculated	
21.01	Reactor Power (NI)	Observe for value to compare to thermal power calculated.	
21.01	Reactor Power (NI)	Observe for value to compare to thermal power calculated.	

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Breakdown of Information to be Collected

Gross Function No.	Parameter to Observe	Observation to Make	Reference No
2.00	Generator Output Voltage	Observe to compare with established limitations	
2.00	Generator ..wer (VA)	Observe to determine rate of change in electric load to compare with load following limitations of other systems	
2.00	Generator Power (Watts)	Observe to determine rate of change in electric load to compare with load following limitations of other systems	
2.00	RCF average temperature	Observe for changes which correspond to expected changes for the transient and compare with RRS reference temperature	
2.00	RRS reference temperature	Observe for changes which correspond to expected changes for down power transient.	
2.00	Reactor Power (NI)	Observe to determine rate of change and compare with operating limitations and constraints established.	
=>			
3.00	Main Feed pump pressure	Observe to determine if feedpump pressure control is responding as expected for down power transient	
3.00	Main Feedwater flow	Observe to compare with steam flow to determine if parameter is load following properly.	
3.00	Main Steam flow	Observe to verify decreasing steam flow for expected down power transient at controlled rate.	
3.00	RCS average temperature	Observe to compare transient to expected performance and assess inter-system transient impacts.	
3.00	Reactor Power (NI)	Observe to determine corresponding load following affect on other dependent systems	
3.00	Steam Generator pressure	Observe to monitor for changes and confirm parameter is within transient limitations (e.g. SG safety's pressure)	
=>			
3.01	Generator Output Voltage	Observe to confirm the parameter is within its operating limitations	

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Breakdown of Information to be Collected

Gross Function No.	Parameter to Observe	Observation to Make	Reference No.
3.01	Generator frequency	Observe to confirm the parameter is within it operating limitations.	
=>			
3.02	Main Feedwater flow	Observe to compare with SG level trend and main steam flow trend to control SG parameters within feed system limitation	
3.02	Main Steam Flow	Observe to verify decreasing steam flow for down power transient	
3.02	Steam Generator level	Observe for "shrink" and parameter changes within the control limitations of the feedwater system.	
3.02	Steam Generator pressure	Observe to verify increase in SG pressure for expected down power transient.	
=>			
3.03	Main Feed pump pressure	Observe to compare with feedwater flow to SG and SG pressure.	
3.03	Main Feedwater flow	Observe to compare to SG level trend and steam flow to maintain SG parameters within feedwater system limitations	
=>			
3.04	Charging low	Observe to monitor for changes within limitations of PLCS control.	
3.04	Letdown flow	Observe to monitor for changes within limitations of PLCS control.	
3.04	Pressurizer level	Observe to monitor for changes within limitations of PLCS control	
=>			
3.05	Generator power (Watts)	Observe to compare with Reactor power to verify consistently decreasing power	
3.05	Reactor Power (NI)	Observe to monitor for decreasing power consistently following decreasing generator load.	
=>			
3.06	Pressurizer Pressure	Observe to monitor changes within limits of PPCS control	
3.06	Pressurizer spray flow	Observe to monitor for changes within limits of PPCS control.	
=>			

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Breakdown of Information to be Collected

Gross Function No.	Parameter to Observe	Observation to Make	Reference No.
4.00	Condenser vacuum	Observe to monitor for control responses of control valve adjustments.	
4.00	Hotwell level	Observe to monitor for changes due to control responses	
4.00	Turbine Bypass System flow	Observe to monitor for changes due to control responses	
=>			
4.01	Reactor Power (P1)	Observe to monitor reactor power is being maintained constant by TBS while turbine is being shutdown.	
=>			
4.02	RCS average temperature	Obser e to compare with RRS reference temp ature	
4.02	RRS reference temperature	Observe to verify temperature consistent with corresponding program and power production by reactor	
=>			
4.03	RCS average temperature	Observe to monitor temperature as a constant with control of TBS maintaining temperature. (no longer using RRS)	
=>			
5.01	Turbine Speed	Observe to determine turbine is slowing to a stop	
=>			
5.02	Generator Output breaker position	Observe to verify output breaker open position.	
5.02	Generator power (Watts)	Observe to verify generator is no longer producing power.	
=>			
6.01	CEA group selection	Observe to determine group selected for control or motion.	
6.01	CEA position	Observe to determine CEA position in the core and direction of motion.	
=>			
6.02	CEA group selection	Observe to determine group selected for control or motion	
6.02	CEA position	Observe to determine position of CEAs in the core and direction of motion	
=>			

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Breakdown of Information to be Collected

Gross Function No.	Parameter to Observe	Observation to Make	Reference No
6.03	CEA group selection	Observe to determine group selected for control or motion	
6.03	CEA position	Observe to determine position of CEAs in the core and direction of motion	
=>			
6.04	CEA group selection	Observe to determine group select for contr[illegible] or motion.	
6.04	CEA position	Observe to determine position of CEAs in the core and direction of motion	
=>			
6.05	CEA group selection	[illegible]erve to determine group selected for [illegible] or motion.	
6.05	CEA position	[illegible] to determine position of CEAs in [illegible] and direction of [illegible]	
=>			
6.06	CEA group selection	Observe to determine group selected for control or motion.	
6.06	CEA position	Observe to determine position of CEAs in the core and direction of motion	
=>			
6.07	Boric Acid Addition Tank Concentration	Observe to determine boron concentration	
6.07	Boric Acid Makeup Valve position	Observe for open position	
6.07	Charging flow	Observe to monitor for changes due to control responses.	
6.07	Letdown flow	Observe to monitor for changes due to control responses.	
6.07	Pressurizer Level	Observe to monitor for changes due to control responses.	
6.07	RCS boron concentration (letdown)	Observe to monitor for changes while borating RCS.	
=>			
6.08	CEA group selection	Observe to confirm selection.	
6.08	CEA position	Observe to determine position of CEA in core/fuel.	
=>			
6.09	CEA group selection	Observe to confirm selection.	

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Breakdown of Information to be Collected

Gross Function No.	Parameter to Observe	Observation to Make	Reference No
6.09	CEA position	Observe to determine position of CEA in core/fuel	
=>			
6.10	CEA group selection	Observe to confirm selection.	
6.10	CEA position	Observe to determine positon of CEA in core/fuel	
=>			
6.11	CEA position	Observe to determine if CEAs are at their bottom 'latched' position.	
6.11	CEA position	Observe to verify CEA's are fully inserted into the core or 'bottomed'.	
=>			
6.12	Reactor Power (NI)	Observe nuclear instrumentation for changes (specifically to verify expected decreases).	
=>			
7.00	later		

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Breakdown of Information to be Collected

Gross Function No.	Parameter to Observe	Observation to Make	Reference No
1.01	CEA position	Observe to determine position of CEA in core/fuel	03
1.01	CEA position	Observe for CEA bottomed position	03
1.01	Reactor Power (NI)	Observe nuclear instrumentation for decay value (indication that reactor is shutting down)	03
=> 1.01	Startup Rate (NI)	Observe nuclear instrumentation for negative rate of change	03
1.02	13.8 kV Services Bus feeder	Observe for closed breaker	03
1.02	DG output breaker	If DG is off, Observe for open position	02
1.02	DG output breaker	If DG is running AND 13.8 kV service bus is without power, Observe for closed position	02
1.02	DG output frequency	If DG is started, Observe for generator frequency	02
1.02	DG output voltage	If DG is started, Observe for output voltage	02
1.02	Turbine Generator Breaker position	Observe for open indication of TG output breaker	03
=> 1.02	Turbine Trip	Observe for indication of Turbine Trip activated	03
1.03	Charging flow	Observe for PLCS demanded flow	05
1.03	Letdown flow	Observe for PLCS demanded flow	05
1.03	PLCS setpoint level	Observe for comparison to Pressurizer level and expected transient demand for setpoint	05
1.03	Pressurizer level	Observe to determine rate of inventory change	03
1.03	Pressurizer level	Observe for PLCS demanded level	03
1.03	RCS subcooling	Observe for indications that subcooling exists	05
=> 1.03	Time	Observe to determine "rate of change"	

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Breakdown of Information to be Collected

Gross Function No.	Parameter to Observe	Observation to Make	Reference No
1.04	PPCS setpoint pressure	Observe for comparison to pressurizer pressure	03
1.04	Pressurizer pressure	Observe for PPCS demanded pressure	03
1.04	Pressurizer pressure	Observe to determine rate of change	03
1.04	Time	Observe to determine "rate of change"	
=>			
1.05	RCP Amperes	Observe for trend of current to determine if RCPs are operating (an analog value method)	03
1.05	RCP speed	Observe to detemine if RCPs are operating (an alternate - digital value method)	05
1.05	RCS cold leg temperature	Observe to determine delta T between hot and cold leg temperatures for the same loop	05
1.05	RCS hot leg temperature	Observe to determine delta T between hot and cold leg temperatures for the same loop	05
=>			
1.06	Emergency feedwater flow	If actuated, observe for flow to restore SG level to normal band while NOT overcooling RCS	
1.06	Main feed flow	Observe for reactor trip override (RTO) response (a bypass controlling flow is expected)	03
1.06	Main Feedpump speed	Observe for (RTO) response to slow speed	16
1.06	Main Feedwater flow	Observe for FWCS demanded flow to restore SG level without overcooling the RCS	16
1.06	Main steam flow	Observe for TBS demanded flow	03
1.06	RCS average temperature	Observe for value being maintained	03
1.06	Steam generator level	Observe for existance of level	05
1.06	Steam generator pressure	Observe for pressure above operating pressure but below SG safety relief limits	03
=>			

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Breakdown of Information to be Collected

	Gross Function No.	Parameter to Observe	Observation to Make	Reference No
	1.07	Containment area radiation	Observe for detection of radiation above normal levels	
	1.07	Containment pressure	Observe for existence of pressure above normal containment atmosphere	12
=>	1.07	Steam plant radiation	Observe for detection of radiation	
	1.08	Containment pressure	Observe for value above normal	12
=>	1.08	Containment temperature	Observe for value above normal	12
	1.09	Containment pressure	Observe for value above normal	12
=>	1.09	Containment temperature	Observe for value above normal	12
	2.00	Containment pressure	Observe for normal containment atmospheric conditions	12
	2.00	Containment temperature	Observe for normal containment atmospheric conditions	12
	2.00	Pressurizer level	Observe for transient recovered by PLCS	[illegible]
	2.00	Pressurizer pressure	Observe for transient recovered by PPCS	05
=>	2.00	Steam Generator level	Observe for transient recovered by FWCS	05
=>	5.00	Pressurizer level	Observe for transient recovered by PLCS	03
=>	6.00	Pressurizer pressure	Observe for transient recovered by PPCS	03
	7.00	Main Steam flow	Observe for small (< 5%) amount of steam flow	
	7.00	RCS average temperature	Observe to monitor for changes due to main steam control responses.	
	7.00	Steam Generator pressure	Observe to monitor for changes due to main steam control responses.	
=>	7.00	Turbine 1st stage steam pressure	Observe to confirm expected turbine trip responses.	

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Breakdown of Information to be Collected

Gross Function No.	Parameter to Observe	Observation to Make	Reference No.
8.00	Steam generator level	Observe for transient recovered by FWCS to normal level	05
=>			
8.01	Main feedwater flow	Observe for FWCS demanded flow	05
=>			
8.02	Emergency feedwater flow	If actuated, observe for flow to restore SG level to normal band while NOT overcooling RCS	
=>			
9.01	Condensate storage tank level	Observe to (mentally) record value for calculation of reserves availability	02
9.01	IRWT level	Observe to (mentally) record value for calculation of reserves availability	02
=>			
9.02	Pressurizer heater power	Observe for ON/OFF conditions as PPCS demands	12
9.02	Pressurizer pressure	Observe for changes in pressure not normal to PPCS control	12
9.02	Pressurizer pressure	Observe for value to make assessment of pressure condition required to make any repairs	12
=>			
10.01	Pressurizer level	Observe for constant inventory	03
=>			
10.02	Pressurizer pressure	Observe for constant pressure	03
=>			
10.03	RCP speed	Observe to determine if RCPs are operating	03
10.03	RCS cold leg temperature	Observe to determine delta T between hot and cold leg temperatures for the same loop	03
10.03	RCS hot leg temperature	Observe to determine delta T between hot and cold leg temperatures for the same loop	03

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Breakdown of Information to be Collected

Gross Function No.	Parameter to Observe	Observation to Make	Reference No
1.01	CEA position	Observe to determine position of CEA in core/fuel	03
1.01	CEA position	Observe for CEA bottomed position	03
1.01	Reactor Power (NI)	Observe nuclear instrumentation for decay value (indication that reactor is shutting down)	03
1.01	Startup Rate (NI)	Observe nuclear instrumentation for negative rate of change	03
=>			
1.02	13.8 kV Services Bus feeder	Observe for closed breaker	03
1.02	DG output breaker	If DG is off, Observe for open position	03
1.02	DG output breaker	If DG is running AND 13.8 kV service bus is without power, Observe for closed position	03
1.02	DG output frequency	If DG is started, Observe for generator frequency	03
1.02	DG output voltage	If DG is started, Observe for output voltage	
1.02	Turbine Generator Breaker position	Observe for open indication of TG output breaker	03
1.02	Turbine Trip	Observe for indication of Turbine Trip activated	03
=>			
1.03	Charging flow	Observe for PLCS demanded flow	03
1.03	Letdown flow	Observe for PLCS demanded flow	03
1.03	PLCS setpoint level	Observe for comparison to Pressurizer level and expected transient demand for setpoint	03
1.03	Pressurizer level	Observe to determine rate of inventory change	03
1.03	Pressurizer level	Observe for PLCS demanded level	03
1.03	RCS subcooling	Observe for indications that subcooling exists	03
1.03	Time	Observe to determine "rate of change"	03
=>			

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Breakdown of Information to be Collected

Gross Function No.	Parameter to Observe	Observation to Make	Reference
1.04	PPCS setpoint pressure	Observe for comparison to pressurizer pressure	03
1.04	Pressurizer Pressure	Observe to determine rate of change	03
1.04	Pressurizer Pressure	Observe for PPCS demanded pressure	03
1.04	Time	Observe to determine "rate of change"	03
=>			
1.05	RCP operating status	Observe to determine if RCPs are operating	03
1.05	RCS cold leg temperature	Observe to determine delta T between hot and cold leg temperatures for the same loop.	03
1.05	RCS hot leg temperature	Observe to determine delta T between hot and cold leg temperatures for the same loop	03
=>			
1.06	Emergency feedwater flow	Observe for flow to restore SG level while NOT overcooling RCS	03
1.06	Main Feed Flow	Observe for rate of change to ramp down feedrate	03
1.06	Main Feedwater flow	Observe for FWCS demanded flow	03
1.06	Main Feedwater setpoint flow	Observe for comparison to Main feedwater flow and expected transient demanded for setpoint	03
1.06	Main Steam Flow	Observe for TBS demanded flow	03
1.06	RCS average temperature	Observe for value being maintained	03
1.06	Steam Generator level	Observe for existance of level	03
1.06	Steam Generator pressure	Observe for pressure above operating pressure but below SG safety relief limits	03
=>			
1.07	Containment area radiation	Observe for detection of radiation above normal levels	03
1.07	Containment pressure	Observe for existence of pressure above normal containment atmosphere	03
1.07	Steam plant radiation	Observe for detection of radiation	03
=>			

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Breakdown of Information to be Collected

Group Function No.	Parameter to Observe	Observation to Make	Reference No
1.08	Containment pressure	Observe for value above normal	03
=> 1.08	Containment temperature	Observe for value above normal	03
1.09	Containment pressure	Observe for value above normal	03
=> 1.09	Containment temperature	Observe for value above normal	03
2.00	Containment pressure	Observe for value above normal	03
2.00	Containment temperature	Observe for value above normal	03
2.00	Pressurizer level	Observe for high level with decreasing pressurizer pressure for some breaks in pressurizer	03
2.00	Pressurizer level	Observe for level dropping faster than PLCS makeup or an empty pressurizer	03
=> 2.00	Pressurizer pressure	Observe for decreasing values	03
5.00	Pressurizer Pressure	Observe for rate of change	03
5.00	Pressurizer pressure	Observe for at or approaching value for automatic SI actuation	
=> 5.00	Time	Observe to determine "rate of change"	03
5.01	SI pressure	If SI started, Observe for indication that HPSI header is pressurized	03
=> 5.01	Safety injection flow	If SI started, Observe for indication of HPSI flow to RCS	03
6.00	SI pressure	Observe for indication that HPSI header is pressurized	03
=> 6.00	Safety injection flow	Observe for indication of HPSI flow to RCS	03
6.01	Charging pump flow	Observe for indication of charging flow	03
=> 6.01	Charging pump status	Observe for indication that all charging pumps are operating	03

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Breakdown of Information to be Collected

Gross Function No.	Parameter to Observe	Observation to Make	Reference No
6.02	SI pump 1 status	Observe for indication that all HPSI pumps are operating	03
6.02	SI pump 2 status	Observe for indication that all HPSI pumps are operating	03
6.02	SI pump 3 status	Observe for indication that all HPSI pumps are operating	03
6.02	SI pump 4 status	Observe for indication that all HPSI pumps are operating	03
=>			
6.03	SI pump power available	Observe for power available to HPSI pumps not operating	03
=>			
6.04	Charging isolation valve position	Observe for open position	03
6.04	SI isolation valve position	Observe for open position	03
=>			
6.05	later		
=>			
7.00	Pressurizer Pressure	Observe for procedural value to make a decision on RCP operation.	
=>			
7.01	RCP 1A status	Observe for pump running status	03
7.01	RCP 1B status	Observe for pump running status	03
7.01	RCP 2A status	Observe for pump running status	03
7.01	RCP 2B status	Observe for pump running status	03
=>			
7.02	Pressurizer Pressure	RCP operating to pressures within Technical specifications	03
=>			
8.00	Time	Observe to (mentally) record baseline of initiation of event	03
=>			
9.00	Pressurizer Level	Observe to (mentally) record to measure effectiveness of actions to isolate LOCA	03
9.00	Pressurizer Pressure	Observe to confirm dropping pressure has been stopped	03

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Breakdown of Information to be Collected

Gross Function No.	Parameter to Observe	Observation to Make	Reference No
9.00 =>	Pressurizer pressure	Observe pressure not above relief setpoints (a possible cause of LOCA)	13
9.01 =>	Letdown isolation valve position	Observe for closed position	03
9.02	Pzr liquid sample isol. valve position	Observe for closed position	03
9.02	Pzr vapor sample isol. valve position	Observe for closed position	03
9.02 =>	RCS hot leg sample valve position	Observe for closed position	03
9.03	CCW return isolation valve position	Observe for closed position	03
9.03	CCW supply isolation valve position	Observe for closed position	03
9.03 =>	CCW temperature	Observe for value above normal	03
9.04 =>	other valves	Observe for closed position	03
9.05 =>	PORV block valve position (see note)	Observe for closed position	
10.01	Aux building area radiation	Observe for detection of radiation above normal levels	03
10.01 =>	Aux building sump level	Observe for detection of inventory in sumps	03
10.02 =>	other valve positions??	Observe for closed position	03
10.03 =>	later		
10.04 =>	later		
11.00	Containment pressure	Observe for value at or above containment isolation setpoint	03
11.00 =>	Containment temperature	Observe for value above normal	03
11.01 =>	Containment fan status	Observe for indication that fans are operating in emergency mode	03

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Gross Function No.	Parameter to Observe	Observation to Make	Reference No
11.02	Containment air recirculation fan status	Observe for indication of fans operating	03
11.02 =>	Containment equipment cooling flow	Observe for indication of normal equipment cooling	03
12.00	Containment pressure	Observe for value at or above containment spray setpoint	03
12.00 =>	Containment temperature	Observe for value above normal	03
12.01	Containment Spray header pressure	Observe for the existance of pressure	03
12.01	Containment pressure	Observe for decreasing rate of change	03
12.01	Containment spray flow	Observe for the existance of flow	03
12.01 =>	Time	Observe to determine "rate of change"	03
12.02 =>	later		
13.00 =>	Containment Hydrogen	Observe for detection of hydrogen in containment	03
14.01	Hydrogen recombiner power	Observe for value	03
14.01 =>	Hydrogen recombiner temperature	Observe for value	03
14.02	Containment air particulate	Observe to report value to Plant Tech Support Center	03
14.02	Containment area radiation	Observe to report value to Plant Tech Support Center	03
14.02	Containment hydrogen	Observe to report value to Plant Tech Support Center	03
14.02	Containment pressure	Observe to report value to Plant Tech Support Center	03
14.02 =>	Containment temperature	Observe to report value to Plant Tech Support Center	03
15.00 =>	Meterogical data	Observe to report value to Plant Tech Support Center	03

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Breakdown of Information to be Collected

Gross Function No.	Parameter to Observe	Observation to Make	Reference No
17.00	Condenser cooling water flow	Observe for existance of cooling water flow through condenser	03
17.00	Condenser cooling water temperature	Observe to evaluate adequacy of cooling water to remove heat	03
17.00	Condenser pressure	Observe for existance of condenser vacuum	03
17.00	Turbine exhaust temperature	Observe for existance of condenser vacuum	03
=>			
17.01	Condenser cooling water flow	Observe for existance of cooling water flow through condenser	03
17.01	Condenser cooling water temperature	Observe to evaluate adequacy of cooling water to remove heat under TBS load	03
17.01	Condenser hotwell level	Observe for value	03
17.01	Condenser pressure	Observe to maintain vacuum under TBS load	03
17.01	RCS average temperature	Observe to determine rate of change	03
17.01	Time	Observe to determine "rate of change"	
17.01	Turbine exhaust temperature	Observe for value	03
=>			
17.02	RCS average temperature	Observe to determine value of temperature to be consistant with SG pressure	03
17.02	RCS average temperature	Observe to determine rate of change	03
17.02	Steam Generator pressure	Observe for pressure above operating pressure but below SG safety relief limits	03
17.02	Time	Observe to determine "rate of change"	03
=>			
18.00	Main steam flow	Observe to (mentally) record value	03
18.00	Steam Generator level	Observe for value at or approaching normal level	03
=>			
18.01	Main feedwater flow	Observe for comparison wiht main steam flow	03
=>			

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Breakdown of Information to be Collected

Gross Function No.	Parameter to Observe	Observation to Make	Reference No.
18.02	Emergency feedwater flow	Observe for comparison with steam flow to maintain or restore SG level while NO/ overcooling SG	03
=>			
19.00	Condensate storage tank level	Observe to (mentally) record value for calculation of reserves availability	03
19.00	IRWT level	Observe to (mentally) record value for calculation of reserves availability	03
=>			
20.00	Charging flow	Observe for existance of flow to RCS	03
20.00	Charging isolation valve position	Observe for open position	03
20.00	Letdown flow	Observe for existance of flow from RCS	03
20.00	Letdown isolation valve position	Observe for open position	03
20.00	Pressurizer level	Observe for existance of inventory in Pressurizer	A
20.00	Pressurizer pressure	Observe to (mentally) record value for assessment of charging flow to RCS	A
=>			
21.00	Pressurizer pressure	Observe to determine rate of change	03
21.00	Pressurizer pressure	Observe to determine rate of change	03
21.00	Time	Observe to determine "rate of change"	03
=>			
21.01	SI header pressure	Observe for value to compare to RCS pressure	03
21.01	Pressurizer Pressure	Observe for decreasing value	03
21.01	Pressurizer pressure	Observe to compare to HPSI header pressure	03
=>			
21.02	Charging flow	Observe to control flow to control RCS pressure	03
21.02	Charging pump pressure	Observe to maintain at or less than RCS pressure	03
21.02	Letdown flow	Observe to control flow to control RCS pressure	03

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Gross Function No.	Parameter to Observe	Observation to Make	Reference No
21.02	Pressurizer Pressure	Observe to compare with Charging pump discharge pressure	03
21.02	Pressurizer level	Observe for constant value of inventory being maintained	A
=>			
21.03	CET temperature	Observe for changes in fluid temperature for anticipating fluid expansion or contraction	03
21.03	Pressurizer level	Observe for constant value for inventory being maintainew	03
21.03	Pressurizer pressure	Observe with SI pump discharge pressures	03
21.03	RCS hot leg temperature	Observe for changes in fluid temperature anticipating fluid expansion or contraction.	03
21.03	SI flow	Observe to control flow to control RCS pressure	03
=>			
22.01	Pressurizer pressure	Observe for value to compare with P-T limits	A
22.01	RCS average temperature	Observe for value to compare with P-T limits	A
22.01	RCS cold leg temperature	Observe to determine delta T between hot and cold leg temperatures for the same loop	A
22.01	RCS hot leg temperature	Observe to determine delta T between hot and cold leg temperature for the same loop	A
=>			
22.02	Main steam flow	Observe for decreasing value	03
22.02	Pressurizer pressure	Observe for decreasing value	A
22.02	RCS average temperature	Observe to determine rate of change	A
22.02	Time	Observe to determine "rate of change"	03
=>			
22.03	Main spray valve position	Observe for closed position	03
=>			
22.04	Auxiliary spray valve position	Observe for closed position	03

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Breakdown of Information to be Collected

Gross Function No.	Parameter to Observe	Observation to Make	Reference #
22.04	Charging pump status	Observe for charging pump operating	03
22.04 =>	Pursaurizer pressure	Observe for decreasing pressure	03
22.05	SI header pressure	Observe for value tu compare to RCS pressure	03
22.05	Pressurizer Pressure	Observe for decreasing value	A
22.05 =>	Pressurizer pressure	Observe for value to compare to HPSI header pressure	A
22.06	Main steam flow	Observe to mentally record value	03
22.06 =>	Steam generator level	Observe for value at or approaching normal level	03
22.07 =>	Main feedwater flow	Observe for comparison with main steam flow	03
22.08 =>	Emergency feedwater flow	Observe for comparison with steam flow maintain or restore SG level while NOT overcooling SG	03
23.01	CET temperatures	Observe to determine value consistent with RCS hot leg temperature	03
23.01 =>	RCS hot leg temperature	Observe to determine delta T between hot and cold leg temperatures for the same loop	A
23.02	Pressurizer pressure	Observe for value "close" to hot standby	A
23.02 =>	RCS average temperature	Observe for value "close" to hot standby	A
23.03	Auxiliary spray valve position	Observe for open position	03
23.03	Charging flow	Observe for flow being directed to pressurizer spray nozzle	03
23.03	Pressurizer pressure	Observe for value to assess urgency of depressurization	A
23.03	Pressurizer pressure	Observe for rate of change	A

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Gross Function No.	Parameter to Observe	Observation to Make	Reference No
23.03	RCS average temperature	Observe for value to assess urgency of depressurization	A
23.03 =>	Time	Observe to determine "rate of change"	03
24.01	13.8 kV RCP bus supply breaker	Observe for closed position	03
24.01 =>	13.8kV RCP Bus voltage	Observe for adequate value	03
24.02	Emergency feedwater flow	Observe for flow to restore SG level while NOT overcooling RCS	03
24.02	Main Feedwater flow	Observe for FWCS demanded flow	03
24.02	Main Feedwater setpoint flow	Observe for comparison to main feedwater flow and expected transient demanded for setpoint	03
24.02	Main Steam Flow	Observe for TBS demanded flow	03
24.02	Main feedwater flow	Observe for rate of change	03
24.02	RCS average temperature	Observe for value being maintained	A
24.02	Steam Generator pressure	Observe for pressure above operating pressure but below SG safety relief limits	
24.02 =>	Steam generator level	Observe for existence of level	03
24.03 =>	Pressurizer level	Observe for constant value above a specific level [56%]	A
24.04	CET temperature	Observe for value for calculation of subcooling	03
24.04 =>	Pressurizer pressure	Observe for value for calculation of subcooling	A
25.01	Charging pump operating status	Observe to determine if pumps are running	03
25.01	SI pump operating status	Observe to determine if pumps are operating	03
25.01 =>	Pressurizer pressure	Observe for value	A

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Breakdown of Information to be Collected

Gross Function No.	Parameter to Observe	Observation to Make	Reference No.
25.02	13.8KV RCP Bus amperes	Observe to determine maximum amperes is not exceeded	03
25.02	Pressurizer pressure	Observe to detect excessive rate of change	A
25.02	RCS cold leg temperature	Observe to determine delta T between hot and cold leg temperatures for the same loop	A
25.0?	RCS hot leg temperature	Observe to determine delta T between hot and cold leg temperature for the same loop	A
=>			
25.03	Pressurizer level	Observe for existance of level as void collapse may have exhausted RCS expansion inventory	A
25.03	Pressurizer pressure	Observe for constant value within operating limits for RCP operation	A
25.03	RCP 1A differential pressure	Observe to determine if pump is running.	03
25.03	RCP 1A speed	Observe to detect pump is running.	03
25.03	RCP 1B differential pressure	Observe to determine if pump is running	03
25.03	RCP 1B speed	Observe to detect pump is running	03
25.03	RCP 2A differential pressure	Observe to determine pump is running	03
25.03	RCP 2A speed	Observe to detect pump is running	03
25.03	RCP 2B differential pressure	Observe to determine if pump is running	03
25.03	RCP 2B speed	Observe to detect pump is running	
=>			
26.00	RCP 1A differential pressure	Observe to determine if RCS forced circulation flow exists.	03
26.00	RCP 1B differential pressure	Observe to determine if RCS forced circulation flow exists.	03
26.00	RCP 1B speed	Observe to detect pump is running	03
26.00	RCP 2A differential pressure	Observe to determine if RCS forced circulation flow exists.	03
26.00	RCP 2A speed	Observe to detect pump is running	03

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Breakdown of Information to be Collected

Gross Function No.	Parameter to Observe	Observation to Make	Reference No.
26.00	RCP 2B differential pressure	Observe to determine if RCS forced circulation flow exists.	03
26.00	RCP 2B speed	Observe to detect pump running	03
26.00 =>	RCP 1A speed	Observe to detect pump is running.	03
26.01	RCS cold leg temperature	Observe to determine delta T between hot and cold leg temperatures in the same loop	03
26.01	RCS hot leg temperature	Observe to determine delta T between hot and cold leg temperatures for the same loop	03
26.01	Steam generator pressure	Observe for pressure above operating pressure but below SG safety relief limits	03
26.01 =>	Time	Observe to determine time spey RCPs have been OFF	03
27.00	CET temperature	Observe for value to indicate core is being cooled	03
27.00	RCS subcooling	Observe for value to indicate two-phase conditions may exist	03
27.00 =>	Steam Generator level	Observe for existance of level	03
27.01	CET temperature	Observe for value to indicate core is being cooled	03
27.01	Main steam flow	Observe for existance of steam flow	03
27.01	RCS hot leg temperature	Observe for bottom oriented RTD sensor in hot leg to be less than other RTDs (indication of RCS condensate runback)	03
27.01	RCS hot leg temperature	Observe for value	03
27.01 =>	Steam generator level	Observe for existance of level	03
27.02	[illegible] temperature	Observe for value to indicate core is being cooled	03
27.02	Main steam flow	Observe for existance of steam flow	03

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Breakdown of Information to be Collected

Gross Function No.	Parameter to Observe	Observation to Make	Reference No.
27.02	RCS cold leg temperature	Observe for bottom oriented RTD sensor in cold leg to be less than other RTDs (indication of RCS condensate runback)	03
27.02 =>	Steam generator level	Observe for existence of level	03
27.03	CET temperature	Observe for value to indicate core is being cooled	03
27.03	Charging isolation valve position	Observe for value to indicate core is being cooled	03
27.03 =>	SI isolation valve position	Observe for open or closed position	03
28.00	Pressurizer level	Observe for constant value of inventory being maintained	A
28.00 =>	RCS hot leg temperature	Observe for value to calculate subcooling	A
28.01	CET temperature	Observe for value to calculate core subcooling	03
28.01	Pressurizer level	Observe for value at or above level specified by criteria	A
28.01	Pressurizer pressure	Observe for value to calculate core subcooling	A
28.01 =>	RCS subcooling	Observe for value at or above specified criteria	03
28.02	SI pump 1 status	Observe for pump operating status	03
28.02	SI isolation valve 1 position	Observe for throttle position	03
28.02	SI pump 2 status	Observe for pump operating status	03
28.02	SI pump 3 status	Observe for pump operating status	03
28.02	SI pump 4 status	Observe for pump operating status	03
28.02	SI isolation valve 2 position	Observe for throttle position	03
28.02	SI isolation valve 3 position	Observe for throttle position	03
28.02 =>	SI isolation valve 4 position	Observe for throttle position	03

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Gross Function No.	Parameter to Observe	Observation to Make	Reference No
28.03	SI pump 1 status	Observe for pump running status	03
28.03	Pressurizer level	Observe for changes in level	A
28.03	Pressurizer pressure	Observe for changes in pressure	A
28.03	SI isolation valve 1 position	Observe for position	03
28.03	SI pump 2 status	Observe for pump running status	03
28.03	SI pump 3 status	Observe for pump running status	03
28.03	SI pump 4 status	Observe for pump running status	03
28.03	SI isolation valve 2 position	Observe for position	03
28.03	SI isolation valve 3 position	Observe for position	03
28.03 =>	SI isolation valve 4 position	Observe for position	03
29.00	Pressurizer level	Observe for dropping level	A
29.00 =>	Pressurizer pressure	Observe for dropping pressure	A
29.01	CET temperature	Observe for value to calculate core subcooling	
29.01	Pressurizer level	Observe for value at or above level specified by criteria	A
29.01	Pressurizer pressure	Observe for value to calculate core subcooling	A
29.01	Pressurizer pressure	Observe for value to calculate core subcooling	A
29.01 =>	RCS subcooling	Observe for value at or above specified criteria	03
29.02	SI isolation valve 1 position	Observe for open position	03
29.02	SI pump 1 status	Observe for pump running status	03
29.02	SI pump 2 status	Observe for pump running status	03
29.02	SI pump 3 status	Observe for pump running status	03
29.02	SI pump 4 status	Observe for pump running status	03

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Breakdown of Information to be Collected

Gross Function No.	Parameter to Observe	Observation to Make	Reference N
29.02	SI isolation valve 2 position	Observe for open position	03
29.02	SI isolation valve 3 position	Observe for open position	03
29.02 =>	SI isolation valve 4 position	Observe for open position	03
29.03	SI pump 1 status	Observe for pump running status	02
29.03	Pressurizer level	Observe for changes in level	A
29.03	Pressurizer pressure	Observe for changes in pressure	A
29.03	SI isolation valve 1 position	Observe for open position	03
29.03	SI pump 2 status	Observe for pump running status	03
29.03	SI pump 3 status	Observe for pump running status	03
29.03	SI pump 4 status	Observe for pump running status	03
29.03	SI isolation valve 2 position	Observe for open position	03
29.03	SI isolation valve 3 position	Observe for open position	03
29.03 =>	SI isolation valve 4 position	Observe for open position	03
30.00	Containment sump	Observe for value to determine inventory reserve capacity	03
30.00 =>	IRWT level	Observe for value to determine inventory reserve capacity	03
31.01	IRWT level	Observe for value at or below specifed level	03
31.01	Recirculation isolation valve	Observe for open position	03
31.01 =>	Recirculation pump status	Observe for pump running status	03
31.02 =>	Containment sump level	Observe for existence of level	03
32.00 =>	Steam generator pressure	Observe for value at or above specified pressure during depressurization	03
32.01 =>	MSIS blocked status	Observe to confirm MSIS actuation has been blocked	03

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From Function No.	Parameter to Observe	Observation to Make	Reference No
33.00	Pressurizer pressure	Observe for value at or above specified pressure during depressurization	03
=>			
33.01	SI tank 2 isolation valve	Observe for closed position	03
33.01	SI tank 3 isolation valve	Observe for closed position	03
33.01	SI tank 4 isolation valve	Observe for closed position	03
33.01	SI tank isolation 1 valve	Observe for closed position	03
=>			
33.02	Pressurizer pressure	Observe for value at or above specified pressure during depressurization	03
33.02	SI tank 1 vent valve position	Observe for open position	03
33.02	SI tank 2 vent valve position	Observe for open position	03
33.02	SI tank 3 vent valve position	Observe for open position	03
33.02	SI tank 4 vent valve position	Observe for open position	03
=>			
33.03	Pressurizer pressure	Observe for value at or above specified pressure during depressurization.	
33.03	SI tank 1 drain valve position	Observe for open position	03
33.03	SI tank 2 drain valve position	Observe for open position	03
33.03	SI tank 3 drain valve position	Observe for open position	03
33.03	SI tank 4 drain valve position	Observe for open position	03
=>			
34.00	Pressurixer pressure	Observe for value at or above specific pressure during depressurization and cooldown	03
34.00	RCS average temperature	Observe for value at or above specific pressure during depressurization and cooldown	03
=>			
35.00	CET temperatures	Observe for value to confirm core cooling	03
35.00	SI flow header 1	Observe for existance of flow	03
35.00	SI flow header 2	Observe for existance of flow	03

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Gross Function No.	Parameter to Observe	Observation to Make	Reference No
35.00	Pressurizer pressure	Observe for value at or below specific pressure during depressurization	03
35.00	SI flow header 3	Observe for existance of flow	03
35.00	SI flow header 4	Observe for existance of flow	03
=>			
36.00	Pressurizer level	Observe for value at or above specific level during depressurization and cooldown	A
36.00	Pressurizer pressure	Observe for value at or below specific pressure during depressurization and cooldown	03
36.00	RCS average temperature	Observe for value at or below specific temperature during depressurization and cooldown	03
36.00	RCS subcooling	Observe for value at or above specific criteria	03
=>			
37.00	Pressurizer pressure	Observe for changes in pressure that are LESS than expected	03
=>			
39.00	Pressurizer level	Observe for constant value of inventory being maintained	10
39.00	RCS hot leg temperature	Observe for value to calculate subcooling	10
=>			
39.01	CET temperature	Observe for value to calculate core subcooling	03
39.01	Pressurizer Pressure	Observe for value to calculate subcooling	10
39.01	Pressurizer level	Observe for value at or above level specified by criteria	10
39.01	RCS subcooling	Observe for value at or above specific criteria	03
=>			
39.02	SI pump 1 status	Observe for pump running status	03
39.02	SI isolation valve position	Observe for throttle position	03

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Gross Function No.	Parameter to Observe	Observation to Make	Reference No.
39.02	SI pump 2 status	Observe for pump running status	03
39.02	SI pump 3 status	Observe for pump running status	03
39.02	SI pump 4 status	Observe for pump running status	03
39.03	SI pump 1 status	Observe for pump running status	03
39.03	Pressurizer level	Observe for changes in level	10
39.03	Pressurizer pressure	Observe for changes in pressure	10
39.03	SI isolation valve position	Observe for throttle position	03
39.03	SI pump 2 status	Observe for pump running status	03
39.03	SI pump 3 status	Observe for pump running status	03
39.03	SI pump 4 status	Observe for pump running status	03
40.00	Pressurizer level	Observe for drop in level	10
40.00	Pressurizer pressure	Observe for drop in pressure	10
40.01	CET temperature	Observe for value to calculate core subcooling	[illegible]
40.01	Pressurizer level	Observe for value to calculate core subcooling	10
40.01	Pressurizer pressure	Observe for value to calculate core subcooling	10
40.01	RCS subcooling	Observe for value at or above specified criteria	03
40.02	SI pump 1 status	Observe for pump running status	03
40.02	SI isolation valve 1 position	Observe for open position	03
40.02	SI pump 2 status	Observe for pump running status	03
40.02	SI pump 3 status	Observe for pump running status	03
40.02	SI pump 4 status	Observe for pump running status	03
40.02	SI isolation valve 2 position	Observe for open position	03

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Gross Function No.	Parameter to Observe	Observation to Make	Reference No
40.02	SI isolation valve 3 position	Observe for open position	03
40.02 =>	SI isolation valve 4 position	Observe for open position	03
40.03	SI pump 1 status	Observe for pump running status	03
40.03	Pressurizer level	Observe for changes in level	10
40.03	Pressurizer pressure	Observe for changes in pressure	10
40.03	SI isolation valve 1 position	Observe for open position	03
40.03	SI pump 2 status	Observe for pump running status	03
40.03	SI pump 3 status	Observe for pump running status	03
40.03	SI pump 4 status	Observe for pump running status	03
40.03	SI isolation valve 2 position	Observe for open position	03
40.03	SI isolation valve 3 position	Observe for open position	03
40.03 =>	SI isolation valve 4 position	Observe for open position	03
41.00	Charging flow	Observe for existance of flow in RCS	03
41.00	Charging isolation valve position	Observe for open position	03
41.00	Letdown flow	Observe for existance of flow from RCS	03
41.00	Letdown isolation valve position	Observe for open position	03
41.00	Pressurizer level	Observe for existance of inventory in Pressurizer	10
41.00 =>	Pressurizer pressure	Observe to (mentally) record value for assessment of charging flow to RCS	10
42.00	Pressurizer pressure	Observe for value to assess later control performance.	03
42.00	RCP 1A differential pressure	Observe to determine if a loop 1 RCP is running to make available Pressurizer Main Spray.	
42.00 =>	RCP 1B differential pressure	Observe to determine if a loop 1 RCP is operating to make available Pressurizer Main Spray.	03

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Gross Function No.	Parameter to Observe	Observation to Make	Reference No
42.01	Pressurizer pressure	Observe to determine rate of change	10
42.01	Time	Observe to determine "rate of change"	03
42.02	Charging flow	Observe to control flow to control RCS pressure	03
42.02	Charging pump pressure	Observe to maintain at or less than RCS pressure	03
42.02	Letdown flow	Observe to control flow to control RCS pressure	03
42.02	Pressurizer level	Observe for constant value of inventory being maintained	10
42.02	Pressurizer pressure	Observe to compare with charging pump discharge pressure	10
42.03	SI header pressure	Observe for value to compare to RCS pressure	03
42.03	Pressurizer pressure	Observe for decreasing value	10
42.03	Pressurizer pressure	Observe to compare to HPSI header pressure	
43.01	Pressurizer pressure	Observe for value to compare with P-T limits	A
43.01	RCS average temperature	Observe for value to compare with P-T limits	A
43.01	RCS cold leg temperature	Observe to determine delta T between hot and cold leg temperature for the same loop	A
43.01	RCS hot leg temperature	Observe to determine delta T between hot and cold leg temperature for the same loop	A
43.02	Main Steam flow	Observe for decreasing value	03
43.02	Pressurizer pressure	Observe for decreasing value	A
43.02	RCS average temperature	Observe to determine rate of change	A
43.02	Time	Observe to determine "rate of change"	03

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Gross Function No.	Parameter to Observe	Observation to Make	Reference No.
43.03 =>	Main Spray valve position	Observe for closed position	03
43.04	Auxiliary spray valve position	Observe for closed position	03
43.04	Charging pump status	Observe for charging pump operating	03
43.04 =>	Pressurizer pressure	Observe for decreasing pressure	A
43.05	SI header pressure	Observe for value to compare to RCS pressure	03
43.05	Pressurizer pressure	Observe for decreasing value	A
43.05 =>	Pressurizer pressure	Observe for value to compare to HPSI header pressure	A
44.00	Main Steam flow	Observe to (mentally) record value	03
44.00 =>	Steam generator level	Observe for value at or approaching normal level	03
44.01 =>	Main feedwater flow	Observe for comparison with main steam flow	03
44.02 =>	Emergency feedwater flow	Observe for comparison with steam flow to maintain or restore SG level while NOT overcooling SG	03
45.00	Condensate storage tank level	Observe to (mentally) record value for calculation of reserves availability	03
45.00 =>	IRWT level	Observe to (mentally) record value for calculation of reserves availability	03
46.01	BAM tank boron concentration	Observe to calculate amount of borated makeup to add	03
46.01	RCS boron concentration	Observe to record representative boron concentration of the RCS fluids	03
46.01 =>	RCS hot leg sample valve position	Observe for open position	03
46.02	Pressurizer boron concentration	Observe to record representation boron concentration of the Pressurizer fluid	03

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Gross Function No.	Parameter to Observe	Observation to Make	Reference No
46.02	Pzr liquid sample valve position	Observe for open position	03
46.02	RCP operating status	Observe to determine if RCPs are operating	03
=>			
46.03	Pressurizer boron concentration	Observe to record representative boron concentration of the Pressurizer fluid	03
46.03	Pzr liquid sample valve position	Observe for open position	03
46.03	RCP operating status	Observe to determine if RCPs are NOT operating	03
=>			
47.00	Condenser cooling water flow	Observe for existance of cooling water flow through condenser	03
47.00	Condenser cooling water temperature	Observe to evaluate adequacy of cooling water to remove heat	03
47.00	Condenser pressure	Observe for existance of condenser vacuum	03
47.00	Turbine exhaust temperature	Observe for existance of condenser vacuum	03
=>			
47.01	Condenser cooling water flow	Observe for existance of cooling water flow through condenser	03
47.01	Condenser cooling water temperature	Observe to evaluate adequacy of cooling water to remove heat under TBS load	03
47.01	Condenser hotwell level	Observe for value	03
47.01	Condenser pressure	Observe to maintain vacuum under TBS load	03
47.01	RCS average temperature	Observe to determine rate of change	A
47.01	Time	Observe to determine "rate of change"	03
47.01	Turbine exhaust temperature	Observe for value	03
=>			
47.02	RCS average temperature	Observe to determine value of temperature to be consistent with SG pressure	A
47.02	RCS average temperature	Observe to determine rate of change	A

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Gross Function No.	Parameter to Observe	Observation to Make	Reference No
47.02	Steam generator pressure	Observe for pressure above operating pressure but below SG safety relief limits	03
47.02 =>	Time	Observe to determine "rate of change"	03
48.01	CET temperatures	Observe to determine value consistent with RCS hot leg temperature	03
48.01	RCS cold leg temperature	Observe to determine delta T between hot and cold leg temperatures for the same loop	03
48.01	RCS hot leg temperature	Observe to determine delta T between hot and cold leg temperatures for the same loop	03
48.01 =>	RCS hot leg temperature	Observe for value	03
48.02	Pressurizer pressure	Observe for value "close" to hot standby	A
48.02 =>	RCS average temperature	Observe for value "close" to hot standby	03
48.03	Auxiliary spray valve position	Observe for open position	03
48.03	Charging flow	Observe for flow being directed to pressurizer spray nozzle	03
48.03	Pressurizer pressure	Observe for value to assess urgency of depressurization	A
48.03	Pressurizer pressure	Observe for rate of change	A
48.03	RCS average temperature	Observe for value to assess urgency of depressurization	03
48.03 =>	Time	Observe to determine "rate of change"	03
49.00	13.8 kV RCP bus supply breaker	Observe for closed position	03
49.00	13.8 kV RCP bus voltage	Observe for adequate value	03
49.00	Pressurizer level	Observe for constant value of inventory being maintained above specified procedural value.	03

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Gross Function No.	Parameter to Observe	Observation to Make	Reference No
49.00	Pressurizer pressure	Observe for value of calculation of subcooling	03
49.00	RCS average temperature	Observe for value for calculation of subcooling	03
49.00	RCS cold leg temperature	Observe for value for calculation of subcooling	03
49.00	RCS hot leg temperature	Observe for value for calculation of subcooling	03
49.00	Steam generator level	Observe for the existance of level.	
49.00	Steam generator pressure	Observe for pressure above operating pressure but below SG safety relief pressure.	03
=>			
50.01	Charging pump operating status	Observe to determine if pumps are running	03
50.01	SI pump operating status	Observe to determine if pumps are operating	03
50.01	Pressurizer pressure	Observe for value	
=>			
50.02	13.8kV RCP bus amperes	Observe to determine maximum amperes is not exceeded	03
50.02	Pressurizer pressure	Observe to detect excessive rate of change	A
50.02	RCS cold leg temperature	Observe to determine delta T between hot and cold leg temperatures for the same loop	A
50.02	RCS hot leg temperature	Observe to determin delta T between hot and cold leg temperature for the same loop	A
=>			
50.03	Pressurizer level	Observe for existance of level as void collapse may have exhausted RCS expansion inventory	03
50.03	Pressurizer pressure	Observe for constant value within operating limits for RCP operation	A
50.03	RCP 1A differential pressure	Observe to determine if pump is running.	03

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Gross Function No.	Parameter to Observe	Observation to Make	Reference No.
50.03	RCP 1A speed	Observe to detect pump running.	03
50.03	RCP 1B differential pressure	Observe to determine if pump is running.	03
50.03	RCP 1B speed	Observe to detect pump running	03
50.03	RCP 2A differential pressure	Observe to determine if pump is running	03
50.03	RCP 2A speed	Observe to detect pump running	03
50.03	RCP 2B differential pressure	Observe to determine if pump is running	03
50.03	RCP 2B speed	Observe to detect pump running	03
51.00	RCP 1A differential pressure	Observe to determine if RCP is running	03
51.00	RCP 1B differential pressure	Observe to determine if RCP is running	03
51.00	RCP 2A differential pressure	Observe to determine if RCP is running	03
51.00	RCP 2B differential pressure	Observe to determine if RCP is running	03
51.00	RCP 1A speed	Observe to determine if RCP is running	03
51.00	RCP 1B speed	Observe to detect pump running	03
51.00	RCP 2A speed	Observe to detect pump running	03
51.00	RCP 2B speed	Observe to detect pump running	03
51.01	RCS cold leg temperature	Observe to determine delta T between hot and cold leg temperatures in the same loop	03
51.01	RCS hot leg temperature	Observe to determine delta T between hot and cold leg temperatures for the same loop	03
51.01	Steam generator pressure	Observe for pressure above operating pressure but below SG safety relief limits	03
51.01	Time	Observe to determine time span RCPs have been OFF	03
52.00	Pressurizer pressure	Observe for value at or above specified pressure during depressurization	A

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Gross Function No.	Parameter to Observe	Observation to Make	Reference No.
52.00 =>	Steam generator pressure	Observe for value at or above specified pressure during depressurization	03
52.01	MSIS blocked status	Observe to confirm MSIS actuation has been blocked	03
52.01 =>	Steam generator pressure	Observe to determine if pressure is below actuation pressure	03
52.02	CIAS blocked status	Observe to confirm CIAS actuation has been blocked	03
52.02	Pressurizer pressure	Observe to determine if pressure is below actuation pressure	03
52.02 =>	SIAS blocked status	Observe to confirm SIAS actuation has been blocked.	
53.00 =>	Pressurizer pressure	Observe for value at or above specified pressure during depressurization	A
53.01	SI tank 1 isolation valve	Observe for closed position	[illegible]
53.01	SI tank 2 isolation valve	Observe for closed position	03
53.01	SI tank 3 isolation valve	Observe for closed position	03
53.01 =>	SI tank 4 isolation valve	Observe for closed position	03
53.02	Pressurizer pressure	Observe for value at or above specified pressure during depressurization	A
53.02	SI tank 1 pressure	Observe to monitor tank depressurization	03
53.02	SI tank 2 pressure	Observe to monitor tank depressurization	03
53.02	SI tank 3 pressure	Observe to monitor tank depressurization	03
53.02	SI tank 4 pressure	Observe to monitor tank depressurizeiton	03
53.02	SI tank 1 vent valve position	Observe for open position	03
53.02	SI tank 2 vent valve position	Observe for open position	03
53.02	SI tank 3 vent valve position	Observe for open position	03
53.02 =>	SI tank 4 vent valve position	Observe for open position	03

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Breakdown of Information to be Collected

Gross Function No.	Parameter to Observe	Observation to Make	Reference No.
53.03	Pressurizer pressure	Observe for value at or above specified pressure during depressurization	A
53.03	SI tank 1 pressure	Observe to monitor tank depressurization	03
53.03	SI tank 2 pressure	Observe to monitor tank depressurization	03
53.03	SI tank 3 pressure	Observe to monitor tank depressurization	03
53.03	SI tank 4 pressure	Observe to monitor tank depressurization	03
53.03	SI tank 1 drain valve position	Observe for open position	03
53.03	SI tank 2 drain valve position	Observe for open position	03
53.03	SI tank 3 drain valve position	Observe for open position	03
53.03	SI tank 4 drain valve position	Observe for open position	03
=>			
54.00	Pressurizer pressure	Observe for value at or above specific pressure during depressurization and cooldown	A
54.00	RCS average temperature	Observe for value at or above specific pressure during depressurization and cooldown	A
=>			
55.00	Pressurizer level	Observe for value at or above specific level during depressurization and cooldown	A
55.00	Pressurizer pressure	Observe for value at or below specific pressure during depressurization and cooldown	A
55.00	RCS average temperature	Observe for value at or below specific temperature during depressurization and cooldown	A
55.00	RCS subcooling	Observe for value at or above specific criteria	03
=>			
56.00	Pressurizer pressure	Observe for changes in pressure that are LESS than expected	A

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Breakdown of Information to be Collected

Gross Function No.	Parameter to Observe	Observation to Make	Reference No
1.01	CEA position	Observe to determine position of CEA in core/fuel	03
1.01	CEA position	Observe for CEA bottomed position	
1.01	Reactor Power (NI)	Observe nuclear instrumentation for decay value (indication that reactor is shutting down)	03
1.01	Startup Rate (NI)	Observe nuclear instrumentation for negative rate of change	03
=>			
1.02	13.8 kV Service Bus feeder	Observe for closed Breaker	03
1.02	DG output breaker	If DG is off, Observe for open position	03
1.02	DG output breaker	If DG is running AND 13.8 kV service bus is without power, Observe for closed position	03
1.02	DG output frequency	If DG is started, Observe for generator frequency adequate.	03
1.02	DG output voltage	If DG is started, Observe for output voltage adequate.	
1.02	Turbine Generator Breaker position	Observe for open indication of TG output breaker	03
1.02	Turbine Trip	Observe for turbine trip in trip actuation position or status	03
=>			
1.03	Charging flow	Observe for PLCS demanded flow.	03
1.03	Letdown flow	Observe for PLCS demanded flow.	03
1.03	PLCS setpoint level	Observe for comparison to Pressurizer level with RRS setpoint demand or demand previously set if manual setpoint	03
1.03	Pressurizer level	Observe to determine rate of inventory change	03
1.03	Pressurizer level	Observe for PLCS demanded level	03
1.03	RCS subcooling	Observe that RCS fluids are subcooled	
1.03	Time	Observe to determine "rate of change"	
=>			

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Breakdown of Information to be Collected

Gross Function No.	Parameter to Observe	Observation to Make	Reference No.
1.04	PPCS setpoint pressure	Observe for similarities to pressurizer pressure	03
1.04	Pressurizer Pressure	Observe for PPCS demanded pressure	03
1.04	Pressurizer pressure	Observe to determine rate of change	03
=> 1.04	Time	Oberve to determine "rate of change"	
1.05	RCP Amperes	Observe for trend of curre[illegible] to determine if RCPs operating (an ana[illegible] value method)	03
1.05	RCP speed	Observe to determine if RCPs are operating (an alternate - digital value method)	03
1.05	RCS cold leg temperature	Observe to determine delta T between hot and cold leg temperatures for the same loop	03
1.05	RCS hot leg temperature	Observe to determine delta T between hot and cold leg temperatures for the same loop	03
=>			
1.06	Emergency Feedwater flow	Observe for flow to restore SG level while NOT overcooling RCS	
1.06	Main Feedpump speed	Observe for (RTO) response to slow speed	16
1.06	Main Feedwater flow	Observe for FWCS demanded flow to restore SG level without overcooling the RCS	16
1.06	Main Steam Flow	Observe for TBS demanded flow	
1.06	Main feed flow	Observe for reactor trip override (RTO) response (a bypass controlling flowrate is expected)	16
1.06	RCS average temperature	Observe for value being maintained constant	03
1.06	Steam Generator level	Observe for existence of level	
1.06	Steam Generator pressure	Observe for pressure above operating pressure but below SG safety relief limits	03
=>			

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Breakdown of Information to be Collected

Gross Function No.	Parameter to Observe	Observation to Make	Reference No.
1.07	Containment area radiation	Observe all radiation monitors clear	
1.07	Containment pressure	Observe for existence of pressure above normal containment atmosphere	03
1.07	Steam plant radiation	Observe for which steam line indicates high radiation	
=>			
1.08	Containment pressure	Observe for any value above normal	
1.08	Containment temperature	Observe for any value above normal	
=>			
1.09	Containment pressure	Observe for any value above normal	
1.09	Containment temperature	Observe for any value above normal	
=>			
2.00	Air Ejector High Activity	Observe that high activity exists in steam lines (either SG affected)	
2.00	Air Ejector High Activity	Observe that high activity exists in steam lines (either SG affected) prior to Reactor Trip	
2.00	Pressurizer Level	Observe decreasing level at rate greater than RCS makeup response (i.e. "noticable rate")	
2.00	Pressurizer Pressure	Observe pressure decreasing at rate greater than heater capacity can makeup (i.e. "noticable rate")	03
2.00	SG Blowdown High Activity	Observe that high activity exists in a Steam Generator	
2.00	SG level	Observe for increasing level	
2.00	Steam Generator Level	Observe to (mentally) record level to evaluate rate of change.	03
2.00	Steam Generator Level	Observe for increase in a Steam Generator's level	
2.00	Time	Observe to determine "rate of change"	
2.00	Time	Observe to (mentally) record baseline of initiation of event.	
=>			
3.00	CEA position	Observe that all CEAs are positioned to be fully inserted into the core region	

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Breakdown of Information to be Collected

Gross Function No.	Parameter to Observe	Observation to Make	Reference No
3.00	Electrical power available (list)	Observe that reliable electrical power is available to specific equipment required for plant safety	
3.00	Pressurizer Level	Observe for existance of RCS inventory	03
3.00	Pressurizer Pressure	Observe to (mentally) record pressure to calculate subcooling	03
3.00	RCS subcooling	Observe for minimum subcooling	
3.00	Steam Generator Level	Observe for existence of level for RCS heat removal availability	
=>			
4.00	Air Ejector High Activity	Observe that high activity is confirmed to exist in steam lines	
4.00	SG Blowdown High Activity	Observe that high activity exists in a Steam Generator	
4.00	Steam Generator Level	Observe for increasing level	
=>			
5.00	SG liquid sample for Boron	Read or listen to determine which SG has leakage from the RCS.	
5.00	SG liquid sample high activity	Read or listen to determine which SG has leakage from the RCS.	
=>			
6.00	Pressurizer Level	Observe for decreasing level	03
6.00	Pressurizer Pressure	Observe pressure and rate of pressure decrease to (1300 psia or required worst case event SI and RCP setpoints)	03
6.00	RCS subcooling	Observe for minimum subcooling	
6.00	Time	Observe to (mentally) record baseline time for (automatic) system re-alignment (note: loss of CCW to RCPs)??	
=>			
6.01	SI pressure	Observe for indication that HPSI header is pressurized	
6.01	Safety injection flow	Observe for indication of HPSI flow to RCS	
=>			
7.00	Charging flow	Observe for the presence of maximum charging flow to the RCS	

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Breakdown of Information to be Collected

Gross Function No.	Parameter to Observe	Observation to Make	Reference No.
7.00	Safety Injection Flow	Observe for the presence of Safety Injection flow	
=>			
7.01	Charging pump flow	Observe for flow consistent with the number of charging pumps running	
7.01	Charging pump status	Observe all available charging pumps running	
=>			
7.02	SI pump 1 status	Observe for indication that all HPSI pumps are operating	
7.02	SI pump 2 status	Observe for indication that all HPSI pumps are operating	
7.02	SI pump 3 status	Observe for indication that all HPSI pumps are operating	
7.02	SI pump 4 status	Observe for indication that all HPSI pumps are operating	
=>			
7.03	SI pump power available	Observe for power available to HPSI pumps not operating	
=>			
7.04	Charging isolation valve position	Observe for open position	
7.04	SI isolation valve position	Observe for open position	
=>			
7.05	CCW to HPSI seal & coolers	Observe for component cooling performance adequate	
=>			
8.00	Pressurizer Pressure	Observe pressure maintaining greater than RCP lowest operating pressure	03
8.00	RCP bleedoff flow	Observe for the proper operation of RCP bleedoff flow	
8.00	RCP seal temperature(s)	Observe to (mentally) record RCP seal temperatures	
=>			
8.01	RCP Amperes	Observe for RCPs deenergized (alternate)	
8.01	RCP 1A speed	Observe to determine if RCPs have stopped	

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Breakdown of Information to be Collected

Gross Function No.	Parameter to Observe	Observation to Make	Reference No
8.01	RCP 1B speed	Observe to determine if RCPs have stopped.	03
8.01	RCP 2A speed	Observe to determine if RCPs have stopped.	03
8.01	RCP 2B speed	Observe to determine if RCPs have stopped.	03
=>			
8.02	Pressurizer pressure	Observe for comparison to RCP operating limits	03
8.02	RCS cold leg temperature	Observe for comparision to RCP operating limits	03
=>			
8.03	RCP Amperes	Observe for RCP deenergized (alternate)	
8.03	RCP 1A speed	Observe for RCP stopped	
8.03	RCP 1B speed	Observe for RCP stopped.	03
8.03	RCP 2A speed	Observe for RCP stopped	
8.03	RCP 2B speed	Observe for RCP stopped.	
=>			
9.01	Condenser Vacuum	Observe to determine if TBS can be used for heat removal, or ADVs must be used	
9.01	RCS Hot Leg Temperature	Observe hot leg temperature maintaining less than 545 degrees F	03
9.01	RCS Hot Leg Temperature	Observe hot leg temperature maintaining less than 520 degrees F	03
9.01	SG Safety valve position	Observe for closed safety valve position Steam flow only via TBS or ADV path as directed by Tech Support Center	
9.01	SG liquid sample results	Read or Listen to results of SG liquid samples	
=>			
9.02	Main Steam flow	Observe to (mentally) record value to later evaluate feedwater requirements	
9.02	Steam Generator Level	Observe for constant steam and feed rate & increasing level	
9.02	Steam generator pressure	Observe pressure does not indicate a possible ESDE	
=>			

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Breakdown of Information to be Collected

Gross Function No.	Parameter to Observe	Observation to Make	Reference No.
9.03	Condensate hotwell level	Observe for adequate condensate inventory	
9.03	Main feedwater flow	Observe for (RTO) feedwater flow to restor or maintain SG level without overcooling RCS - Tave controlled.	
=>			
9.04	Emergency feedwater flow	Observe for feedwater flow to restore or maintain SG level without overcooling the RCS - low flow rates	
=>			
10.02	Steam Generator Level	Observe for increasing level in isolated Steam Generator	
10.02	Steam Generator Pressure	Observe for pressure increase in isolated SG	
=>			
11.00	Steam Generator Level	Observe for increases in level	
11.00 =>	Steam Generator Pressure	Observe for pressure increases	
11.01	Steam Generator Level	Observe for changes in level	
11.01 =>	Steam Generator Pressure	Observe for changes in SG pressure	
11.02	Main Feedwater Flow	Observe to confirm feedwater flow conditions are controlable	
11.02	Main Steam Flow	Observe to confirm steam flow conditions are controlable.	
11.02 =>	RCS average temperature	Observe that it is NOT increasing	03
12.01	SG blowdown valve position	Observe for open position	
12.01	Steam generator blowdown flow	Observe for flow less than maximum Blowdown rate	
12.01	Steam generator level	Observe to determine/prevent SG from going SOLID.	
=>			
12.02	Pressurizer Pressure	Observe to compare w/SG pressure for approach to + or - 50 psid difference.	03
12.02	Steam Generator pressure	Observe to compare w/RCS pressure for approach to + or - 50 psid difference.	
=>			

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Breakdown of Information to be Collected

Gross Function No.	Parameter to Observe	Observation to Make	Reference N
13.01	Main Steam flow	Observe to confirm controlable flow	
13.01 =>	Steam generator level	Observe to confirm within operating band or limits	
13.02	Condenser hotwell level	Observe to determine amount of condensate inventory.	
13.02 =>	Main feedflow	Observe to confirm a controlable flow	
13.03	Condensate storage tank level	Observe to determine amount of condensate inventory.	
13.03 =>	Emergency feedwater flow	Observe to confirm a controlable flow	
14.00	Core CET temperatures	Observe to record for later calculation of Core Subcooling	
14.00	Emergency Feedwater Flow	Observe for the existance of feedwater flow to SG	
14.00	Main Feedwater Flow	Observe for the existance of feedwater flow to SG	
14.00	Main Steam Flow	Observe for the existance of Steam flow from SG	
14.00	Pressurizer Level	Observe for indication of level with a constant or increasing level	A
14.00 =>	Safety Injection Flow	Observe to (mentally) record present flow conditions	
14.03	Pressurizer Level	Observe for a constant or controlable level	
14.03 =>	Pressurizer Pressure	Observe for a constant or controlable pressure	
15.00	Pressurizer Level	Observe for decreasing level	A
15.00 =>	Pressurizer Pressure	Observe for decreasing pressure	A
15.01	Core CET temperatures	Observe to record for later calculation of Core Subcooling	

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Breakdown of Information to be Collected

Gross Function No.	Parameter to Observe	Observation to Make	Reference No.
15.01 =>	RCS Subcooling	Observe for decreasing subcooling	
15.02	Safety injection flow	Observe to determine and confirm full SI flow to the core	
15.02	SI pump 1 status	Observe for pump running status	
15.02	SI pump 2 status	Observe for pump running status	
15.02	SI pump 3 status	Observe for pump running status	
15.02	SI pump 4 status	Observe for pump running status	
15.02	SI isolation valve 1 position	Observe for open position	
15.02	SI isolation valve 2 position	Observe for open position	
15.02	SI isolation valve 3 position	Observe for open position	
15.02 =>	SI isolation valve 4 position	Observe for open position	
16.00	Charging flow	Observe for the existance of Charging flow and (mentally) record value	
16.00	Letdown Flow	Observe for the existance of letdown flow and (mentally) record value	
16.00	Pressurizer Level	Observe for the existance of level and a constant or maintaining level	A
16.00 =>	RCS Subcooling	Observe for minimum acceptable subcooling	
17.01	Pressurizer Pressure	Observe to (mentally) record RCS pressure	A
17.01 =>	RCS cold leg temperature	Observe to (mentally) record RCS temperature	A
17.02 =>	RCS average temperature	Observe for a constant temperature	A
17.03 =>	Pressurizer pressure	Observe for a decreasing pressure	A
17.04	Charging pump status	Observe charging pumps are operating	
17.04 =>	Pressurizer pressure	Observe for a decreasing pressure	A

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Breakdown of Information to be Collected

Gross Function No.	Parameter to Observe	Observation to Make	Reference No.
17.05	Pressurizer pressure	Observe for a decreasing pressure	A
17.05	SI flow header 1	Observe to confirm changes in flow for termination/throttling criteria decision	
17.05	SI flow header 2	Observe to confirm changes in flow for termination/throttling criteria decision	
17.05	SI flow header 3	Observe to confirm changes in flow for termination/throttling criteria decision	
17.05	SI flow header 4	Observe to confirm changes in flow for termination/throttling criteria decision	
=>			
17.06	Main steam flow	Observe for existance of flow to determine if heat sink exists (using either TBS or ADVs)	
17.06	Steam generator level	Observe for a level within allowable bands or limits	
=>			
17.07	Condensate hotwell level	Observe to determine amount of condensate inventory.	
17.07	Main feedwater flow	Observe for existance of flow to unisolated SG.	
=>			
17.08	Condensate storage tank level	Observe to determine amount of condensate inventory	
17.08	Emergency feedwater flow	Observe for existance of flow to unisolated SG	
=>			
18.01	Core CET temperatures	Observe to (mentally) record Core temperature	
18.01	RCS cold leg temperature	Observe to (mentally) record RCS SG return temperature	03
18.01	RCS hot leg temperature	Observe to (mentally) record RCS SG supply temperature	03
=>			
18.02	RCP seal stage pressure(s)	Observe to (mentally) record pressures	
18.[illegible]	RCP seal stage temperatures	Observe to (mentally) record temperatures	

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Breakdown of Information to be Collected

Gross Function No.	Parameter to Observe	Observation to Make	Reference No.
18.02 =>	Time	Observe to (mentally) record time to calculate time duration of CCW interruption to RCPs	
18.03 =>	Pressurizer Pressure	Observe to (mentally) record RCS pressure	03
19.01 =>	Electrical power available (list)	Observe that reliable electrical power is available to start and run RCPs	
19.02	Emergency Feedwater Flow	Observe for existance of Emergency feedwater flow to SG	
19.02	Main Feedwater Flow	Observe for existance of Main feedwater flow to SG	
19.02 =>	Main Steam Flow	Observe for existance of Steam flow from SG	
19.03 =>	Pressurizer Level	Observe for level being maintained	A
19.04	Core CET temperatures	Observe to (mentally) record Core temperatures	
19.04	Pressurizer pressure	Observe for pressure being maintained	03
19.04 =>	RCS Subcooling	Observe for minimum subcooling	
20.01 =>	Pressurizer level	Observe for excessive shrinkage	A
20.02	RCP amperes	Observe for existance of a loaded motor driving RCS fluid	
20.02	RCP 1A speed	Observe for existance of rotation of motor to drive pump	
20.02	RCP 1B speed	Observe for existance of rotation of motor to drive pump	
20.02	RCP 2A speed	Observe for existance of rotation of motor to drive pump	
20.02 =>	RCP 2B speed	Observe for existance of rotation of motor to drive pump	

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Gross Function No.	Parameter to Observe	Observation to Make	Reference No
20.03	RCP 1A bleedoff flow	Observe for existance of bleedoff flow	
20.03	RCP 1A motor temperature	Observe to (mentally) record temperature for checking proper electrical heat dissipation	
20.03	RCP 1A seal stage pressure(s)	Observe to (mentally) record pressures	
20.03	RCP 1A seal stage temperatures	Observe to (mentally) record temperature	
20.03	RCP 1B bleedoff flow	Ob[illegible] for existance of bleedoff flow	
20.03	RCP 2A bleedoff flow	Observe for existance of bleedoff flow.	
20.03	RCP 2B bleedoff flow	Observe for existance of bleedoff flow	
20.03	RCP 1B motor temperature	Observe to (mentally) record temperature for checking proper electrical heat dissipation.	
20.03	RCP 2A motor temperature	Observe to (mentally) record temperature for checking proper electrical heat dissipation.	
20.03	RCP 1B seal stage pressure(s)	Observe to (mentally) record pressures	
20.03	RCP 2A seal stage pressure(s)	Observe to (mentally) record pressures	
20.03	RCP 2B seal stage pressure(s)	Observe to (mentally) record pressures	
20.03	RCP 1B seal stage temperatures	Observe to (mentally) record temperature	
20.03	RCP 2A seal stage temperature	Observe to (mentally) record temperature	
=> 20.03	RCP 2B seal stage temperature	Observe to (mentally) record temperature	
21.00	RCP 1A speed	Observe for pumps not running	
21.00	RCP 1B speed	Observe for pumps not running	
21.00	RCP 2A speed	Observe for pumps not running	
=> 21.00	RCP 2B speed	Observe for pumps not running	
21.01	Core CET temperatures	Observe to record for later calculation of Core Subcooling	
21.01	Emergency Feedwater Flow	Observe for the existance of feedwater flow to SG	

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Gross Function No.	Parameter to Observe	Observation to Make	Reference No.
21.01	Main Feedwater Flow	Observe for the existance of feedwater flow to SG	
21.01	Main Steam Flow	Observe for the existance of Steam flow from SG	
21.01	Pressurizer Level	Observe for the existance of level	A
21.01	RCS Subcooling	Observe for minimum subcooling	
21.01	RCS cold leg temperature	Observe to (mentally) record temperature and for a constant or decreasing	03
21.01	RCS hot leg temperature	Observe to (mentally) record temperature and for a constant or decreasing	03
21.01	Reactor Vessel Level	Observe for level greater than RCS hot leg vessel penetration	
21.01	Steam Generator Level	Observe for maintaining a constant level	
=>			
22.00	RCS Boron Concentration	Observe to record representative Boron concentration of the RCS fluids	
=>			
22.01	RCS hot leg sample valve position	Observe for open position (feedback for sampling)	
=>			
22.02	Pressurizer boron concentration	Observe results of sample to determine dilution affects of Pzr liquid volume	
22.02	Pzr liquid sample valve position	Observe for open position (feedback for sampling)	
22.02	RCP 1A speed	Observe to determine if RCPs operating hence the availablity of main spray for mixing	
22.02	RCP 1B speed	Observe to determine if RCPs operating hence the availabilitiy of main spray for mixing	
=>			
22.03	Pressurizer Boron Concentration	Observe to record representative Boron concentration of Pzr fluids stagnating in Pressurizer	
22.03	Pzr liquid sample valve position	Observe for open position (feedback for sampling)	

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Gross Function No.	Parameter to Observe	Observation to Make	Reference No
22.03	RCP 1A speed	Observe to determine if RCPs NOT operating	
22.03	RCP 1B speed	Observe to determine if RCPs NOT operating.	
=>			
23.00	Condenser Circulating Water Flow	Observe for existance of cooling water through main condenser	
23.00	Condenser Vacuum	Observe for value of vacuum to allow use of TBS.	
23.00	Condenser Circulating water temperature	Observe for value to evaluate condenser performance.	
=>			
23.01	Condenser Circulating water flow	Observe for value to evaluate condenser performance.	
23.01	Condenser Circulating water temperature	Observe for value to evaluate condenser performance.	
23.01	Condenser Vacuum	Observe to monitor for changes due to control responses.	
23.01	Condenser hotwell level	Observe to monitor for changes due to control responses.	
23.01	Condenser pressure	Observe to monitor for changes due to control responses.	
23.01	RCS average temperature	Observe to detemine rate of change.	03
23.01	Time	Observe to determine the "rate" of change	
=>			
23.02	Atmospheric Dump Steam Flow	Observe for existance of steam flow from Steam generator	
23.02	Atmospheric Dump Valve position	Observe for open/shut position to allow a regulated steam flow over time	
23.02	RCS cold leg temperature	Observe for rate of decrease	03
23.02	RCS cold leg temperature	Observe for decreasing temperature	03
23.02	Time	Observe to determine "rate of change"	
=>			
24.00	Pressurizer Level	Observe for decreasing level due to cooldown shrinkage of fluids in RCS	03

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Gross Function No.	Parameter to Observe	Observation to Make	Reference No
24.00 =>	Pressurizer Pressure	Observe for decreasing pressure	03
25.01	Pressurizer Pressure	Observe for value to compare with P-T limits	A
25.01	RCS average temperature	Observe for value to compare with P-T limits	A
25.01	RCS cold leg temperature	Observe to determine delta T between hot and cold leg temperature for the same loop	A
25.01 =>	RCS hot leg temperature	Observe to determine delta T between hot and cold leg temperature for the same loop	A
25.02	Main Steam Flow	Observe for decreasing value	
25.02	Pressurizer pressure	Observe for decreasing value	A
25.02	RCS average temperature	Observe to determine rate of change	A
25.02 =>	Time	Observe to determine "rate of change"	
25.03 =>	Main spray valve position	Observe for closed position	
25.04	Charging pump status	Observe for charging pump operation	
25.04 =>	Pressurizer pressure	Observe for decreasing pressure	A
25.05	SI header pressure	Observe for value to compare to RCS pressure	
25.05	Pressurizer pressure	Observe for decreasing value	A
25.05 =>	Pressurizer pressure	Observe for value to compare to HPSI header pressure	A
26.01	Main Steam Flow	Observe to (mentally) record present steam flow conditions from SG	
26.01 =>	Steam Generator Level	Observe for changes in level	
26.02 =>	Main Feedwater Flow	Observe to (mentally) record present feedwater flow conditions	

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Gross Function No.	Parameter to Observe	Observation to Make	Reference No.
26.03 =>	Emergency feedwater flow	Observe to (mentally) record present feedwater flow conditions	
27.00	Condensate Storage Tank Level	Observe to record level	
27.00	Deaerating Feedwater Tank Level	Observe to record level (ALWR design item for BOP system)	
27.00	Main Condenser Hotwell level	Observe to record level	
27.00 =>	Refueling Water Tank Level	Observe to record level	
28.00 =>	SG liquid sample high activity	Read or listen to determine which SG has leakage from RCS.	
28.01	Steam Generator Level	Observe for existance of level to monitor Feed and Bleed operations	
28.01	Steam Generator Pressure	Observe to record pressure	
28.01 =>	Steam Generator Temperature(s)	Observe to record steam generator evaporator region temperature - region controlling SG depressurization	
28.02 =>	TBS valve position	Observe to confirm valve response to control action (whether in auto or manual control)	
28.03	ADV position	Observe to confirm valve response to control actions (whether in auto or manual control)	
28.03 =>	RCS average temperature	Observe for rate of change (cooldown)	A
28.04 =>	Steam Generator Level	Observe for level above tube bundle	
28.05 =>	Main Feedwater Flow	Observe for existance of feedwater flow to SG when performing Feed and Bleed operations	
28.06 =>	Emergency Feedwater Flow	Observe for existance of feedwater flow to SG when performing Feed and Bleed operation	

Nuplex 80 + Functional Analysis
Breakdown of Information to be Collected

Gross Function No.	Parameter to Observe	Observation to Make	Reference No
29.00	Condensate liquid sample high activity	Sample for high activity	
29.00	Other system samples ???		
29.00	Turbine Building Air Sample	Sample for high activity	
29.00	Turbine Building Area Sample	Sample for general and specific area radiation levels	
29.00 =>	Turbine Building Sump liquid sample	Sample for high activity	
30.00	Pressurizer pressure	Observe below SIAS reset enable BUT above SIAS setpoint	A
30.00 =>	Steam Generator Pressure	Observe below MSIS reset enable BUT above MSIS setpoint	
31.00	Pressurizer Pressure	Observe to record RCS pressure below SIT isolation setpoint.	A
31.00 =>	Safety Injection Tank Pressure	Observe to compare pressure is less than RCS pressure	
31.01	SI tank 1 isolation valve	Observe for closed position	
31.01	SI tank 2 isolation valve	Observe for closed position	
31.01	SI tank 3 isolation valve	Observe for closed position	
31.01 =>	SI tank 4 isolation valve	Observe for closed position	
31.02	Pressurizer pressure	Observe pressure remains above SIT pressure until SIT vented.	A
31.02	SI tank 1 vent valve	Observe for open position	
31.02	SI tank 2 vent valve	Observe for open position	
31.02	SI tank 3 vent valve	Observe for open position	
31.02	SI tank 4 vent valve	Observe for open position	
31.02 =>	SI tank nitrogen isolation valve	Observe for closed position	
31.03	Pressurizer pressure	Observe pressure remains above SIT pressure until SIT is depressurized.	A

Nuplex 80 + Functional Analysis
Breakdown of Information to be Collected

Gross Function No.	Parameter to Observe	Observation to Make	Reference No.
31.03	SI tank 1 drain valve	Observe for open position	
31.03	SI tank 2 drain valve	Observe for open position	
31.03	SI tank 3 drain valve	Observe for open position	
31.03	SI tank 4 drain valve	Observe for open position	
31.03 =>	SI tank nitrogen isolation valve	Observe for closed position	
32.00	Pressurizer pressure	Observe for pressure below setpoint of LTOP	A
32.00 =>	RCS cold leg temperature	Observe for temperetrue below criteria to establish LTOP	A
33.00	Pressurizer Pressure	Observe to record pressure	A
33.00	RCS cold leg temperature	Observe to record temperature and rate of temperature decrease	A
33.00 =>	Time	Observe to determine "rate of change"	
34.01	Pressurizer Level	Observe for rise in level not explained by SI or charging flows. RCS fluid displacement due to voiding	A
34.01	...urizer pressure	Observe for presrue within P-T limits	A
34.01	...old leg temperature	Observe for temperature within P-T limitations	A
34.01	RCS subcooling	Obrerve for subcooling with band or limits (20 to 200 deg F subcooling)	
34.01 =>	Reactor Vessel Level	Observe for existence of voiding	
34.02 =>	Letdown isolation valve	Observe for closed position	
34.03	Auxiliary spray valve position	Observe for position (open or closed)	
34.03	[illegible] spray valve position	Observe for position (open or closed)	
34.03	Pressurizer pressure	Observe to confirm changes in pressure due to initated actions	A

Nuplex 80 + Functional Analysis
Breakdown of Information to be Collected

Gross Function No.	Parameter to Observe	Observation to Make	Reference #
1.00	CSS valve position (list)	Observe for closed position	
1.00	RCS cold leg temperature	Observe to monitor for changes and compare with RCS limitations for temperature	
1.00	RHR Heat Exchanger outlet temperature	Observe to monitor for changes	
1.00	RHR flow	Observe to confirm existence of flow for Heat Removal	
1.00	RHR pump operating status	Observe to determine if RHR pump is operating - another indication for existence of flow	
1.00 =>	RHR valve position (list)	Observe for open position	
2.00 =>	Reactor Power (NI)	Observe to monitor for changes	
3.02 =>	Containment temperature	Observe to compare with human habitability limitations for temperature (Confirm control of ventalation)	
12.01 =>	Reactor Power (NI)	Observe to monitor for changes	
12.04 =>	Reactor Power (NI)	Observe to monitor for changes	
13.01 =>	RCT average temperature	Observe to monitor for changes and compare with RCS limitations for temperature	
13.03	Reactor Power (NI)	Observe to monitor for changes	

Appendix F

Detailed RCS Parameter Usage by Parameter

The contents of this appendix provide the observations for the (collect) task element information for specific RCS parameters used in the NUPLEX 80+ general operations. The parameters listed are identified by gross function and event for the following parameters:

Nuplex 80 + Functional Analysis
Parameter uses for I&C Operations Characteristics

Gross Function No.	Event	Observation to Make
1.03	[illegible]	Observe to determine rate of inventory change
1.03	LOCA	Observe for PLCS demanded level
2.00	LOCA	Observe for high level with decreasing pressurizer pressure for [illegible] breaks in pressurizer
2.00	LOCA	Observe for level dropping faster than PLCS makeup or an empty pressurizer
9.00	LOCA	Observe to (mentally) record to measure effectiveness of actions to isolate LOCA
20.00	LOCA	Observe for existance of inventory in Pressurizer
21.02	LOCA	Observe for constant value of inventory being maintained
21.03	LOCA	Observe for constant value for inventory being maintained
24.03	LOCA	Observe for constant value above a specific level [56%]
25.03	LOCA	Observe for existance of level as void collapse may have exhausted RCS expansion inventory
28.00	LOCA	Observe for constant value of inventory being maintained
28.01	LOCA	Observe for value at or above level specified by criteria
28.03	LOCA	Observe for changes in level
29.00	LOCA	Observe for dropping level
29.01	LOCA	Observe for value at or above level specified by criteria
29.03	LOCA	Observe for changes in level
36.00	LOCA	Observe for value at or above specific level during depressurization and cooldown
39.00	LOCA	Observe for constant value of inventory being maintained

Nuplex 80 + Functional Analysis
Parameter uses for I&C Operations Characteristics

Gross Function No.	Event	Observation to Make
39.01	LOCA	Observe for value at or above level specified by criteria
39.03	LOCA	Observe for changes in level
40.00	LOCA	Observe for drop in level
40.01	LOCA	Observe for value to calculate core subcooling
40.03	LOCA	Observe for changes in level
41.00	LOCA	Observe for existance of inventory in Pressurizer
42.02	LOCA	Observe for constant value of inventory being maintained
49.00	LOCA	Observe for constant value of inventory being maintained above specified procedural value.
50.03	LOCA	Observe for existance of level as void collapse may have exhausted RCS expansion inventory
55.00	LOCA	Observe for value at or above specific level during depressurization and cooldown
1.03	LOCA-1	Observe to determine rate of inventory change
1.03	LOCA-1	Observe for PLCS demanded level
2.00	LOCA-1	Observe for high level with decreasing pressurizer pressure for small breaks in pressurizer
2.00	LOCA-1	Observe for level dropping faster than PLCS makeup or an empty pressurizer
9.00	LOCA-1	Observe to (mentally) record to measure effectiveness of actions to isolate LOCA
20.00	LOCA-1	Observe for existance of inventory in Pressurizer
21.02	LOCA-1	Observe for constant value of inventory being maintained

Nuplex 80 + Functional Analysis
Parameter uses for I&C Operations Characteristics

Gross Function No.	Event	Observation to Make
24.03	LOCA-1	Observe for constant value above a specific level [56%]
25.03	LOCA-1	Observe for existence of level as void collapse may have exhausted RCS expansion inventory
28.00	LOCA-1	Observe for constant value of inventory being maintained
28.01	LOCA-1	Observe for value at or above level specified by criteria
28.03	LOCA-1	Observe for changes in level
29.00	LOCA-1	Observe for dropping level
29.01	LOCA-1	Observe for value at or above level specified by criteria
29.03	LOCA-1	Observe for changes in level
36.00	LOCA-1	Observe for value at or above specific level during depressurization and cooldown
1.03	Rx Trip	Observe to determine rate of inventory change
1.03	Rx Trip	Observe for PLCS demanded level
2.00	Rx Trip	Observe for transient recovered by PLCS
5.00	Rx Trip	Observe for transient recovered by PLCS
10.01	Rx Trip	Observe for constant inventory
1.03	SGTR	Observe to determine rate of inventory change
1.03	SGTR	Observe for PLCS demanded level
2.00	SGTR	Observe decreasing level at rate greater than RCS makeup response (i.e. "noticable rate")
3.00	SGTR	Observe for existance of RCS inventory
6.00	SGTR	Observe for decreasing level
14.00	SGTR	Observe for indication of level with a constant or increasing level

Nuplex 80 + Functional Analysis
Parameter uses for I&C Operations Characteristics

Gross Function No.	Event	Observation to Make
14.03	SGTR	Observe for a constant or controlable level
15.00	SGTR	Observe for decreasing level
16.00	SGTR	Observe for the existance of level and a constant or maintaining level
19.03	SGTR	Observe for level being maintained
20.01	SGTR	Observe for excessive shrinkage
21.01	SGTR	Observe for the existance of level
24.00	SGTR	Observe for decreasing level due to cooldown shrinkage of fluids in RCS
34.01	SGTR	Observe for rise in level not explained by SI or charging flows. RCS fluid displacement due to voiding
3.02	SR Ops	Observe for constant value within control limitations as compared with level setpoint (level program & power)
3.04	Shutdown	Observe to monitor for changes within limitations of PLCS control
6.07	Shutdown	Observe to monitor for changes due to control responses.
3.01	Startup	Observe for maintaining level constant
3.04	Transient1	Observe to monitor for changes within limitations of PLCS control
3.04	Transient2	Observe to monitor for changes within limitations of PLCS control
3.04	Transient3	Observe to monitor for changes within limitations of PLCS control
3.04	Transient4	Observe to monitor for changes within limitations of PLCS control

Nuplex 80 + Functional Analysis
Parameter uses for I&C Operations Characteristics

Gross Function No.	Event	Observation to Make
1.04	LOCA	Observe to determine rate of change
1.04	LOCA	Observe for PPCS demanded pressure
2.00	LOCA	Observe for decreasing values
5.00	LOCA	Observe for rate of change
5.00	LOCA	Observe for at or approaching value for automatic SI actuation
7.00	LOCA	Observe for procedural value to make a decision on RCP operation.
7.02	LOCA	RCP operating to pressures within Technical specifications
9.00	LOCA	Observe to confirm dropping pressure has been stopped
9.00	LOCA	Observe pressure not above relief setpoints (a possible cause of LOCA)
20.00	LOCA	Observe to (mentally) record value for assessment of charging flow to RCS
21.00	LOCA	Observe to determine rate of change
21.00	LOCA	Observe to determine rate of change
21.01	LOCA	Observe for decreasing value
21.01	LOCA	Observe to compare to HPSI header pressure
21.02	LOCA	Observe to compare with Charging pump discharge pressure
21.03	LOCA	Observe with SI pump discharge pressures
22.01	LOCA	Observe for value to compare with P-T limits
22.02	LOCA	Observe for decreasing value
22.05	LOCA	Observe for decreasing value
22.05	LOCA	Observe for value to compare to HPSI header pressure
23.02	LOCA	Observe for value "close" to hot standby

Nuplex 80 + Functional Analysis
Parameter uses for I&C Operations Characteristics

Gross Function No.	Event	Observation to Make
23.03	LOCA	Observe for value to assess urgency of depressurization
23.03	LOCA	Observe for rate of change
24.04	LOCA	Observe for value for calculation of subcooling
25.01	LOCA	Observe for value
25.02	LOCA	Observe to detect excessive rate of change
25.03	LOCA	Observe for constant value within operating limits for RCP operation
28.01	LOCA	Observe for value to calculate core subcooling
28.03	LOCA	Observe for changes in pressure
29.00	LOCA	Observe for dropping pressure
29.01	LOCA	Observe for value to calculate core subcooling
29.01	LOCA	Observe for value to calculate core subcooling
29.03	LOCA	Observe for changes in pressure
33.00	LOCA	Observe for value at or above specified pressure during depressurization
33.02	LOCA	Observe for value at or above specified pressure during depressurization
33.03	LOCA	Observe for value at or above specified pressure during depressurization.
34.00	LOCA	Observe for value at or above specific pressure during depressurization and cooldown
35.00	LOCA	Observe for value at or below specific pressure during depressurization
36.00	LOCA	Observe for value at or below specific pressure during depressurization and cooldown
37.00	LOCA	Observe for changes in pressure that are LESS than expected

Nuplex 80 + Functional Analysis
Parameter uses for I&C Operations Characteristics

Gross Function No.	Event	Observation to Make
39.01	LOCA	Observe for value to calculate subcooling
39.03	LOCA	Observe for changes in pressure
40.00	LOCA	Observe for drop in pressure
40.01	LOCA	Observe for value to calculate core subcooling
40.03	LOCA	Observe for changes in pressure
41.00	LOCA	Observe to (mentally) record value for assessment of charging flow to RCS
42.00	LOCA	Observe for value to assess later control performance.
42.01	LOCA	Observe to determine rate of change
42.02	LOCA	Observe to compare with charging pump discharge pressure
42.03	LOCA	Observe for decreasing value
42.03	LOCA	Observe to compare to HPSI header pressure
43.01	LOCA	Observe for value to compare with P-T limits
43.02	LOCA	Observe for decreasing value
43.04	LOCA	Observe for decreasing pressure
43.05	LOCA	Observe for decreasing value
43.05	LOCA	Observe for value to compare to HPSI header pressure
48.02	LOCA	Observe for value "close" to hot standby
48.03	LOCA	Observe for value to assess urgency of depressurization
48.03	LOCA	Observe for rate of change
49.00	LOCA	Observe for value of calculation of subcooling
50.01	LOCA	Observe for value

Nuplex 80 + Functional Analysis
Parameter uses for I&C Operations Characteristics

Gross Function No.	Event	Observation to Make
50.02	LOCA	Observe to detect excessive rate of change
50.03	LOCA	Observe for constant value within operating limits for RCP operation
52.00	LOCA	Observe for value at or above specified pressure during depressurization
52.02	LOCA	Observe to determine if pressure is below actuation pressure
53.00	LOCA	Observe for value at or above specified pressure during depressurization
53.02	LOCA	Observe for value at or above specified pressure during depressurization
53.03	LOCA	Observe for value at or above specified pressure during depressurization
54.00	LOCA	Observe for value at or above specific pressure during depressurization and cooldown
55.00	LOCA	Observe for value at or below specific pressure during depressurization and cooldown
56.00	LOCA	Observe for changes in pressure that are LESS than expected
1.04	LOCA-1	Observe to determine rate of change
1.04	LOCA-1	Observe for PPCS demanded pressure
2.00	LOCA-1	Observe for decreasing values
5.00	LOCA-1	Observe for rate of change
5.00	LOCA-1	Observe for at or approaching value for automatic SI actuation
7.02	LOCA-1	RCP operating to pressures within Technical specifications
9.00	LOCA-1	Observe to confirm dropping pressure has been stopped
9.00	LOCA-1	Observe pressure not above relief setpoints (a possible cause of LOCA)

Nuplex 80 + Functional Analysis
Parameter uses for I&C Operations Characteristics

Gross Function No.	Event	Observation to Make
20.00	LOCA-1	Observe to (mentally) record value for assessment of charging flow to RCS
21.00	LOCA-1	Observe to determine rate of change
21.00	LOCA-1	Observe to determine rate of change
21.01	LOCA-1	Observe for decreasing value
21.01	LOCA-1	Observe to compare to HPSI header pressure
21.02	LOCA-1	Observe to compare with Charging pump discharge pressure
22.01	LOCA-1	Observe for value to compare with P-T limits
22.02	LOCA-1	Observe for decreasing value
22.05	LOCA-1	Observe for decreasing value
22.05	LOCA-1	Observe for value to compare to HPSI header pressure
23.02	LOCA-1	Observe for value "close" to hot standby
23.03	LOCA-1	Obser for value to assess urgency of depressurization
23.03	LOCA-1	Observe for rate of change
24.04	LOCA-1	Observe for value for calculation of subcooling
25.01	LOCA-1	Observe for value
25.02	LOCA-1	Observe to detect excessive rate of change
25.03	LOCA-1	Observe for constant value within operating limits for RCP operation
28.01	LOCA-1	Observe for value to calculate core subcooling
28.03	LOCA-1	Observe for changes in pressure
29.00	LOCA-1	Observe for dropping pressure
29.01	LOCA-1	Observe for value to calculate core subcooling

Nuplex 80 + Functional Analysis
Parameter uses for I&C Operations Characteristics

Gross Function No.	Event	Observation to Make
29.01	LOCA-1	Observe for value to calculate core subcooling
29.03	LOCA-1	Observe for changes in pressure
33.00	LOCA-1	Observe for value at or above specified pressure during depressurization
33.02	LOCA-1	Observe for value at or above specified pressure during depressurization
33.03	LOCA-1	
34.00	LOCA-1	Observe for value at or above specific pressure during depressurization and cooldown
35.00	LOCA-1	Observe for value at or below specific pressure during depressurization
36.00	LOCA-1	Observe for value at or below specific pressure during depressurization and cooldown
37.00	LOCA-1	Observe for changes in pressure that are LESS than expected
1.04	Rx Trip	Observe for PPCS demanded pressure
1.04	Rx Trip	Observe to determine rate of change
2.00	Rx Trip	Observe for transient recovered by PPCS
6.00	Rx Trip	Observe for transient recovered by PPCS
9.02	Rx Trip	Observe for changes in pressure not normal to PPCS control
9.02	Rx Trip	Observe for value to make assessment of pressure condition required to make any repairs
10.02	Rx Trip	Observe for constant pressure
1.04	SGTR	Observe for PPCS demanded pressure
1.04	SGTR	Observe to determine rate of change
2.00	SGTR	Observe pressure decreasing at rate greater than heater capacity can makeup (i.e. "noticable rate")

Nuplex 80 + Functional Analysis
Parameter uses for I&C Operations Characteristics

Gross Function No.	Event	Observation to Make
3.00	SGTR	Observe to (mentally) record pressure to calculate subcooling
6.00	SGTR	Observe pressure and rate of pressure decrease to (1300 psia or required worst case event SI and RCP setpoints)
8.00	SGTR	Observe pressure maintaining greater than RCP lowest operating pressure
8.02	SGTR	Observe for comparison to RCP operating limits
12.02	SGTR	Observe to compare w/SG pressure for approach to + or - 50 psid difference.
14.03	SGTR	Observe for a constant or controlable pressure
15.00	SGTR	Observe for decreasing pressure
17.01	SGTR	Observe to (mentally) record RCS pressure
17.03	SGTR	Observe for a decreasing pressure
17.04	SGTR	Observe for a decreasing pressure
17.05	SGTR	Observe for a decreasing pressure
18.03	SGTR	Observe to (mentally) record RCS pressure
19.04	SGTR	Observe for pressure being maintained
24.00	SGTR	Observe for decreasing pressure
25.01	SGTR	Observe for value to compare with P-T limits
25.02	SGTR	Observe for decreasing value
25.04	SGTR	Observe for decreasing pressure
25.05	SGTR	Observe for decreasing value
25.05	SGTR	Observe for value to compare to HPSI header pressure
30.00	SGTR	Observe below SIAS reset enable BUT above SIAS setpoint

Nuplex 80 + Functional Analysis
Parameter uses for I&C Operations Characteristics

Gross Function No.	Event	Observation to Make
31.00	SGTR	Observe to record RCS pressure below SIT isolation setpoint.
31.02	SGTR	Observe pressure remains above SIT pressure until SIT vented.
31.03	SGTR	Observe pressure remains above SIT pressure until SIT is depressurized.
32.00	SGTR	Observe for pressure below setpoint of LTOP
33.00	SGTR	Observe to record pressure
34.01	SGTR	Observe for presarue within P-T limits
34.03	SGTR	Observe to confirm changes in pressure due to initated actions
3.03	SS Ops	Observe for constant value with control limitations for power operation
3.06	Shutdown	Observe to monitor changes within limits of PPCS control
6.04	Startup	Observe to record for later calculation of core physics data confirmation
3.06	Transient1	Observe to monitor changes within limits of PPCS control
3.06	Transient2	Observe to monitor control within limitations of PPCS control.
3.06	Transient3	Observe to monitor changes within limits of PPCS control
3.06	Transient4	Observe to monitor changes within limits of PPCS control

Nuplex 80 + Functional Analysis
Parameter uses for I&C Operations Characteristics

Gross Function No.	Event	Observation to Make
3.06	Shutdown	Observe to monitor for changes within limits of PPCS control.
3.06	Transient1	Observe to monitor for changes within limits of PPCS control.
3.06	Transient2	Observe to monitor control within limitations of PPCS control.
3.06	Transient3	Observe tu monitor for changes within limits of PPCS control.
3.06	Transient4	Observe to monitor for changes within limits of PPCS control.

Nuplex 80 + Functional Analysis
Parameter uses for I&C Operations Characteristics

Gross Function No.	Event	Observation to Make
25.03	LOCA	Observe to determine if pump is running.
26.00	LOCA	Observe to determine if RCS forced circulation flow exists.
42.00	LOCA	Observe to determine if a loop 1 RCP is running to make available Pressurizer Main Spray.
50.03	LOCA	Observe to determine if pump is running.
51.00	LOCA	Observe to determine if RCP is running

Nuplex 80 + Functional Analysis
Parameter uses for I&C Operations Character ·.ics

Grome Function No.	Event	Observation to Make
25.03	LOCA	Observe to determine if pump is running
26.00	LOCA	Observe to detemine if RCS forced circulation flow exists.
42.00	LOCA	Observe to determine if a loop 1 RCP is operating tr make available Pressurizer Main Spray.
50.03	LOCA	Observe to determine if pump is running.
51.00	LOCA	Observe to determine if RCP is running

Nuplex 80 + Functional Analysis
Parameter uses for I&C Operations Characteristics

Gross Function No.	Event	Observation to Make
25.03	LOCA	Observe to determine pump is running
26.00	LOCA	Observe to determine if RCS forced circulation flow exists.
50.03	LOCA	Observe to determine if pump is running
51.00	LOCA	Observe to determine if RCP is running

Nuplex 80 + Functional Analysis
Parameter uses for I&C Operations Characteristics

Gross Function No.	Event	Observation to Make
25.03	LOCA	Observe to determine if pump is running
26.00	LOCA	Observe to determine if RCS forced circulation flow exists.
50.03	LOCA	Observe to determine if pump is running
51.00	LOCA	Observe to determine if RCP is running

Nuplex 80 + Functional Analysis
Parameter uses for I&C Operations Characteristics

Gross Function No.	Event	Observation to Make
25.03	LOCA	Observe to detect pump is running.
26.00	LOCA	Observe to detect pump is running.
50.03	LOCA	Observe to detect pump running.
51.00	LOCA	Observe to determine if RCP is running
26.00	LOCA-1	Observe to determine if RCP is running
8.01	SGTR	Observe to determine if RCPs have stopped
8.03	SGTR	Observe for RCP stopped
20.02	SGTR	Observe for existance of rotation of motor to drive pump
21.00	SGTR	Observe for pumps not running
22.02	SGTR	Observe to determine if RCPs operating hence the availability of main spray for mixing
22.03	SGTR	Observe to determine if RCPs NOT operating

Nuplex 80 + Functional Analysis
Parameter uses for I&C Operations Characteristics

Gross Function No.	Event	Observation to Make
25.03	LOCA	Observe to detect pump is running
26.00	LOCA	Observe to detect pump is running
50.03	LOCA	Observe to detect pump running
51.00	LOCA	Observe to detect pump running
8.03	SGTR	Observe for RCP stopped.
20.02	SGTR	Observe for existance of rotation of motor to drive pump
21.00	SGTR	Observe for pumps not running
22.02	SGTR	Observe to determine if RCPs operating hence the availablitiy of main sprey for mixing
22.03	SGTR	Observe to determine if RCPs NOT operating.

Nuplex 80 + Functional Analysis
Parameter uses for I&C Operations Characteristics

Gross Function No.	Event	Observation to Make
25.03	LOCA	Observe to detect pump is running
26.00	LOCA	Observe to detect pump is running
50.03	LOCA	Observe to detect pump running
51.00	LOCA	Observe to detect pump running
8.01	SGTR	Observe to determine if RCPs have stopped.
8.03	SGTR	Observe for RCP stopped
20.02	SGTR	Observe for existence of rotation of motor to drive pump
21.00	SGTR	Observe for pumps not running

Nuplex 80 + Functional Analysis
Parameter uses for I&C Operations Characteristics

Gross Function No.	Event	Observation to Make
25.03	LOCA	Observe to detect pump is running
26.00	LOCA	Observe to detect pump running
50.03	LOCA	Observe to detect pump running
51.00	LOCA	Observe to detect pump running
8.01	SGTR	Observe to determine if RCPs have stopped.
8.03	SGTR	Observe for RCP stopped.
20.02	SGTR	Observe for existance of rotation of motor to drive pump
21.00	SGTR	Observe for pumps not running

Nuplex 80 + Functional Analysis
Parameter uses for I&C Operations Characteristics

Gross Function No.	Event	Observation to Make
1.05	Rx Trip	Observe for trend of current to determine if RCPs are operating (an analog value method)
1.05	SGTR	Observe for trend of current to determine if RCPs operating (an analog value method)
8.01	SGTR	Observe for RCPs deenergized (alternate)
8.03	SGTR	Observe for RCP deenergized (alternate)
20.02	SGTR	Observe for existance of a loaded motor driving RCS fluid

Nuplex 80 + Functional Analysis
Parameter uses for I&C Operations Characteristics

Gross Function No.	Event	Observation to Make
20.03	SGTR	Observe for existance of bleedoff flow

Nuplex 80 + Functional Analysis
Parameter uses for I&C Operations Characteristics

Gross Function No.	Event	Observation to Make
20.03	SGTR	Observe for existance of bleedoff flow

Nuplex 80 + Functional Analysis
Parameter uses for I&C Operations Characteristics

Gross Function No.	Event	Observation to Make
20.03	SGTR	Observe for existance of bleedoff flow.

Nuplex 80 + Functional Analysis
Parameter uses for I&C Operations Characteristics

Gross Function No.	Event	Observation to Make
20.03	SGTR	Observe for existence of bleedoff flow

Nuplex 80 + Functional Analysis
Parameter uses for I&C Operations Characteristics

Gross Function No.	Event	Observation to Make
20.03	SGTR	Observe to (mentally) record temperature for checking proper electrical heat dissipation

Nuplex 80 + Functional Analysis
Parameter uses for I&C Operations Characteristics

Gross Function No.	Event	Observation to Make
20.03	SGTR	Observe to (mentally) record temperature for checking proper electrical heat dissipation.

Nuplex 80 + Functional Analysis
Parameter uses for I&C Operations Characteristics

Group Function No.	Event	Observation to Make
20.03	SGTR	Observe to (mentally) record temperature for checking proper electrical heat dissipation.

Nuplex 80 + Functional Analysis
Parameter uses for I&C Operations Characteristics

Gross Function No.	Event	Observation to Make
20.03	SGTR	Observe to (mentally) record temperature for checking proper electrical heat dissipation

Nuplex 80 + Functional Analysis
Parameter uses for I&C Operations Characteristics

Gross Function No.	Event	Observation to Make
1.05	LOCA	Observe to determine if RCPs are operating
46.02	LOCA	Observe to determine if RCPs are operating
46.03	LOCA	Observe to determine if RCPs are NOT operating
1.05	LOCA-1	Observe to determine if RCPs are operating

Nuplex 80 + Functional Analysis
Parameter uses for I&C Operations Characteristics

Gross Function No.	Event	Observation to Make
20.03	SGTR	Observe to (mentally) record pressures
20.03	SGTR	Observe to (mentally) record temperature

Nuplex 80 + Functional Analysis
Parameter uses for I&C Operations Characteristics

Gross Function No.	Event	Observation to Make
20.03	SGTR	Observe to (mentally) record pressures
20.03	SGTR	Observe to (mentally) record temperature

Nuplex 80 + Functional Analysis
Parameter uses for I&C Operations Characteristics

Gross Function No.	Event	Observation to Make
20.03	SGTR	Observe to (mentally) record pressures
20.03	SGTR	Observe to (mentally) record temperature

Nuplex 80 + Functional Analysis
Parameter uses for I&C Operations Characteristics

Group Function No.	Event	Observation to Make
20.03	SGTR	Observe to (mentally) record pressures
20.03	SGTR	Observe to (mentally) record temperature

Nuplex 80 + Functional Analysis
Parameter uses for I&C Operations Characteristics

Gross Function No.	Event	Observation to Make
20.03	SGTR	Observe to (mentally) record temperature

Nuplex 80 + Functional Analysis
Parameter uses for I&C Operations Characteristics

Gross Function No.	Event	Observation to Make
20.03	SGTR	Observe to (mentally) record temperature

Nuplex 80 + Functional Analysis
Parameter uses for I&C Operations Characteristics

Gross Function No.	Event	Observation to Make
20.03	SGTR	Observe to (mentally) record temperature

Nuplex 80 + Functional Analysis
Parameter uses for I&C Operations Characteristics

Gross Function No.	Event	Observation to Make
20.03	SGTR	Observe to (mentally) record temperature

Nuplex 80 + Functional Analysis
Parameter uses for I&C Operations Characteristics

Gross Function No.	Event	Observation to Make
1.06	LOCA	Observe for value being maintained
17.01	LOCA	Observe to determine rate of change
17.02	LOCA	Observe to determine value of temperature to be consistant with SG pressure
17.02	LOCA	Observe to determine rate of change
22.01	LOCA	Observe for value to compare with P-T limits
22.02	LOCA	Observe to determine rate of change
23.02	LOCA	Observe for value "close" to hot standby
23.03	LOCA	Observe for value to assess urgency of depressurization
24.02	LOCA	Observe for value being maintained
34.00	LOCA	Observe for value at or above specific pressure during depressurization and cooldown
36.00	LOCA	Observe for value at or below specific temperature during depressurization and cooldown
43.01	LOCA	Observe for value to compare with P-T limits
43.02	LOCA	Observe to determine rate of change
47.01	LOCA	Observe to determine rate of change
47.02	LOCA	Observe to determine value of temperature to be consistant with SG pressure
47.02	LOCA	Observe to determine rate of change
48.02	LOCA	Observe for value "close" to hot standby
48.03	LOCA	Observe for value to assess urgency of depressurization
49.00	LOCA	Observe for value for calculation of subcooling

Nuplex 80 + Functional Analysis
Parameter uses for I&C Operations Characteristics

Gross Function No.	Event	Observation to Make
54.00	LOCA	Observe for value at or above specific pressure during depressurization and cooldown
55.00	LOCA	Observe for value at or below specific temperature during depressurization and cooldown
1.06	LOCA-1	Observe for value being maintained
17.01	LOCA-1	Observe to determine rate of change
17.02	LOCA-1	Observe to determine value of temperature to be consistant with SG pressure
17.02	LOCA-1	Observe to determine rate of change
22.01	LOCA-1	Observe for value to compare with P-T limits
22.02	LOCA-1	Observe to determine rate of change
23.02	LOCA-1	Observe for value "close" to hot standby
23.03	LOCA-1	Observe for value to assess urgency of depressurization
24.02	LOCA-1	Obser for value being maintained
34.00	LOCA-1	Observe for value at or above specific pressure during depressurization and cooldown
36.00	LOCA-1	Observe for value at or below specific temperature during depressurization and cooldown
13.01	Refueling	Observe to monitor for changes and compare with RCS limitations for temperature
1.06	Rx Trip	Observe for value being maintained
7.00	Rx Trip	Observe to monitor for changes due to main steam control responses.
1.00	SDHR	Observe for value being maintained
1.06	SGTR	Observe for valve being maintained constant

Nuplex 80 + Functional Analysis
Parameter uses for I&C Operations Characteristics

Gross Function No.	Event	Observation to Make
11.02	SGTR	Observe that it is NOT increasing
17.02	SGTR	Observe for a constant temperature
23.01	SGTR	Observe to determine rate of change.
25.01	SGTR	Observe for value to compare with P-T limits
25.02	SGTR	Observe to determine rate of change
28.03	SGTR	Observe for rate of change (cooldown)
2.00	SS Ops	Observe for changes consistant with load demand and RCS heat removal rates and poison buildup & burnout.
2.01	SS Ops	Observe for an unexpected change which corresponds to a transient and compare with RCS reference temperature
2.03	SS Ops	Observe to monitor for changes
3.00	SS Ops	Observe to monitor for changes
3.00	SS Ops	Observe to compare with RRS reference temperature and monitor for changes
2.00	Shutdown	Observe for changes which correspond to expected changes for the transient and compare with RRS reference temperature
3.00	Shutdown	Observe to compare transient to expected performance and assess inter-system transient impacts.
4.02	Shutdown	Observe to compare with RRS reference temperature
4.03	Shutdown	Observe to monitor temperature as a constant with control of TBS maintaining temperature. (no longer using RRS)
1.01	Startup	Observe for temperature maintaining at or above [525] degrees F
2.03	Startup	Observe for changes
2.06	Startup	Observe for changes (none should be observed)
2.09	Startup	Observe for changes

Nuplex 80 + Functional Analysis
Parameter uses for I&C Operations Characteristics

Gross Function No.	Event	Observation to Make
5.00	Startup	Observe to record for later calculation of core physics data confirmation
6.00	Startup	Observe for constant value (monitoring for unexpected MTC affects to reactivity control.
6.04	Startup	Observe to record for later calculation of core physics data confirmation
8.00	Startup	
21.01	Startup	Observe for value to verify calculated power - loop 1
21.01	Startup	Observe for value to verify calculated power - loop 2
2.00	Transient1	Observe for changes which correspond to expected changes for the transient
3.00	Transient1	Observe to compare transient to expected performance to assess inter-system transient impacts
2.00	Transient2	Observe for changes which correspond to expected changes for the transient
3.00	Transient2	Observe to compare transient to expected performance to assess inter-system transient impacts
2.00	Transient3	Observe for changes which correspond to expected changes for the transient
3.00	Transient3	Observe to compare transient to expected performance to assess inter-system transient impacts
2.00	Transient4	Observe for changes which correspond to expected changes for the transient
3.00	Transient4	Observe to compare transient to expected performance to assess inter-system transient impacts

Nuplex 80 + Functional Analysis
Parameter uses for I&C Operations Characteristics

Gross Function No.	Event	Observation to Make
46.01	LOCA	Observe to record representative boron concentration of the RCS fluids
22.00	SGTR	Observe to record representative Boron concentration of the RCS fluids
3.02	Startup	Observe to monitor representative Boron concentration of the RCS fluids during dilution (periodically).
3.02	Startup	Observe to determine representative Boron concentration at the start of the dilution activity.
6.00	Startup	Observe for constant value (monitoring for unexpected changes which may adversely affect reactivity control.
6.04	Startup	Observe to record representative Boron concentration of the RCS fluids for later calculation of core physics data
6.07	Shutdown	Observe to monitor for changes while borating RCS.

Nuplex 80 - Functional Analysis
Parameter uses for I&C Operations Characteristics

Gross Function No.	Event	Observation to Make
1.05	LOCA	Observe to determine delta T between hot and cold leg temperatures for the same loop.
22.01	LOCA	Observe to determine delta T between hot and cold leg temperatures for the same loop
25.02	LOCA	Observe to determine delta T between hot and cold leg temperatures for the same loop
26.01	LOCA	Observe to detemine delta T between hot and cold leg temperatures in the same loop
27.02	LOCA	Observe for bottom oriented RTD sensor in cold leg to be less than other RTDs (indication of RCS condensate runback)
43.01	LOCA	Observe to determine delta T between hot and cold leg temperature for the same loop
48.01	LOCA	Observe to determine delta T between hot and cold leg temperatures for the same loop
49.00	LOCA	Observe for value for calculation of subcooling
50.02	LOCA	Observe to determine delta T between hot and cold leg temperatures for the same loop
51.01	LOCA	Observe to determine delta T between hot and cold leg temperatures in the same loop
1.05	LOCA-1	Observe to determine delta T between hot and cold leg temperatures for the same loop.
22.01	LOCA-1	Observe to determine delta T between hot and cold leg temperatures for the same loop
25.02	LOCA-1	Observe to determine delta T between hot and cold leg temperatures for the same loop
26.01	LOCA-1	Observe to detemine delta T between hot and cold leg temperatures in the same loop

Nuplex 80 + Functional Analysis
Parameter uses for I&C Operations Characteristics

Gross Function No.	Event	Observation to Make
27.02	LOCA-1	Observe for bottom oriented RTD sensor in cold leg to be less than other RTDs (indication of RCS condensate runback)
1.00	Refueling	Observe to monitor for changes and compare with RCS limitations for temperature
1.05	Rx Trip	Observe to determine delta T between hot and cold leg temperatures for the same loop
10.03	Rx Trip	Observe to determine delta T between hot and cold leg temperatures for the same loop
1.05	SGTR	Observe to determine delta T between hot and cold leg temperatures for the same loop
8.02	SGTR	Observe for comparision to RCP operating limits
17.01	SGTR	Observe to (mentally) record RCS temperature
18.01	SGTR	Observe to (mentally) record RCS SG return temperature
21.01	SGTR	Observe to (mentally) record temperature and for a constant or decreasing
23.02	SGTR	Observe for rate of decrease
23.02	SGTR	Observe for decreasing temperature
25.01	SGTR	Observe to determine delta T between hot and cold leg temperature for the same loop
32.00	SGTR	Observe for temperatrue below criteria to establish LTOP
33.00	SGTR	Observe to record temperature and rate of temperature decrease
34.01	SGTR	Observe for temperature within P-T limitations
2.02	SS Ops	Observe to compare with CET temperatures to determine heat removal from fuel bundles

Nuplex 80 + Functional Analysis
Parameter uses for I&C Operations Characteristics

Gross Function No.	Event	Observation to Make
21.01	Startup	Observe for value to calculate power loop 1
21.01	Startup	Observe for value to calculate power loop 2

Nuplex 80 + Functional Analysis
Parameter uses for I&C Operations Characteristics

Gross Function No.	Event	Observation to Make
1.05	LOCA	Observe to determine delta T between hot and cold leg temperatures for the same loop
21.03	LOCA	Observe for changes in fluid temperature anticipating fluid expansion or contraction.
22.01	LOCA	Observe to determine delta T between hot and cold leg temperature for the same loop
23.01	LOCA	Observe to determine delta T between hot and cold leg temperatures for the same loop
25.02	LOCA	Observe to determine delta T between hot and cold leg temperature for the same loop
26.01	LOCA	Observe to determine delta T between hot and cold leg temperatures for the same loop
27.01	LOCA	Observe for bottom oriented RTD sensor in hot leg to be less than other RTDs (indication of RCS condensate runback)
27.01	LOCA	Observe for value
28.00	LOCA	Observe for value to calculate subcooling
39.00	LOCA	Observe for value to calculate subcooling
43.01	LOCA	Observe to determine delta T between hot and cold leg temperature for the same loop
48.01	LOCA	Observe to determine delta T between hot and cold leg temperatures for the same loop
48.01	LOCA	Observe for value
49.00	LOCA	Observe for value for calculation of subcooling
50.02	LOCA	Observe to determin delta T between hot and cold leg temperature for the same loop

Nuplex 80 + Functional Analysis
Parameter uses for I&C Operations Characteristics

Gross Function No.	Event	Observation to Make
51.01	LOCA	Observe to determine delta T between hot and cold leg temperatures for the same loop
1.05	LOCA-1	Observe to determine delta T between hot and cold leg temperatures for the same loop
22.01	LOCA-1	Observe to determine delta T between hot and cold leg temperature for the same loop
23.01	LOCA-1	Observe to determine delta T between hot and cold leg temperatures for the same loop
25.02	LOCA-1	Observe to determine delta T between hot and cold leg temperature for the same loop
26.01	LOCA-1	Observe to determine delta T between hot and cold leg temperatures for the same loop
27.01	LOCA-1	Obser for value
27.01	LOCA-1	Observe for bottom oriented RTD sensor in hot leg to be less than other RTDs (indication of RCS condensate runback)
28.00	LOCA-1	Observe for value to calculate subcooling
1.05	Rx Trip	Observe to determine delta T between hot and cold leg temperatures for the same loop
10.03	Rx Trip	Observe to determine delta T between hot and cold leg temperatures for the same loop
1.05	SGTR	Observe to determine delta T between hot and cold leg temperatures for the same loop
9.01	SGTR	Observe hot leg temperature maintaining less than 545 degrees F
9.01	SGTR	Observe hot leg temperature maintaining less than 520 degrees F
18.01	SGTR	Observe to (mentally) record RCS SG supply temperature

Nuplex 80 + Functional Analysis
Parameter uses for I&C Operations Characteristics

Gross Function No.	Event	Observation to Make
21.01	SGTR	Observe to (mentally) record temperature and for a constant or decreasing
25.01	SGTR	Observe to determine delta T between hot and cold leg temperature for the same loop
2.00	SS Ops	Observe for value consistant with power demand program
2.02	SS Ops	Observe to compare with CET temperatures to determine adequacy of heat removal
7.02	Startup	Observe for increase at POAH power level
21.01	Startup	Observe for value to calculate power loop 1
21.01	Startup	Observe for value to calculate power loop 2

Nuplex 80 + Functional Analysis
Parameter uses for I&C Operations Characteristics

Gross Function No.	Event	Observation to Make
1.03	LOCA	Observe for indications that subcooling exists
27.00	LOCA	Observe for value to indicate two-phase conditions may exist
28.01	LOCA	Observe for value at or above specified criteria
29.01	LOCA	Observe for value at or above specified criteria
36.00	LOCA	Observe for value at or above specific criteria
39.01	LOCA	Observe for value at or above specific criteria
40.01	LOCA	Observe for value at or above specified criteria
55.00	LOCA	Observe for value at or above specific criteria
1.03	LOCA-1	Observe for indications that subcooling exists
27.00	LOCA-1	Observe for value to indicate two-phase conditions may exist
28.01	LOCA-1	Observe for value at or above specified criteria
29.01	LOCA-1	Observe for value at or above specified criteria
36.00	LOCA-1	Observe for value at or above specific criteria
1.03	Rx Trip	Observe for indications that subcooling exists
1.03	SGTR	Observe that RCS fluids are subcooled
3.00	SGTR	Observe for minimum subcooling
6.00	SGTR	Observe for minimum subcooling
15.01	SGTR	Observe for decreasing subcooling
16.00	SGTR	Observe for minimum acceptable subcooling

Nuplex 80 + Functional Analysis
Parameter uses for I&C Operations Characteristics

Gross Function No.	Event	Observation to Make
19.04	SGTR	Observe for minimum subcooling
21.01	SGTR	Observe for minimum subcooling
34.01	SGTR	Observe for subcooling with band or limits [20 to 200 deg F subcooling]

Nuplex 80 + Functional Analysis
Parameter uses for I&C Operations Characteristics

Gross Function No.	Event	Observation to Make
21.01	SGTR	Observe for level greater than RCS hot leg vessel penetration
34.01	SGTR	Observe for existance of voiding

Appendix G

Summary of RCS Parameter Usage by Parameter and Information Characteristics

The contents of this appendix provide a summary of (collect) task element information for specific RCS parameters used in the NUPLEX 80+ general operations. The parameters listed are identified by gross function prompt for the following parameters:

Parameter Summary for...

Pressurizer Pressure

Summary of Usage

decision points	allocation	Notes
RELIEF VALVE OPEN	automatic	
HI PRESS DEVIATION	automatic	
NORMAL PRESSURE	automatic	
LO PRESS DEVIATION	automatic	
SI BLOCK ENABLE		Window to actuate SIAS block for cooldown
SI ACTUATION	automatic	
TRIP RCPs T2/L2		EOP strategy
RCP RESTART PRESSURE PERMIT		on increasing pressure
TRIP ALL RCPs		on decreasing pressure
ISOLATE SIT		during controlled cooldown only on decreasing pressure
UNISOLATE LTOP		on decreasing temperature
SCS ENTRY		during controlled cooldown & depressurization

Characteristics for RCS parameter...

Pressurizer Pressure

Gross Function Prompt

SI Actuation

Characteristic		Rationale
Display	Status	A pressure point is needed to determine when to implement SI actuation for EOP events with a loss of pressure/inventory control
Range	Actuate SI/off	See rationale for status above
Accuracy	N/A	Display accuracy for a status is ambiguous therfore no requirement is specified.
Units	ON/OFF	Units for an operator prompt or annunciator (on/off represents no specific unit requirements)

Characteristics for RCS parameter...

Pressurizer Pressure

Gross Function Prompt

RCP trip

Characteristic		Rationale
Display	Status	A pressure point is needed to determine when to implement the trip 2/leave 2 RCP operating strategy for EOP events with a loss of pressure/inventory control. (also for trip 4 when below RCP operating limits)
Range	Trip RCPs/off	See rationale for status above
Accuracy	N/A	Display accuracy for a status is ambiguous therfore no requirement is specified.
Units	ON/OFF	Units for an operator prompt or annunciator (on/off represents no specific unit requirements)

Characteristics for RCS parameter...

Pressurizer Pressure

Gross Function Prompt

Pressure Temperature Tech Spec Limitations

Characteristic		**Rationale**
Display	Value	A value is needed to assess the parameter to compare with P-T technical specification limitations.
Range	500 to 2500	These high and low values are consistant with the pressure contraints of the P-T curve supplied with CE plants. (see Figure G-5)
Accuracy	later	Display accuracy for a P-T limitations later.
Units	psia	Units for a pressurized fluid system operated at elevated temperatures. PSIA are the appropriate units to determine subcooling of a system's fluid For U.S. measurements psia suits the majority of manufacturing, operating, and engineering units for the US nuclear industry. (Note: Foreign measurements may require a different set of units and values to support a different population of users.)

Characteristics for RCS parameter...

Pressurizer Pressure

Gross Function Prompt

RHR operation (Shutdown Cooling System Operation)

Characteristic		**Rationale**
Display	Value	A value is needed to assess the parameter with the constraints or limits of RHR operation.
Range	0 to 900	The high is the minimum pressure for SDC entry (System 80 +). The low is a minimum to monitor Refueling operations entry. (approx. atmospheric)
Accuracy	+ or - 15	To be able to determine if depressurized or if change in pressure has occured to approach LTOP.
Units	psia	Units for a pressurized fluid system operated at elevated temperatures. PSIA are the appropriate units to determine subcooling of a system's fluid For U.S. measurements psia suits the majority of manufacturing, operating, and engineering units for the US nuclear industry. (Note: Foreign measurements may require a different set of units and values to support a different population of users.)

Characteristics for RCS parameter...

Pressurizer Pressure

Gross Function Prompt

Standard Post Trip Actions

Characteristic		Rationale
Display	Trend	A pressure trend supports diagnostics and assessment of plant transient conditions.
Range	500 - 2500	Low range: below SI tank pressure (LOCA large break)(Figure G-5) High range: safety or PORV relief setpoint (ATWS/LOCA)(Figure G-6)
Accuracy	+ or - 100	Based on transient rates of pressure (-600 psi/min (LOCA) ; -650 psi/min (SGTR) ; and -400 psi/min (RT) and the application, accuracy for diagnostics is not as important as the ability to determine the parameter's characteristic trend or changes.
Units	psia	Units for a pressurized fluid system operated at elevated temperatures. PSIA are the appropriate units to determine subcooling of a system's fluid. For U.S. measurements psia suits the majority of manufacturing, operating, and engineering units for the US nuclear industry. (Note: Foreign measurements may require a different set of units and values to support a different population of users.)

Characteristics for RCS parameter...

RCS subcooling (Pressurizer Pressure based)

Gross Function Prompt

Margin of Subcooling

Characteristic		**Rationale**
Display		
	Value	A value is needed to assess the parameter as compared with saturation conditions. The intent is to ensure subcooled liquid is available to transfer mass (fluid mass) for heat removal.
Range	0 - 2000	T_h is approx 615 degree F which corresponds to approx. 1600 psi as a high saturation pressure without pressurizer control (LOCA, SGTR, etc.) to Hi Pzr Pressures of approx 2400 psi (Hi relief pressure). A low T_h is approx. 500 degree F which corresponds to approx. 680 psi an assumed low for LOCA & SGTR. From normal operating pressure this yields a margin of pressure equivalent to approx. 1600 psia. MSLB approx. 400 degree F and 250 psi or 2000 psi subcooled
Accuracy	+ or - 70	To be able to determine if subcooling exists or does not exist in the fluid remaining. assume the relation: 7psi/degree F and + or - 10 degree F
Units	psia subcooled	Use of units need to be consistant with the normal measures of pressure. (i.e. pressurized subcooled system at high temperatures using psia)

APPENDIX G: Summary of RCS Parameters and Information Characteristics

Parameter Summary for...

Pressurizer Level / Reactor Vessel Level

Summary of Usage

decision points	allocation	Notes
FULL		- PZR LEVEL -
RCP RESTART LEVEL PERMIT		If all pumps are tripped
NORMAL LEVEL	automatic	Normal PLCS control active
HEATER UNCOVERED	automatic	Heater cutoff equipment protection
PZR EMPTY HEAD VOID		
		- VESSEL LEVEL -
RCS HOT LEG EMPTY		Ensure - Two phase Natural Circulation procedures plus SI cooling aligments EOP strategy
TOP OF CORE EXPOSED		

Characteristics for RCS parameter...

Pressurizer Level

Gross Function Prompt

Charging / Letdown performance

Characteristic		Rationale
Display	Value	A value is within the program level span is needed to compare with program level (PLCS) to evaluate level control to program responses.
Range	25 - 75	The program level is typically maintained , a function of T_{ave} between 30 , 56 %. The range specified , ompasses the program ban and no...l transients. The intent is to provide adequate resolution to make comparisons to assess charging and letdown performance during transients.
Accuracy	+ or - 1	To compare with program level to assess performace of charing and letdown (the best accuracy is desired for performancy assessments) The accuracy 1% is assumed to be adequate for assessing this type of operational performance.
Units	%	For a fixed volume as the Pressurizer % is a common set of units to associated amount of a container volume (this assumes no association to other components in the RCS).

Characteristics for RCS parameter...

Pressurizer Level

Gross Function Prompt

RCP Restart

Characteristic		Rationale
Display	Value /Trend	A value of rapid decreasing level is needed to determine if Pzr level transient is due to RCP restart / void collapse / etc. Operator making determination if the pressurizer is still a functional component. (i.e. heaters covered, saturated volume exists)
Range	0 - 100 (Empty - Full)	Should be able to display empty to full for assessment of recovery of level for EOP and RCS inventory control for normal evolutions.
Accuracy	+ or - 15	Based on existance of inventory to "pump" fluid in the RCS, indication that level exists and is trending toward either maintaining or loosing this inventory is needed as a gross indication. This ensures that the hot leg remains full of subcooled liquid.
Units	%	For a fixed volume as the Pressurizer % is a common set of units to associated amount of a container volume (this assumes no association to other components in the RCS).

Characteristics for RCS parameter...

Pressurizer Level

Gross Function Prompt

HPSI termination criteria

Characteristic		**Rationale**
Display	Status	A level point is needed to determine if and when pressure control can be returned to the Pressurizer using its normal controls - Pressurizer heaters and not HPSI shutoff head.
Range	Heaters Covered/ Heaters Exposed	See the rationale above
Accuracy	N/A	Display accuracy for a status is ambiguous therfore no requirement is specified.
Units	OFF/ON	Units for a operator prompt or annunciator (off/on represents no specific unit requirements)

Characteristics for RCS parameter...

Reactor Vessel Level

Gross Function Prompt

Hot Leg Voiding

Characteristic		**Rationale**
Display	Status	A status is needed to assess whether or not the hot leg is full.
Range	Hot Leg Voided/ Hot Leg Full	See the rationale above
Accuracy	N/A	Display accuracy for a status is ambiguous therfore no requirement is specified.
Units	OFF/ON	Units for an operator prompt or annunciator (off/on represents no specific unit requirements)

Characteristics for RCS parameter...

Pressurizer Level

Gross Function Prompt

HPSI Restart

Characteristic		Rationale
Display	Value /Trend	A trend to support assessments that the parameter is being maintained with charging and letdown or not.
Range	0 - 10C (Empty - Full)	Should be able to display empty to full for assessment of recovery of level for EOP and RCS inventory control for normal evolutions.
Accuracy	+ or - 2.5	Based on normal minimum level (approx. 33 %) and heater cutoff (approx. 28 %) a difference of approximately 5 % exists from <u>one</u> functional perspective. To determine if the heaters are covered and the pressurizer is still functioning. An accuracy of < 5/2% is needed to determine encroachment to heater cutoff and an "unavailable" pressurizer.
Units	%	For a fixed volume as the Pressurizer % is a common set of units to associated amount of a container volume (this assumes no association to other components in the RCS).

Parameter Summary for...

RCS Temperatures

Summary of Usage

decision points	allocation	Notes
T_{hot} (100% power)	automatic	Temperature control program
T_{ave} (100% power)	automatic	
T_{cold} (100% power)	automatic	
HOT STANDBY TEMPERATURE	automatic	Turbine Bypass control default temperature
LTOP (temperature)		Low Temperature Overpressure Protection
SCS (OR RHR) ENTRY TEMPERATURE PERMIT		Change from one system/component control to another.
SCS (OR RHR/RCS) LOW TEMPERATURE LIMIT		

Characteristics for RCS parameter...

RCS Average Temperature

Gross Function Prompt

Cooldown

Characteristic		Rationale
Display	Trend	A Trend is needed to assess the rate of cooldown and temperatures during the cooldown to compare with technical specifications.
Range	325 - 575	Span of the cooldown is between hot standby conditions (approx. 545 deg F) and shutdown cooling entry conditions (approx. 350 deg F) Span inclues ESDE event overcooling rates.
Accuracy	+ or - 5	The resolution of the display to adequatedly measure or determine a cooldown rate < 100 deg F/hr or more on a real time measure 1.66 deg F/min. This accuracy allows 3 minutes to assess trend feedback or 5 deg F to confirm a cooldown rate.
Units	deg F	The English Engineering System of units is used by the U.S. Nuclear Industry. However, for foreign applications the International practical temperature scale, IPTS-68 is commonly used. The units degrees Celsius would be used.

Characteristics for RCS parameter...

RCS Average Temperature

Gross Function Prompt

RHR (or Shutdown Cooling) Cooldown

Characteristic		**Rationale**
Display	Trend	A Trend is needed to assess the rate of cooldown and temperatures during the cooldown to compare with technical specifications.
Range	50 - 450	Span of the cooldown is between points of entry temperature (approx.) for SDC operation and above minimum RCS temperatures.
Accuracy	+ or - 5	The resolution of the display to adequatedly measure or determine a cooldown rate < 100 deg F/hr or more on a real time measure 1.66 deg F/min. This accuracy allows 3 minutes to assess trend feedback or 5 deg F to confirm a cooldown rate.
Units	deg F	The English Engineering System of units is used by the U.S. Nuclear Industry. However, for foreign applications the International practical temperature scale, IPTS-68 is commonly used. The units degrees Celsius would be used.

Characteristics for RCS parameter...

RCS Average Temperature

Gross Function Prompt

Temperature Control Program

Characteristic		Rationale
Display	Value	To determine if the operator is maintaining RCS temperature consistant with the temperature expected for power operation a valve to valve comparison is needed.
Range	520 - 620	The low value allows for assessment of TBS expected performance in hot standby. The high value allows for assessment of power controlled temperature program.
Accuracy	+ or - 2.5	A 10 deg F band for maintain control is a demonstrated band for which control with user confidence has been documented in various industry procedures. [Reference: OPPD-RT EOP (10 deg F); BGE-RT EOP (10 deg F); CPC-RT EOP (20 deg F); procedures written by operations engineering staffs]
Units	deg F	The English Engineering System of units is used by the U.S. Nuclear Industry. However, for foreign applications the International practical temperature scale, IPTS-68 may be more appropriate. This uses degrees Celsius.

Characteristics for RCS parameter...

RCS Subcooling (T_{hot} Based)

Gross Function Prompt

Two Phase or Single Phase Natural Circulation State for Heat Removal

Characteristic		Rationale
Display	Value	To determine if the operator is maintaining the RCS in a "state" that is subcooled by measure relative to current plant conditions.
Range	0 - 220	Low value is used to identify that a two-phase liquid state may exist. High value is used to identify that a high degree of subcooling (200 deg F) exists and may limit rate of cooldown.
Accuracy	+ or - 10	If a scale is used to depict a value
	+ or - 1	If a numerical display is used to depict a value. The accuracy must allow for a correlation for calculations of subcooling using pressurizer pressure and RCS hot leg temperature.
Units	deg F	Units for "amount of subcooling" uses temperature as a preference to associate "boiling" in the RCS. The English Engineering System of units is used by the U.S. Nuclear Industry .

Characteristics for RCS parameter...

RCS Subcooling (CET Based)

Gross Function Prompt

HPSI Termination

Characteristic		Rationale
Display	Value	To determine if the operator is maintaining the RCS in a "state" that is subcooled by measure relative to current plant conditions.
Range	0 - 100	Low value is to identify that two phase state may exist. High value is to identify that core subcooling is above minimum (20 deg F) and normal subcooling (40 - 50 deg F at 100 % power)
Accuracy	+ or - 10	If a scale is used to depict a value
	+ or - 1	If a numerical display is used to depict value. Accuracy must allow for correlation to calculations using Pressurizer pressure and CET temperatures to determine subcooling.
Units	deg F	Units for "amount of subcooling" uses temperature as a preference to associate "boiling" in the Core. The English Engineering System of unitsd is used by the U.S. Nuclear Industry.

Characteristics for RCS parameter...

RCS Hot Leg Temperature (RTD local temperatures)

Gross Function Prompt

Two Phase Cooling / Reflux Cooling

Characteristic		Rationale
Display	Trend	A Trend is needed to assess the existance of two phase cooling. The trend is also needed to assess the phenomenon to maintain it for current cooling conditions.
Range	400 - 600	Low value coresponds to 250 psi saturation temperature. High value corresponds to 1600 psi saturation temperature. (SI injection pressures associated with high and low pressures using and even 100 valuc.
Accuracy	+ or - 2.5	To determine a temperature difference exist between top oriented and bottom oriented hot leg RTDs for the purpose of confirming natural circulation.
Units	deg F	The English Engineering System of units is used by the U.S. Nuclear Industry. However, for foreign applications the International practical temperature scale, IPTS-68 is commonly used. The units degrees Celsius would be used.

Characteristics for RCS parameter...

RCS loop delta T

Gross Function Prompt

Detect / Maintain Natural Circulation Flow

Characteristic		**Rationale**
Display	Value	To determine performance adequacy of RCS heat removal using the Steam Generators - whether it be by forced circulation or natural circulation. Delta T is called out as an measure to assess basic heat transfer relationships Q = mc (D T) or Q = UA (D T)
Range	-10 to +90	The low value allows for RCS heatup with RCPs and reverse heat transfer phenomenon for idle SG. The high value allows for assessment of full power DT and natural circulation DT to be observed up to optimal values (NC cooldown - Reference # 15 pg 2-3. if assume start cooldown after 15 minutes)
Accuracy	+ or - 1	To measure performance under non power forced circulation conditions adequately the best accuracy obtainable is required.
Units	deg F	The English Engineering System of units is used by the U.S. Nuclear Industry.

Characteristics for RCS parameter...

RCS Temperature Rate of Change

Gross Function Prompt

Cooldown Rate and Heatup Rate (Technical Specifications)

Characteristic		**Rationale**
Display	Value	To determine the rate of an RCS cooldown or heatup for PTS monitoring and technical specification monitoring.
Range	+100 to -200	High value allow measure of heatup a rates within limitations of Tech specs. Low value allows measure of cooldown within limitations of Tech specs and Excess cooldown events.
Accuracy	+ or - 10	The ability to determine accurately that the rate of cooldown and heatup is < 100 °F/hr << 200 °F/hr excessive cooldown. Correlates to both time and temperature accuracy in determining or calculating rate. Using 1 minute and 5 °F to approximate temperature resolution
Units	deg F/Hr	The English Engineering System of units is used by the U.S. Nuclear Industry.

Characteristics for RCS parameter...

RCP Operating Status

Gross Function . ot

Forced Circulation present

Characteristic		**Rationale**
Display	Status	A status providing information that an RCP is running and pumping RCS fluid around the system is needed.
Range	Running/Off	See rational for status above
Accuracy	N/A	Display accuracy for a status is ambiguous therefore no requiremen is specified.
Units	ON/OFF	Units for an operator status or prompt (on/off represents no specific unit requirements)

Figure G-1
Core Power: Representative Small Break LOCA

Reference: CEN-152 Rev. 03

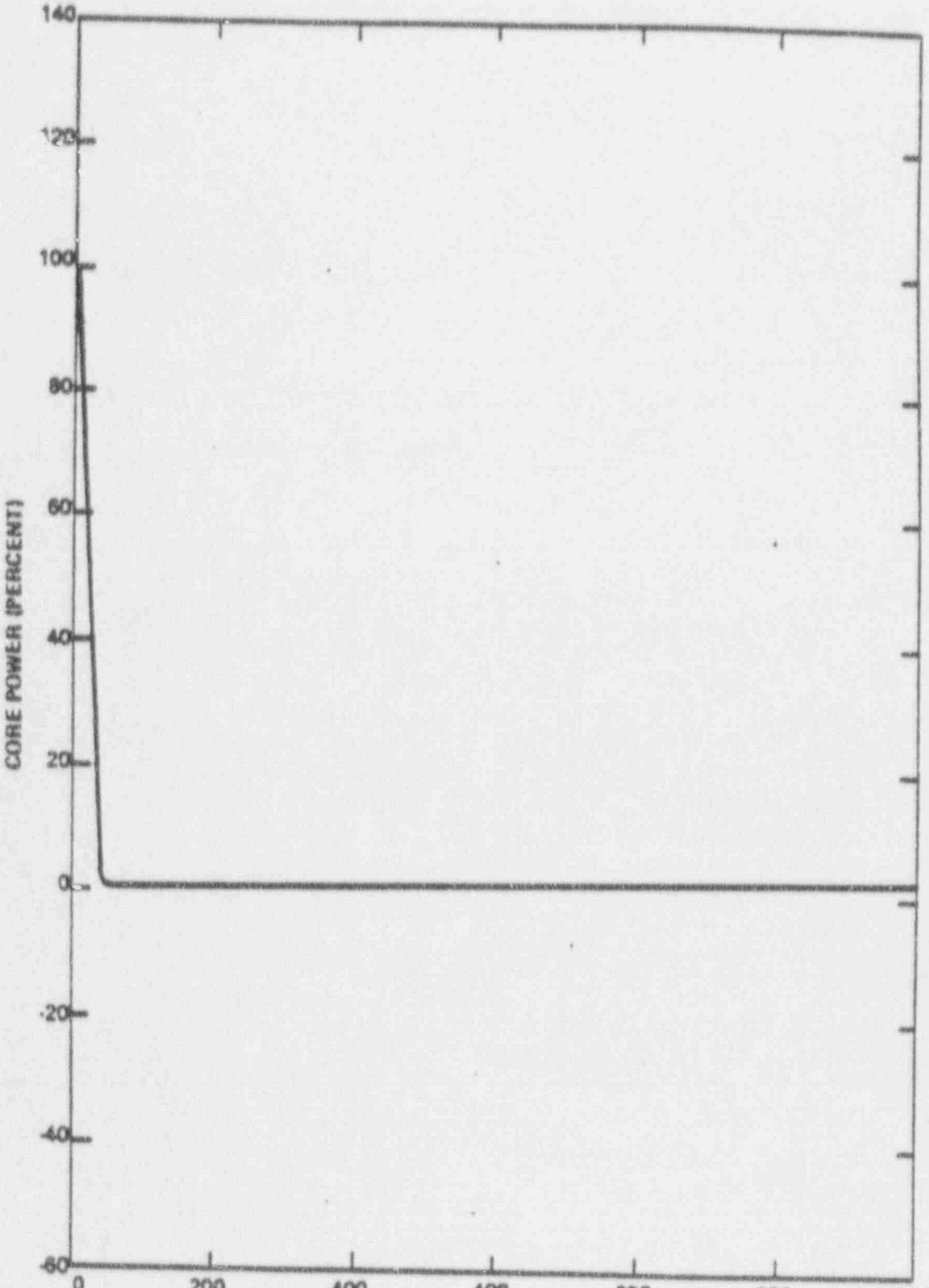


Figure G-2
RCS Temperatures: Representative Reactor Trip

Reference: CEN-152 Rev. 03

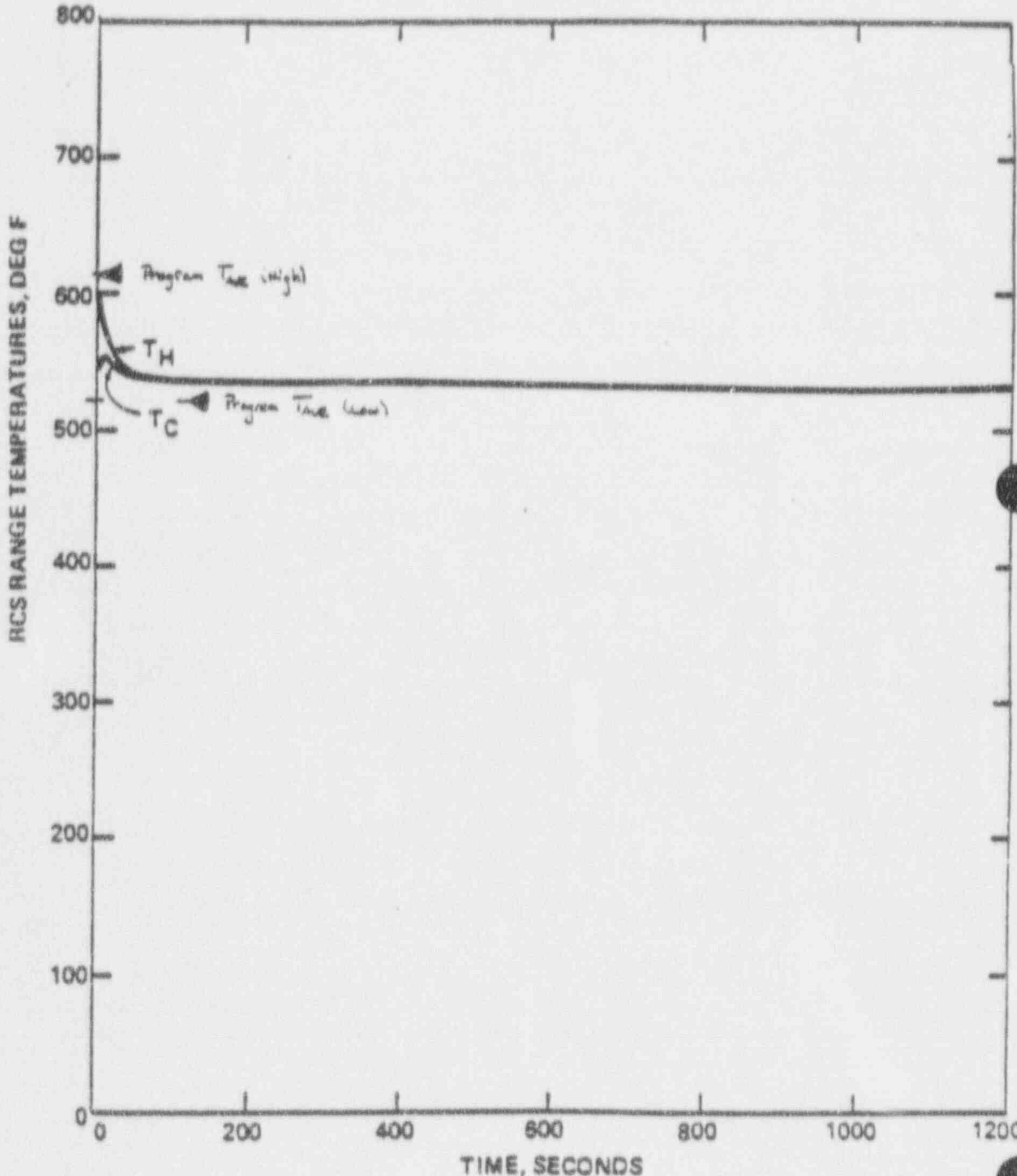


Figure G-3
RCS Hot Leg Temperatures: Representative Small Break LOCA

Reference: CEN-152 Rev. 03

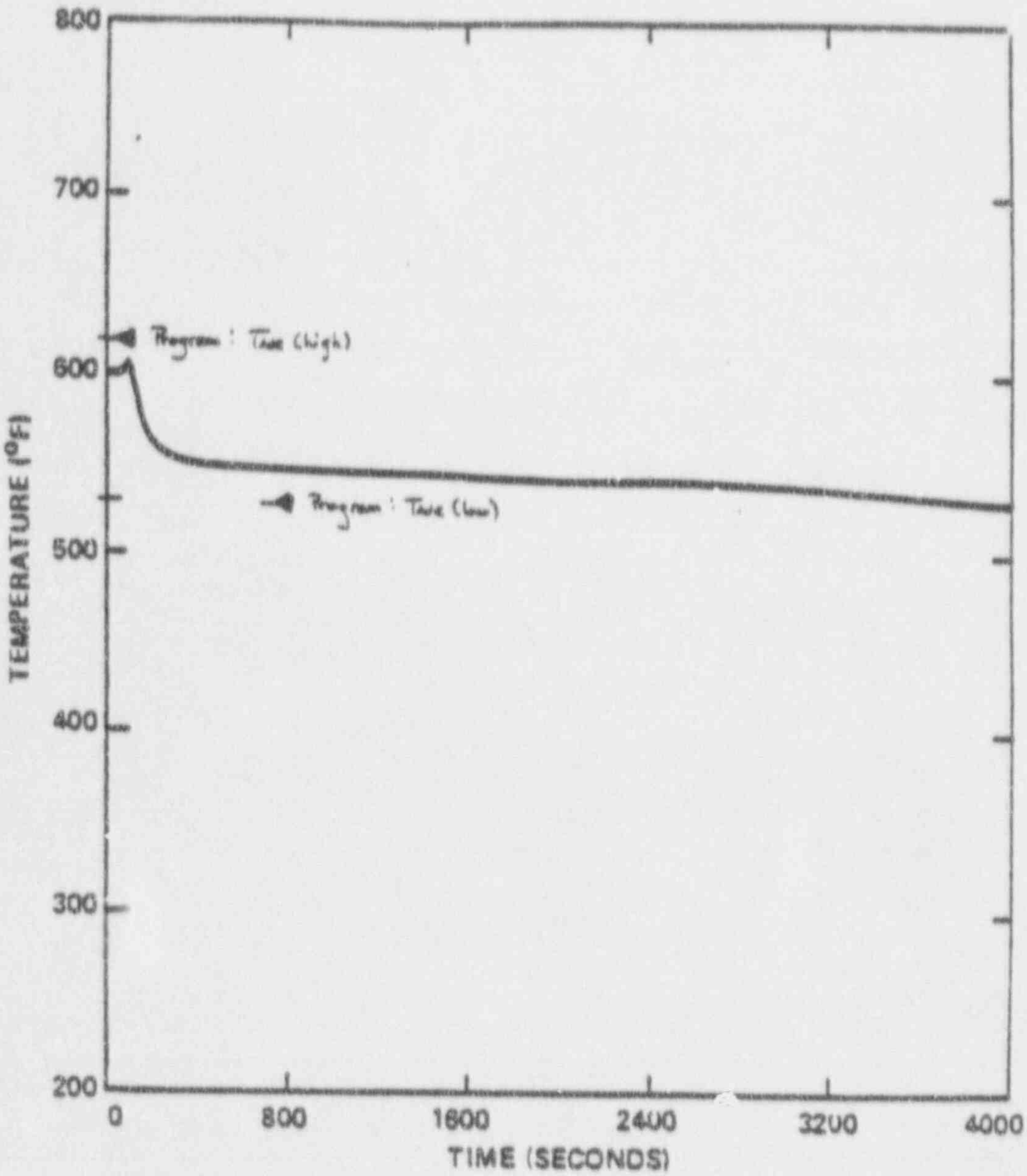


Figure G-4
RCS Cold Leg Temperatures: Representative Small Break LOCA

Reference: CEN-152 Rev. 03

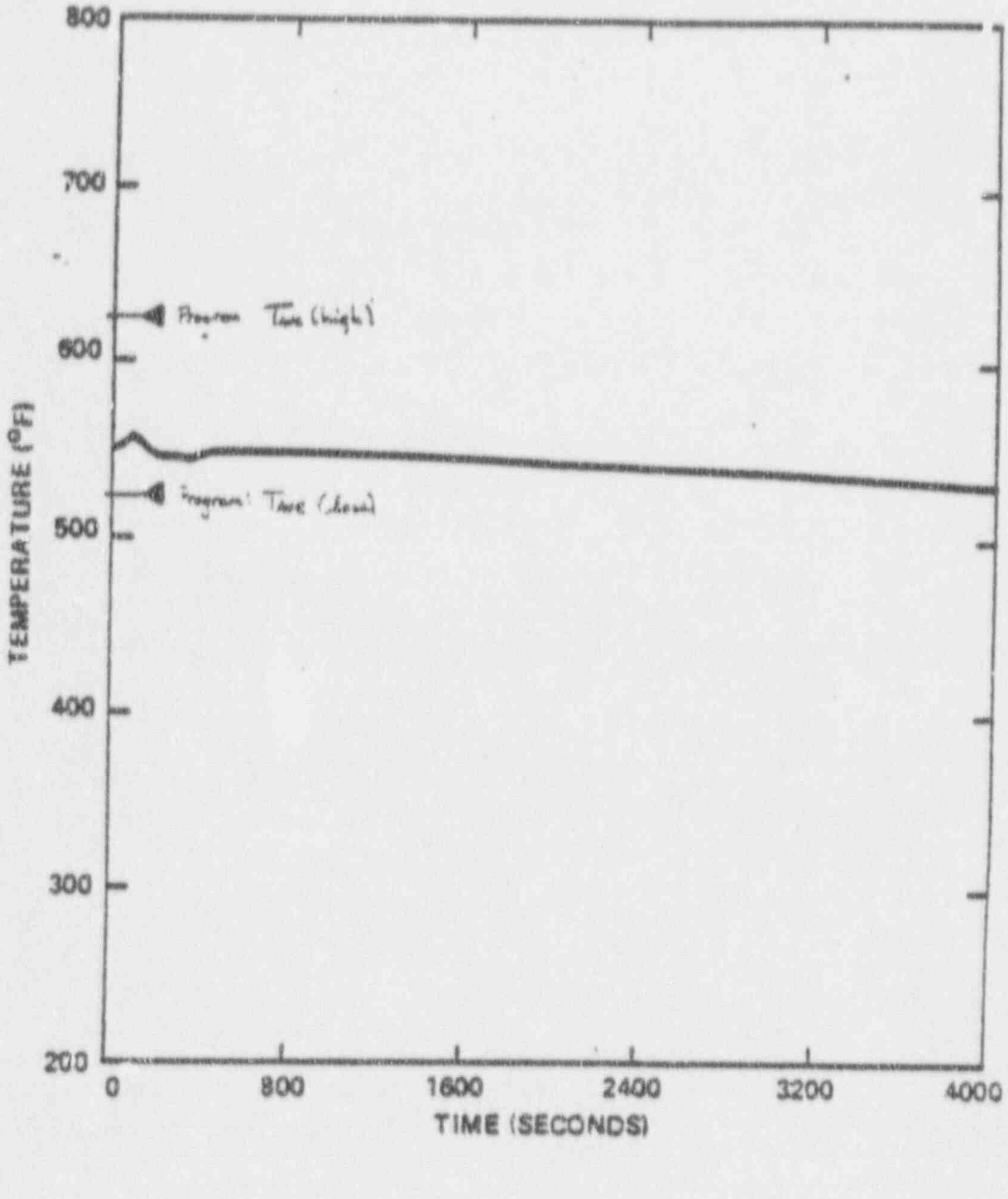
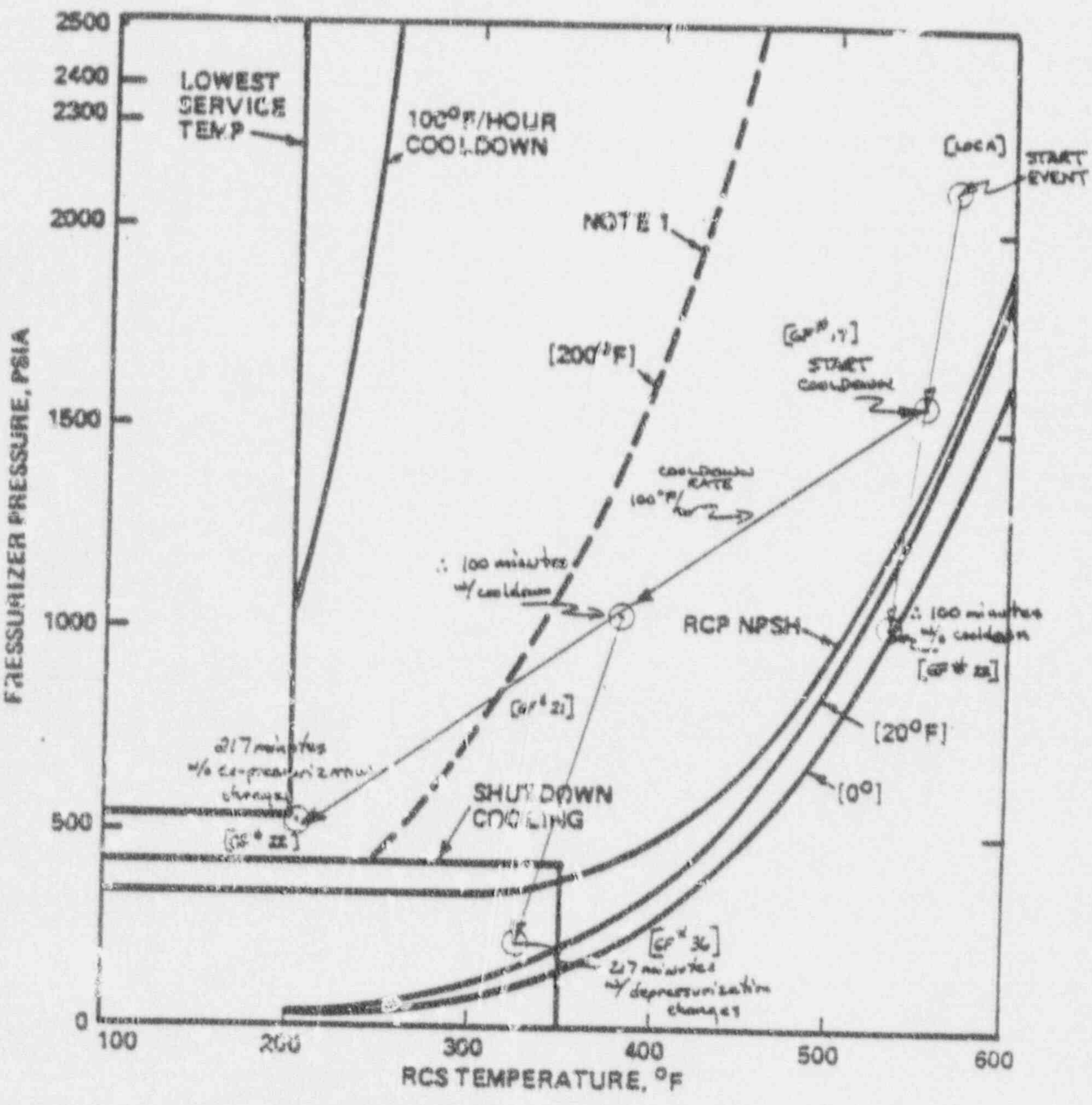


Figure G-5
RCS Cooldown: Temperatures and Pressures

Reference: CEN-152 Rev. 03

TYPICAL POST ACCIDENT PRESSURE-TEMPERATURE LIMITS(2)



NOTES: (1) THIS CURVE SUPERSEDES THE 100°F/HOUR COOLDOWN CURVE ANYTIME THE RCS HAS EXPERIENCED AN UNCONTROLLED COOLDOWN WHICH CAUSES RCS TEMPERATURE TO GO BELOW 500°F
(2) THESE CURVES MUST BE ADJUSTED FOR INSTRUMENT INACCURACIES

Figure G-6
Pressurizer Pressure: ATWS Transient

Reference: CE ATWS Generic Report (Fig. 2-3)

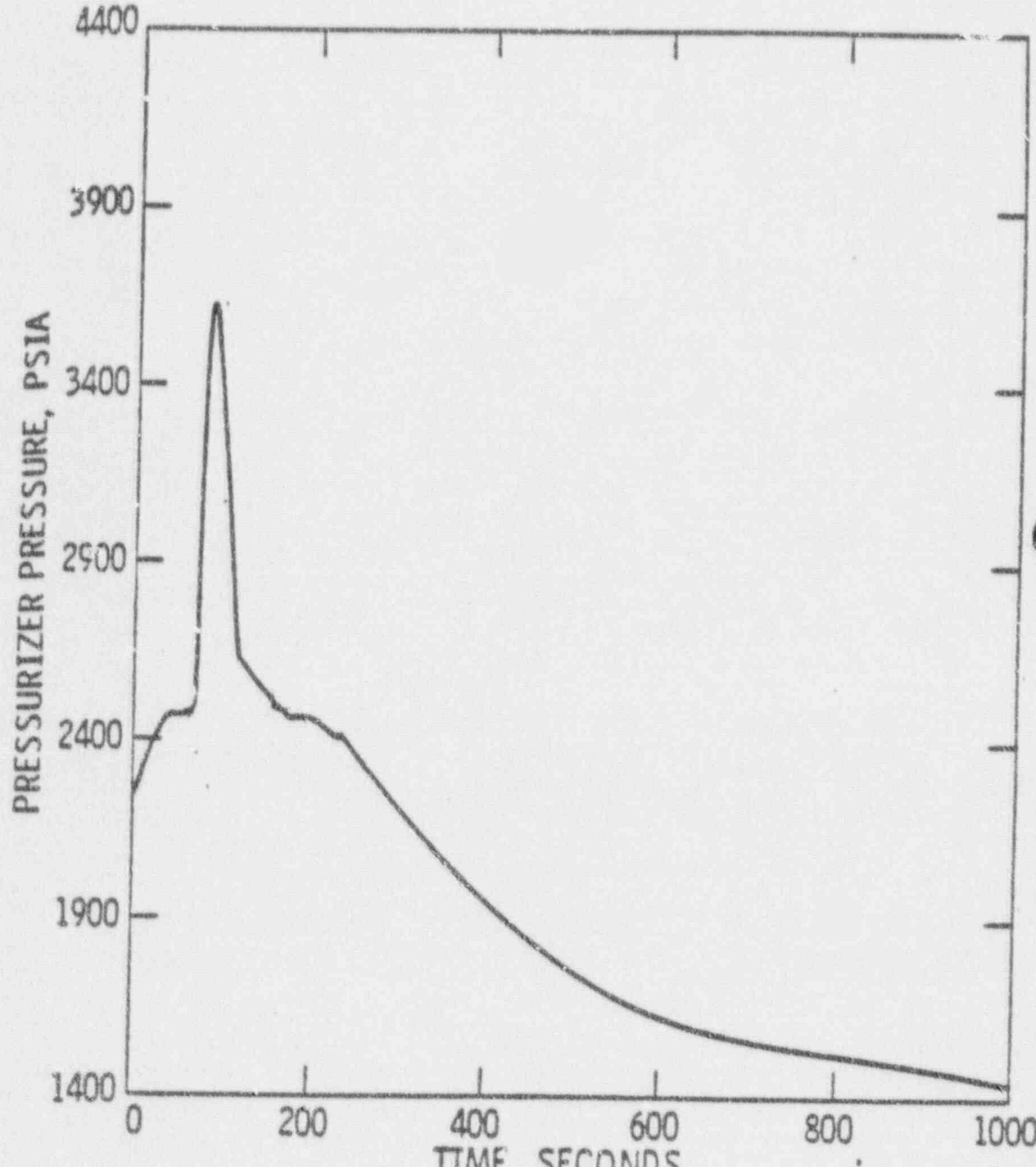


Figure G-7
Pressurizer Pressure: Representative Reactor Trip

Reference: CEN-152 Rev. 03

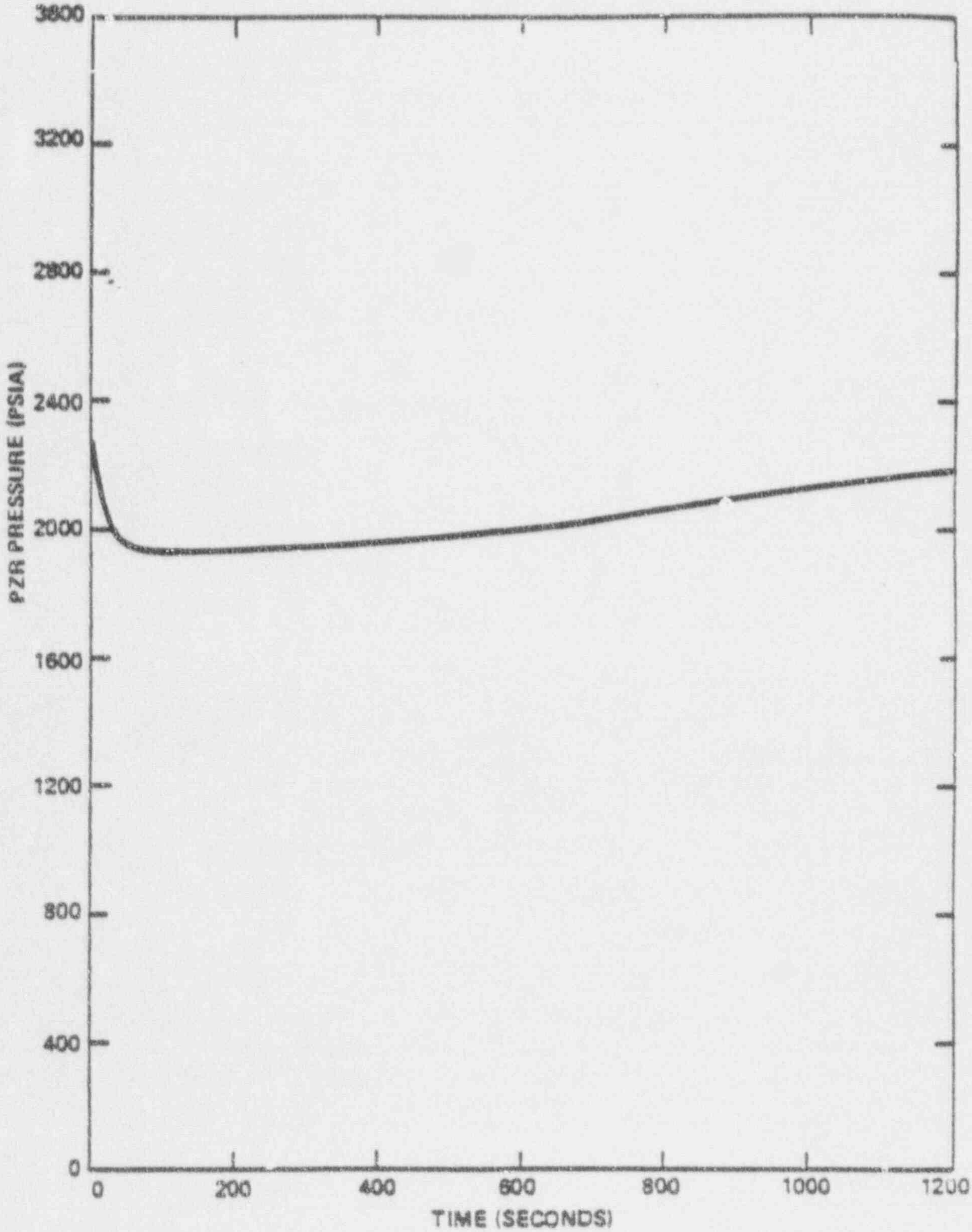
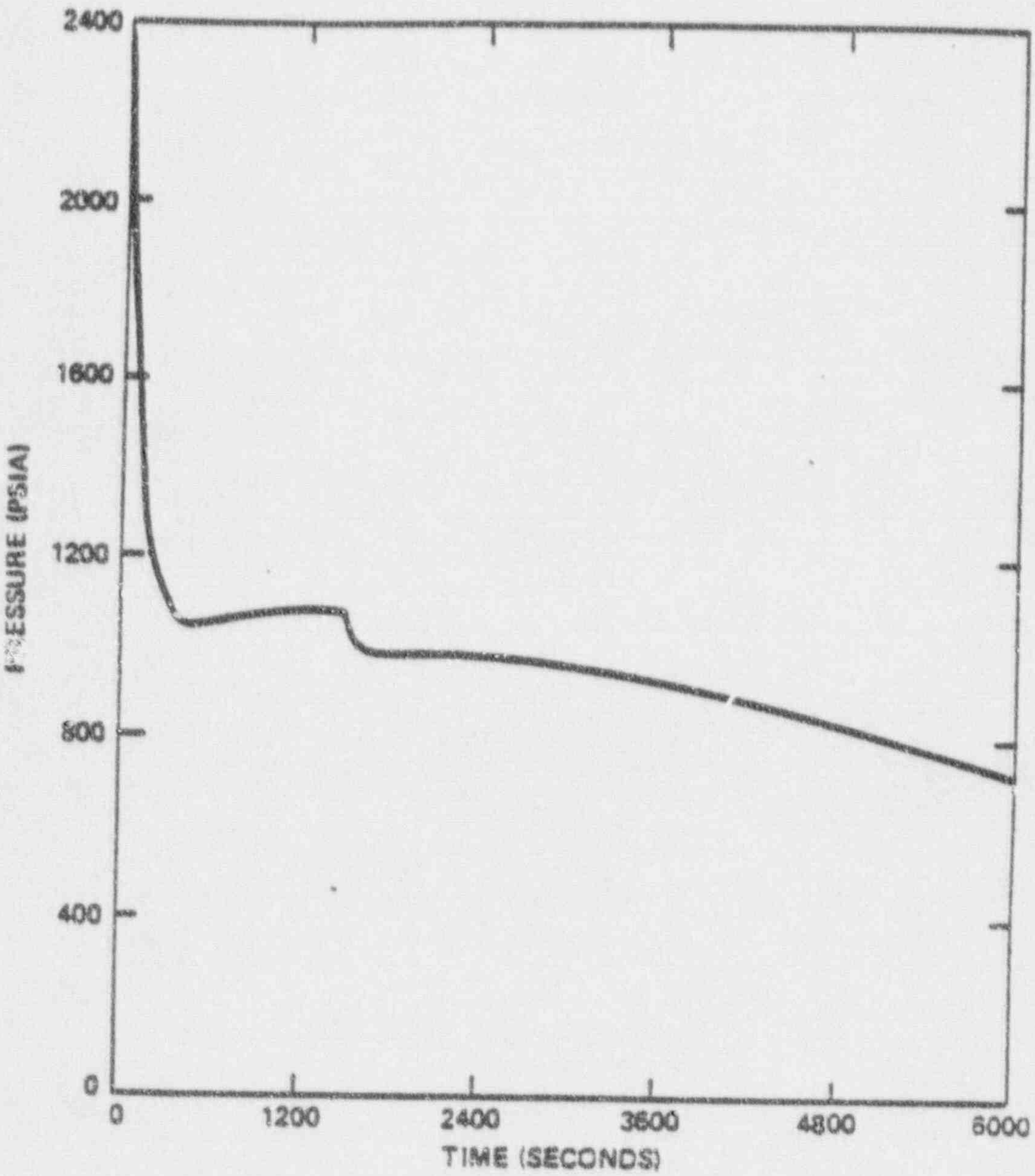


Figure G-8
Pres,urizer Pressure: Reprosentative Small Break LOCA

Reference: CEN-152 Rev. 03



Appendix H

Time Profiles for Event Sequences

The contents of this appendix provide the time assessment data for the collected task element information. The time assessment data is partitioned by gross function and subfunction for the following events:

Nuplex 80 + Functional Analysis

Time Profiles for Event Sequences by (Collected) Task Elements

Gross Function No.	Time into event (minutes)	Parameter to Observe	Time allotment for Information (minutes)	Processing Times (msec)	Number of Control Actions	Correction Factor (sec)
1.00	0.00	120 V DC Bus A Voltage	30.00	380	0	1.0
1.00	0.00	120 V DC Bus B Voltage	30.00	380	0	1.0
1.00	0.00	120 V Inverter Voltage Inst. Bus A	30.00	380	0	1.0
1.00	0.00	120 V Inverter Voltage Inst. Bus B	30.00	380	0	1.0
1.00	0.00	120 V Inverter Voltage Inst. Bus C	30.00	380	0	1.0
1.00	0.00	120 V Inverter Voltage Inst. Bus D	30.00	380	0	1.0
1.00	0.00	13.8kV (Alt.) RCP Bus Supply Breaker	30.00	248	0	1.0
1.00	0.00	13.8kV RCP Bus Supply Breaker	30.00	248	0	1.0
1.00	0.00	13.8kV Service Bus Supply Breaker	30.00	248	0	1.0
1.00	0.00	4160 V A2 Bus Supply Breaker	30.00	248	0	1.0
1.00	0.00	4160 V Bus A1 (Emerg.) Supply Breaker	30.00	248	0	1.0
1.00	0.00	4160 V Bus A1 Supply Breaker	30.00	248	0	1.0
1.00	0.00	4160 V Bus A3 Supply Breaker (etc.)	30.00	248	0	1.0
1.00	0.00	4160 V Bus B1 (Emerg.) Supply Breaker	30.00	248	0	1.0
1.00	0.00	4160 V Bus B1 Supply Breaker	30.00	248	0	1.0
1.00	0.00	4160 V Bus B2 Supply Breaker	30.00	248	0	1.0
1.00	0.00	4160 V Bus B3 Supply Breaker (etc.)	30.00	248	0	1.0
1.00	0.00	4160 V Transformer A Supply Breaker	30.00	248	0	1.0
1.00	0.00	4160 V Transformer B Supply Breaker	30.00	248	0	1.0
1.00	0.00	480 V Xformer A1A Supply Breaker	30.00	248	0	1.0
1.00	0.00	480 V Xformer A1B Supply Breaker	30.00	248	0	1.0
1.00	0.00	480 V Xformer A2A Supply Breaker	30.00	248	0	1.0
1.00	0.00	480 V Xformer A2B Supply Breaker	30.00	248	0	1.0
1.00	0.00	480 V Xformer A3A Supply Breaker (etc.)	30.00	248	0	1.0
1.00	0.00	480 V Xformer A3B Supply Breaker (etc.)	30.00	248	0	1.0
1.00	0.00	480 V Xformer B1A Supply Breaker	30.00	248	0	1.0
1.00	0.00	480 V Xformer B1B Supply Breaker	30.00	248	0	1.0
1.00	0.00	480 V Xformer B2A Supply Breaker	30.00	248	0	1.0
1.00	0.00	480 V Xformer B2B Supply Breaker	30.00	248	0	1.0
1.00	0.00	480 V Xformer B3A Supply Breaker (etc.)	30.00	248	0	1.0
1.00	0.00	480 V Xformer B3B Supply Breaker (etc.)	30.00	248	0	1.0
1.00	0.00	CEAM power supply energized	30.00	248	0	1.0
1.00	0.00	Diesel Gen. A Fuel Storage Tank Level	30.00	380	0	1.0
1.00	0.00	Diesel Gen. B Fuel Storage Tank Level	30.00	380	0	1.0
1.00	0.00	Diesel Generator A Day Tank Level	30.00	380	0	1.0
1.00	0.00	Diesel Generator B Day Tank Level	30.00	380	0	1.0
1.00	0.00	Permission or Authorization	30.00	248	0	1.0
1.00	0.00	Process Instrumentation energized	30.00	248	0	1.0
1.00	0.00	Protective Systems energized	30.00	248(8)	0	4.5
1.00	0.00	RCP 1A supply breaker	30.00	248	0	1.0
1.00	0.00	RCP 1B supply breaker	30.00	248	0	1.0
1.00	0.00	RCP 2A supply breaker	30.00	248	0	1.0

Nuplex 80 + Functional Analysis

Time Profiles for Event Sequences
by (Collected) Task Elements

Gross Function No.	Time into event (minutes)	Parameter to Observe	Time allotment for Information (minutes)	Processing Times (msec)	Number of Control Actions	Correction Factor (sec)
1.00	0.00	RCP 2B supply breaker	30.00	248	0	1.0
1.00	0.00	Reactor power	30.00	450(4)	0	2.5
1.00	0.00	Refueling Activity	30.00	248	0	1.0
1.00	0.00	Regulating Systems energized	30.00	248(6)	0	3.5
1.00	0.00	Report of Estimated CEA positions	30.00	380	0	1.0
1.00	0.00	Report of Process Instruments Calibrated	30.00	248	0	1.0
1.00	0.00	Report of Protective Inst. Calibrated	30.00	248	0	1.0
1.00	0.00	Report of RCS boron concentration	30.00	380	0	1.0
1.00	0.00	Report of Regulating Systems Calibrated	30.00	248	0	[illegible]
1.00	0.00	Report of completed maintenance	30.00	248	0	1.0
1.00	0.00	Report of last Diesel Gen. testing	30.00	380+380	0	1.5
1.00	0.00	Station Battery Charger A (Amperes)	30.00	380	0	[illegible]
1.00	0.00	Station Battery Charger B (Amperes)	30.00	380	0	1.0
1.00	0.00	Station Battery Voltage A	30.00	380	0	1.0
1.00	0.00	Station Battery Voltage B	30.00	380	0	1.0
1.00	0.00	Time	30.00	380	0	1.0
1.00	0.00	Time of CEA Estimates	30.00	380	0	1.0
1.00	0.00	number of operators	30.00	380	0	1.0
1.01	0.00	RCS average temperature	30.00	380	0	1.0
1.01	0.00	Steam Generator Pressure	30.00	380	0	1.0
1.01	0.00	Turbine bypass controller mode	30.00	248	0	1.0
1.01	0.00	Turbine bypass pressure control setting	30.00	380	0	1.0
1.02	0.00	Steam Generator Level	30.00	310	0	1.0
1.03	0.00	Main Feedwater Flow	30.00	380	0	1.0
1.03	0.00	Main Steam Flow	30.00	380	0	1.0
1.03	0.00	Startup Feedpump Status	30.00	248	0	1.0
=>						
2.01	30.00	CEA Group Selection	0.25	310	2	1.0
2.02	30.00	CEA position	1.00	310(6)	2	3.5
2.03	30.00	Reactor Power (NI)	0.25	380(4)	0	2.5
2.03	30.00	CEA position	1.00	310(6)	0	3.5
2.03	30.00	CEA position	1.00	248	0	1.0
2.03	30.00	RCS average temperature	2.00	310	0	1.0
=>						
2.04	33.00	CEA Group Selection	0.25	310	2	1.0
2.0[illegible]	33.00	CEA position	0.25	310(6)	2	3.5
2.06	33.00	CEA position	0.00	310(6)	0	3.5
2.06	33.00	RCS average temperature	0.00	310	0	1.0
2.06	33.00	Reactor Power (NI)	0.00	380(4)	0	2.5
2.06	33.00	CEA position	0.25	310(6)	0	3.5
=>						
2.07	36.00	CEA Group Selection	0.25	310	2	1.0

Nuplex 80 + Functional Analysis

Time Profiles for Event Sequences
by (Collected) Task Elements

Gross Function No.	Time into event (minutes)	Parameter to Observe	Time allotment for Information (minutes)	Processing Times (msec)	Number of Control Actions	Correction Factor (sec)
2.08	36.00	CEA position	0.25	310(6)	2	3.5
2.09	36.00	CEA position	0.00	248(6)	0	3.5
2.09	36.00	RCS average temperature	0.00	310	0	1.0
2.09	36.00	Reactor Power (NI)	0.00	380(4)	0	2.5
2.09	36.00	CEA position	0.25	310(6)	0	3.5
=>						
3.01	45.00	Charging flow valve alignment	2.00	380	4	1.0
3.01	45.00	Letdown flow	2.00	450	1	1.0
3.01	45.00	Pressurizer Level	2.00	310	0	1.0
3.02	45.00	RCS Boron concentration	2.00	3?0	0	1.0
=>						
3.02	343.00	RCS Boron Concentration	10.00	310	0	1.0
=>						
4.02	350.00	CEA Group position	0.25	310	2	1.0
4.03	350.00	CEA position	1.00	380(4)	2	2.5
=>						
4.04	352.00	CEA Group position	0.25	310	2	1.0
4.05	352.00	CEA position	0.25	380(4)	2	2.5
=>						
4.06	354.00	CEA group position	0.25	310	2	1.0
4.07	354.00	CEA position	0.25	380(4)	2	2.5
=>						
4.08	356.00	CEA Group position	0.25	310	2	1.0
4.09	356.00	CEA position	0.25	380(4)	2	2.5
=>						
4.10	358.00	CEA Group position	0.25	310	2	1.0
4.11	358.00	CEA position	0.25	380(4)	2	2.5
=>						
4.12	360.00	CEA Group position	0.25	310	2	1.0
4.13	360.00	CEA position	0.25	380(4)	2	2.5
=>						
4.14	362.00	CEA Sequential Control Mode	0.25	310	1	1.0
4.15	362.00	CEA position	1.00	380(4)	2	2.5
=>						
5.00	364.00	Reactor Power (NI)	0.25	450(4)	0	2.5
5.00	364.00	RCS average temperature	2.00	380	0	1.0
=>						
6.00	380.00	RCS boron concentration	0.00	380	0	1.0
6.00	380.00	Reactor Power (NI)	0.00	310(4)	2	2.5
6.00	380.00	Startup rate (NI)	0.00	310(4)+450	2	2.5
6.00	380.00	RCS average temperature	0.25	380	0	1.0
6.01	380.00	CEA position	1.00	310	2	1.0

Nuplex 80 + Functional Analysis

Time Profiles for Event Sequences
by (Collected) Task Elements

Gross Function No.	Time into event (minutes)	Parameter to Observe	Time allotment for Information (minutes)	Processing Times (msec)	Number of Control Actions	Correction Factor (sec)
6.02	380.00	Reactor Power (NI)	0.25	310(4)	0	2.5
6.02	380.00	Startup rate (NI)	0.25	310(4)+450	0	2.5
6.03	380.00	Reactor Power rate of change	0.25	310(4)+450	2	2.5
6.04	380.00	Pressurizer Pressure	2.00	380	0	1.0
6.04	380.00	RCS Boron concentration	2.00	380	0	1.0
6.04	380.00	RCS average temperature	2.00	380	0	1.0
=>						
7.01	390.00	CEA position	1.00	248(64)	2	32.5
7.02	390.00	Reactor Power (NI)	0.25	380(4)	0	2.5
7.02	390.00	RCS hot leg temperature	2.00	310(2)	2	1.5
=>						
8.00	400.00	Startup rate (NI)	0.00	310(4)+450	0	2.5
8.00	400.00	RCS average temperature	0.25	380	0	1.0
8.00	400.00	Reactor Power (NI)	0.25	310(4)	0	2.5
8.01	400.00	CEA position	1.00	310(64)	2	32.5
8.02	400.00	CEA position	0.25	310	0	1.0
8.02	400.00	Reactor Power rate of change	0.25	310(4)+450	2	2.5
=>						
9.00	420.00	Turbine Trip	0.50	248	0	1.0
9.00	420.00	Turbine jacking gear	0.50	248	0	1.0
9.00	420.00	Turbine rotation	0.50	248(2)	0	1.5
9.00	420.00	Deaerating Feedwater Storage Tank Level	1.00	248	0	1.0
9.00	420.00	Condenser Circulating Water Flow	2.00	248	0	1.0
9.00	420.00	Condenser Hotwell Level	2.00	310	0	1.0
9.00	420.00	Condenser vacuum	2.00	248+380	0	1.0
9.00	420.00	[Service] Cooling Water (list)	2.00	380(2)	0	1.5
=>						
9.00	425.00	Reactor Power (NI)	0.25	310(4)	0	2.5
9.00	425.00	Condensate pump	0.50	248	0	1.0
9.00	425.00	Deaerating Feedwater Storage Tank Level	1.00	310	0	1.0
9.00	425.00	Dearating Feedwater Tank temperature	1.00	380	0	1.0
9.00	425.00	LP Turbine exhaust hood temperature	1.00	248	0	1.0
9.00	425.00	[Raw or Salt] Cooling Water (list)	2.00	380(2)	0	1.5
9.00	425.00	Main Feedpump	3.00	310	0	1.0
=>						
9.00	430.00	Unit Transformer cooling water flow	1.00	380	0	1.0
9.00	430.00	Unit Transformer cooling water temp.	1.00	248	0	1.0
9.01	430.00	Generator H2 pressure	1.00	380	2	1.0
9.01	430.00	Generator H2 seal oil flow	1.00	248	2	1.0
9.01	430.00	Generator H2 seal oil temperature	1.00	248	0	1.0
9.01	430.00	H2 cooler inlet temperature	1.00	380	0	1.0
9.01	430.00	H2 cooler outlet temperature	1.00	380	2	1.0

Nuplex 80 + Functional Analysis

Time Profiles for Event Sequences by (Collected) Task Elements

Gross Function No.	Time into event (minutes)	Parameter to Observe	Time allotment for Information (minutes)	Processing Times (msec)	Number of Control Actions	Correction Factor (sec)
9.01	430.00	Stator Liquid cooling pump	1.00	248	0	1.0
9.01	430.00	Stator temperature	1.00	380	0	1.0
=>						
10.01	435.00	Load limit Set Potentiometer	1.00	380	1	1.0
10.01	435.00	Turbine Trip	1.00	248	1	1.0
10.01	435.00	Turbine first stage feedback	1.00	248	0	1.0
=>						
10.02	440.00	EHC oil pressure	1.00	380	1	1.0
10.02	440.00	EHC oil temperature	1.00	380+380	0	1.0
=>						
10.03	450.00	Heater Drain Dump Valve control (list)	1.00	450(6)	0	3.5
10.03	450.00	MSR Steam Supply valve position	1.00	248	0	1.0
10.03	450.00	Bleeder Trip valve control (list)	3.00	248(8)	0	4.5
10.03	450.00	Bleeder Trip valve position (list)	3.00	248(8)	0	4.5
=>						
10.03	455.00	Heater Drain Dump valve control (list)	3.00	450(6)	6	3.5
10.03	455.00	MSR Steam Supply valve control (list)	3.00	248(2)	4	1.5
10.04	455.00	Bleeder Trip Valves (list)	2.00	248(8)	8	4.5
10.04	455.00	Bleeder Trip Valve control (list)	3.00	248(8)	8	4.5
=>						
10.04	460.00	Heater Drain Dump valve position	1.00	248	1	1.[illegible]
10.04	460.00	Heater drain tank dump valve control	1.00	248	1	1.[illegible]
10.04	460.00	Heater drain tank high level dump valve	1.00	450	1	1.0
=>						
10.05	480.00	Turbine Trip	1.00	248	0	1.0
10.05	480.00	Turbine Stop valves (list)	3.00	248(2)	4	1.5
10.05	480.00	Turbine control valves (list)	3.00	248(5)	5	3.0
=>						
10.05	485.00	Turbine Bleeder Trip valves (list)	3.00	248(6)	6	3.5
10.05	485.00	Turbine intercept valves (list)	3.00	248(2)	4	1.5
10.05	485.00	Turbine intermediate stop valves (list)	3.00	248(2)	2	1.5
=>						
10.06	490.00	Chest warmup control	1.00	310	1	1.0
10.06	490.00	Inner Chest Casing temperature	1.00	380	0	1.0
10.06	490.00	Main Stop Valve Bypass	1.00	248+310	0	1.0
10.06	490.00	Outer Chest casing temperature	1.00	380	0	1.0
10.06	490.00	Steam Chest Pressure	1.00	248	0	1.0
10.06	490.00	Time	1.00	380	0	1.0
=>						
11.00	495.00	Main Steam Flow	0.50	380	0	1.0
11.00	495.00	Steam Generator Level	0.50	310(2)	0	1.5
11.01	495.00	Main Feedwater Flow	0.50	380(2)	0	1.5

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Time Profiles for Event Sequences
by (Collected) Task Elements

Gross Function No.	Time into event (minutes)	Parameter to Observe	Time allotment for Information (minutes)	Processing Times (msec)	Number of Control Actions	Correction Factor (sec)
11.01	495.00	Startup Feed Pump	1.00	248	0	1.0
=>						
11.01	500.00	Feed Regulating Mode control	1.00	248	1	1.0
11.02	500.00	Feedwater Temperature	2.00	248	0	1.0
11.03	500.00	Condensate Storage Tank Level	2.00	450(2)	0	1.5
11.03	500.00	Hotwell Level	2.00	450	0	1.0
12.00	500.00	Shell and Rotor expansion difference	1.00	380	0	1.0
12.00	500.00	Time	1.00	380	0	1.0
12.00	500.00	Time	1.00	380	0	1.0
12.00	500.00	Time	1.00	380	0	1.0
12.00	500.00	Turbine First Stage Shell temperature	1.00	380	0	1.0
12.00	500.00	Turbine speed	1.00	380	2	1.0
12.00	500.00	Turbine speed rate of change	1.00	310	0	1.0
=>						
12.01	505.00	Bearing Oil Temperature	1.00	450	0	1.0
12.01	505.00	Exhaust Hood Temperature	1.00	380	0	1.0
12.01	505.00	First stage shell temperature	1.00	380+380	0	1.0
12.01	505.00	Shell and Rotor expansion difference	1.00	380	0	1.0
12.01	505.00	Turbine Bearing oil flow	2.00	248	0	1.0
12.01	505.00	Turbine generator rubbing or vibration	3.00	248(INFO IN)	0	1.0
12.02	505.00	later	0.25		0	1.0
13.00	505.00	Turning Gear status	1.00	248	0	1.0
13.01	505.00	Startup rate (NI)	0.00	310(4)+450	0	2.5
13.01	505.00	Reactor Power (NI)	0.25	380(4)	0	2.5
13.01	505.00	Reactor Power (NI)	0.50	380(4)	0	2.5
13.01	505.00	Intercept valve(s) position	1.00	248(2)	0	1.5
13.01	505.00	Main Stop Valve position	1.00	248	0	1.0
13.01	505.00	Turbine Control valve position	1.00	248	0	1.0
14.01	505.00	Turbine 1st stage pressure	0.25	380	0	1.0
14.01	505.00	High pressure lift pump status	1.00	248	0	1.0
14.01	505.00	Turning Gear Motor Status	1.00	248	0	1.0
14.01	505.00	Bearing Header pressure	2.00	380	0	1.0
14.01	505.00	Main Shaft Oil pump discharge pressure	2.00	380	0	1.0
=>						
14.01	506.00	Bearing Oil temperature	1.00	450	0	1.0
14.01	506.00	Turbine Speed	2.00	380	1	1.0
14.02	506.00	later	0.25		0	1.0
14.02	506.00	Mechanical Trip (TG)	0.50	380	1	1.0
=>						
14.03	508.00	later	0.25		0	1.0
14.03	508.00	Mechanical Trip (TG)	0.50	380	1	1.0
=>						

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Time Profiles for Event Sequences by (Collected) Task Elements

Gross Function No.	Time into event (minutes)	Parameter to Observe	Time allotment for Information (minutes)	Processing Times (msec)	Number of Control Actions	Correction Factor (sec)
15.01	510.00	later	0.25		0	1.0
15.01	510.00	Generator Disconnects	1.00	248	0	1.0
15.01	510.00	Turbine Generator Breakers	1.00	248(2)	0	1.5
15.02	510.00	later	0.25		0	1.0
15.02	510.00	Generator exciter field breaker	1.00	248	2	1.0
15.02	510.00	Generator field breaker	1.00	248	0	1.0
15.03	510.00	later	0.25		0	1.0
15.03	510.00	Generator Output Voltage	1.00	450	2	1.0
15.03	510.00	Generator Voltage Control	1.00	450	1	1.0
15.03	510.00	Generator Voltage Mode Control	1.00	248	1	1.0
15.03	510.00	Generator Voltage Mode Control	1.00	248	1	1.0
15.03	510.00	Turbine Speed	1.00	450	2	1.0
15.04	510.00	later	0.25		0	1.0
15.04	510.00	Load limit control position	1.00	380	1	1.0
16.00	510.00	later	0.25		0	1.0
16.00	510.00	Generator Voltage	1.00	310	0	1.0
16.00	510.00	Grid (running) Voltage	1.00	310	0	1.0
16.00	510.00	Synchroscope	1.00	310	2	1.0
17.00	510.00	later	0.25		0	1.0
17.00	510.00	Generator Voltage	1.00	310	1	1.0
17.00	510.00	Turbine Generator Power	1.00	310	0	1.0
17.00	510.00	Turbine Speed	1.00	310	2	1.[illegible]
17.01	510.00	later	0.25		0	1.0
17.01	510.00	Turbine Cooling Water Temperature	2.00	310	1	1.0
=>						
18.00	520.00	later	0.25		0	1.0
18.00	520.00	Load Authorization	5.00	248(INFO IN)	0	1.0
19.00	520.00	later	0.25		0	1.0
19.00	520.00	Generator Frequency	1.00	380	0	1.0
19.00	520.00	Generator Voltage	1.00	380	0	1.0
19.00	520.00	Turbine Generator Power	1.00	310	1	1.0
19.00	520.00	Turbine Generator Power	1.00	380	0	1.0
20.00	520.00	Main feed flow	0.00	380	0	1.0
20.00	520.00	Main steam flow	0.00	380	0	1.0
20.00	520.00	Main Feedwater Flow	0.50	380	0	1.0
20.00	520.00	Main Steam Flow	0.50	380	0	1.0
20.00	520.00	Steam Generator Level	0.50	310(2)	0	1.5
20.00	520.00	Steam Generator Pressure	0.50	450	0	1.0
20.01	520.00	Main feed flow	0.00	450	2	1.0
20.01	520.00	Steam Generator level	0.25	310(2)	0	1.5
20.01	520.00	Main Feedwater Control Valve position	0.50	450(2)	0	1.5
20.02	520.00	Deaerator pressure	0.00	380	0	1.0

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Time Profiles for Event Sequences
by (Collected) Task Elements

Gross Function No.	Time into event (minutes)	Parameter to Observe	Time allotment for Information (minutes)	Processing Times (msec)	Number of Control Action	Correction Factor (sec)
20.02	520.00	Feedwater Temperature	2.00	248	0	1.0
20.03	520.00	Condensate storage tank A level	0.00	450	0	1.0
20.03	520.00	Condensate storage tank B level	0.25	450	0	1.0
20.03	520.00	Hotwell Level	2.00	450	0	1.0
21.01	520.00	RCS average temperature	0.00	380	0	1.0
21.01	520.00	RCS cold leg temperature	0.00	380	0	1.0
21.01	520.00	RCS hot leg temperature	0.00	380	0	1.0
21.01	520.00	Reactor Power (CPC)	0.00	380	0	1.0
21.01	520.00	Reactor Power (CPC)	0.00	380	0	1.0
21.01	520.00	Reactor Power (NI)	0.00	310(4)	0	2.5
21.01	520.00	Reactor Power (NI)	0.00	310(4)	0	2.5
21.01	520.00	RCS average temperature	0.25	380	0	1.0
21.01	520.00	Reactor Power (NI)	0.25	310	0	1.0
21.01	520.00	RCS flow	0.50	380	0	1.0
21.01	520.00	CPC Thermal power	1.00	380	0	1.0
21.01	520.00	RCS cold leg temperature	1.00	380	0	1.0
21.01	520.00	RCS hot leg temperature	1.00	380	0	1.0

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Time Profiles for Event Sequences
by (Collected) Task Elements

Gross Function No.	Time into event (minutes)	Parameter to Observe	Time allotment for Information (minutes)	Processing Times (msec)	Number of Control Actions	Correction Factor (sec)
1.00	0.00	none	0.25		0	1.0
3.04	0.00	Charging flow	0.25	310+380	0	1.0
3.07	0.00	later	0.25		0	1.0
=>						
2.00	0.25	Generator Power (Watts)	0.00	310+450	1	1.0
2.00	0.25	Generator Power (VA)	0.25	310+450	0	1.0
3.00	0.25	Main steam Flow	0.25	450	0	1.0
3.02	0.25	Steam Generator Level	0.00	450	0	1.0
3.02	0.25	Main Steam Flow	0.25	450+380	0	1.0
3.06	0.25	Pressurizer Pressure	0.80	310+380	0	1.0
=>						
3.02	0.50	Steam Generator Pressure	0.25	450	0	1.0
=>						
3.00	0.80	Feedwater Flow	2.50	450	0	1.0
3.02	0.80	Main Feedwater flow	0.25	450	1	1.0
3.03	0.80	Main Feedwater flow	0.25	450	1	1.0
3.04	0.80	Pressurizer level	0.25	310+380	0	1.0
3.04	0.80	Letdown flow	10.00	310+380	0	1.0
3.06	0.80	Pressurizer Spray flow	4.00	310+380	0	1.0
=>						
2.00	2.50	RCS average temperature	0.00	310+450	0	1[illegible]
2.00	2.50	Reactor Power (NI)	0.00	310(4)+450(4)	0	2.[illegible]
2.00	2.50	Generator Output Voltage	0.25	380	0	1.0
3.00	2.50	Main Feedpump pressure	0.25	450	0	1.0
3.00	2.50	Steam Generator Pressure	2.50	310+380	0	1.0
3.03	2.50	Main Feedpump pressure	0.25	450	0	1.0
=>						
3.00	5.00	RCS average temperature	0.25	450	0	1.0
=>						
3.00	7.50	Reactor Power (NI)	0.25	310(4)	0	2.5
3.01	7.50	Generator Output Voltage	0.00	380	0	1.0
3.01	7.50	Generator Frequency	0.25	380	0	1.0
3.05	7.50	Reactor Power (NI)	0.00	310(4)+450	0	2.5
3.05	7.50	Generator Power (Watts)	0.25	310+380	1	1.0

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Time Profiles for Event Sequences
by (Collected) Task Elements

Gross Function No.	Time into event (minutes)	Parameter to Observe	Time allotment for Information (minutes)	Processing Times (msec)	Number of Control Actions	Correction Factor (sec)
3.04	0.00	Charging flow	0.25	310+380	0	1.0
3.06	0.00	Pressurizer Spray Flow	0.25	310+380	0	1.0
=>						
2.00	0.25	Generator Power (Watts)	0.00	310+450	0	1.0
2.00	0.25	Generator Power (VA)	0.25	310+450	0	1.0
3.00	0.25	Main Steam Flow	0.25	450	1	1.0
3.00	0.25	Feedwater Flow	1.00	450	1	1.0
3.02	0.25	Steam Generator Level	0.00	450(2)+380(2)	0	1.5
3.02	0.25	Main Steam Flow	0.25	450	0	1.0
3.02	0.25	Main Feedwater flow	1.00	450	0	1.0
3.03	0.25	Main Feedwater flow	2.00	450	0	1.0
=>						
2.00	1.00	Reactor Power (NI)	0.25	310(4)+450(4)	0	2.5
2.00	1.00	RCS average temperature	2.00	310+450	0	1.0
3.00	1.00	Steam Generator Pressure	0.25	450	0	1.0
3.00	1.00	RCS average temperature	2.00	450	0	1.0
3.02	1.00	Steam Generator Pressure	0.25	310+380	0	1.0
3.04	1.00	Letdown flow	1.50	310+380	0	1.0
3.04	1.00	Pressurizer level	2.00	310+380	0	1.0
3.06	1.00	Pressurizer Pressure	1.00	310+380	0	1.0
=>						
3.00	2.50	Main Feedpump pressure	0.25	450	0	1.0
3.03	2.50	Main Feedpump pressure	2.00	450	0	1.0
=>						
2.00	5.00	Generator Output Voltage	0.25	380	0	1.0
3.01	5.00	Generator Output Voltage	0.00	380	0	1.0
3.01	5.00	Generator Frequency	0.25	380	0	1.0
=>						
3.00	7.50	Reactor Power (NI)	0.25	310(4)	0	2.5
3.05	7.50	Generator Power (Watts)	0.25	310(')+450	1	2.5
3.05	7.50	Reactor Power (NI)	0.25	310+. J	0	1.0

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Time Profiles for Event Sequences
by (Collected) Task Elements

Gross Function No.	Time into event (minutes)	Parameter to Observe	Time allotment for Information (minutes)	Processing Times (msec)	Number of Control Actions	Correction Factor (sec)
2.00	0.00	Generator Power (Watts)	0.00	310+450	0	1.0
2.00	0.00	Generator Power (VA)	0.25	310+450	0	1.0
2.00	0.00	Reactor Power (NI)	0.70	310(4)+450(4)	0	2.5
3.04	0.00	Charging flow	0.25	310+380	0	1.0
=>						
3.00	0.25	Main Steam Flow	0.25	450	0	1.0
3.00	0.25	Reactor Power (NI)	0.70	310(4)	0	2.5
3.02	0.25	Main Steam Flow	0.25	450	0	1.0
=>						
3.00	0.70	Feedwater Flow	0.70	450	0	1.0
3.02	0.70	Main Feedwater flow	0.70	450	1	1.0
3.03	0.70	Main Feedwater flow	0.70	450	1	1.0
=>						
2.00	1.00	RCS average temperature	2.00	310+450	0	1.0
3.00	1.00	RCS average temperature	2.00	450	0	1.0
3.00	1.00	Main Feedpump pressure	5.00	450	0	1.0
3.00	1.00	Steam Generator Pressure	10.00	450	0	1.0
3.02	1.00	Steam Generator Level	4.00	450(2)+380	0	1.5
3.02	1.00	Steam Generator Pressure	10.00	450	0	1.0
3.03	1.00	Main Feedpump pressure	5.00	450	0	1.0
3.04	1.00	Pressurizer level	0.25	310+380	[illegible]	1.[illegible]
=>						
3.04	2.00	Letdown Flow	5.00	310+380	0	1.0
=>						
2.00	17.00	Generator Output Voltage	0.25	380	0	1.0
3.01	17.00	Generator Frequency	8.00	380	0	1.0
3.01	17.00	Generator Output Voltage	8.00	380	0	1.0
3.05	17.00	Reactor Power (NI)	0.00	310+380	0	1.0
3.05	17.00	Generator Power (Watts)	0.25	310(4)+450	0	2.5
=>						
3.06	25.00	Pressurizer Pressure	5.00	310+380	[illegible]	1.0
3.06	25.00	Pressurizer Spray Flow	5.00	310+380	0	1.0

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Time Profiles for Event Sequences
by (Collected) Task Elements

Gross Function No.	Time into event (minutes)	Parameter to Observe	Time allotment for Information (minutes)	Processing Times (msec)	Number of Control Actions	Correction Factor (sec)
2.00	0.00	Generator Power (Watts)	0.00	310+450	1	1.0
2.00	0.00	Generator Power (VA)	0.25	310+450	0	1.0
3.04	0.00	Charging flow	0.25	310+380	0	1.0
=>						
2.00	0.25	Reactor Power (NI)	0.25	310(4)+450(4)	0	2.5
3.00	0.25	Reactor Power (NI)	6.00	310(4)	0	2.5
3.00	0.25	Main Steam Flow	0.25	450	0	1.0
3.02	0.25	Main Steam Flow	0.25	450	0	1.0
=>						
2.00	1.00	RCS average temperature	0.25	310+450	0	1.0
3.00	1.00	RCS average temperature	0.25	450	0	1.0
3.06	1.00	Pressurizer Pressure	2.00	310+380	0	[illegible]
=>						
3.04	1.60	Letdown Flow	3.00	310+380	[illegible]	[illegible]
=>						
3.00	2.00	Steam Generator Pressure	2.00	310+380	[illegible]	[illegible]
3.02	2.00	Steam Generator Pressure	2.00	450	[illegible]	[illegible]
3.02	2.00	Steam Generator Level	6.00	450(2)+380	[illegible]	[illegible]
=>						
3.00	3.00	Feedwater Flow	3.00	450	0	1.0
3.02	3.00	Main Feedwater flow	2.00	450	1	1.0
3.03	3.00	Main Feedwater flow	2.00	450	1	1.0
3.06	3.00	Pressurizer Spray Flow	2.00	310+380	0	1.0
=>						
3.00	4.00	Main Feedpump pressure	4.00	450	0	1.0
3.03	4.00	Main Feedpump pressure	4.00	450	0	1.0
=>						
2.00	17.00	Generator Output Voltage	0.25	380	0	1.0
3.01	17.00	Generator Frequency	8.00	380	0	1.0
3.01	17.00	Generator Output Voltage	8.00	380	0	1.0
3.05	17.00	Generator Power (Watts)	0.25	310(4)+450	0	2.5
3.05	17.00	Reactor Power (NI)	0.70	310+380	0	1.0
=>						
3.04	18.00	Pressurizer level	10.00	310+380	0	1.0

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Time Profiles for Event Sequences
by (Collected) Task Elements

Task Function No.	Time into event (minutes)	Parameter to Observe	Time allotment for Information (minutes)	Processing Times (msec)	Number of Control Actions	Correction Factor (sec)
1.01	0.00	CEA position	0.50	380	1	1.0
1.01	0.00	CEA position	0.50	248	0	1.0
1.01	0.00	Reactor Power (NI)	0.50	450(4)	0	2.5
1.01	0.00	Startup Rate (NI)	0.50	310(4)	0	2.5
1.02	0.00	Turbine Generator Breaker position	0.50	248	0	1.0
1.02	0.00	Turbine Trip	0.50	248	0	1.0
1.03	0.00	Time	0.25	380	0	1.0
1.04	0.00	Timer	0.25	380	0	1.0
1.04	0.00	Pressurizer pressure	0.50	380	0	1.0
1.05	0.00	RCP Amperes	0.25	310+450(4)	0	2.5
1.06	0.00	Main Feedpump speed	0.00	248(2)	0	1.5
1.06	0.00	Emergency feedwater flow	0.25	450+450(2)	0	1.5
7.00	0.00	Steam Generator pressure	0.00	380(2)	0	1.5
7.00	0.00	Turbine 1st stage steam pressure	0.00	380	0	1.0
7.00	0.00	RCS average temperature	0.25	380(2)	0	1.5
=>						
1.07	0.14	Containment pressure	2.00	248	0	1.0
1.08	0.14	Containment pressure	2.00	248	0	0.5
1.08	0.14	Containment temperature	2.00	248	0	1.0
1.09	0.14	Containment pressure	2.00	248	0	0.5
1.09	0.14	Containment temperature	2.00	248	0	[illegible]
2.00	0.14	Containment pressure	2.00	248	0	[illegible]
2.00	0.14	Containment temperature	2.00	248	0	0.5
=>						
1.02	0.50	13.8 kV Services Bus feeder	0.50	248(2)	0	1.5
1.02	0.50	DG output breaker	0.50	248(2)	0	1.5
1.02	0.50	DG output frequency	1.50	380(2)	0	1.5
1.02	0.50	DG output voltage	1.50	380(2)	0	1.5
1.03	0.50	PLCS setpoint level	0.50	310+450	0	1.0
2.00	0.50	Pressurizer pressure	2.00	310	0	4.0
2.00	0.50	Steam Generator level	10.00	310(2)	0	3.5
=>						
1.05	0.60	RCP speed	2.50	248(4)	0	2.5
1.05	0.60	RCS cold leg temperature	2.50	310(4)	0	3.0
1.05	0.60	RCS hot leg temperature	2.50	310(2)	0	2.0
=>						
1.03	1.00	Charging flow	0.05	380	0	1.0
1.03	1.00	Letdown flow	0.50	380	0	1.0
1.04	1.00	PPCS setpoint pressure	0.50	310	0	1.0
1.06	1.00	Main Feed flow	0.50	380(2)	0	1.5
1.06	1.00	Main Feedwater flow	0.50	450(2)	0	1.5
1.06	1.00	Steam generator level	0.50	248(2)	0	1.5

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Time Profiles for Event Sequences by (Collected) Task Elements

Gross Function No.	Time into event (minutes)	Parameter to Observe	Time allotment for information (minutes)	Processing Times (msec)	Number of Control Actions	Correction Factor (sec)
1.06	1.00	Steam generator pressure	0.50	380(2)	0	1.5
1.07	1.00	Steam plant radiation	0.50	248	0	1.0
=>						
1.04	1.20	Pressurizer pressure	0.50	310	0	1.0
=>						
1.03	1.33	Pressurizer level	2.50	380	0	1.0
1.03	1.33	Pressurizer level	2.50	310	0	0.5
2.00	1.33	Pressurizer level	2.50	450	0	0.5
=>						
1.02	1.50	DG output breaker	1.50	380(2)	0	1.5
1.03	1.50	RCS subcooling	1.50	248	0	1.0
=>						
1.06	2.00	Main steam flow	0.50	380(2)	0	1.5
5.00	2.00	Pressurizer level	6.50	310	0	1.0
=>						
1.06	2.50	RCS average temperature	0.50	380(2)	0	1.5
6.00	2.50	Pressurizer pressure	0.50	310	0	1.0
=>						
1.07	3.00	Containment area radiation	2.00	248	0	1.0
=>						
7.00	3.50	Main Steam flow	10.00	380(2)	1	1.0
10.03	3.50	RCP speed	10.00	248(4)	0	2.5
10.03	3.50	RCS cold leg temperature	10.00	310(4)	0	3.0
10.03	3.50	RCS hot leg temperature	10.00	310(2)	0	2.0
=>						
9.02	7.60	Pressurizer heater power	2.00	380	0	1.0
9.02	7.60	Pressurizer pressure	2.00	310	0	1.0
9.02	7.60	Pressurizer pressure	2.00	450	0	0.5
=>						
8.00	10.00	Steam generator level	5.00	310(2)	0	1.5
8.01	10.00	Main feedwater flow	0.50	380(2)	2	1.5
8.02	10.00	Emergency feedwater flow	2.50	450+380(2)	2	1.5
=>						
9.01	20.00	Condensate storage tank level	15.00	310(2)	0	2.0
9.01	20.00	IRWT level	15.00	310	0	1.5
10.01	20.00	Pressurizer level	10.00	310	0	1.0
10.02	20.00	Pressurizer pressure	10.00	310	0	1.0

Appendix I

Functic Allocation Evaluation Results

This appendix provides the results of the function allocation evaluation. The criteria listed in table 4.3-2 of this document was applied to the element data (appendix E) and the criteria listed in table 4.3-3 of this document was applied to time profile data (appendix H).

EVENT: Steady State Operations

Generic Function Allocation (table 4.3-2):

The current function allocation for System 80 adequately meets the generic function allocation criteria listed in table 4.3-2. All observations that need to be made require operator judgement to determine adequacy of the value.

Important parameter deviations from known ranges should be indicated to the operator via the annunciator system to ensure operator attention of degraded situations. Requiring the operator to double check the control room systems is acceptable as long as it does not overload the operator during intense attentional situations or high stress situations. Normal steady state operations typical do not fall into these categories.

EVENT: Transient Power Operations

Generic Function Allocation (table 4.3-2):

The current function allocation for System 80 adequately meets the generic function allocation criteria listed in table 4.3-2.

Cognitive Loading and Parameter Access (table 4.3-3):

Transient power operations (100-15% power ramp) evaluation indicates parameter access limitations from minute 0 to minute 1. According to the access criteria, the operator may experience an overload situation if he is required to search through 3 levels of CRT menus to access each parameter at different MCC panels. The access criteria estimates 2.8 seconds for menu selection plus 1 second for physical movement around the MCC (total of 3.8 seconds required for access time). This evaluation interval indicates 3.4 seconds are available for parameter access.

No cognitive overload situations exist during the remaining portions of the 100-15% power ramp. Further, no cognitive overload situations exist during the other transient power event sequences analyzed. The operator can perceive, make decisions and access all necessary information within the time required.

EVENT: Startup

Generic Function Allocation (table 4.3-2):

- The parameters listed below should be automated based on generic function allocation criteria # M-1. These multiple status checks should be done by the computer and only those breakers in the wrong state should be displayed to the operator. This will reduce the number of redundant manual equipment status checks the operator has to perform. It is understood that the status of breakers, valves and pumps are mode dependent. Automation of this type of information gathering task should be done when the state of the plant can be ascertained by the software systems and clear criteria available for the determination of proper and improper operations state. If this is not possible, all required status information may be presented to the operator in one central location when needed e.g. CRT display. This will decrease the chance of operator error by ensuring that all necessary breakers will be checked and not omitted. Two intervals were identified as possible problem areas.

  1. Time interval 0.0 minute - 30.0 minute contain multiple status checks. These status checks are detailed in gross function number 1.00 of the startup event.

  2. Time interval 480.0 minute - 485.0 minute contains multiple status checks. These status checks are detailed in gross functions numbers 10.03, 10.04, 10.05.

- Criteria # M-5 states that machines excel in storing and recalling information quickly and accurately. Various gross functions in the LOCA event require the operator to 'mentally record' (store) information and recall it for later use. Although criteria # M-5 suggests automation of all tasks that require the operator to mentally record information, closer inspection of the pertinent gross functions reveal that this type of task can be separated into 2 separate issues: 1.) Operators are required to mentally record certain plant parameters to determine the effectiveness of his actions and 2.)the operator must mentally record (physically write down) certain parameters to do calculations. Each of these situations will be discussed separately.

  First, when an operator mentally records a parameter to determine effectiveness of his actions, he is expected to use judgement and adopt the appropriate procedures for plant reaction. Criteria # H-4 and H-5 indicate that the human excels in this type of behavior. For these instances current function allocation is adequate. Example are found in the following gross function numbers:

1.03	10.02	20.00
9.01	10.06	
9.02	12.00	

On the other hand, when an operator is required to observe or mentally record a number of parameters for well defined calculations, the chance of operator observation error or calculation error is introduced. Criteria # M-6 and M-8 indicate that the machine is better suited to collect multiple data points and perform routine calculations. These data points should be recorded by the hardware and software, calculations completed and the calculation results presented to the operator. This does not imply that the discrete parameter values should be obscured all together from the operator. The operator should still be able to access this information if he desiras. Again, it is understood that parameter readings need to be acquired during specific points in this event. Hardware and software intelligence may make this feature impractical. For examples of these instances refer to the following gross functions:

5.00	6.04	21.01

Cognitive Loading and Parameter Access (table 4.3-3):

No cognitive overload situations exist during the startup event sequence according to the criteria of this analysis. The operator can perceive, make decisions and access all necessary information within the time required.

EVENT: Shutdown

Generic Function Allocation (table 4.3-2):

The current function allocation for System 80 adequately meets the generic function allocation criteria listed in table 4.3-2. All observations that need to be made require operator judgement to determine adequacy of the value.

Important parameter deviations from known ranges should be indicated to the operator via the annunciator system to ensure operator attention of degraded situations. Requiring the operator to double check the control room systems is acceptable as long as it does not overload the operator during intense attentional situations or high stress situations. Normal shutdown events typical do not fall into these categories.

EVENT: Reactor Trip

Generic Function Allocation (table 4.3-2):

All parameters during minute 0 to minute 2 should be automated according to generic function allocation criteria # M-1 and # M-7. During this interval the operator is required to do multiple status checks in a very short period of time (see discussion below). Most of these parameters should only be displayed only if they in an incorrect state for the situation. Alternatively if this is not possible, all of these parameters should be centrally displayed to the operator (e.g. CRT display) to ensure all necessary parameters are checked and not overlooked as well as to increase the speed in which the operator can access this information.

Cognitive Loading and Parameter Access (table 4.3-3):

Reactor Trip evaluation indicates parameter access is limited to an average of 1.6 seconds during minute 0 to minute 2. According to the access criteria, the operator during this interval only has sufficient time to physically orient himself to a discrete continuous display (1 second) or step through 1 menu selection without a physical move to another panel (0.9 seconds). Parameter access through 2 menu levels requires at least 1.9 seconds plus 1 second if movement is required between panels.

No cognitive overload situations exist during remaining portions of this event sequence according to the criteria of this analysis. The operator can perceive, make decisions and access all necessary information within the time required.

EVENT: LOCA

Generic Function Allocation (table 4.3-2):

The generic function allocation criteria listed in Table 4.3-2 indicates that the following information gathering tasks may be better automated if the hardware and computer technology allows.

o Criteria # M-1 states that machines excel in monitoring equipment. Routine status checks of breaker positions, valve positions and pump operations should be done automatically. Only deviations from the proper operating status should be provided to the operator. It is understood that the status of breakers, valves and pumps are mode dependent. Automation of this type of information gathering task should be done when the state of the plant can be ascertained by the software systems and clear criteria available for the determination of proper and improper operations state.

  Examples of breaker status checks can be found in gross function 1.02.

  Examples of valve status checks can be found in the following gross functions:

6.04	10.02	29.02
9.01	20.00	33.02
9.02	22.00	53.03
9.03	22.02	
9.04	22.04	
9.05	23.04	

  Examples of pump status checks can be found in the following gross functions:

25.01	39.02
25.03	40.02
28.02	51.00
29.02	

o Also based on criteria # M-1 (machines excel in monitoring equipment) as well as criteria # M-2 (machines excel in performing routine operations), the operator task of collecting values for T hot and T cold to determine delta T should be automated. This simple repetitive calculation is repeated at least 9 times during this event. The delta T value should be provided to the operators.

Examples of RCS delta T determination are found in the following gross functions:

1.05	43.02
22.01	48.02
23.01	50.02
25.01	51.01
26.01	

o Criteria # M-5 states that machines excel in storing and recalling information quickly and accurately. Various gross functions in the LOCA event require the operator to 'mentally record' (store) information and recall it for later use. Although criteria # M-5 suggests automation of all tasks that require the operator to mentally record information, closer inspection of the pertinent gross functions reveal that this type of task can be separated into 2 separate issues: 1.) Operators are required to mentally record certain plant parameters to determine the effectiveness of his actions and 2.)the operator must mentally record (physically write down) certain parameters to do calculations. Each of these situations will be discussed separately.

First, when an operator mentally records a parameter to determine effectiveness of his actions, he is expected to use judgement and adopt the appropriate procedures for plant reaction. Criteria # H-4 and H-5 indicate that the human excels in this type of behavior. For these instances current function allocation is adequate. Example are found in the following gross function numbers:

8.00	22.06
9.00	41.00
18.01	44.00
20.00	

On the other hand, when an operator is required to observe or mentally record a number of parameters for well defined calculations, the chance of operator observation error or calculation error is introduced. Criteria # M-6 and M-8 indicate that the machine is better suited to collect multiple data points and perform routine calculations. These data points should be recorded by the hardware and software, calculations completed and the calculation results presented to the operator. This does not imply that the discrete parameter values should be obscured all together from the operator. The operator should still be able to access this information if he desires. Again, it is understood that parameter readings need to be acquired during specific points in this event. Hardware and software intelligence may make this feature impractical. For examples of these instances refer to the following gross functions:

19.00	39.00	46.01
24.04	39.01	
29.01	45.00	

o During a LOCA event, there are several instances where the control room operator must report information to the Technical Support Center. Machines excel in equipment monitoring according to criteria D M-1. By introducing another level of intervention in the transmittal of this data, the chance of human error (misinterpretation) is increased. The people in the Technical Support Center should have direct access to a data display system for the parameters they require.

For examples of this type of operator task refer to gross function 14.02.

EVENT: Steam Generator Tube Rupture (SGTR)

Generic Function Allocation (table 4.3-2):

The generic function allocation criteria listed in Table 4.3-2 indicates that the following information gathering tasks may be better automated if the hardware and computer technology allows.

- Criteria # M-1 states that machines excel in monitoring equipment. Routine status checks of breaker positions, valve positions and pump operations should be done automatically and only the components that deviate from the proper state should be provided to the operator. It is understood that the status of breakers, valves and pumps are mode dependent. Automation of this type of information gathering task should be done when the state of the plant can be ascertained by the software systems and clear criteria developed for the determination of proper and improper operations status.

  Examples of breaker status checks can be found in gross function 1.02.

  Examples of valve status checks can be found in the following gross functions:

7.04	31.02
22.02	31.03
22.03	34.02
31.01	34.03

  Examples of pump status checks can be found in the following gross functions:

  7.02
  15.02

o Also based on criteria # M-1 (machines excel in monitoring equipment) as well as criteria # M-2 (machines excel in performing routine operations), the operator task of collecting values for T hot and T cold to determine delta T should be automated. This simple repetitive calculation is repeated during this event. The delta T value should be available to the operators.

Examples of RCS delta T determination are found in the following gross functions:

1.05
25.01

o Criteria # M-5 states that machines excel in storing and recalling information quickly and accurately. Various gross functions in the LOCA event require the operator to 'mentally record' (store) information and recall it for later use. Although criteria # M-5 suggests automation of all tasks that require the operator to mentally record information, closer inspection of the pertinent gross functions reveal that this type of task can be separated into 2 separate issues: 1.) Operators are required to mentally record certain plant parameters to determine the effectiveness of his actions and 2.)the operator must mentally record (physically write down) certain parameters to do calculations. Each of these situations will be discussed separately.

First, when an operator mentally records a parameter to determine effectiveness of his actions, he is expected to use judgement and adopt the appropriate procedures for plant reaction. Criteria # H-4 and H-5 indicate that the human excels in this type of behavior. For these instances current function allocation is adequate. Example are found in the following gross function numbers:

2.0	18.02	26.02
8.0	18.03	
16.00	20.03	
17.01	26.01	

On the other hand, when an operator is required to observe or mentally record a number of parameters for well defined calculations, the chance of operator observation error or calculation error is introduced. Criteria # M-6 and M-8 indicate that the machine is better suited to collect multiple data points and perform routine calculations. These data points should be recorded by the hardware and software, calculations completed and the calculation results presented to the operator. This does not imply that the discrete parameter values should be obscured all together from the operator. The operator should still be able to access this information if he desires. Again, it is understood that parameter readings need to be acquired during specific points in this event. Hardware and software intelligence may make this feature impractical. For examples of these instances refer to the following gross functions:

3.0 21.0

Appendix J

Process Time Calculations

This appendix provides the raw data calculations for the process intervals. This information is summarized and evaluated in appendix I.

Note: In some of the time intervals, you will notice "****.**" for access time per parameter. This indicates that no access time was required.

Nuplex 80 + Functional Analysis
Process Time Calculations

Evaluation Interval (minutes)	Number of parameters	Processing Times (msec)	Correction Times (sec)	Total Times (sec)	Percent Use of	Fraction of time/ para. # (sec)		Fraction of time/ cntrl # (sec)	
Span: 0 - 1 minute									
0.00 - 0.25	3	690.00	3.00	3.69	100 %	3.69	3	0.00	0
0.25 - 0.25	2	760.00	2.00	2.76	100 %	2.76	2	1.20	1
0.25 - 0.50	3	1590.00	3.00	4.59	100 %	4.59	3	0.00	0
0.25 - 1.05	1	690.00	1.00	1.69	93 %	1.58	1	0.00	0
0.50 - 0.75	1	0.00	1.00	1.00	100 %	1.00	1	0.00	0
0.80 - 1.05	3	690.00	3.00	3.69	80 %	2.95	2	1.92	2
0.80 - 3.30	1	0.00	1.00	1.00	8 %	0.08	0	0.00	0
0.80 - 4.80	1	690.00	1.00	1.69	5 %	0.08	0	0.00	0
0.80 - 10.80	1	690.00	1.00	1.69	2 %	0.03	0	0.00	0
TIME LEFT (min): 0.66 ACCESS TIME/PARAMETER: 3.34 sec.						16.77	12	3.12	3
Span: 1 - 2 minute									
0.25 - 1.05	1	690.00	1.00	1.69	6 %	0.10	0	0.00	0
0.80 - 1.05	3	690.00	3.00	3.69	20 %	0.73	1	0.48	2
0.80 - 3.30	1	0.00	1.00	1.00	40 %	0.40	0	0.00	0
0.80 - 4.80	1	690.00	1.00	1.69	25 %	0.42	0	0.00	0
0.80 - 10.80	1	690.00	1.00	1.69	10 %	0.16	0	0.00	0
TIME LEFT (min): 0.96 ACCESS TIME/PARAMETER: 57.68 sec.						1.83	1	0.48	2
Span: 2 - 3 minute									
0.80 - 3.30	1	0.00	1.00	1.00	40 %	0.40	0	0.00	0
0.80 - 4.80	1	690.00	1.00	1.69	25 %	0.42	0	0.00	0
0.80 - 10.80	1	690.00	1.00	1.69	10 %	0.16	0	0.00	0
2.50 - 2.50	2	2000.00	3.50	5.50	100 %	5.50	2	0.00	0
2.50 - 2.75	3	0.00	3.00	3.00	100 %	3.00	3	0.00	0
2.50 - 5.00	1	690.00	1.00	1.69	20 %	0.33	0	0.00	0
TIME LEFT (min): 0.83 ACCESS TIME/PARAMETER: 8.36 sec.						9.82	6	0.00	0

Nuplex 80 + Functional Anaiysis
Process Time Calculations

Evaluation Interval (minutes)	Number of parameters	Processing Times (msec)	Correction Times (sec)	Total Times (sec)	Percent Use of	Fraction of time/ para. # (sec)		Fraction of time/ cntrl # (sec)	
Span: 3 - 4 minute									
0.70 - 3.30	1	0.00	1.00	1.00	12 %	0.12	0	0.00	0
0.80 - 4.80	1	690.00	1.00	1.69	25 %	0.42	0	0.00	0
0.80 - 10.80	1	690.00	1.00	1.69	10 %	0.16	0	0.00	0
2.50 - 5.00	1	690.00	1.00	1.69	40 %	0.67	0	0.00	0
TIME LEFT (min): 0.97 ACCESS TIME/PARAMETER: 58.61 sec.						1.38	1	0.00	0
Span: 4 - 5 minute									
0.80 - 4.80	1	690.00	1.00	1.69	20 %	0.33	0	0.00	0
0.80 - 10.80	1	690.00	1.00	1.69	10 %	0.16	0	0.00	0
2.50 - 5.00	1	690.00	1.00	1.69	40 %	0.67	0	0.00	0
TIME LEFT (min): 0.98 ACCESS TIME/PARAMETER: 58.81 sec.						1.18	1	0.00	0
Span: 5 - 6 minute									
0.80 - 10.80	1	690.00	1.00	1.69	10 %	0.16	0	0.00	0
5.00 - 5.25	1	0.00	1.00	1.00	100 %	1.00	1	0.00	0
TIME LEFT (min): 0.98 ACCESS TIME/PARAMETER: 58.83 sec.						1.16	1	0.00	0
Span: 6 - 7 minute									
0.80 - 10.80	1	690.00	1.00	1.69	10 %	0.16	0	0.00	0
TIME LEFT (min): 0.99 ACCESS TIME/PARAMETER:****.** sec.						0.16	0	0.00	0

Nuplex 80 + Functional Analysis
Process Time Calculations

Evaluation Interval (minutes)	Number of parameters	Processing Times (msec)	Correction Times (sec)	Total Times (sec)	Percent Use of	Fraction of time/ para. (sec)	#	Fraction of time/ cntrl (sec)	#
Span: 7 - 8 minute									
0.80 - 10.80	1	690.00	1.00	1.69	10 %	0.16	0	0.00	0
7.50 - 7.50	2	1240.00	3.50	4.74	100 %	4.74	2	0.00	0
7.50 - 7.75	3	1930.00	4.50	6.43	100 %	6.43	3	1.20	1
TIME LEFT (min): 0.79	ACCESS TIME/PARAMETER: 9.49 sec.					11.33	5	1.20	1

Nuplex 80 + Functional Analysis
Process Time Calculations

Evaluation Interval (minutes)	Number of parameters	Processing Times (msec)	Correction Times (sec)	Total Times (sec)	Percent Use of	Fraction of time/ para. # (sec)		Fraction of time/ cntrl # (sec)	
Span: 0 - 1 minute									
0.00 - 0.25	2	1380.00	2.00	3.38	100 %	3.38	2	0.00	0
0.25 - 0.25	2	1660.00	2.50	4.16	100 %	4.16	2	0.00	0
0.25 - 0.50	3	760.00	3.00	3.76	100 %	3.76	3	1.20	1
0.25 - 1.25	2	0.00	2.00	2.00	75 %	1.50	2	0.90	1
0.25 - 2.25	1	0.00	1.00	1.00	37 %	0.37	0	0.00	0
TIME LEFT (min): 0.74 ACCESS TIME/PARAMETER: 4.96 sec.						13.17	9	2.10	2
Span: 1 - 2 minute									
0.25 - 1.25	2	0.00	2.00	2.00	25 %	0.50	1	0.30	1
0.25 - 2.25	1	0.00	1.00	1.00	50 %	0.30	1	0.00	0
1.00 - 1.25	3	1930.00	4.50	6.43	100 %	6.43	3	0.00	0
1.00 - 2.00	1	690.00	1.00	1.69	100 %	1.69	1	0.00	0
1.00 - 2.50	1	690.00	1.00	1.69	66 %	1.12	1	0.00	0
1.00 - 3.00	3	1450.00	3.00	4.45	50 %	2.22	2	0.00	0
TIME LEFT (min): 0.78 ACCESS TIME/PARAMETER: 6.74 sec.						12.47	7	0.30	1
Span: 2 - 3 minute									
0.25 - 2.25	1	0.00	1.00	1.00	12 %	0.12	0	0.00	0
1.00 - 2.50	1	690.00	1.00	1.69	33 %	0.56	0	0.00	0
1.00 - 3.00	3	1450.00	3.00	4.45	50 %	2.22	2	0.00	0
2.50 - 2.75	1	0.00	1.00	1.00	100 %	1.00	1	0.00	0
2.50 - 4.50	1	0.00	1.00	1.00	25 %	0.25	0	0.00	0
TIME LEFT (min): 0.93 ACCESS TIME/PARAMETER: 18.61 sec.						4.16	3	0.00	0

Nuplex 80 + Functional Analysis
Process Time Calculations

Evaluation Interval (minutes)	Number of parameters	Processing Times (msec)	Correction Times (sec)	Total Times (sec)	Percent Use of	Fraction of time/ para. # (sec)		Fraction of time/ cntrl # (sec)	
Span: 3 - 4 minute									
2.50 - 4.50	1	0.00	1.00	1.00	50 %	0.50	1	0.00	0
TIME LEFT (min): 0.99 ACCESS TIME/PARAMETER: 59.50 sec.						0.50	1	0.00	0
Span: 4 - 5 minute									
2.50 - 4.50	1	0.00	1.00	1.00	25 %	0.25	0	0.00	0
TIME LEFT (min): 0.99 ACCESS TIME/PARAMETER:****.** sec.						0.25	0	0.00	0
Span: 5 - 6 minute									
5.00 - 5.25	2	0.00	2.00	2.00	100 %	2.00	2	0.00	0
TIME LEFT (min): 0.96 ACCESS TIME/PARAMETER: 29.00 sec.						2.00	2	0.00	0
Span: 6 - 7 minute									
7.50 - 7.75	3	3170.00	6.00	9.17	100 %	9.17	3	1.20	1
TIME LEFT (min): 0.82 ACCESS TIME/PARAMETER: 16.54 sec.						9.17	3	1.20	1

Date: 01/18/89

Nuplex 80 + Functional Analysis
Process Time Calculations

Evaluation Interval (minutes)	Number of parameters	Processing Times (msec)	Correction Times (sec)	Total Times (sec)	Percent Use of	Fraction of time/ para. # (sec)		Fraction of time/ cntrl # (sec)	
Span: 0 - 1 minute									
0.00 - 0.25	2	1450.00	2.00	3.45	100 %	3.45	2	0.00	0
0.00 - 0.70	1	1240.00	2.50	3.74	100 %	3.74	1	0.00	0
0.25 - 0.50	2	0.00	2.00	2.00	100 %	2.00	2	0.00	0
0.25 - 0.95	1	1240.00	2.50	3.74	100 %	3.74	1	0.00	0
0.70 - 1.40	3	0.00	3.00	3.00	42 %	1.28	1	1.02	2
TIME LEFT (min): 0.74 ACCESS TIME/PARAMETER: 6.39 sec.						14.21	7	1.02	2
Span: 1 - 2 minute									
0.70 - 1.40	3	0.00	3.00	3.00	57 %	1.71	2	1.37	2
1.00 - 1.25	1	690.00	1.00	1.69	100 %	1.69	1	0.00	0
1.00 - 3.00	2	760.00	2.00	2.76	50 %	1.38	1	0.00	0
1.00 - 5.00	1	900.00	1.50	2.40	25 %	0.60	0	0.00	0
1.00 - 6.00	2	0.00	2.00	2.00	20 %	0.40	0	0.00	0
1.00 - 11.00	2	0.00	2.00	2.00	10 %	0.20	0	0.00	0
TIME LEFT (min): 0.87 ACCESS TIME/PARAMETER: 10.52 sec.						5.98	5	1.37	2
Span: 2 - 3 minute									
1.00 - 3.00	2	760.00	2.00	2.76	50 %	1.38	1	0.00	0
1.00 - 5.00	1	900.00	1.50	2.40	25 %	0.60	0	0.00	0
1.00 - 6.00	2	0.00	2.00	2.00	20 %	0.40	0	0.00	0
1.00 - 11.00	2	0.00	2.00	2.00	10 %	0.20	0	0.00	0
2.00 - 7.00	1	690.00	1.00	1.69	20 %	0.33	0	0.00	0
TIME LEFT (min): 0.95 ACCESS TIME/PARAMETER: 28.54 sec.						2.91	2	0.00	0

Nuplex 80 + Functional Analysis
Process Time Calculations

Evaluation Interval (minutes)	Number of parameters	Processing Times (msec)	Correction Times (sec)	Total Times (sec)	Percent Use of	Fraction of time/ para. # (sec)		Fraction of time/ cntrl # (sec)	
Span: 3 - 4 minute									
1.00 - 5.00	1	900.00	1.50	2.40	25 %	0.60	0	0.00	0
1.00 - 6.00	2	0.00	2.00	2.00	20 %	0.40	0	0.00	0
1.00 - 11.00	2	0.00	2.00	2.00	10 %	0.20	0	0.00	0
2.00 - 7.00	1	690.00	1.00	1.69	20 %	0.33	0	0.00	0
TIME LEFT (min): 0.97 ACCESS TIME/PARAMETER: 58.46 sec.						1.53	1	0.00	0
Span: 4 - 5 minute									
1.00 - 5.00	1	900.00	1.50	2.40	25 %	0.60	0	0.00	0
1.00 - 6.00	2	0.00	2.00	2.00	20 %	0.40	0	0.00	0
1.00 - 11.00	2	0.00	2.00	2.00	10 %	0.20	0	0.00	0
2.00 - 7.00	1	690.[illegible]	1.00	1.69	20 %	0.33	0	0.00	0
TIME LEFT (min): 0.97 ACCESS TIME/PARAMETER: 58.46 sec.						1.53	1	0.00	0
Span: 5 - 6 minute									
1.00 - 6.00	2	0.00	2.00	2.00	20 %	0.40	0	0.00	0
1.00 - 11.00	2	0.00	2.00	2.00	10 %	0.20	0	0.00	0
2.00 - 7.00	1	690.00	1.00	1.69	20 %	0.33	0	0.00	0
TIME LEFT (min): 0.98 ACCESS TIME/PARAMETER: 59.06 sec.						0.93	1	0.00	0
Span: 6 - 7 minute									
1.00 - 11.00	2	0.00	2.00	2.00	10 %	0.20	0	0.00	0
2.00 - 7.00	1	690.00	1.00	1.69	20 %	0.33	0	0.00	0
TIME LEFT (min): 0.99 ACCESS TIME/PARAMETER:****.** sec.						0.53	0	0.00	0

Nuplex 80 + Functional Analysis
Process Time Calculations

Evaluation Interval (minutes)	Number of parameters	Processing Times (msec)	Correction Times (sec)	Total Times (sec)	Percent Use of	Fraction of time/ para. # (sec)		Fraction of time/ cntrl # (sec)	
Span: 7 - 8 minute									
1.00 - 11.00	2	0.00	2.00	2.00	10 %	0.20	0	0.00	0
TIME LEFT (min): 0.99 ACCESS TIME/PARAMETER:****.** sec.						0.20	0	0.00	0
Span: 8 - 9 minute									
1.00 - 11.00	2	0.00	2.00	2.00	10 %	0.20	0	0.00	0
TIME LEFT (min): 0.99 ACCESS TIME/PARAMETER:****.** sec.						0.20	0	0.00	0
Span: 9 - 10 minute									
1.00 - 11.00	2	0.00	2.00	2.00	10 %	0.20	0	0.00	0
TIME LEFT (min): 0.99 ACCESS TIME/PARAMETER:****.** sec.						0.20	0	0.00	0
Span: 10 - 11 minute									
1.00 - 11.00	2	0.00	2.00	2.00	10 %	0.20	0	0.00	0
TIME LEFT (min): 0.99 ACCESS TIME/PARAMETER:****.** sec.						0.20	0	0.00	0
Span: 11 - 12 minute									
17.00 - 17.25	2	1240.00	3.50	4.74	100 %	4.74	2	0.00	0
17.00 - 25.00	2	0.00	2.00	2.00	12 %	0.25	0	0.00	0
TIME LEFT (min): 0.91 ACCESS TIME/PARAMETER: 27.50 sec.						4.99	2	0.00	0

Nuplex 80 + Functional Analysis
Process Time Calculations

Evaluation Interval (minutes)	Number of parameters	Processing Times (msec)	Correction Times (sec)	Total Times (sec)	Percent Use of	Fraction of time/ para. # (sec)		Fraction of time/ cntrl # (sec)	
Span: 18 - 19 minute									
17.00 - 25.00	2	0.00	2.00	2.00	12 %	0.25	0	0.00	0
TIME LEFT (min): 0.99 ACCESS TIME/PARAMETER:*"*',** sec.						0.25	u	0.no	0
Span: 19 - 20 minute									
17.00 - 25.00	2	0.00	2.00	2.00	12 %	0.25	0	0.00	0
TIME LEFT (min): 0.99 ACCESS TIME/PARAMETER:****.** sec.						0.25	0	0.00	0
Span: 20 - 21 minute									
17.00 - 25.00	2	0.00	2.00	2.00	12 %	0.25	0	0.00	0
TIME LEFT (min): 0.99 ACCESS TIME/PARAMETER:****.** sec.						0.25	0	0.00	0
Span: 21 - 22 minute									
17.00 - 25.00	2	0.00	2.00	2.00	12 %	0.25	C	0.00	0
TIME LEFT (min): 0.99 ACCESS TIME/PARAMETER:****.** sec.						0.25	0	0.00	0
Span: 22 - 23 minute									
17.00 - 25.00	2	0.00	2.00	2.00	12 %	0.25	0	0.00	0
TIME LEFT (min): 0.99 ACCESS TIME/PARAMETER:****.** sec.						0.25	0	0.00	0

Nuplex 80 + Functional Analysis
Process Time Calculations

Evaluation Interval (minutes)	Number of parameters	Processing Times (msec)	Correction Times (sec)	Total Times (sec)	Percent Use of	Fraction of time/ para. # (sec)		Fraction of time/ cntrl # (sec)	
Span: 23 - 24 minute									
17.00 - 25.00	2	0.00	2.00	2.00	12 %	0.25	0	0.00	0
TIME LEFT (min): 0.99	ACCESS TIME/PARAMETER:****.** sec.					0.25	0	0.00	0
Span: 24 - 25 minute									
17.00 - 25.00	2	0.00	2.00	2.00	12 %	0.25	0	0.00	0
TIME LEFT (min): 0.99	ACCESS TIME/PARAMETER:****.** sec.					0.25	0	0.00	0

Nuplex 80 + Functional Analysis
Process Time Calculations

Evaluation Interval (minutes)	Number of parameters	Processing Times (msec)	Correction Times (sec)	Total Times (sec)	Percent Use of	Fraction of time/ para. # (sec)		Fraction of time/ cntrl # (sec)	
Span: 0 - 1 minute									
0.00 - 0.25	2	1450.00	2.00	3.45	100 %	3.45	2	0.00	0
0.25 - 0.25	1	1240.00	2.50	3.74	100 %	3.74	1	0.00	0
0.25 - 0.50	3	1240.00	4.50	5.74	100 %	5.74	3	0.00	0
TIME LEFT (min): 0.78 ACCESS TIME/PARAMETER: 7.84 sec.						12.93	6	0.00	0
Span: 1 - 2 minute									
1.00 - 1.25	2	760.00	2.00	2.76	100 %	2.76	2	0.00	0
1.00 - 3.00	1	690.00	1.00	1.69	50 %	0.84	1	0.00	0
1.60 - 4.60	1	690.00	1.00	1.69	13 %	0.22	0	0.00	0
TIME LEFT (min): 0.93 ACCESS TIME/PARAMETER: 18.72 sec.						3.83	3	0.00	0
Span: 2 - 3 minute									
1.00 - 3.00	1	690.00	1.00	1.69	50 %	0.84	1	0.00	0
1.60 - 4.60	1	690.00	1.00	1.69	33 %	0.56	0	0.00	0
2.00 - 4.00	2	690.00	2.00	[illegible]	50 %	1.34	1	0.00	0
2.00 - 8.00	1	900.00	1.50	2.40	16 %	0.40	0	0.00	0
TIME LEFT (min): 0.94 ACCESS TIME/PARAMETER: 28.42 sec.						3.15	2	0.00	0
Span: 3 - 4 minute									
1.60 - 4.60	1	690.00	1.00	1.69	33 %	0.56	0	0.00	0
2.00 - 4.00	2	690.00	2.00	2.69	50 %	1.34	1	0.00	0
2.00 - 8.00	1	900.00	1.50	2.40	16 %	0.40	0	0.00	0
3.00 - 5.00	3	690.00	3.00	3.69	50 %	1.84	2	1.20	2
3.00 - 6.00	1	0.00	1.00	1.00	33 %	0.33	0	0.00	0
TIME LEFT (min): 0.90 ACCESS TIME/PARAMETER: 18.10 sec.						4.48	3	1.20	2

Nuplex 80 + Functional Analysis
Process Time Calculations

Evaluation Interval (minutes)	Number of parameters	Processing Times (msec)	Correction Times (sec)	Total Times (sec)	Percent Use of	Fraction of time/ para. # (sec)		Fraction of time/ cntrl # (sec)	
Span: 4 - 5 minute									
1.60 - 4.60	1	690.00	1.00	1.69	10 %	0.33	0	0.00	0
2.00 - 8.00	1	900.00	1.50	2.40	16 %	0.40	0	0.00	0
3.00 - 5.00	3	690.00	3.00	3.69	50 %	1.84	2	1.20	2
3.00 - 6.00	1	0.00	1.00	1.00	33 %	0.33	0	0.00	0
4.00 - 8.00	2	0.00	2.00	2.00	25 %	0.50	1	0.00	0
TIME LEFT (min): 0.92	ACCESS TIME/PARAMETER: 18.46 sec.					3.41	3	1.20	2
Span: 5 - 6 minute									
2.00 - 8.00	1	900.00	1.50	2.40	16 %	0.40	0	0.00	0
3.00 - 6.00	1	0.00	1.00	1.00	33 %	0.33	0	0.00	0
4.00 - 8.00	2	0.00	2.00	2.00	25 %	0.50	1	0.00	0
TIME LEFT (min): 0.97	ACCESS TIME/PARAMETER: 58.76 sec.					1.23	1	0.00	0
Span: 6 - 7 minute									
2.00 - 8.00	1	900.00	1.50	2.40	16 %	0.40	0	0.00	0
4.00 - 8.00	2	0.00	2.00	2.00	25 %	0.50	1	0.00	0
TIME LEFT (min): 0.98	ACCESS TIME/PARAMETER: 59.10 sec.					0.90	1	0.00	0
Span: 7 - 8 minute									
2.00 - 8.00	1	900.00	1.50	2.40	16 %	0.40	0	0.00	0
4.00 - 8.00	2	0.00	2.00	2.00	25 %	0.50	1	0.00	0
TIME LEFT (min): 0.98	ACCESS TIME/PARAMETER: 59.10 sec.					0.90	1	0.00	0

Nuplex 80 + Functional Analysis
Process Time Calculations

Evaluation Interval (minutes)	Number of parameters	Processing Times (msec)	Correction Times (sec)	Total Times (sec)	Percent Use of	Fraction of time/ para. # (sec)		Fraction of time/ cntrl # (sec)	
Span: 8 - 9 minute									
17.00 - 17.25	2	1240.00	3.50	4.74	100 %	4.74	2	0.00	0
17.00 - 17.70	1	690.00	1.00	1.69	100 %	1.69	1	0.00	0
17.00 - 25.00	2	0.00	2.00	2.00	12 %	0.25	0	0.00	0
TIME LEFT (min): 0.88 ACCESS TIME/PARAMETER: 17.77 sec.						6.68	3	0.00	0

Nuplex 80 + Functional Analysis
Process Time Calculations

Evaluation Interval (minutes)	Number of parameters	Processing Times (msec)	Correction Times (sec)	Total Times (sec)	Percent Use of	Fraction of time/ para. # (sec)		Fraction of time/ cntrl # (sec)	
Span: 0 - 2 minute									
0.00 - 30.00	68	6032.00	76.00	82.03	6 %	5.46	5	0.00	0
TIME LEFT (min): 1.90 ACCESS TIME/PARAMETER: 22.90 sec.						5.46	5	0.00	0
Span: 2 - 4 minute									
0.00 - 30.00	68	6032.00	76.00	82.03	6 %	5.46	5	0.00	0
TIME LEFT (min): 1.90 ACCESS TIME/PARAMETER: 22.90 sec.						5.46	5	0.00	0
Span: 4 - 6 minute									
0.00 - 30.00	68	6032.00	76.00	82.03	6 %	5.46	5	0.00	0
TIME LEFT (min): 1.90 ACCESS TIME/PARAMETER: 22.90 sec.						5.46	5	0.00	0
Span: 6 - 8 minute									
0.00 - 30.00	68	6032.00	76.00	82.03	6 %	5.46	5	0.00	0
TIME LEFT (min): 1.90 ACCESS TIME/PARAMETER: 22.90 sec.						5.46	5	0.00	0
Span: 8 - 10 minute									
0.00 - 30.00	68	6032.00	76.00	82.03	6 %	5.46	5	0.00	0
TIME LEFT (min): 1.90 ACCESS TIME/PARAMETER: 22.90 sec.						5.46	5	0.00	0

Nuplex 80 + Functional Analysis
Process Time Calculations

Evaluation Interval (minutes)	Number of parameters	Processing Times (msec)	Correction Times (sec)	Total Times (sec)	Percent Use of	Fraction of time/ para. # (sec)		Fraction of time/ cntrl # (sec)	
Span: 10 - 12 minute									
0.00 - 30.00	68	6032.00	76.00	82.03	6 %	5.46	5	0.00	0
TIME LEFT (min): 1.90 ACCESS TIME/PARAMETER: 22.90 sec.						5.46	5	0.00	0
Span: 12 - 14 minute									
0.00 - 30.00	68	6032.00	76.00	82.03	6 %	5.46	5	0.00	0
TIME LEFT (min): 1.90 ACCESS TIME/PARAMETER: 22.90 sec.						5.46	5	0.00	0
Span: 14 - 16 minute									
0.00 - 30.00	68	6032.00	76.00	82.03	6 %	5.46	5	0.00	0
TIME LEFT (min): 1.90 ACCESS TIME/PARAMETER: 22.90 sec.						5.46	5	0.00	0
Span: 16 - 18 minute									
0.00 - 30.00	68	6032.00	76.00	82.03	6 %	5.46	5	0.00	0
TIME LEFT (min): 1.90 ACCESS TIME/PARAMETER: 22.90 sec.						5.46	5	0.00	0
Span: 18 - 20 minute									
0.00 - 30.00	68	6032.00	76.00	82.03	6 %	5.46	5	0.00	0
TIME LEFT (min): 1.90 ACCESS TIME/PARAMETER: 22.90 sec.						5.46	5	0.00	0

Nuplex 80 + Functional Analysis
Process Time Calculations

Evaluation Interval (minutes)	Number of parameters	Processing Times (msec)	Correction Times (sec)	Total Times (sec)	Percent Use of	Fraction of time/ para. # (sec)		Fraction of time/ cntrl # (sec)	
Span: 20 - 22 minute									
0.00 - 30.00	68	6032.00	76.00	82.03	6 %	5.46	5	0.00	0
TIME LEFT (min): 1.90 ACCESS TIME/PARAMETER: 22.90 sec.						5.46	5	0.00	0
Span: 22 - 24 minute									
0.00 - 30.00	68	6032.00	76.00	82.03	6 %	5.46	5	0.00	0
TIME LEFT (min): 1.90 ACCESS TIME/PARAMETER: 22.90 sec.						5.46	5	0.00	0
Span: 24 - 26 minute									
0.00 - 30.00	68	6032.00	76.00	82.03	6 %	5.46	5	0.00	0
TIME LEFT (min): 1.90 ACCESS TIME/PARAMETER: 22.90 sec.						5.46	5	0.00	0
Span: 26 - 28 minute									
0.00 - 30.00	68	6032.00	76.00	82.03	6 %	5.46	5	0.00	0
TIME LEFT (min): 1.90 ACCESS TIME/PARAMETER: 22.90 sec.						5.46	5	0.00	0
Span: 28 - 30 minute									
0.00 - 30.00	68	6032.00	76.00	82.03	6 %	5.46	5	0.00	0
TIME LEFT (min): 1.90 ACCESS TIME/PARAMETER: 22.90 sec.						5.46	5	0.00	0

Nuplex 80 + Functional Analysis
Process Time Calculations

Evaluation Interval (minutes)	Number of parameters	Processing Times (msec)	Correction Times (sec)	Total Times (sec)	Percent Use of	Fraction of time/ para. # (sec)		Fraction of time/ cntrl # (sec)	
Span: 30 - 32 minute									
30.00 - 30.25	2	1520.00	3.50	5.02	100 %	5.02	2	2.40	2
30.00 - 31.00	3	3720.00	8.00	11.72	100 %	11.72	3	2.40	2
30.00 - 32.00	1	0.00	1.00	1.00	100 %	1.00	1	0.00	0
TIME LEFT (min): 1.62 ACCESS TIME/PARAMETER: 16.24 sec.						17.74	6	4.80	4
Span: 32 - 34 minute									
33.00 - 33.00	3	3380.00	7.00	10.38	100 %	10.38	3	0.00	0
33.00 - 33.25	3	3720.00	8.00	11.72	100 %	11.72	3	4.80	4
TIME LEFT (min): 1.55 ACCESS TIME/PARAMETER: 15.51 sec.						22.10	6	4.80	4
Span: 34 - 36 minute									
No intervals found									
Span: 36 - 38 minute									
36.00 - 36.25	3	3720.00	8.00	11.72	100 %	11.72	3	4.80	4
TIME LEFT (min): 1.72 ACCESS TIME/PARAMETER: 34.49 sec.						11.72	3	4.80	4
Span: 38 - 40 minute									
No intervals found									
Span: 40 - 42 minute									

Nuplex 80 + Functional Analysis
Process Time Calculations

Evaluation Interval (minutes)	Number of parameters	Processing Times (msec)	Correction Times (sec)	Total Times (sec)	Percent Use of	Fraction of time/ para. # (sec)		Fraction of time/ cntrl # (sec)	
Span: 40 - 42 minute									
No intervals found									
Span: 42 - 44 minute									
No intervals found									
Span: 44 - 46 minute									
45.00 - 47.00	4	0.00	4.00	4.00	50 %	2.00	2	3.00	5
TIME LEFT (min): 1.91 ACCESS TIME/PARAMETER: 57.50 sec.						2.00	2	3.00	5
Span: 46 - 48 minute									
45.00 - 47.00	4	0.00	4.00	4.00	50 %	2.00	2	3.00	5
TIME LEFT (min): 1.91 ACCESS TIME/PARAMETER: 57.50 sec.						2.00	2	3.00	5
Span: 48 - 50 minute									
No intervals found									
Span: 50 - 52 minute									
No intervals found									
Span: 52 - 54 minute									

Nuplex 80 + Functional Analysis
Process Time Calculations

Evaluation Interval (minutes)	Number of parameters	Processing Times (msec)	Correction Times (sec)	Total Times (sec)	Percent Use of	Fraction of time/ para. # (sec)	Fraction of time/ cntrl # (sec)

Span: 52 - 54 minute

No intervals found

Span: 54 - 56 minute

No intervals found

Span: 56 - 58 minute

No intervals found

Span: 58 - 60 minute

No intervals found

Span: 60 - 62 minute

No intervals found

Span: 62 - 64 minute

No intervals found

Span: 64 - 66 minute

No intervals found

Span: 66 - 68 minute

No intervals found

Span: 68 - 70 minute

Nuplex 80 + Functional Analysis
Process Time Calculations

Evaluation Interval (minutes)	Number of parameters	Processing Times (msec)	Correction Times (sec)	Total Times (sec)	Percent Use of	Fraction of time/ para. # (sec)	Fraction of time/ cntrl # (sec)

Span: 68 - 70 minute

No intervals found

Span: 70 - 72 minute

No intervals found

Span: 72 - 74 minute

No intervals found

Span: 74 - 76 minute

No intervals found

Span: 76 - 78 minute

No intervals found

Span: 78 - 80 minute

No intervals found

Span: 80 - 82 minute

No intervals found

Span: 82 - 84 minute

No intervals found

Span: 84 - 86 minute

Nuplex 80 + Functional Analysis
Process Time Calculations

Evolution Interval (minutes)	Number of parameters	Processing Times (msec)	Correction Times (sec)	Total Times (sec)	Percent Use of	Fraction of time/ para. # (sec)	Fraction of time/ cntrl # (sec)

Span: 84 - 86 minute

No intervals found

Span: 86 - 88 minute

No intervals found

Span: 88 - 90 minute

No intervals found

Span: 90 - 92 minute

No intervals found

Span: 92 - 94 minute

No intervals found

Span: 94 - 96 minute

No intervals found

Span: 96 - 98 minute

No intervals found

Span: 98 - 100 minute

No intervals found

Span: 100 - 102 minute

Nuplex 80 + Functional Analysis
Process Time Calculations

Evaluation Interval (minutes)	Number of parameters	Processing Times (msec)	Correction Times (sec)	Total Times (sec)	Percent Use of	Fraction of time/ para. # (sec)	Fraction of time/ cntrl # (sec)

Span: 100 - 102 minute

No intervals found

Span: 102 - 104 minute

No intervals found

Span: 104 - 106 minute

No in[illegible] found

Span: 106 - 108 minute

No intervals found

Span: 108 - 110 minute

No intervals found

Span: [illegible] 112 minute

N[illegible]tervals found

Span: 112 - 114 minute

No intervals found

Span: 114 - 116 minute

No intervals found

Span: 116 - 118 minute

Nuplex 80 + Functional Analysis
Process Time Calculations

Evaluation Interval (minutes)	Number of parameters	Processing Times (msec)	Correction Times (sec)	Total Times (sec)	Percent Use of	Fraction of time/ para. # (sec)	Fraction of time/ cntrl # (sec)

118 minute

Intervals found

Span: ... - 120 minute

No intervals found

Span: 11... 122 minute

No intervals found

Span: 122 - 124 minute

No intervals found

Span: 124 - 126 minute

No intervals found

Span: 12? - 128 minute

No intervals found

Span: 128 - 130 minute

No intervals found

Span: 130 - 132 minute

No intervals found

Span: 132 - 134 minute

Nuplex 80 + Functional Analysis
Process Time Calculations

Evaluation Interval (minutes)	Number of parameters	Processing Times (msec)	Correction Times (sec)	Total Times (sec)	Percent Use of	Fraction of time/ para. # (sec)	Fraction of time/ cntrl # (sec)

Span: 132 - 134 minute

No intervals found

Span: 134 - 136 minute

No intervals found

Span: 136 - 138 minute

No intervals found

Span: 138 - 140 minute

No intervals found

Span: 140 - 142 minute

No intervals found

Span: 142 - 144 minute

No intervals found

Span: 144 - 146 minute

No intervals found

Span: 146 - 148 minute

No intervals found

Span: 148 - 150 minute

Nuplex 80 + Functional Analysis
Process Time Calculations

Evaluation Interval (minutes)	Number of parameters	Processing Times (msec)	Correction Times (sec)	Total Times (sec)	Percent Use of	Fraction of time/ para. # (sec)	Fraction of time/ cntrl # (sec)

Span: 148 - 150 minute

No intervals found

Span: 150 - 152 minute

No intervals found

Span: 152 - 154 minute

No intervals found

Span: 154 - 156 minute

No intervals found

Span: 156 - 158 minute

No intervals found

Span: 158 - 160 minute

No intervals found

Span: 160 - 162 minute

No intervals found

Span: 162 - 164 minute

No intervals found

Span: 164 - 166 minute

Nuplex 80 + Functional Analysis
Process Time Calculations

Evaluation Interval (minutes)	Number of parameters	Processing Times (msec)	Correction Times (sec)	Total Times (sec)	Percent Use of	Fraction of time/ para. # (sec)	Fraction of time/ cntrl # (sec)

Span: 164 - 166 minute

No intervals found

Span: 166 - 168 minute

No intervals found

Span: 168 - 170 minute

No intervals found

Span: 170 - 172 minute

No intervals found

Span: 172 - 174 minute

No intervals found

Span: 174 - 176 minute

No intervals found

Span: 176 - 178 minute

No intervals found

Span: 178 - 180 minute

No intervals found

Span: 180 - 182 minute

Nuplex 80 + Functional Analysis
Process Time Calculations

Evaluation Interval (minutes)	Number of parameters	Processing Times (msec)	Correction Times (sec)	Total Times (sec)	Percent Use of	Fraction of time/ para. # (sec)	Fraction of time/ cntrl # (sec)

Span: 180 - 182 minute

No intervals found

Span: 182 - 184 minute

No intervals found

Span: 184 - 186 minute

No intervals found

Span: 186 - 188 minute

No intervals found

Span: 188 - 190 minute

No intervals found

Span: 190 - 192 minute

No intervals found

Span: 192 - 194 minute

No intervals found

Span: 194 - 196 minute

No intervals found

Span: 196 - 198 minute

Nuplex 80 + Functional Analysis
Process Time Calculations

Evaluation Interval (minutes)	Number of parameters	Processing Times (msec)	Correction Times (sec)	Total Times (sec)	Percent Use of	Fraction of time/ para. # (sec)	Fraction of time/ cntrl # (sec)

Span: 196 - 198 minute

No intervals found

Span: 198 - 200 minute

No intervals found

Span: 200 - 202 minute

No intervals found

Span: 202 - 204 minute

No intervals found

Span: 204 - 206 minute

No intervals found

Span: 206 - 208 minute

No intervals found

Span: 208 - 210 minute

No intervals found

Span: 210 - 212 minute

No ervals found

Span: 212 - 214 minute

Nuplex 80 + Functional Analysis
Process Time Calculations

Evaluation Interval (minutes)	Number of parameters	Processing Times (msec)	Correction Times (sec)	Total Times (sec)	Percent Use of	Fraction of time/ para. # (sec)	Fraction of time/ cntrl # (sec)

Span: 212 - 214 minute

No intervals found

Span: 214 - 216 minute

No intervals found

Span: 216 - 218 minute

No intervals found

Span: 218 - 220 minute

No intervals found

Span: 220 - 222 minute

No intervals found

Span: 222 - 224 minute

No intervals found

Span: 224 - 226 minute

No intervals found

Span: 226 - 228 minute

No intervals found

Span: 228 - 230 minute

Nuplex 80 + Functional Analysis
Process Time Calculations

Evaluation Interval (minutes)	Number of parameters	Processing Times (msec)	Correction Times (sec)	Total Times (sec)	Percent Use of	Fraction of time/ para. # (sec)	Fraction of time/ cntrl # (sec)

Span: 228 - 230 minute

No intervals found

Span: 230 - 232 minute

No intervals found

Span: 232 - 234 minute

No intervals found

Span: 234 - 236 minute

No intervals found

Span: 236 - 238 minute

No intervals found

Span: 238 - 240 minute

No intervals found

Span: 240 - 242 minute

No intervals found

Span: 242 - 244 minute

No intervals found

Span: 244 - 246 minute

Nuplex 80 + Functional Analysis
Process Time Calculations

Evaluation Interval (minutes)	Number of parameters	Processing Times (msec)	Correction Times (sec)	Total Times (sec)	Percent Use of	Fraction of time/ para. # (sec)	Fraction of time/ cntrl # (sec)

Span: 244 - 246 minute

No intervals found

Span: 246 - 248 minute

No intervals found

Span: 248 - 250 minute

No intervals found

Span: 250 - 252 minute

No intervals found

Span: 252 - 254 minute

No intervals found

Span: 254 - 256 minute

No intervals found

Span: 256 - 258 minute

No intervals found

Span: 258 - 260 minute

No intervals found

Span: 260 - 262 minute

Nuplex 80 + Functional Analysis
Process Time Calculations

Evaluation Interval (minutes)	Number of parameters	Processing Times (msec)	Correction Times (sec)	Total Times (sec)	Percent Use of	Fraction of time/ para. # (sec)	Fraction of time/ cntrl # (sec)

Span: 260 - 262 minute

No intervals found

Span: 262 - 264 minute

No intervals found

Span: 264 - 266 minute

No intervals found

Span: 266 - 268 minute

No intervals found

Span: 268 - 270 minute

No intervals found

Span: 270 - 272 minute

No intervals found

Span: 272 - 274 minute

No intervals found

Span: 274 - 276 minute

No intervals found

Span: 276 - 278 minute

Nuplex 80 + Functional Analysis
Process Time Calculations

Evaluation Interval (minutes)	Number of parameters	Processing Times (msec)	Correction Times (sec)	Total Time (sec)	Percent Use of	Fraction of time/ para. # (sec)	Fraction of time/ cntrl # (sec)

Span: 276 - 278 minute

No intervals found

Span: 278 - 280 minute

No intervals found

Span: 280 - 282 minute

No intervals found

Span: 282 - 284 minute

No intervals found

Span: 284 - 286 minute

No intervals found

Span: 286 - 288 minute

No intervals found

Span: 288 - 290 minute

No intervals found

Span: 290 - 292 minute

No intervals found

Span: 292 - 294 minute

Nuplex 80 + Functional Analysis
Process Time Calculations

Evaluation Interval (minutes)	Number of parameters	Processing Times (msec)	Correction Times (sec)	Total Times (sec)	Percent Use of	Fraction of time/ para. # (sec)	Fraction of time/ cntrl # (sec)

Span: 292 - 294 minute

No intervals found

Span: 294 - 296 minute

No intervals found

Span: 296 - 298 minute

No intervals found

Span: 298 - 300 minute

No intervals found

Span: 300 - 302 minute

No intervals found

Span: 302 - 304 minute

No intervals found

Span: 304 - 306 minute

No intervals found

Span: 306 - 308 minute

No intervals found

Span: 308 - 310 minute

Nuplex 80 + Functional Analysis
Process Time Calculations

Evaluation Interval (minutes)	Number of parameters	Processing Times (msec)	Correction Times (sec)	Total Times (sec)	Percent Use of	Fraction of time/ para. # (sec)	Fraction of time/ cntrl # (sec)

Span: 308 - 310 minute

No intervals found

Span: 310 - 312 minute

No intervals found

Span: 312 - 314 minute

No intervals found

Span: 314 - 316 minute

No intervals found

Span: 316 - 318 minute

No intervals found

Span: 318 - 320 minute

No intervals found

Span: 320 - 322 minute

No intervals found

Span: 322 - 324 minute

No intervals found

Span: 324 - 325 minute

Nuplex 80 + Functional Analysis
Process Time Calculations

Evaluation Interval (minutes)	Number of parameters	Processing Times (sec)	Correction Times (sec)	Total Time (sec)	Percent Use of	Fraction of time/ para. # (sec)	Fraction of time/ cntrl # (sec)

Span: 324 - 326 minute

No intervals found

Span: 326 - 328 minute

No intervals found

Span: 328 - 330 minute

No intervals found

Span: 330 - 332 minute

No intervals found

Span: 332 - 334 minute

No intervals found

Span: 334 - 336 minute

No intervals found

Span: 336 - 338 minute

No intervals found

Span: 338 - 340 minute

No intervals found

Span: 340 - 342 minute

Nuplex 80 + Functional Analysis
Process Time Calculations

Evaluation Interval (minutes)	Number of parameters	Processing Times (msec)	Correction Times (sec)	Total Times (sec)	Percent Use of	Fraction of time/ para. # (sec)		Fraction of time/ cntrl # (sec)	
Span: 340 - 342 minute									
No intervals found									
Span: 342 - 344 minute									
No intervals found									
Span: 344 - 346 minute									
345.00 - 355.00	1	0.00	1.00	1.00	10 %	0.10	0	0.00	0
TIME LEFT (min): 1.99 ACCESS TIME/PARAMETER:****.** sec.						0.10	0	0.00	0
Span: 346 - 348 minute									
345.00 - 355.00	1	0.00	1.00	1.00	20 %	0.20	0	0.00	0
TIME LEFT (min): 1.99 ACCESS TIME/PARAMETER:****.** sec.						0.20	0	0.00	0
Span: 348 - 350 minute									
345.00 - 355.00	1	0.00	1.00	1.00	20 %	0.20	0	0.00	0
TIME LEFT (min): 1.99 ACCESS TIME/PARAMETER:****.** sec.						0.20	0	0.00	0
Span: 350 - 352 minute									
345.00 - 355.00	1	0.00	1.00	1.00	20 %	0.20	0	0.00	0
350.00 - 350.25	1	0.00	1.00	1.00	100 %	1.00	1	2.40	2
350.00 - 351.00	1	1520.00	2.50	4.02	100 %	4.02	1	2.40	2
TIME LEFT (min): 1.83 ACCESS TIME/PARAMETER: 54.99 sec.						5.22	2	4.80	4

Nuplex 80 + Functional Analysis
Process Time Calculations

Evaluation Interval (minutes)	Number of parameters	Processing Times (msec)	Correction Times (sec)	Total Times (sec)	Percent Use of	Fraction of time/ para. # (sec)		Fraction of time/ cntrl # (sec)	
Span: 352 - 354 minute									
345.00 - 355.00	1	0.00	1.00	1.00	20 %	0.20	0	0.00	0
352.00 - 352.25	2	1520.00	3.50	5.02	100 %	5.02	2	4.80	4
TIME LEFT (min): 1.83 ACCESS TIME/PARAMETER: 54.99 sec.						5.22	2	4.80	4
Span: 354 - 356 minute									
345.00 - 355.00	1	0.00	1.00	1.00	10 %	0.10	0	0.00	0
354.00 - 354.25	2	1520.00	3.50	5.02	100 %	5.02	2	4.80	4
TIME LEFT (min): 1.33 ACCESS TIME/PARAMETER: 55.04 sec.						5.12	2	4.80	4
Span: 356 - 358 minute									
356.00 - 356.25	2	1520.00	3.50	5.02	100 %	5.02	2	4.80	4
TIME LEFT (min): 1.83 ACCESS TIME/PARAMETER: 55.09 sec.						5.02	2	4.80	4
Span: 358 - 360 minute									
358.00 - 358.25	2	1520.00	3.50	5.02	100 %	5.02	2	4.80	4
TIME LEFT (min): 1.83 ACCESS TIME/PARAMETER: 55.09 sec.						5.02	2	4.80	4
Span: 360 - 362 minute									

Nuplex 80 + Functional Analysis
Process Time Calculations

Evaluation Interval (minutes)	Number of parameters	Processing Times (msec)	Correction Times (sec)	Total Times (sec)	Percent Use of	Fraction of time/ para. # (sec)		Fraction of time/ cntrl # (sec)	
Span: 360 - 362 minute									
360.00 - 360.25	2	1520.00	3.50	5.02	100 %	5.02	2	4.80	4
TIME LEFT (min): 1.83 ACCESS TIME/PARAMETER: 55.09 sec.						5.02	2	4.80	4
Span: 362 - 364 minute									
362.00 - 362.25	1	0.00	1.00	1.00	100 %	1.00	1	1.20	1
362.00 - 363.00	1	1520.00	2.50	4.02	100 %	4.02	1	2.40	2
TIME LEFT (min): 1.85 ACCESS TIME/PARAMETER: 55.69 sec.						5.02	2	3.60	3
Span: 364 - 366 minute									
364.00 - 364.25	1	1800.00	2.50	4.30	100 %	4.30	1	0.00	0
364.00 - 366.00	1	0.00	1.00	1.00	100 %	1.00	1	0.00	0
TIME LEFT (min): 1.91 ACCESS TIME/PARAMETER: 57.35 sec.						5.30	2	0.00	0

Span: 366 - 368 minute

No intervals found

Span: 368 - 370 minute

No intervals found

Span: 370 - 372 minute

Nuplex 80 + Functional Analysis
Process Time Calculations

Evaluation Interval (minutes)	Number of parameters	Processing Times (msec)	Correction Times (sec)	Total Times (sec)	Percent Use of	Fraction of time/ para. # (sec)		Fraction of time/ cntrl # (sec)	
Span: 370 - 372 minute									
No intervals found									
Span: 372 - 374 minute									
No intervals found									
Span: 374 - 376 minute									
No intervals found									
Span: 376 - 378 minute									
No intervals found									
Span: 378 - 380 minute									
No intervals found									
Span: 380 - 382 minute									
380.00 - 380.25	4	3720.00	8.50	12.22	100 %	12.22	4	2.40	2
380.00 - 381.00	1	0.00	1.00	1.00	100 %	1.00	1	2.40	2
380.00 - 382.00	3	0.00	3.00	3.00	100 %	3.00	3	0.00	0
TIME LEFT (min): 1.64 ACCESS TIME/PARAMETER: 12.37 sec.						16.22	8	4.80	4
Span: 382 - 384 minute									
No intervals found									
Span: 384 - 386 minute									

Nuplex 80 + Functional Analysis
Process Time Calculations

Evaluation Interval (minutes)	Number of parameters	Processing Times (msec)	Correction Times (sec)	Total Times (sec)	Percent Use of	Fraction of time/ para. # (sec)		Fraction of time/ cntrl # (sec)	

Span: 384 - 386 minute

No intervals found

Span: 386 - 388 minute

No intervals found

Span: 388 - 390 minute

No intervals found

Span: 390 - 392 minute

Evaluation Interval (minutes)	Number of parameters	Processing Times (msec)	Correction Times (sec)	Total Times (sec)	Percent Use of	Fraction of time/ para. # (sec)		Fraction of time/ cntrl # (sec)	
390.00 - 390.25	1	1520.00	2.50	4.02	100 %	4.02	1	0.00	0
390.00 - 391.00	1	1488.00	32.50	3[illegible].98	100 %	33.98	1	2.40	2
390.00 - 392.00	1	620.00	1.50	2.12	100 %	2.12	1	2.40	2
TIME LEFT (min): 1.25 ACCESS TIME/PARAMETER: 25.02 sec.						40.12	3	4.80	4

Span: 392 - 394 minute

No intervals found

Span: 394 - 396 minute

No intervals found

Span: 396 - 398 minute

No intervals found

Span: 398 - 400 minute

Nuplex 80 + Functional Analysis
Process Time Calculations

Evaluation Interval (minutes)	Number of parameters	Processing Times (msec)	Correction Times (sec)	Total Times (sec)	Percent Use of	Fraction of time/ para. # (sec)		Fraction of time/ cntrl # (sec)	

Span: 398 - 400 minute

No intervals found

Span: 400 - 402 minute

400.00 - 400.25	4	2480.00	7.0[illegible]	9.48	100 %	9.48	4	2.40	2
400.00 - 401.00	1	1860.00	32.5[illegible]	34.36	100 %	34.36	1	2.40	2

TIME LEFT (min): 1.18 ACCESS TIME/PARAMETER: 14.27 sec. 43.34 5 4.80 4

Span: 402 - 404 minute

No intervals found

Span: 404 - 406 minute

No intervals found

Span: 406 - 408 minute

No intervals found

Span: 408 - 410 minute

No intervals found

Span: 410 - 412 minute

No intervals found

Span: 412 - 414 minute

Nuplex 80 + Functional Analysis
Process Time Calculations

Evaluation Interval (minutes)	Number of parameters	Processing Times (msec)	Correction Times (sec)	Total Times (sec)	Percent Use of	Fraction of time/ para. # (sec)		Fraction of time/ cntrl # (sec)	
Span: 412 - 414 minute									
No intervals found									
Span: 414 - 416 minute									
No intervals found									
Span: 416 - 418 minute									
No intervals found									
Span: 418 - 420 minute									
No intervals found									
Span: 420 - 422 minute									
420.00 - 420.50	3	496.00	3.50	3.99	100 %	3.99	3	0.00	0
420.00 - 421.00	1	0.00	1.00	1.00	100 %	1.00	1	0.00	0
420.00 - 422.00	4	1388.00	4.50	5.88	100 %	[illegible].88	4	0.00	0
TIME LEFT (min): 1.81 ACCESS TIME/PARAMETER: 13.63 sec.						10.88	8	0.00	0
Span: 422 - 424 minute									
No intervals found									
Span: 424 - 426 minute									
425.00 - 425.25	1	1240.00	2.50	3.74	100 %	3.74	1	0.00	0
425.00 - 425.50	1	0.00	1.00	1.00	100 %	1.00	1	0.00	0
425.00 - 426.00	3	0.00	3.00	3.00	100 %	3.00	3	0.00	0
425.[illegible] 427.00	1	760.00	1.50	2.26	50 %	1.13	1	0.00	0
425.[illegible] - 428.00	1	0.00	1.00	1.00	33 %	0.33	0	0.[illegible]	0
TIME LEFT (min): 1.84 ACCESS TIME/PARAMETER: 18.46 sec.						9.20	6	0.00	0

Nuplex 80 + Functional Analysis
Process Time Calculations

Evaluation Interval (minutes)	Number of parameters	Processing Times (msec)	Correction Times (sec)	Total Times (sec)	Percent Use of	Fraction of time/ para. # (sec)		Fraction of time/ cntrl # (sec)	
Span: 426 - 428 minute									
425.00 - 427.00	1	760.00	1.50	2.26	50 %	1.13	1	0.00	0
425.00 - 428.00	1	0.00	1.00	1.00	66 %	0.66	1	0.00	0
TIME LEFT (min): 1.97 ACCESS TIME/PARAMETER: 118.20 sec.						1.79	1	0.00	0
Span: 428 - 430 minute									
No intervals found									
Span: 430 - 432 minute									
430.00 - 431.00	9	0.00	9.00	9.00	100 %	9.00	9	7.20	6
TIME LEFT (min): 1.73 ACCESS TIME/PARAMETER: 11.53 sec.						9.00	9	7.20	6
Span: 432 - 434 minute									
No intervals found									
Span: 434 - 436 minute									
435.00 - 436.00	3	0.00	3.00	3.00	100 %	3.00	3	2.40	2
TIME LEFT (min): 1.91 ACCESS TIME/PARAMETER: 38.20 sec.						3.00	3	2.40	2
Span: 436 - 438 minute									

Nuplex 80 + Functional Analysis
Process Time Calculations

Evaluation interval (minutes)	Number of parameters	Processing Times (msec)	Correction Times (sec)	Total Times (sec)	Percent Use of	Fraction of time/ para. # (sec)		Fraction of time/ cntrl # (sec)	
Span: 436 - 438 minute									
No intervals found									
Span: 438 - 440 minute									
No intervals found									
Span: 440 - 442 minute									
440.00 - 441.00	2	760.00	2.00	2.76	100 %	2.76	2	1.20	1
TIME LEFT (min): 1.93 ACCESS TIME/PARAMETER: 58.02 sec.						2.76	2	1.20	1
Span: 442 - 444 minute									
No intervals found									
Span: 444 - 446 minute									
No intervals found									
Span: 446 - 448 minute									
No intervals found									
Span: 448 - 450 minute									
No intervals found									
Span: 450 - 452 minute									

Nuplex 80 + Functional Analysis
Process Time Calculations

Evaluation Interval (minutes)	Number of parameters	Processing Times (msec)	Correction Times (sec)	Total Times (sec)	Percent Use of	Fraction of time/ para. # (sec)		Fraction of time/ cntrl # (sec)	
Span: 450 - 452 minute									
450.00 - 451.00	2	2700.00	4.50	7.20	100 %	7.20	2	0.00	0
450.00 - 453.00	2	3968.00	9.00	12.96	66 %	8.64	1	0.00	0
TIME LEFT (min): 1.73 ACCESS TIME/PARAMETER: 34.71 sec.						15.84	3	0.00	0
Span: 452 - 454 minute									
450.00 - 453.0	2	3968.00	9.00	12.96	33 %	4.32	1	0.00	0
TIME LEFT (min): 1.92 ACCESS TIME/PARAMETER: 115.67 sec.						4.32	1	0.00	0
Span: 454 - 456 minute									
455.00 - 457.00	1	1984.00	4.50	6.48	50 %	3.24	1	4.80	8
455.00 - 458.00	3	5180.00	9.50	14.68	33 %	4.89	1	7.20	18
TIME LEFT (min): 1.66 ACCESS TIME/PARAMETER: 49.93 sec.						8.13	2	12.00	26
Span: 456 - 458 minute									
455.00 - 457.00	1	1984.00	4.50	6.48	50 %	3.24	1	4.80	8
455.00 - 458.00	3	5180.00	9.50	14.68	66 %	9.78	2	14.40	18
TIME LEFT (min): 1.46 ACCESS TIME/PARAMETER: 29.25 sec.						13.02	3	19.20	26

Span: 458 - 460 minute

Nuplex 80 + Functional Analysis
Process Time Calculations

Evaluation Interval (minutes)	Number of parameters	Processing Times (msec)	Correction Times (sec)	Total Times (sec)	Percent Use of	Fraction of time/ para. (sec)	#	Fraction of time/ cntrl (sec)	#
Span: 458 - 460 minute									
No intervals found									
Span: 460 - 462 minute									
460.00 - 461.00	3	0.00	3.00	3.00	100 %	3.00	3	3.60	3
TIME LEFT (min): 1.89 ACCESS TIME/PARAMETER: 37.80 sec.						3.00	3	3.60	3
Span: 462 - 464 minute									
No intervals found									
Span: 464 - 466 minute									
No intervals found									
Span: 466 - 468 minute									
No intervals found									
Span: 468 - 470 minute									
No intervals found									
Span: 470 - 472 minute									
No intervals found									
Span: 472 - 474 minute									

Nuplex 80 + Functional Analysis
Process Time Calculations

Evaluation Interval (minutes)	Number of parameters	Processing Times (msec)	Correction Times (sec)	Total Times (sec)	Percent Use of	Fraction of time/ pars. # (sec)		Fraction of time/ cntrl # (sec)	
Span: 472 - 474 minute									
No intervals found									
Span: 474 - 476 minute									
No intervals found									
Span: 476 - 478 minute									
No intervals found									
Span: 478 - 480 minute									
No intervals found									
Span: 480 - 482 minute									
480.00 - 481.00	1	0.00	1.00	1.00	100 %	1.00	1	0.00	0
480.00 - 483.00	2	1736.00	4.50	6.23	66 %	4.15	1	7.20	9
TIME LEFT (min): 1.79 ACCESS TIME/PARAMETER: 53.62 sec.						5.15	2	7.20	9
Span: 482 - 484 minute									
480.00 - 483.00	2	1736.00	4.50	6.23	33 %	2.07	1	3.60	9
TIME LEFT (min): 1.90 ACCESS TIME/PARAMETER: 114.32 sec.						2.07	1	3.60	9
Span: 484 - [illegible] minute									

Nuplex 80 + Functional Analysis
Process Time Calculations

Evaluation Interval (minutes)	Number of parameters	Processing Times (msec)	Correction Times (sec)	Total Times (sec)	Percent Use of	Fraction of time/ para. (sec)	#	Fraction of time/ cntrl (sec)	#
Span: 484 - 486 minute									
485.00 - 488.00	3	2480.00	6.50	8.9C	33 %	2.99	1	4.00	10
TIME LEFT (min): 1.88 ACCESS TIME/PARAMETER: 113.00 sec.						2.99	1	4.00	10
Span: 486 - 488 minute									
48[illegible].00 - 488.00	3	2480.00	6.50	8.98	66 %	5.98	2	8.00	10
TIME LEFT (min): 1.76 ACCESS TIME/PARAMETER: 53.00 sec.						5.98	2	8.00	10
Span: 488 - 490 minute									
No intervals found									
Span: 490 - 492 minute									
490.00 - 491.00	6	558.00	6.00	6.56	100 %	6.55	6	1.20	1
TIME LEFT (min): 1.87 ACCESS TIME/PARAMETER: 18.70 sec.						[illegible]	6	1.20	1
Span: 492 - 494 minute									
No intervals found									
Span: 494 - 496 minute									
495.00 - 495.50	3	1380.00	4.00	5.38	100 %	5.38	3	0.00	0
495.00 - 496.00	1	0.00	1.00	1.00	100 %	1.00	1	0.00	0
TIME LEFT (min): 1.89 ACCESS TIME/PARAMETER: 28.40 sec.						6.38	4	0.00	0

Nuplex 80 + Functional Analysis
Process Time Calculations

Evaluation Interval (minutes)	Number of parameters	Processing Times (msec)	Correction Times (sec)	Total Times (sec)	Percent Use of	Fraction of time/ para. # (sec)		Fraction of time/ cntrl # (sec)	
Span: 496 - 498 minute									
No intervals found									
Span: 498 - 500 minute									
No intervals found									
Span: 500 - 502 minute									
500.00 - 501.00	8	0.00	8.00	8.00	100 %	8.00	8	3.60	3
500.00 - 502.00	3	900.00	3.50	4.40	100 %	4.40	3	0.00	0
TIME LEFT (min): 1.73 ACCESS TIME/PARAMETER: 9.45 sec.						12.40	11	3.60	3
Span: 502 - 504 minute									
No intervals found									
Span: 504 - 506 minute									
505.00 - 505.00	2	1240.00	3.50	4.74	100 %	4.74	2	1.20	1
505.00 - 505.25	3	1520.00	4.50	6.02	100 %	6.02	3	0.00	0
505.00 - 505.50	1	1520.00	2.50	4.02	100 %	4.02	1	0.00	0
505.00 - 506.00	10	1256.00	10.50	11.75	100 %	11.75	10	0.00	0
505.00 - 507.00	3	0.00	3.00	3.00	50 %	1.50	2	0.00	0
505.00 - 508.00	1	0.00	1.00	1.00	33 %	0.33	0	0.00	0
TIME LEFT (min): 1.50 ACCESS TIME/PARAMETER: 5.02 sec.						28.36	18	1.20	1

Nuplex 80 + Functional Analysis
Process Time Calculations

Evaluation Interval (minutes)	Number of parameters	Processing Times (msec)	Correction Times (sec)	Total Times (sec)	Percent Use of	Fraction of time/ para. # (sec)		Fraction of time/ cntrl # (sec)	
Span: 506 - 508 minute									
505.00 - 507.00	3	0.00	3.00	3.00	50 %	1.50	2	0.00	0
505.00 - 508.00	1	0.00	1.00	1.00	66 %	0.66	1	0.00	0
506.00 - 506.25	1	0.00	1.00	1.00	100 %	1.00	1	0.00	0
506.00 - 506.50	1	0.00	1.00	1.00	100 %	1.00	1	1.20	1
506.00 - 507.00	1	0.00	1.00	1.00	100 %	1.00	1	0.00	0
506.00 - 508.00	1	0.00	1.00	1.00	100 %	1.00	1	1.20	1
TIME LEFT (min): 1.85 ACCESS TIME/PARAMETER: 18.57 sec.						6.16	6	2.40	2
Span: 508 - 510 minute									
508.00 - 508.25	1	0.00	1.00	1.00	100 %	1.00	1	0.00	0
508.00 - 508.50	1	0.00	1.00	1.00	100 %	1.00	1	1.20	1
TIME LEFT (min): 1.94 ACCESS TIME/PARAMETER: 58.40 sec.						2.00	2	1.20	1
Span: 510 - 512 minute									
510.00 - 510.25	7	0.00	7.00	7.00	100 %	7.00	7	0.00	0
510.00 - 511.00	16	496.00	16.50	16.99	100 %	16.99	16	18.00	15
510.00 - 512.00	1	0.00	1.00	1.00	100 %	1.00	1	1.20	1
TIME LEFT (min): 1.26 ACCESS TIME/PARAMETER: 3.15 sec.						24.99	24	19.20	16

Span: 512 - 516 minute

No intervals found

Span: 514 - 516 minute

Nuplex 80 + Functional Analysis
Process Time Calculations

Evaluation Interval (minutes)	Number of parameters	Processing Times (msec)	Correction Times (sec)	Total Times (sec)	Percent Use of	Fraction of time/ para. # (sec)		Fraction of time/ cntrl # (sec)	
Span: 514 - 516 minute									
No intervals found									
Span: 516 - 518 minute									
No intervals found									
Span: 518 - 520 minute									
No intervals found									
Span: 520 - 522 minute									
520.00 - 520.25	8	1240.00	9.00	10.24	100 %	10.24	8	0.00	0
520.00 - 520.50	6	1520.00	7.00	8.52	100 %	8.52	6	0.00	0
520.00 - 521.00	7	0.00	7.00	7.00	100 %	7.00	7	1.20	1
520.00 - 522.00	2	0.00	2.00	2.00	100 %	2.00	2	0.00	0
520.00 - 525.00	1	0.00	1.00	1.00	40 %	0.40	0	0.00	0
TIME LEFT (min): 1.51	ACCESS TIME/PARAMETER: 3.94 sec.					28.16	23	1.20	1

Nuplex 80 + Functional Analysis

Process Time Calculations

Evaluation Interval (minutes)	Number of parameters	Processing Times (msec)	Correction Times (sec)	Total Times (sec)	Percent Use of	Fraction of time/ para. # (sec)		Fraction of time/ cntrl # (sec)	
Span: 0 - 1 minute									
0.00 - 0.25	5	2426.00	7.50	9.92	100 %	9.92	5	0.00	0
0.00 - 0.50	7	3040.00	10.00	13.04	100 %	13.04	7	1.20	1
0.14 - 2.14	7	0.00	4.50	4.50	43 %	1.93	3	0.00	0
0.50 - 1.00	3	1752.00	4.00	5.75	100 %	5.75	3	0.00	0
0.50 - 2.00	2	1520.00	3.00	4.52	33 %	1.50	1	0.00	0
0.50 - 2.50	1	0.00	4.00	4.00	25 %	1.00	0	0.00	0
0.50 - 10.50	1	620.00	3.50	4.12	5 %	0.20	0	0.00	0
0.60 - 3.10	3	2852.00	7.50	10.35	16 %	1.65	0	0.00	0
TIME LEFT (min): 0.39 ACCESS TIME/PARAMETER: 1.25 sec.						35.02	19	1.20	1
Span: 1 - 2 minute									
0.14 - 2.14	7	0.00	4.50	4.50	50 %	2.25	4	0.00	0
0.50 - 2.00	2	1520.00	3.00	4.52	66 %	3.01	1	0.00	0
0.50 - 2.50	1	0.00	4.00	4.00	50 %	2.00	1	0.00	0
0.50 - 10.50	1	620.00	3.50	4.12	10 %	0.41	0	0.00	0
0.60 - 3.10	3	2852.00	7.50	10.35	40 %	4.14	1	0.00	0
1.00 - 1.05	1	0.00	1.00	1.00	100 %	1.00	1	0.00	0
1.00 - 1.50	7	2916.00	9.00	11.91	100 %	11.91	7	0.00	0
1.20 - 1.70	1	0.00	1.00	1.00	100 %	1.00	1	0.00	0
1.33 - 3.83	3	0.00	2.00	2.00	26 %	0.53	1	0.00	0
1.50 - 3.00	2	760.00	2.50	3.26	33 %	1.08	1	0.00	0
TIME LEFT (min): 0.54 ACCESS TIME/PARAMETER: 1.92 sec.						27.35	17	0.00	0

Span: 2 - 3 minute

Nuplex 80 + Functional Analysis
Process Time Calculations

Evaluation Interval (minutes)	Number of parameters	Processing Times (msec)	Correction Times (sec)	Total Times (sec)	Percent Use of	Fraction of time/ para. # (sec)		Fraction of time/ cntrl # (sec)	
Span: 2 - 3 minute									
0.14 - 2.14	7	0.00	4.50	4.50	7 %	0.31	0	.00	0
0.50 - 2.50	1	0.00	4.00	4.00	25 %	1.00	0	0.00	0
0.50 - 10.50	1	620.00	3.50	4.12	10 %	0.41	0	0.00	0
0.60 - 3.10	3	2852.00	7.50	10.35	40 %	4.16	1	0.00	0
1.33 - 3.83	3	0.00	2.00	2.00	40 %	0.80	1	0.00	0
1.50 - 3.00	2	760.00	2.50	3.26	[illegible] %	2.17	1	0.00	0
2.00 - 2.50	1	760.00	1.50	2.26	[illegible]	2.26	1	0.00	0
2.00 - 8.50	1	0.00	1.00	1.00	[illegible] %	0.15	0	0.00	0
2.50 - 3.00	2	760.00	2.50	3.26	100 %	3.26	2	0.00	0
TIME LEFT (min): 0.75	ACCESS TIME/PARAMETER: 5.68 sec.					14.51	8	0.00	0
Span: 3 - 4 minute									
0.50 - 10.50	1	620.00	3.50	4.12	10 %	0.41	0	0.00	0
0.60 - 3.10	3	2852.00	7.50	10.35	4 %	0.41	0	0.00	0
1.33 - 3.83	3	0.00	2.00	2.00	33 %	0.66	1	0.00	0
2.00 - 8.50	1	0.00	1.00	1.00	15 %	0.15	0	0.00	0
3.00 - 5.00	1	0.00	1.00	1.00	50 %	0.50	1	0.00	0
3.50 - 13.50	4	3612.00	8.50	12.11	5 %	0.60	0	0.06	1
TIME LEFT (min): 0.95	ACCESS TIME/PARAMETER: 28.59 sec.					2.74	2	0.06	1
Span: 4 - 5 minute									
0.50 - 10.50	1	620.00	3.50	4.12	10 %	0.41	0	0.00	0
2.00 - 8.50	1	0.00	1.00	1.00	15 %	0.15	0	0.00	0
3.00 - 5.00	1	0.00	1.00	1.00	50 %	0.50	1	0.00	0
3.50 - 13.50	4	3612.00	8.50	12.11	10 %	1.21	0	0.12	1
TIME LEFT (min): 0.96	ACCESS TIME/PARAMETER: 57.60 sec.					2.27	1	0.12	1

Nuplex 80 + Functional Analysis
Process Time Calculations

Evaluation Interval (minutes)	Number of parameters	Processing Times (msec)	Correction Times (sec)	Total Times (sec)	Percent Use of	Fraction of time/ para. # (sec)		Fraction of time/ cntrl # (sec)	
Span: 5 - 6 minute									
0.50 - 10.50	1	620.00	3.50	4.12	10 %	0.41	0	0.00	0
2.00 - 8.50	1	0.00	1.00	1.00	15 %	0.15	0	0.00	0
3.50 - 13.50	4	3612.00	8.50	12.11	10 %	1.21	0	0.12	1
TIME LEFT (min): 0.96 ACCESS TIME/PARAMETER: 58.10 sec.						1.77	1	0.12	1
Span: 6 - 7 minute									
0.50 - 10.50	1	620.00	3.50	4.17	10 %	0.41	0	0.00	0
2.00 - 8.50	1	0.00	1.00	1.00	15 %	0.15	0	0.00	0
3.50 - 13.50	4	3612.00	8.50	12.11	10 %	1.21	0	0.12	1
TIME LEFT (min): 0.96 ACCESS TIME/PARAMETER: 58.10 sec.						1.77	1	0.12	1
Span: 7 - 8 minute									
0.50 - 10.50	1	620.00	3.50	4.12	10 %	0.41	0	0.00	0
2.00 - 8.50	1	0.00	1.00	1.00	15 %	0.15	0	0.00	0
3.50 - 13.50	4	3612.00	8.50	12.11	10 %	1.21	0	0.12	1
7.60 - 9.60	3	0.00	2.50	2.50	20 %	0.50	1	0.00	0
TIME LEFT (min): 0.96 ACCESS TIME/PARAMETER: 57.60 sec.						2.27	1	0.12	1
Span: 8 - 9 minute									
0.50 - 10.50	1	620.00	3.50	4.12	10 %	0.41	0	0.00	0
2.00 - 8.50	1	0.00	1.00	1.00	7 %	0.07	0	0.00	0
3.50 - 13.50	4	3612.00	8.50	12.11	10 %	1.21	0	0.12	1
7.60 - 9.60	3	0.00	2.50	2.50	50 %	1.25	2	0.00	0
TIME LEFT (min): 0.94 ACCESS TIME/PARAMETER: 28.46 sec.						2.95	2	0.12	1

Nuplex 80 + Functional Analysis
Process Time Calculations

Evaluation Interval (minutes)	Number of parameters	Processing Times (msec)	Correction Times (sec)	Total Times (sec)	Percent Use of	Fraction of time/ para. # (sec)		Fraction of time/ cntrl # (sec)	
Span: 9 - 10 minute									
0.50 - 10.50	1	620.00	3.50	4.12	10 %	0.41	0	0.00	0
3.50 - 13.50	4	3612.00	8.50	12.11	10 %	1.21	0	0.12	1
7.60 - 9.60	3	0.00	2.50	2.50	30 %	0.75	1	0.00	0
TIME LEFT (min): 0.95	ACCESS TIME/PARAMETER: 57.50 sec.					2.37	1	0.12	1
Span: 10 - 11 minute									
0.50 - 10.50	1	620.00	3.50	4.12	5 %	0.20	0	0.00	0
3.50 - 13.50	4	3612.00	8.50	12.11	10 %	1.21	0	0.12	1
10.00 - 10.50	1	760.00	1.50	2.26	100 %	2.26	1	2.40	2
10.00 - 12.50	1	832.00	1.50	2.33	40 %	0.93	0	0.96	2
10.00 - 15.00	1	620.00	1.50	2.12	20 %	0.42	0	0.00	0
TIME LEFT (min): 0.85	ACCESS TIME/PARAMETER: 25.74 sec.					5.03	2	3.48	3
Span: 11 - 12 minute									
3.50 - 13.50	4	3612.00	8.50	12.11	10 %	1.21	0	0.12	1
10.00 - 12.50	1	832.00	1.50	2.33	40 %	0.93	0	0.96	2
10.00 - 15.00	1	620.00	1.50	2.12	20 %	0.42	0	0.00	0
TIME LEFT (min): 0.93	ACCESS TIME/PARAMETER: 56.35 sec.					2.56	1	1.08	3
Span: 12 - 13 minute									
3.50 - 13.50	4	3612.00	8.50	12.11	10 %	1.21	0	0.12	1
10.00 - 12.50	1	832.00	1.50	2.33	20 %	0.46	0	0.48	2
10.00 - 15.00	1	620.00	1.50	2.12	20 %	0.42	0	0.00	0
TIME LEFT (min): 0.95	ACCESS TIME/PARAMETER: 57.29 sec.					2.10	1	0.60	3

Nuplex 80 + Functional Analysis
Process Time Calculations

Evaluation Interval (minutes)	Number of parameters	Processing Times (msec)	Correction Times (sec)	Total Times (sec)	Percent Use of	Fraction of time/ para. # (sec)		Fraction of time/ cntrl # (sec)	
Span: 13 - 14 minute									
3.50 - 13.50	4	3612.00	8.50	12.11	5 %	0.60	0	0.06	1
10.00 - 15.00	1	620.00	1.50	2.12	20 %	0.42	0	0.00	0
TIME LEFT (min): 0.98 ACCESS TIME/PARAMETER:****.** sec.						1.02	0	0.06	1
Span: 14 - 15 minute									
10.00 - 15.00	1	620.00	1.50	2.12	20 %	0.42	0	0.00	0
TIME LEFT (min): 0.99 ACCESS TIME/PARAMETER:****.** sec.						0.42	0	0.00	0

Span: 15 - 16 minute

No intervals found

Span: 16 - 17 minute

No intervals found

Span: 17 - 18 minute

No intervals found

Span: 18 - 19 minute

No intervals found

Span: 19 - 20 minute

Nuplex 80 + Functional Analysis
Process Time Calculations

Evaluation Interval (minutes)	Number of parameters	Processing Times (msec)	Correction Times (sec)	Total Times (sec)	Percent Use of	Fraction of time/ para. # (sec)		Fraction of time/ cntrl # (sec)	
Span: 19 - 20 minute									
No intervals found									
Span: 20 - 21 minute									
20.00 - 30.00	2	0.00	2.00	2.00	10 %	0.20	0	0.00	0
20.00 - 35.00	2	620.00	3.50	4.12	6 %	0.27	0	0.00	0
TIME LEFT (min): 0.99 ACCESS TIME/PARAMETER: ****.** sec.						0.47	0	0.00	0