CP&L
Carolina Power & Light Company
P. O. Box 1551 • Raleigh, N. C. 27602

DEC 27 1984

SERIAL: NLS-84-506

E. E. UTLEY
Executive Vice President
Power Supply and Engineering & Construction

Director of Nuclear Reactor Regulation
Attention: Mr. D. B. Vassallo, Chief
Operating Reactors Branch No. 2
Division of Licensing
United States Nuclear Regulatory Commission
Washington, DC 20555

BRUNSWICK STEAM ELECTRIC PLANT, UNIT NOS. 1 AND 2
DOCKET NOS. 50-325 & 50-324/LICENSE NOS. DPR-71 & DPR-62
SUPPLEMENTAL RESPONSE TO GENERIC LETTER 82-33
REQUIREMENTS FOR EMERGENCY RESPONSE CAPABILITY

Dear Mr. Vassallo:

On February 22, 1984 your staff issued a confirmatory order concerning Emergency Response Capability for the Brunswick Steam Electric Plant, Unit Nos. 1 and 2. This order requires Carolina Power & Light Company (CP&L) to submit a firm completion schedule for each of the specific items described in the attachment to the order no later than December 31, 1984. The following constitutes our plans with respect to these items:

1. SAFETY PARAMETERS DISPLAY SYSTEM (SPDS):

   a. Enclosure 1 and 2 contain the Safety Analysis Report for the SPDS Computer System and the Company's plan for implementation of SPDS at Brunswick. General Electric considers some of the information contained in Enclosure 1 to be proprietary in nature. An affidavit describing the proprietary basis for Enclosure 1 is provided in Enclosure 9. It is, therefore, requested that Enclosure 1 be withheld from public disclosure in accordance with 10CFR2.790. Enclosure 3 consists of a System Overview Document which has been provided for your information only.

      It should be understood that for a project of this complexity, many changes in system features and in implementation details are sure to occur as work progresses. It is expected that these changes will not alter the important characteristics of the system nor cause major changes in the implementation process, but this cannot be guaranteed.

   b. The Company proposes to have the SPDS with General Electric based displays fully operational with operators trained for each unit as noted below:

      (1) The engineering and implementation schedule for Brunswick-2 is included as Enclosure 4. This schedule reflects our initial implementation plan to have SPDS operational with operators

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trained within 3 months after the end of the reload 6 outage, currently scheduled to begin December 1986. This schedule is contingent on not having to replace recirculation system piping during this outage.

(2) The engineering and implementation schedule for Brunswick-1 is included as Enclosure 5 This schedule reflects our initial implementation plan to have SPDS operational with operators trained within three months after the end of the reload 5 outage, currently scheduled to begin in April 1987.

It should be noted that CP&L plans to upgrade the SPDS displays in accordance with the Control Room Design Review Task Analysis which will be accomplished using Revision 4 of Emergency Procedure Guidelines as a basis. This upgrade will provide a method of integrating several recommendations of NUREG-0737, Supplement 1: e.g., Section 5.1.b(ii). Enclosure 6 contains a description of the human factors engineering implementation plan used in the design and implementation process for the ERFIS.

2. DETAILED CONTROL ROOM DESIGN REVIEW:

a. The Company's program plan is submitted as Enclosure 7.

b. A summary report including a proposed schedule of implementation is planned to be submitted for both units within 6 months after the end of reload 6 for Brunswick-2 (October 1987).

3. REGULATORY GUIDE 1.97 - APPLICATION TO EMERGENCY RESPONSE FACILITIES:

a. Complete (as noted in the confirmatory order).

b. The implementation requirements are submitted as Enclosure 8. The Company proposes to complete this implementation within three months after reload 5 for Brunswick-1 (scheduled to begin April 1987) and within three months after reload 6 for Brunswick-2 (scheduled to begin December 1986).

Please note that these implementation requirements do not include modifications or new requirements which may result from resolution of comments made by the NRC by letter dated November 23, 1984 regarding Revision 2 to the Brunswick Position Paper on Regulatory Guide 1.97 and the Brunswick response to NUREG-0737, Supplement 1 - Regulatory Guide 1.97 - Application to Emergency Response Facilities, Revision 2 (both submitted by letter dated February 1, 1984). Any additional modifications or new requirements will be addressed by a supplemental schedule.

4. UPGRADE EMERGENCY OPERATING PROCEDURES (EOPS):

a. Complete (as noted in the confirmatory order).

b. Complete (as noted in the confirmatory order).

5. EMERGENCY RESPONSE FACILITIES:

a. The technical support center is planned to be functional (with SPDS displays available) for Brunswick-2 three months after reload 6 and for Brunswick-1 three months after reload 5 in accordance with the current outage schedule.

b. Complete (as noted in the confirmatory order).

c. The emergency operations facility (EOF) is planned to be operational (with SPDS and supplemental TSC/EOF displays available) for Brunswick-2 three months after reload 6 and for Brunswick-1 three months after reload 5 (SPDS only) in accordance with the current outage schedule.

The Technical Support Center is being utilized as an interim facility. Building construction is essentially complete with construction of certain interior features currently being concluded. This construction activity consists of completing the installation, testing and acceptance of HEPA filters, radiation monitors, Emergency Diesel Generator and Battery System, and other items which support the operation of the facility. The telecommunications and security system for the facility have been installed and are currently operational.

Carolina Power & Light Company is committed to the requirements of NRC Generic Letter 82-33 as a means of improving operating safety at Brunswick. We have scheduled our Emergency Response Capability implementation to coincide with major maintenance and/or refueling outages. Scheduling of the outages is tentative and it is conceivable that operational considerations will require adjustments to the current outage plans, thereby impacting the scheduled completion dates. The Emergency Response Capability implementation will be incorporated into the long-term plan being developed for Brunswick. Please defer review of the compliance schedule for these activities until receipt of our long-range schedule in February 1985. Any changes to the completion schedules will be made in accordance with the provisions of the long-term plan.

Should you have any questions concerning this submittal, please contact Mr. Sherwood R. Zimmerman at (919) 836-6242.

Yours very truly,

E. E. Utley

EEU/ccc (927MAT)

cc: Mr. D. O. Myers (NRC-BNP)
Mr. J. P. O'Reilly (NRC-RII)
Mr. M. Grotenhuis (NRC)

E. E. Utley, having been first duly sworn, did depose and say that the information contained herein is true and correct to the best of his information, knowledge and belief; and the sources of his information are officers, employees, contractors, and agents of Carolina Power & Light Company.

Cathy J. White
Notary (Seal)

My commission expires:
6-27-88

Enclosure 1

to SERIAL: NLS-84-506

Enclosure 1 consists of the Safety Analysis Report (SAR) for the Safety Parameter Display System at Brunswick (NEDC-30842, dated November 1984). General Electric considers portions of this report to contain proprietary information and, therefore, not for public disclosure. The SAR is included as a separate attachment.

(927MAT/ccc)

Enclosure 2

to SERIAL: NLS-84-506

IMPLEMENTATION PLAN FOR BRUNSWICK UNITS 1 AND 2

Safety Parameter Display System (SPDS)

I. INTRODUCTION

This document describes the salient features of the Brunswick SPDS and the plan for implementation as it is now known. The Brunswick SPDS is a subsystem of the Emergency Response Facility Information System (ERFIS) which supplies data beyond SPDS requirements for further enhancement of the operator's and support staff's abilities to improve the safety of plant operations. It should be understood that for a project of this complexity, many changes in system features and in implementation details are likely to occur as work progresses. It is expected that these changes will not alter the important characteristics of the system nor cause major changes in the implementation process. If major changes are required, the NRC will be informed by letter.

The ERFIS System will be supplied by General Electric. It is to be a computer based system that integrates the SPDS and other computer functions into a single system.

The remainder of this submittal consists of a general description of the system and a presentation of the implementation schedule.

II. GENERAL SYSTEM DESCRIPTION

The Emergency Response Facility Information System (ERFIS) is an information gathering, analysis and display system. It acquires analog and digital inputs from field sensors and other plant systems. It monitors systems throughout the plant and processes, displays, and logs these with the intent of improving the decision-making process in the event of an incident, as well as supporting routine plant operation.

Data processed by the ERFIS originates from the field sensors and is pre-processed through the Analogics data acquisition equipment prior to its transfer into the host computer. In addition, the ERFIS may be required to receive and transmit data to/from other computer systems outside the ERFIS. For example, when a Meteorological Computer (MET) interface is desired, a data link is provided between the computers.

The ERFIS computer system consists of two mainframe CPUs per operating unit. The two CPUs share the total operating load although a single CPU can perform the complete function in the event of a CPU failure.

A more complete description is provided in the enclosed Systems Overview Document.

II.A. ERFIS HARDWARE

The ERFIS consi :s of three major hardware sections:

1. Data Acqui: ition System Hardware.

2. Computer S; stem Hardware.

3. Display Sy: em Hardware.

The Data Acquis: ion Hardware includes Analogics 1E and non-1E modules, the re: ote multiplexer equipment, fiber optic communication links an: data formatters. The computer system hardware is configured a: und two DEC VAX 11/785 computers. The display hardware is bas : around Toshiba Intelligent Graphic Display Terminals. Mor complete descriptions are included in the enclosed System Overview Document.

II.B ERFIS SOFTWARE

The ERFIS softw: e is segregated into functional subsystems. The major subsy: ems are:

1.VAX/VMS Operating System

2.HABITAT Data Base Management System.

3.CDCI - C: mon Data and Control Interface.

4.TRA - Tr: sient Recording and Analysis Application.

5.RTAD - G: phic Display Application.

6.PLA - Pr: ess Log and Alarm.

Brief descripti: s of these systems are contained in the enclosed Systems Overvie: Document.

II.C PHYSICAL ARRANG: MENT

The CPUs and as: ciated disc drives, tape drives, etc., will be located in the : mputer Room in the TSC/EOF Building. The Computer Room : s in the TSC portion of this building. The building is loc: ed at the security fence some 700 feet from the Control Room - : ble Spreading Room area. During any site event, the TSC includi: the Computer Room is inside the security fence.

The data acquis: ion equipment will be located in the Cable Spread Rooms, t: e Electronics Equipment Room, the Process Computer Room, : d in a very few cases located locally throughout the plant. The CRTs, printers, video copiers, etc., will be located in the : ntrol Room, TSC, EOF and Computer Room as described in th: enclosed Systems Overview Document.

The entire system (except for all 1E trains)* will be powered from off-site power introduced at the TSC/EOF area. This power will be supplied through an uninterruptible power supply (UPS) (designed to carry the system for 30 minutes on batteries) and backed up by a diesel generator. A static transfer switch will also be provided as part of the UPS system.

II.D OTHER SYSTEM FEATURES

Several specific system features that are of possible interest because of their relationship to system implementation are discussed below.

II.D.1 SPDS DISPLAYS

The basic system displays are discussed in some detail in the Safety Analysis Report. These displays are based on the Emergency Procedure Guidelines (EPGs) Revision 2 and are formatted to give assistance in following the Brunswick Steam Electric Plant Emergency Operating Procedures (EOPs). It should be noted here that the system status blocks which somewhat overcrowd many of the displays are under consideration for modifications or deletion.

The top level safety parameter display is the Critical Plant Variables Display which provides a quick summary of the plant status by providing current values of the RPV and containment control parameters.

The RPV Control Displays and the Containment Control Displays provide parameter information to aid in the execution of the BSEP EOPs.

In addition, trend plot displays for all control parameters, 2D plot displays showing the two-dimensional limits defined in the EOPs, and validation status displays are also provided.

Any display can be called up from any authorized console.

II.D.2 INPUTS

Inputs required for the SPDS displays are discussed in the Safety Analysis Report that accompanies this submittal. Additional inputs for the ERFIS were determined by starting with all essential available and planned Regulatory Guide 1.97 parameters as the base set (e.g., Meteorological data for release assessment activity will be input to the system).

The Data Acquisition Subsystem provides all of the equipment necessary to convert the specified process I/O signals to digital words at the rates specified. Each multiplexer connects over fiber-optic cables to each of the two data formatters.

* All 1E data acquisition equipment will be powered from the plant 1E power source.

Each data formatter is cross-connected to the two host computers through high-speed parallel interfaces. This provides redundant data acquisition capability from the conversion point to the host computer system.

II.D.3 DATA HANDLING FEATURES

The entire system is designed to provide reliable data and high availability. Computer system availability (not accounting for supporting systems) should exceed 0.99.

System features provided to assure reliable data include:

II.D.3.a ERROR MONITORING

Each major system employs on-line error monitoring. Error monitoring is also provided for the backup components to ensure their availability if a failure occurs in the on-line system.

II.D.3.b DATA QUALITY

The DAS assigns a "Data Quality Code" to each field-input and calculated point at the time the point is processed. These quality codes are assigned based on a series of checks/tests performed during both input-data validation and point processing. The assigned Data Quality Code is then stored, along with the Point value, in the system's Current Values Table (CVT) for access by other applications tasks (e.g., MMIS, Data Archival/ Retrieval, etc.).

II.D.3.c PROGRAMMER/ENGINEER'S CONSOLE FUNCTIONS

The Programmer/Engineer's Console in the Computer Room can be used for addition or modification of point attributes, generating new displays, modifications to the log programs, or for normal system programming. Any changes which are made to the data base from this terminal will be written to the printer.

II.D.3.d DATA PROTECTION

The VAX provides memory access protection both within and between processes. Each process has its own independent virtual address space which can be mapped in private pages or shared pages. A process cannot access any other process's private pages.

Protection of shared pages of memory, files and interprocess communication facilities (such as mailboxes and event flags) is based on a file ownership and application group identification.

Security provisions based on key lock, password and physical console location will be provided. The ability to define security for each function will be provided via the Programmer's terminal.

II.D.3.e HISTORICAL DATA STORAGE AND RETRIEVAL

The Data Archival/Retrieval Subsystem supports the archival and retrieval of both field-input points and calculated points. The latter includes transforms, pseudo-analog and logical points such as Boolean, AND, and OR.

Three types of data archival are supported:

1. Short-Term Data Storage (Short-Term Archival).

2. Mid-Term Data Storage (Mid-Term Archival).

3. Long-Term Data Storage (Long-Term Archival).

The following methods of data recording are included:

1. Delta Data Recording

2. Scan Data Recording

3. Trigger Recording

4. Historical Archive Recording

In the discussion of archival storage, the following definitions apply:

Analog variable	Analog input, analog-calculated variable and analog composed point.
Digital variable	Digital process sensor, digital-calculated variable and digital composed point.
Window change	The user-defined incremental change value used to determine if an analog input value has changed sufficiently to be stored in the archival file (storage by exception).
System state	The state of ERFIS system which affects the technical review of operator interaction with the ERFIS system. System state variables include, but are not necessarily limited to: -Failover system status

Event-Initiated Changes	Changes to the plant state that are initiated by events external to the ERFIS system. These include: -Alarms -Sequence-of-event occurrences -Operator data base contents changes -System Failover/restarts -Control Rod movements -Operator-initiated requests -Display selections changes for each console

The system will provide for high-speed transient recording (i.e., scan recording) and longer term operational recording (i.e., delta data recording).

The archival software will save the system state, analog variables and digital variables on the archival file when either:

a. a predefined, operator-selectable time has elapsed since the last snapshot, appropriate to the operator's need for historical retention of full data sets for record keeping purposes.

b. a predefined amount of the disc has been utilized since the last snapshot.

In the period between snapshot recordings, window changes on analog variables, changes in digital variables, event-initiated changes and system state changes will be reported to the archival file. Window changes on analog variables are computed at the assigned update frequency; changes in digital variables are reported every second; event-initiated changes and system state changes are reported as they occur. By recording all changes in the ERFIS system, the system engineer can: accurately reconstruct the exact order and sequence of process variable changes and operator responses to an event, and assess the adequacy of the overall system design.

The frequency for sensor data collection for the Historical Archive immediately after a SCRAM is determined by the sample plan in effect. The duration is the length of time required to fill up 9/10 of the disc's scan recording area.

II.D.3.e(1) Delta Data Recording

Process data will be recorded from the DAS on a significant change basis. Recording for analog points will be such that only significant change for analog variables will be recorded. In addition, all analog points will be recorded at system initialization and restart, and at least once an hour thereafter. The signals will utilize significant change limits and additional criteria for determining these limits will be defined later.

All digital inputs will be recorded only when a change of state occurs, at system initialization and restart, and at least once an hour.

Disc space will be allocated via an adjustable parameter for delta data processing files. Messages will be provided to the operator when the allocated space is 80 percent full, 90 percent full and in an over-write condition.

II.D.3.e(2) SCAN DATA RECORDING

Provisions will be made to record the process data at a specified sampling rate.

Depending on the scan rates and disc storage allocated, this function is capable of storing two hours of pre-event and 12 hours of post-event data.

When a trigger mode is used to capture data associated with a specific event, a real-time check will be performed on up to 100 prespecified system variables for change to a prespecified state. Change to a prespecified state of any of these variables will cause a trigger generation. Definition of the trigger system variables will be determined later.

The data will be constantly written into a circular file. The transient recording process under normal conditions would be constantly overwriting the oldest data that was stored in the file.

Upon occurrence of an EVENT TRIGGER, such as a plant SCRAM, the transient recording process would continue to collect and store data at very high resolution. After 9/10ths of the oldest pre-event data is overwritten with post-event data, in order to preserve the transient data, the system would cease overwriting that circular data file. A new circular data file would then be started, the recording of the data to the file continued and the same procedure would occur if another event were triggered. The system will have the capability to store two such events. The recording may be terminated by the operator at any time prior to automatic termination.

After an EVENT TRIGGER, controls will be in place to ensure that the event is not overwritten until it has been either spooled off-line or released by the operator. A message will appear on the computer system console to notify the operator to either spool or release the transient data files.

II.D.3.e(3) HISTORICAL (ARCHIVAL) DATA RECORDING

The user will have the capability to store and retrieve data from magnetic tape. This capability will be provided for all disc-recorded data and will include sufficient detail to reconstruct process data and pseudo points in engineering units. Files will be properly identified to distinguish transient (i.e., scan) and historical (i.e., delta) data and will include time and date.

II.D.3.e(4) DATA RETRIEVAL AND ANALYSIS

Users can request historical data and direct it to CRTs or printers from authorized consoles in the TSC, EOF, and Control Room. The data may be requested from:

a. Scan Recording File
b. Delta Recording File
c. Archival Tape

Output Choices

Historical data may be printed, plotted, displayed or transferred to disc or magnetic tape. The user may select the retrieval output options from the console.

Retrieval Choices

The user can specify the source of data, data desired, time period of concern and type of analysis desired.

Archival Retrieval

Retrieval options and output choices are available for archived data on magnetic tape as well as on-line disc resident data.

II.D.4 HUMAN FACTORS/VALIDATION AND VERIFICATION

Human factors considerations have been applied in design of the consoles and in the displays.

General Electric will perform validation and verification on the system hardware and software design. The General Electric organization responsible for this activity is independent of the system design organization.

Enclosure 3

to SERIAL: NLS-84-506