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MIDDLE SOUTH
UTILITIES SYSTEM

February 18, 1985 W3P85-0432
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3-H1
A4.05

Director of Nuclear Reactor Regulation
Attention: Mr. G.W. Knighton, Chief
Licensing Branch No. 3
Division of Licensing
U.S. Nuclear Regulatory Commission
Washington, D.C. 20555

SUBJECT: Waterford SES Unit 3
Docket No. 50-382
Request for Schedular Exception
to SPDS, CEPADAS and Regulatory
Guide 1.47 Implementation

REFERENCES: (1) W3P83-2936 dated September 29, 1983
(2) W3P84-2565 dated December 26, 1984

Dear Sir:

In Reference (1) LP&L committed to implementing the Safety Parameter
Display System (SPDS) and Regulatory Guide 1.47 (Bypassed and Inoperable
Status Indication) prior to exceeding five percent power. Through the
combination of the Waterford 3 Emergency Plan (Revision 07) and Reference
(2), LP&L committed to availability of the SPDS and Computerized Emergency
Planning and Data Acquisition System (CEPADAS) in the Emergency Operations
Facility (EOF) by February 28, 1985.

SPDS, CEPADAS and Regulatory Guide 1.47 are software implementations on the
Plant Monitoring Computer (PMC), a non-safety related system. The PMC
employs a redundant computer complex consisting of three central processing
units (CPUs) in each complex. LP&L has determined that the third CPU,
dedicated to evaluation and analysis, does not incorporate sufficient
computing capacity to support the software scheduled for execution.
Although no CPU 3 software performs a safety-related function, nor would
lack of the software involve an unreviewed safety question or technical
specification violation, there remains a need to request relief from the
above schedular commitments on SPDS, CEPADAS and Regulatory Guide 1.47.

To resolve the capacity problem with CPU 3 as well as provide for future
computer applications, LP&L has placed an order for a redundant fourth CPU.
Delivery is expected in March, 1985, and hardware/software installation and
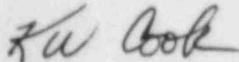
testing will be complete by June 30, 1985. In the interim, as detailed in the attached discussion, LP&L requests NRC concurrence that:

1. SPDS display in the control room be limited to Modes 3-6 upon operator demand,
2. SPDS/CEPADAS availability in the TSC/EOF be limited to Modes 3-6 upon demand by control room, TSC or EOF personnel, and
3. Implementation of Regulatory Guide 1.47 requirements be deferred during the interim period.

Should you feel that a discussion would be useful, we request that a meeting be scheduled for the week of February 18, 1985 for the purpose of reaching final resolution. Please feel free to contact me or Mike Meisner (504-595-2832) should you require further information.

Yours very truly,

K.W. Cook
Nuclear Support & Licensing Manager

KWC/MJM/pcl

Attachment

cc: E.L. Blake, W.M. Stevenson, R.D. Martin, D.M. Crutchfield
    J. Wilson, G.L. Constable

REQUEST FOR SCHEDULAR EXCEPTION

TO SPDS, CEPADAS AND REGULATORY

GUIDE 1.47 IMPLEMENTATION

I. Introduction

The Waterford 3 Plant Monitoring Computer (PMC), a non-safety related system, employs a redundant computer complex consisting of three central processing units (CPUs) in each complex. LP&L has determined that the third CPU, dedicated to evaluation and analysis, does not incorporate sufficient computing capacity to support the software scheduled for execution. Although no CPU 3 software performs a safety-related function, nor would lack of the software involve an unreviewed safety question or technical specification violation, there remains a need to request relief from certain schedular commitments. Specifically, 5 percent power (and EOF) operability commitments with respect to SPDS and Regulatory Guide 1.47, as well as certain meteorological data collection commitments are affected. The ultimate solution to the computer capacity problem involves the implementation of a fourth CPU for both computer complexes prior to June 30, 1985. The following material will discuss in detail the computer hardware and software involved; the commitments, requirements, technical specifications and safety significance associated with the software; proposed interim solutions; and final resolution and schedule.

II. Problem Description

A. Plant Monitoring Computer (PMC)

The PMC is a non-safety related system; for the purpose of design basis accident analysis, all PMC hardware and software is assumed to be unavailable. Additionally, for any control system driven by PMC software, the consequences produced by any credible malfunction would be less severe than any which could be produced by the mechanisms considered as causes of the transients analyzed in FSAR Chapter 15.

The PMC system consists of a dual, three-CPU configuration. In this configuration there are three on-line CPUs and three CPUs off-line for redundancy. The capabilities of the PMC can be divided into major areas corresponding to the three CPUs:

    CPU 1 - interfacing for receiving
            and sending field
            input/output
    CPU 2 - alarming, displaying,
            operator interface (except
            SPDS/CEPADAS), and data
            base management
    CPU 3 - performance of nuclear
            calculations and emergency
            response software

Further description of the PMC is provided in FSAR Appendix 7.5A.

B. CPU 3 Capacity

In determining the overall computing capacity necessary for
execution of CPU 3 tasks, average usage factors were measured for
the individual tasks. These factors, primarily a function of
calculation frequency specified for a task, are included in the
following table.

CPU 3 Task[1]	Average Usage (%)
NSSS (including COLSS)	50
QSPDS	15
RMS	8
ERF	22-40
SPDS[2]	5
CEPADAS[2]	12
Reg. Guide 1.47[3]	10
DDC	5
MICDS	0-8
RPC[3]	3
BPMS	5
CECOR Verification File	0-10
UTDV	0-3
Total Minimum Usage	135%

Average usage figures do not take into account the usage peaking
due to operator demand or multiple user demand. For that reason
total average usage for a CPU should be controlled to a maximum
of 75-80%. As will be discussed later, the disparity between CPU
3 capacity and scheduled tasks imposes the necessity for choosing
between executing either NSSS software (including COLSS) or
emergency response software (ERF, SPDS, CEPADAS), but not both
concurrently.

C. Solution

LP&L has placed an order for the hardware necessary to implement
a redundant CPU 4. This will allow CPU 3 tasks to be divided
between CPU 3 and CPU 4, providing sufficient computing capacity
to execute all scheduled software. The hardware orders were
placed in December, 1984 with the expectation of timely delivery,
and hardware and software installation, to support the Waterford
3 five percent power schedule. Due to manufacturer schedule
slippage, hardware delivery is presently not expected until
March 15, 1985. Operability of CPU 4 is now scheduled prior to
June 30, 1985.

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1 Descriptions of each task are included in Section III.
2 Requires ERF software.
3 Estimated average usage.

III. CPU 3 Software

As previously noted, the software scheduled for CPU 3 is not safety-related, however in some cases regulatory requirements and/or LP&L commitments are affected. In this section, the CPU 3 software is functionally described, regulatory requirements are identified, and the safety significance associated with loss of function is evaluated.

A. NSSS

As will be discussed more fully later, LP&L proposes for the interim period prior to CPU 4 operability that NSSS/COLSS software be available during times the PMC is operable in Modes 1 and 2. Following reactor trip the control room personnel will have the option of implementing the emergency response software in preference to NSSS/COLSS. The NSSS software is non-safety related, acting primarily as an operator aid during Modes 1 and 2. Below Mode 2 the NSSS software performs no necessary function either as an operator aid or in support of the Technical Specifications.

The NSSS software incorporates a number of different functions into one package (COLSS is treated separately).

1. CEA Positioning

This module is an operator aid in tracking rod positions, dropped rods, out of sequence groups, regulating group averages, CEA limit checking and alarming, and power dependent and prepower dependent insertion limits.

2. CEA Sequencing

The CEA group sequencing program provides input to the Control Element Drive Mechanism Control System (CEDMCS) in the form of permissive signals. These signals permit sequential insertion and withdrawal of regulating CEA groups by the CEDMCS, with a preprogrammed overlap between consecutive groups during automatic sequential and manual sequential modes of operation.

3. CPC/CEAC Data Acquisition

This program provides data acquisition (a report is available upon operator demand) and cross channel comparisons of input/output data for the CPCs and output data for the CEACs.

4. Fixed In-Core Detectors (FICDs)

This module performs scanning of FICD raw voltage signals from the field and alarming when signals exceed analog to digital converter limits.

5. FICD Correction Calculations

   This module processes FICD signals by their sensitivity and
   background correction factors and calculates neutron flux.

6. FICD Test

   This program is used, when COLSS is not scheduled, to
   calibrate the FICDs.

7. Post Trip Review

   The post trip review program provides for a fixed format log
   of 50 analog data points giving 5 minute pre-trip and 5
   minute post-trip reporting at a 2 second resolution.

        Regulatory Requirements : Generic Letter 83-28 (Salem
             ATWS), in Item 1.2, required a description and
             justification of adequacy of the data and
             information capability for post-trip review. This
             included requirements for a sequence of events (SOE)
             logging capability for digital (on-off) points and a
             time history for analog variables. The LP&L
             response (W3P84-0288, dated February 6, 1984)
             included a detailed description of the Waterford 3
             post-trip review information capability including
             credit for the SOE log (which runs on CPU 2 and is
             unaffected by the present discussion), the analog
             post-trip review program, and the SPDS (run on
             CPU 3). Under the conditions of the proposed
             interim solution prior to implementation of CPU 4
             (discussed later), the post-trip review program will
             be available until the operator chooses to enable
             the emergency response software following a reactor
             trip. SPDS is not necessary to fulfill the
             post-trip review requirements when the post-trip
             review program is available.

B. Core Operating Limit Supervisory System (COLSS)

   COLSS consists of algorithms to monitor the limiting
   conditions for operation on: 1) peak linear heat rate,
   2) margin to DNB, 3) total core power, and 4) azimuthal tilt.
   If a limiting condition for operation is exceeded for any of
   these parameters, the PMC initiates alarms and operator
   action is taken as required by the Technical Specifications.

        Technical Specifications: COLSS is not directly
             covered by Technical Specifications; however, when
             COLSS is available Technical Specifications (e.g.
             3/4.2 - Power Distribution Limits) allow its use for
             maintaining margin above the applicable limiting

conditions for operation. Operation without COLSS
is acceptable although generally a power penalty
results.

Regulatory Requirements : None

Safety Significance   : None - Operation without
COLSS presents no safety concern as the safety-
related CPCs provide adequate monitoring of the core
power distribution. Additionally, the proposed
interim solution (discussed later) will include
operation of COLSS in Modes 1 and 2.

C. QSPDS Data Processing

The QSPDS is a redundant system, separate from the PMC, which
processes and displays inadequate core cooling
instrumentation and other safety-related input. The QSPDS
data processing program in the PMC collects and processes the
QSPDS data for use by other PMC software.

Technical Specifications: None

Regulatory Requirements : None

Safety Significance   : None - The data from this
program is used only as input to other non-safety
related software. The proposed interim solution
will include operation of this program at all times
the PMC is available.

D. Radiation Monitoring System (RMS) Processing

The RMS program collects and processes data from the
Radiation Monitoring System to be used as input for other PMC
programs.

Technical Specifications: None

Regulatory Requirements : None

Safety Significance   : None - See Item C, above.

E. Emergency Response Facility (ERF)

The ERF software consists of individual functions needed to
support the emergency response software (SPDS and CEPADAS).
The ERF functions include:

1. Historical data collection - collects data for 2 hour
    pre-trip and 12 hour post-trip and archives data to tape
2. MMI - Man-Machine Interface needed for SPDS, CEPADAS and
    historical data
3. CGS - Color Graphics Display needed for SPDS
4. Logs - enables customized logs on demand

Technical Specifications: None

Regulatory Requirements : See SPDS and CEPADAS, below

Safety Significance   : See SPDS and CEPADAS, below

F. Safety Parameter Display System (SPDS)

"The principal purpose of the SPDS is to aid the control room personnel during abnormal and emergency conditions in determining the safety status of the plant and in assessing whether abnormal conditions warrant corrective action by operators to avoid a degraded core" (NUREG 0737, Supplement 1). A full description of the Waterford 3 SPDS is provided in W3P84-1007, dated April 16, 1984.

Technical Specifications: None

Regulatory Requirements : 1) NUREG 0737, Supplement 1 requires implementation of SPDS on a schedule negotiated with the utility. In response to Supplement 1 (W3P83-2936, dated September 29, 1983) LP&L committed to implement SPDS prior to exceeding 5% power. The SPDS software is presently operational; however, as previously noted, CPU 3 does not have the capacity to run both the emergency response (including SPDS) and NSSS (including COLSS) software concurrently. As will be discussed more fully later, the interim resolution pending CPU 4 operability is to have SPDS available on operator demand following a reactor trip. 2) NUREG 0737, Supplement 1 requires that the TSC and EOF have available those Reg. Guide 1.97 variables essential for performance of their respective functions. In response to this requirement LP&L, in the Emergency Plan (Rev. 07), committed to incorporating the SPDS displays in both the TSC and EOF. Furthermore, in W3P84-2565, dated December 26, 1984 LP&L committed to implementing a fully functional EOF by February 28, 1985. The proposed interim resolution (discussed later) would allow for SPDS display in the TSC and EOF upon operator demand following a reactor trip.

Safety Significance : In accordance with NUREG 0737, Supplement 1, and because of the non-safety related nature of SPDS, control room personnel are trained in assessing plant status both with and without the SPDS. Prior to availability of CPU 4 the operators will have access to the QSPDS - a backup system to the SPDS. The QSPDS, which monitors, processes and displays inadequate core cooling instrumentation (ICCI) information is described in detail in FSAR Appendix 1.9A. In addition to its ICCI function the QSPDS monitors a sufficient subset of the SPDS parameters to provide reliable indication of the status of the five critical safety functions defined in Supplement 1. A listing of those parameters is included in

Attachment 1. Furthermore, CPU 3 will support SPDS in the control room, TSC and EOF during emergency situations (Modes 3-6) when the NSSS/COLSS software is not needed. Based on the foregoing, there is no impact to safety in implementation of the proposed interim resolution.

G. Computerized Emergency Planning and Data Acquisition System (CEPADAS)

CEPADAS uses continuous on-line acquisition (and/or manually inserted data) and processing of radioactive effluent and meteorological monitoring data to provide: 1) radiological effluent reporting, 2) continuous verification and storage of meteorological data, and 3) offsite radiological assessment in the event of an accident.

Technical Specifications: Technical Specification 6.9.1.8 requires submittal of semiannual radioactive effluent release reports, with an annual summary of hour by hour meteorological data on magnetic tape or in the form of joint frequency distributions. CEPADAS, through its processing of meteorological data, was intended to provide the basis for this annual summary. As a backup, meteorological data has been, and will be, collected on strip chart recorders and the graphical data reduced to joint frequency distributions for the semiannual report. LP&L has recently obtained new strip chart recorders for meteorological data to increase data collection reliability. Reporting requirements under the Technical Specification do not begin until initial criticality.

Regulatory Requirements : 1) Regulatory Guide 1.23 specifies that at least the previous 12 hours of 15 minute averages of meteorological data be available in the control room and that the TSC and EOF have access to the data. CEPADAS presently provides this capability. Under the interim proposal CEPADAS will be available in Modes 3-6 upon demand by the control room, TSC or EOF personnel. As a backup, separate software running on CPU 2 will provide, in the control room, the 12 hours of 15 minute averaged meteorological data during any Mode. 2) Regulatory Guide 1.23 specifies that 90% data recovery is required for those meteorological parameters included in the semiannual effluent report. As previously noted, raw data from strip chart recorders will be compiled into joint frequency distributions for the semiannual report, during the interim period when CEPADAS may not be available. 3) In response to FSAR Question 810.009-3 LP&L committed to an operational CEPADAS 45 days prior to

fuel load. The commitment was made to satisfy
requirements for monitoring and collecting
meteorological data. CEPADAS was tested and run on
the PMC for an extended period of time in compliance
with this commitment. To the extent that the
present situation may be construed as non-compliance
with the FSAR commitment, relief is requested as
detailed in Section IV.

Safety Significance   : None - Under the proposed
interim solution, CEPADAS will be available upon
demand by the control room, TSC or EOF personnel in
Modes 3-6.

H. Regulatory Guide 1.47 (Bypassed and Inoperable Status Indication)

The Regulatory Guide 1.47 software is intended to provide
automatic indication to the operator of bypassed and inoperable
status of safety-related systems in accordance with the
Regulatory Guide requirements.

Technical Specifications: None
Regulatory Requirements : Regulatory Guide 1.47 - In
W3P83-2936 dated September 29, 1983 LP&L committed
to operability of the Reg. Guide 1.47 software and
hardware by 5% power.
Safety Significance   : None - The Bypassed and
Inoperable Status Panel (BISP) is a non-safety
related system intended as a backup to administra-
tive procedures. For the interim period prior to
CPU 4 availability, the control room personnel will
have a diversity of information sources as to the
bypassed and inoperable status of safety-related
systems. Administrative procedures require, among
other things, a status board maintained by the Shift
Supervisor (SS), shift turnover status sheets, and
SS and control room logs. Should the operator
determine that additional status indication is
necessary, the BISP may be used in manual mode
without computer support.

I. Direct Digital Control (DDC)

The DDC software enables PMC control of nine non-safety related
temperature/pressure loops within the plant (e.g. main turbine
lube oil temperature control).

Technical Specifications: None
Regulatory Requirements : None
Safety Significance   : None - All loops are
non-safety related and not needed to safely shut
down the plant. Panel mounted manual loop control
is available in the control room.

J. Moveable In-Core Detectors (MICDS)

The MICDS software controls the positioning of two moveable incore detectors. The system is designed so that either detector can obtain neutron flux data from any position within the core.

    Technical Specifications: None
    Regulatory Requirements : None
    Safety Significance   : None - The MICDS is used
        only to provide confirmatory information on neutron
        flux data.

K. Reactor Power Cutback (RPC)

The RPC software provides actuation logic to initiate a "step" reduction in reactor power in order to accommodate certain large plant imbalances (e.g. large turbine load rejection) without tripping the reactor. The step reduction in power is accomplished by the simultaneous dropping of one or more preselected groups of full length regulating CEAs into the core.

    Technical Specifications: None
    Regulatory Requirements : None
    Safety Significance   : None - with RPC unavailable
        the reactor will still trip when safety systems
        determine that a trip is required.

L. Bulk Power Management System (BPMS)

The BPMS program provides pertinent power generation data to Middle South's main control center in Pine Bluff, Arkansas.

    Technical Specifications: None
    Regulatory Requirements : None
    Safety Significance   : None - The BPMS provides
        data off-site for Middle South Utility use only.

M. CECOR Verification File

The CECOR verification file program is used to collect power distribution "snapshots" needed for fuel management and core performance monitoring. It is a program run on demand rather than continuously.

    Technical Specifications: None
    Regulatory Requirements : None
    Safety Significance   : None - The CECOR verifica-
        tion file program is run only on an as-needed basis.
        With NSSS/COLSS software running there is sufficient
        computing capacity to execute the CECOR verification
        file as needed.

N. Update Time Dependent Variables (UTDV)

The UTDV program is used following computer restart to update certain time dependent variables according to the length of time the PMC was unavailable.

> Technical Specifications: None
> Regulatory Requirements :   None
> Safety Significance   :   None - UTDV will be executed
>   as needed following PMC restart.

IV. Interim Solution

Prior to CPU 4 availability, LP&L proposes an interim solution based operational mode. In summary:

1. Modes 1 and 2: NSSS/COLSS software will be available in CPU 3.

2. Modes 3-6: On operator demand following a reactor trip, the emergency response software will be available in the control room, TSC and EOF.

A. Modes 1 and 2

During Modes 1 and 2 the NSSS/COLSS software will be available in CPU 3. Because COLSS requires a significant amount of CPU 3 computing capacity, ERF/SPDS/CEPADAS software cannot be run. It is important to emphasize, however, that at power operation the need for emergency response software is minimal. The Waterford 3 Operations Group has reviewed this position and concurs that, given the availability of QSPDS, as an interim measure SPDS would be needed only following a reactor trip in emergency situations.

During Modes 1 and 2 the following tasks will execute on CPU 3:

Task	Section III Cross Reference
NSSS	A1-7
COLSS	B
QSPDS	C
RMS	D

B. Modes 3-6

During Modes 3-6 the control room personnel may, on demand, activate SPDS in the control room, TSC and EOF. The process of SPDS activation involves minimal operator involvement. The operator, from the main control room consoles, is only required to insert a value in the PMC database - a process which Waterford 3 operators can perform easily. Upon insertion of the value the ERF/SPDS software will be automatically loaded, initialized and executed, providing the SPDS display in the control room, TSC and EOF within 15 minutes.

This process will be proceduralized for the interim period, and control room personnel will be trained in its use.

Control room personnel, at their option, may also activate CEPADAS although activation does not require control room personnel involvement. CEPADAS may be activated, in Modes 3-6 from either the TSC or EOF, following approved procedures.

Upon operator demand, the following tasks would be executed on CPU 3 during Modes 3-6:

Task	Section III Cross Reference
QSPDS	C
RMS	D
ERF	E
SPDS	F
CEPADAS	G

V. Requested Relief

In implementing the above interim solution LP&L requests relief for the duration of the interim period from the following requirements/commitments.

A. SPDS

LP&L requests a temporary exception to the NUREG 0737 Supplement 1 requirement for continuous control room display of the SPDS. The SPDS will be provided upon operator demand following a plant trip. Additionally, a temporary exception to Waterford 3 Emergency Plan commitments for SPDS availability in the TSC/EOF is requested to the extent that availability is contingent on operator demand following a reactor trip.

B. CEPADAS

LP&L requests a temporary exception to Waterford 3 Emergency Plan commitments for CEPADAS availability in the TSC/EOF to the extent that availability is contingent on operator or TSC/EOF demand. To the extent that the LP&L response to FSAR question 810.009-3 may be construed to require a continuously operable CEPADAS, an exception to this interpretation is requested.

C. Regulatory Guide 1.47

LP&L requests deferral of implementation of the bypassed and inoperable status indication software until CPU 4 is operational.

VI. Schedule for Final Resolution

As previously noted, the redundant CPU 4 is presently scheduled for
delivery to the Waterford 3 site on March 15, 1985. Hardware and
software installation and testing will be complete by June 30, 1985.
LP&L requests NRC concurrence with the proposed solution (Section IV)
and exceptions (Section V) for the interim period.

QSPDS

Critical Safety Function	Parameter
Reactivity Control	-Neutron Flux -Boron Concentration
Reactor Core Cooling and RCS Heat Removal	-PZR Pressure -PZR Level -T-Core Exit -Injection Flows -Pressure and Temperature Saturation Margins -Steam Generator Pressure -Feedwater Flow -Hot and Cold Leg Temperature
Radiation Control	-9 Radiation Monitors
Containment Conditions	-Containment Pressure -Containment Temperature -Containment Hydrogen Concentration -Shutdown Cooling Temperature