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June 8, 1988

U. S. Nuclear Regulatory Commission
Attn: Document Control Desk
Washington, DC 20555

Reference: Beaver Valley Power Station, Unit No. 2
Docket No. 50-412, License No. NPF-73
Response to SSER-6 Sections 18.1 and 18.2 (DCRDR-SPDS)

Gentlemen:

Duquesne Light Company has completed a review of Sections 18.1 and 18.2 of Supplement 6 to the Beaver Valley Unit 2 Safety Evaluation Report (SSER-6). These issues pertain to the Detailed Control Room Design Review (DCRDR) and the Safety Parameter Display System (SPDS) respectively. Attachment 1 and Attachment 2 are provided in response to the items addressed in SSER-6 and define DLC's intent to resolve the license conditions addressed herein.

Very truly yours,

J D Sieber

J. D. Sieber
Vice President
Nuclear Group

Attachment

cc: Mr. J. Beall, Sr. Resident Inspector
Mr. W. T. Russell, NRC Region I Administrator
Mr. P. Tam, Project Manager

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DLC Response to NRC Concerns
Addressed in Section 18.2 of
Supplement 6 to the Beaver Valley Unit 2
Safety Evaluation Report

On February 18 and 19, 1987 the NRC conducted an audit of the BV-2 Safety Parameter Display System (SPDS) to the requirements of Supplement 1 to NUREG 0737. The purpose of the audit was to confirm that a verification and validation (V&V) program was being correctly implemented, that the results of testing demonstrated that the SPDS meets functional requirements and that the SPDS exhibits good human engineering practice.

As noted by the NRC in Supplement 6 to the BV-2 Safety Evaluation Report (SSER-6), the SPDS could not be completely evaluated until the system was declared operational. This submittal is being provided in response to concerns addressed by the NRC during the audit and documented in the BV-2 SSER-6.

18.2.2.1 V&V Program Evaluation

18.2.2.1(2) & (3) Design Verification Review and Validation Testing

The NRC noted that the SPDS is one function of the Emergency Response Facility Computer System (ERFCS) and that the SPDS receives data from the Plant Safety Monitoring System (PSMS), the Digital Rod Position Indication (DRPIS), and the Digital Radiation Monitoring System (DRMS). The response to the concerns addressed by the NRC in these two sections are summarized below by system.

DRMS

The DRMS vendor worked to their own system development quality assurance programs (invoked by our purchase specification) which included functional and operational testing.

The software/firmware supplied for BV-2 (RM-11, RM-80) was functionally/operationally tested during the development of the software for the RM-11 and RM-80 (late 1970s). The software/firmware was functionally tested before delivery. Each delivered software or firmware package is documented in a vendor design basis document and this document provides a traceable path from initial design to the delivered design. Sorrento Electronics has management and control procedures to document the above described process. DLC understands that the NRC, via a subcontractor, performed an audit on the software/firmware delivered to Seabrook. This audit included a review of Sorrento Electronics documentation and procedures' for controlling software/firmware configurations.

For the follow-on process, the source code revisions are controlled by the vendor and changes will be controlled and documented in accordance with approved departmental procedures. Validation of data input to and from the DRMS has been and will be controlled by approved procedures which contain design basis criteria for data verification.

This system consists of 73 microprocessor based radiation monitors which are connected to redundant host computers (RM-11) via five dual channel communication links. To validate proper system response and signal processing, the following testing was performed:

1. Prerequisite calibrations, electrical and mechanical tests
2. Initial operating procedures for each monitor (73)
3. Initial operating procedures for each host computer (2)
4. Initial operating procedure for each Alarm Display Panel (1)
5. Initial operating procedure for each communication loop, each channel (10)
6. Pre-Operational tests

By these tests, each of the 73 monitors located throughout the plant and each host computer was checked for proper operation both from a hardware and software aspect. After satisfactory performance of these individual tests, the system was configured in its final operating mode and each of the five communication links to the two host computers was tested. Then, the Category I display panels with its internal processor were tested for proper operation including diagnostics, hardware checks and communication with the appropriate monitors.

To satisfy field verification requirements, each monitor was calibrated using an NBS traceable source. This field signal was processed by the radiation monitor and the information transmitted to the host computer where proper readout was verified. Concurrently, the monitor information was read on the ERFCS console thereby confirming proper operation of the DRMS to ERFCS datalink which supplies the SPDS function.

If a calibration or other test failed, a deficiency report was issued and a test group open item was generated. The open item was cleared when the problem was corrected and the retest was satisfactory.

The RM-80 (local micro-processor) firmware revisions and RM-11 computer source code revisions are controlled and issued by the vendor. Procedural changes and site-specific system parameters are made and controlled on-site in accordance with approved procedures.

The results of the testing and preliminary operation are satisfactory. The data from monitor to final display has been verified and is in accordance with the design basis. Examples of open items at the end of pre-operational testing were: changes requested by Operations, traceable source replacement and undersize cables to monitor equipment. All open items on the DRMS system have been resolved and are documented in accordance with approved procedures.

PSMS

SSER-6 required that DLC submit within 6 months after the date of the low-power license, a V&V plan which will be able to demonstrate the reliability of the PSMS software and which will be approved by the NRC and implemented prior to start-up following the first BV-2 refueling outage.

The V&V Plan for BVPS #2 PSMS (which takes credit for V&V procedures exercised in QA programs specified in the original purchase contract as well as V&V activities exercised during startup testing and also takes credit for applicable plant operating procedures) was submitted by ND3VP:5238, dated November 25, 1987 (2NRC-7-212 dated December 10, 1987).

Westinghouse did not perform a generic V&V program on the PSMS, but performed Plant Specific V&V programs on South Texas and Vogtle. BVPS-2 did not take credit for the South Texas/Vogtle V&V programs performed by Westinghouse although the designs are essentially identical. Note that while the designs of the BVPS-2, South Texas and Vogtle PSMS's are essentially identical, the functions performed are not consistent. The BVPS-2 PSMS does not provide protection or control functions and is not the primary source of control information for all inputs. The V&V program outlined in 2NRC-7-212 is considered to be satisfactory.

The following discussion addresses the status of the PSMS field validation testing and verification of the ERFCS-PSMS datalink to validate the SPDS displayed information.

This system consists of 5 remote processing units, data processing units and 2 plasma displays. The PSMS displays various R. G. 1.97 variables and includes the plant's Reactor Vessel Level indicating System (RVLIS), Subcooling Margin Monitor and Incore Thermocouple display. To validate proper system response and signal processing, the following testing was performed:

1. Prerequisite calibrations, electrical and mechanical tests
2. Initial operating procedures for the data processing units and displays.
3. Initial operating procedure for the remote processing units.

4. Initial operating procedures related to RVLIS, Incore Thermocouples and Subcooling Margin Monitor
5. Power-ascension testing to determine plant-specific coefficients

By these tests, each input to the 5 remote processing units were simulated and proper response from the data processing units to the plasma displays was verified. Each of the field devices supplying information to the system was acceptance tested/calibrated. Proper processing of input data used in the RVLIS, Subcooling and Incore thermocouple algorithms was verified by simulating the necessary input values at the remote processing units. Analog values displayed on the SPDS program were verified by manually entering the value in the PSMS equipment and reading the value on SPDS displays via the PSMS to ERFCS datalink.

In its final operating configuration, the PSMS was used to collect plant heat-up data for determination of plant-specific RVLIS coefficients. After installation of these coefficients, reverification tests were conducted to confirm proper operation of the plant-specific coefficients.

If a calibration or other test failed, a test deficiency report was issued and a test group open item was generated. The open item was cleared when the problem was corrected and the retest was satisfactory.

The PSMS programs, algorithms and computational/display logic are coded in programmable read only memory devices controlled and issued by the vendor. Any problems requiring program or display changes are issued by the vendor through site engineering in accordance with approved procedures.

In the Region I Inspection Report No. 50-412/87-60, the NRC noted that, "The ICCI system installed at Beaver Valley, Unit 2, includes (1) Core Exit Thermocouple (CET) Monitoring, (2) Core Subcooling Margin Monitoring, and (3) a Reactor Vessel Level Indication System (RVLIS). The ICCI system is incorporated as part of the Plant Safety Monitoring System (PSMS). The inspector verified that the system functional tests and calibrations were successfully completed prior to reaching 5% power per previous licensing commitments. Noted test deficiencies were documented for resolution and are being tracked by the licensee's internal tracking system."

Examples of open items at power-ascension testing were: incorrect display of some digital inputs e.g., main steam safety valve status and other minor display problems. These are currently being resolved by the vendor and are scheduled to be installed and retesting completed prior to startup after the first refueling outage.

DRPI

The DRPI system consists of a control board display cabinet, two data cabinets located in containment, and 48 sets of position indicator coils. The system provides visual status of all control rods to the control room and to the ERFCS. To validate proper system response and signal processing, the following testing was performed:

1. Prerequisite calibrations, continuity and megger tests
2. Initial operating procedure for the control board display
3. Initial operating procedure for the transmission of simulated data.
4. Pre-operational tests

To satisfy field verification requirements, each rod was simulated from the data cabinets inside containment and proper display was verified in the control room. Rod position information was again simulated at the DRPI display cabinet and verified at the DRPI to PCS datalink. Finally, with all equipment in its final operating configuration at least one rod from each of the 6 banks was simulated from containment and proper indication verified on the DRPI panel in the control room, the PCS console and the ERFCS console.

As with other testing, if a calibration or other test failed, a deficiency report was issued and test group open item generated. The open item was cleared when the problem was corrected and the retest was satisfactory.

The DRPI system is a fixed-output system, i.e., no software exists that is alterable on line or off line without a hardware change. After initial operation of the system was verified, it was used during power ascension testing and conduct of a System Operability Test as described in the FSAR.

The results of the testing performed is satisfactory. All open items have been resolved in accordance with approved procedures.

ERFCS/SPDS

The NRC reviewed the BV-2 V&V process conducted on the SPDS functions of the ERFCS and found that the process satisfied the intent of the recommendation to conduct an effective V&V program. Factory Acceptance Testing (FAT) of the integrated hardware/software was conducted by Bailey and not Westinghouse as indicated by the NRC in 18.2.2.1(3) on page 18-6 of SSER-6.

The SPDS is derived from inputs supplied by the field and the PSMS and DRMS datalinks. As with PSMS and DRMS, field input tests were performed to verify proper response of the PCS/ERFCS. The results of the testing and preliminary operation are satisfactory. Several open items on SPDS remained at the time of commercial operation. These are as follows:

1. The firmware problem affecting some digital inputs to the PSMS system in turn affects SPDS displays. Once this item is resolved for PSMS, these SPDS inputs can be verified.

2. Completion of the Site Acceptance Test (SAT) on the ERFCS affects some SPDS displays. Once this test is completed, this open item can be cleared

3. A problem exists which prevents proper display of DRPI error code information on the ERFCS. Once this problem is corrected and the appropriate retest performed, this item can be closed.

The resolution of the above open items is scheduled to be completed prior to startup following the first BV-2 refueling outage.

18.2.2.1(4) <u>Field Verification Testing</u>

As indicated by the NRC, the field verification testing program will satisfy the intent of SRP Section 18.2 however, testing was not complete at the time of the audit. Field verification testing for the resolution of SPDS open items is scheduled to be complete prior to startup following the first BV-2 refueling outage.

18.2.2.2 Assessment of SPDS Design

In this section the NRC addressed their evaluation of the SPDS design to the requirements given in SRP 18.2. Because many of the issues presented are related to the identification of the BV-2 SPDS philosophy of operation and use, a description of that philosophy is provided herein.

SPDS Philosophy of Operation and Use

The Safety Parameter Display System (SPDS) provides personnel in the Technical Support Center (TSC), and Emergency Operating Facility (EOF) with immediate access to critical plant indications. The SPDS system provides a concise display of critical plant variables to the control room operators, Shift Technical Advisors (STAs), and plant personnel to aid them in rapidly and reliably determining the safety status of the plant. The SPDS system, by virtue of its installation in the TSC and EOF, reduces the number of staff personnel in the control room, thereby reducing the potential for confusion in the control room during a plant transient or emergency condition. The principal purpose and function of the SPDS system is to aid the control room personnel during an abnormal or emergency condition in determining the plant safety status and to assess whether the abnormal condition(s) warrant corrective actions by the operators to avoid degraded core condition. The licensed operators, STAs, and selected plant personnel are trained on SPDS operations, cognizant of the available SPDS information, and able to interpret the information provided by the SPDS system to understand the plant safety status.

The primary sources of indication for the operation of the plant are the control room indications, including Post Accident Monitoring System (PAM), and plant equipment. The control room indication provides the Operators with the necessary information for safe reactor operations of the plant under normal, transient, and accident conditions. The SPDS system is used as an aid to enhance the control room indications. If the SPDS system is not available the control room operators are trained to mitigate the transient or emergency condition by using their control room indications and the Emergency Operating Procedures (EOPS). The control room operators are trained to respond to the transient or accident condition(s) with and without the SPDS system.

The EOPs are written to mitigate the consequences of various accidents when the EOPs are entered. The operation of the plant is maintained and controlled using the EOPs until the plant conditions are stabilized. With this EOP philosophy in mind, the SPDS philosophy and SPDS procedure guideline are written as an aid and an enhancement to the Emergency Operating Procedures during an abnormal, transient, or accident conditions. The SPDS system is also used during normal plant evolutions as an aid to the control room staff, but the SPDS system and the SPDS procedure guidelines are not considered primary information for the operation of the plant during accident conditions.

The primary operators of the SPDS system are the STAs. The STAs have the available use of the SPDS system to monitor the plant safety status at several Emergency Response Facility Computer System (ERFCS) terminals. The SPDS system for BVPS Unit 2 is a part of the ERFCS computer and is accessible at the ERFCS terminals. There are ERFCS terminals located at the following locations; Unit 2 Control Room, Technical Support Center and at the Emergency Operating Facility (EOF). In addition to the STAs, all licensed operators and selected plant personnel are trained to be able to operate, understand, and interpret the information from these ERFCS terminals for the SPDS. SPDS users are capable of interpreting the color coding and status flags associated with the SPDS parameters. The SPDS users are trained to the level where the users are cognizant on how to use the ERFCS terminals as an available reference tool to enhance existing indications. The SPDS system is and will be considered an enhancement to operation of the plant and a secondary source of plant safety status information. The SPDS system will provide diagnostic information during normal and accident conditions. A trained SPDS operator, at the various locations, can aid the control room staff by monitoring plant status changes for the plant transient or emergency conditions and provide plant safety status information to personnel outside the control room.

The SPDS operator has the ability to call up the Top Level, Map Menu, Trends, or history displays by dedicated SPDS pushbuttons. In addition to the dedicated display pushbuttons, the SPDS system can call up a display by locating the cursor in any display predefined poke field area and executing the Display Page pushbutton. This action will display on the SPDS terminal screen, the associated screen display related to the poke field area. All displays can be called upon by sequential paging, display poke fields, or entry of a specific screen page number.

The SPDS screen displays are divided into six distinct categories. The initial group consists of the SPDS Map and its associated Menu screens. The Menu screens identify the first, second, third and fourth level displays. By visual observations of the SPDS menu screens, the fourth level displays can be associated with the third level displays. The fourth level displays is a tabulator listing of all the computer points used in the third level displays. The last SPDS display group available is the individual sensor input computer points called the Point Detail Displays. These point detail displays are all the computer points used by the higher level displays in the SPDS system.

There are 29 SPDS displays installed in SPDS display levels one, two and three. Level one (also known as Top Level) contains two abstract iconic displays. These two displays represent plant conditions referenced to the optimum operating points and operating limits. The two screens have eight spokes directed outward from the center of the screen. Each spoke represents a normalized plant parameter to provide an octagonal geometric shape. The symmetric octagonal diagram occurs when the active parameters are at or near the optimum operating level. As the plant parameters deviate from the optimum operating limits, the octagonal shape will distort informing the SPDS operator of the parameter deviation.

Top level display 1TL1 Narrow Range Display (NAR RNG) is structured for normal plant operation without a reactor trip condition. Top level display 1TL2 Wide Range Display (WID RNG) is used to show plant operations from full power to plant shutdown after a reactor trip. If the Narrow Range display is on the screen prior to a reactor trip, the Wide Range display will automatically be substituted for the narrow range display after initiation of the reactor trip. Both Top Level displays 1TL1 and 1TL2 are useful to display plant parameter conditions before and soon after a reactor trip. However, the iconic displays in the third and fourth Level provide more useful detail information to analyze/diagnose a plant transient or emergency conditions. Therefore, after a reactor trip, normal operations of the SPDS system would be in the third and fourth levels. Additional information can be acquired using the point detail displays if more specific information is required for the computer point in the SPDS system.

In addition to the normal iconic display Level Two contains the history trend graphs and history iconics. The history trend graphs and history iconics can be called upon using the dedicated SPDS history pushbutton once the reactor trip breakers are opened. The history iconics and trend graphs provide a recorded history replay varying from 30 minutes/5 minutes before and after the reactor trip breakers are opened. The SPDS system stores the data on memory disks for the respective trend graphs or iconic history.

The SPDS procedure guideline is a reference procedure for the SPDS operator. The procedure is written in three parts. The first section is a reference section of the SPDS terminal operational controls, parameter color codings and parameter status flags for the SPDS operator. The second section is a grouping of SPDS parameters that are helpful in analyzing and diagnosing plant conditions which may be used with the EOP procedural steps. A table is provided listing all the SPDS parameter groupings in section two for quick reference to operate the SPDS system on the ERFCS terminal following the EOPs. The last section of the SPDS procedure guideline is the attachment section. The attachment section provides information that is not available in section one or two that may be useful to the SPDS operator.

The procedure guideline allows the SPDS operator to manipulate the ERFCS terminal controls for the SPDS system to gather information as required to diagnose or analyze plant safety status conditions. The procedure guideline provides instructions for the SPDS operator to call up any SPDS screen displays available in the SPDS system. The guideline allows the operator to follow plant conditions as specified by the EOP procedural steps and determine plant performance by viewing plant safety status as the EOP steps are accomplished.

When the SPDS system is used with the EOP procedure, the EOP procedure is the driving force in controlling the SPDS system. The SPDS operator will normally use the SPDS system at the ERFCS terminal to follow plant conditions identified in the EOP steps. In addition, the SPDS operator may observe other plant status to determine the changes influenced by the EOP procedural steps. Operating the SPDS system as described will provide plant personnel with information to determine plant conditions to aid the operating staff in determining the conditions the EOPs were entered.

To ensure the procedure guideline and SPDS philosophy objectives are accomplished, a procedure validation and verification program has been incorporated into the SPDS philosophy. The procedure validation and verification program ensures the procedure guideline and SPDS philosophy are implemented correctly and fulfills the requirements for which they were developed. The procedure validation and verification are the last phase in the development process before the SPDS philosophy and procedure guideline are approved and recommended for use in the plant.

18.2.2.2(2)

During the audit, the NRC indicated that the convenience of the SPDS location in the control room is directly related to the identification (in the SPDS philosophy) of the Shift Technical Advisor (STA) as the primary user of the SPDS in the Control Room and the application of a team concept in the control room to mitigate transients. All STAs, licensed operators and selected plant personnel will be trained to operate, understand and interpret the information displayed on the SPDS terminals. The location of an SPDS terminal on the main control board vertical panel (as at BV-1) could enhance the useability of the system by the control room operators (as indicated by interviews of BV-1 Control Room operators). The primary users of the SPDS are the STAs and the present location supports this philosphy. The SPDS console is also located in close proximity (on the Center Island Console) to the PSMS, DRMS and the PCS computer systems.

The primary source of indication for plant operation is the control room indicators. The control room operators are trained to mitigate transient or emergency conditions using these indicators in conjunction with the Emergency Operating Procedures (EOPs). The location of an SPDS on the main control board is therefore not necessary.

18.2.2.2(3)

The NRC did not consider the continuous display requirement to be satisfied for the following reasons: 1) more than 40 lower level display formats are accessible at the SPDS control room terminal and 2) the SPDS terminal at the reactor operators desk, the center island console (CIC) location is a backup for TSC function of the ERFCS terminal located near the Shift Supervisors Office.

As indicated in the SPDS philosophy, the lower level displays provide more useful detailed information to analyze/diagnose a plant transient or emergency condition. Limiting access to these displays would severely limit the valuable information available to control room personnel on the SPDS. As indicated in discussion during the audit with BV-1 control room operators the information contained on the reactor coolant system flow diagram and the overall plant status displays proved to be more useful and more commonly displayed on the CRT located on the BV-1 vertical section of the control board than the top level narrow-range or wide-range octagon.

The SPDS terminal located at the CIC is designated as a back-up for the ERFCS console located near the Shift Supervisor's office. However, the occasion to use this console as a back-up is only in the event of an emergency when the ERF Technical Support Center (TSC) is activated and then for only the first 30 minutes of the event while the Control Room Shift Supervisor is the acting Emergency Director. After the first 30 minutes of the event, the TSC is declared operational and the TSC function is no longer required in the control room. Operations personnel indicate that the control room operator is not likely to be soliciting SPDS display information during that time.

Additionally, the unavailability estimates for the SPDS of less than 1% in the control room indicate a very minimal likelihood of SPDS failure and a coincident occurrence of an accident requiring TSC activation.

<u>18.2.2.2(4)</u>

In evaluating the ability of the SPDS to aid the operators in rapidly and reliably determining the safety status of the plant the NRC identified the following concerns: 1) Response time testing under extreme system loading to determine actual response times could not be assessed due to the installation status of the system; 2) SPDS availability estimates were incomplete at the time of the audit; 3) Programming change access should be limited to the control room and computer room and 4) verification of SPDS readings should be provided as part of periodic instrument calibration procedures.

The BVPS #2 SPDS Control Room Iconic display availability estimate is 0.995 as documented in design analysis 8700-DEC-0019, BVPS #2 Reliability Calculation for the ERF Computer System. This estimate takes into consideration the DRPI, PSMS and DRMS interface reliability.

An administrative procedure will be developed and implemented prior to start-up following the first refueling outage to monitor the availability of the SPDS. Computer downtime will be tracked using a problem log which will be reviewed for trending purposes to reduce downtime and improve the overall system availability.

SPDS time response testing has been conducted under a heavy loading scenario. The response time recorded to build a complete screen was a maximum of 4.7 seconds for the top level iconic and 10.2 seconds for a low level display. Since the ERFCS has faults requiring resolution, SPDS time response testing will need to be performed again at a later date.

Program changes can only be made from the programmers consoles in the ERF computer room. The ERF/SPDS system contains both monochrome display terminals and color consoles. The two (2) monochrome display terminals are referred to as programmers consoles and are located only in the ERF computer room. Color consoles are stationed in various locations within the ERF and control buildings.

Color consoles are keylocked to prevent unauthorized or inadvertent changes to the database. Only database changes can be made from the color consoles. Program changes cannot be made from these terminals. All database changes are logged on the operations journal printer, indicating the change that was made and the console from which the change occurred.

Approved database changes, and some program changes, can be made 'on-line' with very little time involved. These on-line changes are of a temporary nature since they have not been captured on a master system tape. Our administrative procedures for producing a master system tape require that the old master system tape be loaded as a first step. This restores the system to a known condition and overwrites all on-line changes. Data base changes and programming changes are then incorporated and a new master system tape is generated. The operations journal printout is reviewed to ensure that no other changes are introduced. Procedures for database changes and software changes are covered in the Operating Manual and Chapter 11 of the I&C Manual. The concept of on-line changes allows the system to be quickly adjusted without a lengthy computer system outage without loss of software control.

Provisions to verify SPDS displayed information will be accommodated. The SPDS displayed information will be periodically verified by performing checks with other qualified indication. A program to accomplish these verification checks will be implemented prior to start-up following the first BV-2 refueling outage.

18.2.2.2(6)

A human factors review conducted by the NRC during the February 1987 audit identified several human engineering discrepancies (HEDs). These HEDs will be documented and included in the Detailed Control Room Design Review (DCRDR) Second Supplemental Summary Report (SSR-2). The HEDs will be formally evaluated and dispositioned by the DCRDR Review Team during the completion of the DCRDR activities which are scheduled to be completed during the second quarter of 1988. The implementation of the resolutions to the HEDs which have not already been completed will be completed prior to startup following the first refueling outage.

The following is a summary of the HEDs to date.

a. The use of yellow to represent normal data or conditions is contrary to widely accepted human factors color-coding conventions and may be inconsistent with the control room color conventions.

   Revision 1 to 2CIC-5225 has been issued recommending that the colors be made consistent with those used on other computer systems in the control room.

b. Allowable limits of parameters are not indicated on trend and history plots. Thus, operators cannot perform margin monitoring (i.e., determine how far parameters are from alarm limits).

   Allowable limits of parameters are not included on trend history plots because the limits vary in different EOPs dependent on the specific accident conditions. Inconsistent application of limits could lead to confusion by the user and therefore the limits will not be added. Performance of margin monitoring by the users can be accomplished by determining the limit from the EOP value and comparing it to the parameter value displayed on the SPDS console.

c. Trend and history plots appear to be too small to be readable.

   The trend history plot size is limited by the physical characteristics of the SPDS equipment. The plots are readable by an individual sitting at the designed sit-down console. As the SPDS operator will not normally be viewing the SPDS trend/history plots for an extended duration but rather will check them periodically to observe any significant changes. A change will signal the SPDS operator to further review the detailed parameter data to evaluate the plant condition.

d. One trend plot screen, 2TR2, displays two parameters on the same plot. Lines representing values of each parameter are color-coded identically making discrimination difficult.

   This condition was identified by the NRC and has been corrected. The two parameters in question are now color coded differently.

e. Function pushbuttons are located in two groups, one on the keyboard and one in a vertical configuration on the display terminal. Interaction sequences often require excessive operator hand and arm movement between both groups of pushbuttons.

The SPDS operators are not required to operate the SPDS for extended periods of time. Extensive data entry is not required by the SPDS operator. Therefore, SPDS operator fatigue is not considered a factor in the system operation. Additionally, the primary method of accessing data by SPDS operators less familiar with the system is by locating the desired function on the Map Menu using the cursor and the executing the display function. Lower level displays providing more detailed information can be accessed by the paging function and point details. Parameters identified on the system P&ID (3rd Level display) can be accessed by locating the point with the cursor and executing the display function.

The five function pushbuttons on the vertical panel are only provided as a convenience to the SPDS operator and familiarity with the system precludes their necessity as the operator can access these displays by entering the display identification number on the keyboard.

f. Confusing and/or irrelevant prompts are frequently presented. For example, prompt messages may list three response options. To the right of these options, a prompt to PRESS EXECUTE is displayed. This last prompt indicates a response which produces no actions by the system.

This condition identified by the NRC during the audit has been resolved.

g. Cursor movement via keyboard arrow keys is slow. The option of cursor movement via joystick such as is provided on the BVPS-1 SPDS is generally faster and more efficient.

The joystick in use on the BV-1 SPDS is generally faster than the cursor on the BV-2 SPDS as noted during the audit by the NRC however, the BV-1 SPDS software generally provides a faster system response than BV-2. The cursor movement has been improved on BV-2 to provide a more logical progression of movement. The cursor will not be replaced with a joystick on the BV-2 SPDS at this time since SPDS user feedback on this issue has not indicated this as a significant problem.

18.2.2.2(7)

The NRC determined that with the exception of containment isolation valve status the parameters displayed on the BV-2 SPDS provided SPDS operators with information regarding the status of the five critical safety functions identified in Supplement 1 to NUREG-0737.

Phase A and Phase B containment isolation status has been included in the overall plant status display.

The not activated status appears in CYAN "NOT ACT" meaning that an isolation signal has not been received. If containment isolation is demanded but not complete and that not all valves are closed "NOT ISOL" appears in reverse video red. When isolation has been achieved "ISOL" appears in amber (this will be changed to green when the color consistency change is made).

18.2.2.(8)

The NRC indicated that at the time of the audit, procedures were not available and operators were not trained to respond to accident conditions where the SPDS is available and when the SPDS is not available.

The SPDS philosophy discusses the development of procedure guidelines and addresses the SPDS operator training requirements. Attachment A provides a schedule for the implementation of the SPDS philosophy and associated personnel training. Attachment B provides a brief discussion of a 3-phase SPDS Training Procedure. Initial training of all personnel will be completed prior to startup following the first BV-2 refueling outage.

The SPDS procedure guideline will be subjected to a validation and verification program. Implementation of this program will demonstrate that the SPDS Procedure guideline provides the proper guidance to the SPDS operator in assessing the overall accident and plant transients in conjunction with applicable EOPs.

ATTACHMENT A

SAFETY PARAMETER DISPLAY SYSTEM PHILOSOPHY TIME SCHEDULE

December 15, 1987

1. SPDS philosophy development
2. SPDS procedure validation and procedure verification (V&V) program development
3. SPDS training program schedule development

February 29, 1988

1. Initial SPDS philosophy complete
2. Initial SPDS procedure guideline 70% complete
3. SPDS procedure validation and procedure verification program complete
4. SPDS procedure validation and procedure verification initiated for:

    a. SPDS philosophy
    b. SPDS procedure guideline

March 31, 1988

1. SPDS philosophy development complete
2. SPDS procedure guideline development complete
3. Review comments, procedure validation and procedure verification comments incorporation initiated

    a. SPDS philosophy
    b. SPDS procedure guideline

4. SPDS training requirements formalized

May 30, 1988

1. SPDS procedure verification complete
2. SPDS procedure validation complete
3. SPDS philosophy comment incorporation complete
4. SPDS procedure guideline comment incorporation complete
5. SPDS philosophy and procedure guideline OSC reviewed and recommended approval

July 30, 1988

1. SPDS philosophy and procedure guideline training classes initiated

    a. Shift Technical Advisors (STAs)
    b. Selected licensed personnel
    c. Selected plant personnel

2. All licensed personnel study guide training initiated

Unit 2 1R Initial Refueling Outage (May 1, 1989)

1. All initial SPDS training requirements completed

ATTACHMENT B

SPDS PROCEDURE TRAINING OUTLINE

The initial training on the SPDS procedure would consist of three sections.

The first section would be a system review of the SPDS computer, human factors, and basic user operation.

The second section would be an in-class lecture covering the procedure and procedure use.

The third section would consist of a worksheet, or some similar interactive correspondance, in which the student would use the SPDS to evaluate plant status, given a certain set of conditions.

The first two sections would be conducted in a formal lecture as part of the normal operator License Retraining Program (LRT). The third section would be completed by the student independently and returned to the Training Center.

RESPONSE TO NRC CONCERNS
ADDRESSED IN CHAPTER 18.1 OF
SUPPLEMENT 6 TO THE BEAVER VALLEY UNIT 2
SAFETY EVALUATION REPORT

On January 8, 1987 Duquesne Light Co. (DLC) submitted the Detailed Control Room Design Review (DCRDR) Supplemental Summary Report (SSR) documenting the results of further survey evaluations and in response to concerns identified by the NRC during an audit conducted on February 11 and 12, 1986 and documented in interim Safety Evaluation Report issued by the NRC on July 28 1986. Chapter 18.1 of Supplement 6 to the Beaver Valley Unit 2 Safety Evaluation Report (SSER-6) documented the results of the NRC review of the DCRDR-SSR. This report is being provided in response to concerns addressed by the NRC in Chapter 18.1 and Appendix S (Technical Evaluation Report) of SSER-6.

18.1.2 Control Room Survey to identify deviations from accepted human factors principles.

Performance of the following surveys is scheduled to be initiated following completion and start-up after the sixth refueling outage of Beaver Valley Unit 1.

Work Space
Emergency Equipment
Communications
Heating Ventilation and Air Conditioning (HVAC)
Illumination
Ambient Noise

The surveys will be conducted to accommodate concurrent evaluation of the same surveys in the Beaver Valley Unit 1 control area. In addition, the human factors criteria identified in Section 2.1.2 of Appendix S and in Appendix A to Attachment 1 (page 6-3) of the DCRDR-SSR will be evaluated during this same time frame.

The results of the evaluation of the six surveys and the evaluation of the miscellaneous criteria identified in Section 2.1.2 of Appendix S will be documented in a second supplemental summary report.

This section also indicated that the staff did not accept DLC's justification/resolution for the HED regarding DLC's use of single filament single bulb indicator lights. The following detailed justification is provided for further clarification of DLC's position that the existing conditions are considered acceptable.

Single Filament/Single Bulb Indicator Lights

1. 2SIS*MOV865A, 865B, 865C - Safety Injection Accumulator's Discharge Stop Valve

The operation of safety injection accumulator discharge stop valve [2SIS*MOV865A] is described below and is typical for safety injection accumulator outlet isolation valves [2SIS*MOV865B] and [2SIS*MOV865C] with the substitution of Train B for Train A. Switch positions are OPEN-AUTO-CLOSE, maintained in the CLOSE position, spring returned to AUTO from OPEN. During normal plant operation, isolation valves [2SIS*MOV865A, 865B, 865C] have their power removed by means of a banana plug disconnect on Vertical Board Section A and at the Emergency Shutdown Panel (SDP) to prevent spurious operation of these valves.

The safety injection accumulator discharge stop valve [2SIS*MOV865A] will open provided any of the following conditions are met:

a. Control switch for [2SIS*MOV865A] in OPEN and no motor thermal overload and banana plug installed.

b. Control switch for [2SIS*MOV865A] in AUTO and two out of three pressurizer pressure channels greater than 2,000 psig and no motor thermal overload.

c. Safety injection signal (Train A).

The safety injection accumulator discharge stop valve [2SIS*MOV865A] will close provided all the following conditions are met:

a. Control switch for [2SIS*MOV865A] in CLOSE and banana plug installed.

b. No motor thermal overload.

c. No safety injection signal (Train A) present.

Red (open) and green (closed) indicating lights are located above the control switches on the benchboard in the Control Room and the Emergency Shutdown Panel. Red and green redundant indicating lights are located above the lock out banana plugs at the SDP on the vertical board in the Control Room. A white (valve change position demand) light is located above the lock out banana plugs at the SDP and on the Vertical Board-Section A in the Control Room. Upon receipt of a hi containment sump water level signal the circuit breakers for [2SIS*MOV865A, B, C] trip open and the red and green indicating lights above the control witches in the Control Room and at the SDP will be de-energized. Valve position indication is only available from the redundant indicating lights above the banana lockout jacks in the Control Room and at the Emergency Shutdown Panel. The red and green indicating lights above the control switches in the Control Room and at the Emergency Shutdown Panel will only be illuminated at the switch that is controlling the valve, either in the Control Room or at the Emergency Shutdown Panel.

The white indicating light illuminates only when the control switch is turned to a position which is opposite of the existing valve position.

2. 2SIS*MOV8889 - Low Head Safety Injection Pump Discharge to Hot Leg Isolation Valve

Control switch positions are OPEN-CLOSE with a spring return to center position. Red (open) and green (closed) indicating lights are provided above the control switch which is located at benchboard-Section A. A power lockout jack, red (open), white (valve change position demand) and green (closed), indicating lights are located on vertical board-section A.

The low head SI pump discharge to hot leg isolation valve [2SIS*MOV8889] will open provided all of the following conditions exist:

a. Control switch [2SIS*MOV8889] in OPEN.

b. No motor thermal overload.

c. Power lockout jack installed.

The low head SI pump discharge to hot leg isolation valve [2SIS*MOV8889] will close provided all of the following conditions exist:

a. Control switch [2SIS*MOV8889] in CLOSE.

b. No motor thermal overload.

c. Power lockout jack installed.

3. 2CHS*MOV311 - Pressurizer Auxiliary Spray Isolation Valve

This motor operated valve is normally closed and has its control power removed through the use of a banana plug.

Control of [2CHS*MOV311] may be initiated from either the Control Room or the Emergency Shutdown Panel (SDP). A pushbutton on the SDP will transfer control to the SDP. A manual reset at relay [43-CHSNVX], located at [PNL-REL-251], is used to transfer control back to the Control Room.

Control switch positions are CLOSE-OPEN (spring return to center), with red (open) and green (closed) indicating lights, one each for [2CHS*MOV311], on the Benchboard Section A and the SDP. White "Valve Position Change Demand" lights are supplied at the Benchboard and the SDP.

The letdown supply valve to pressurizer spray [2CHS*MOV311] will open provided the following conditions exist:

a. Control switch [2CHS*MOV311] in OPEN

b. No motor thermal overload

c. Banana plug installed

The letdown supply valve to pressurizer spray [2CHS*MOV311] will close provided the following conditions exist:

a. Control switch [2CHS*MOV311] in CLOSE

b. No motor thermal overload

c. Banana plug installed

4. 2HVR*MOD23A, 23B - Containment Purge Discharge Isolation Dampers

Containment purge discharge isolation dampers [2HVR*MOD23A, 23B] are controlled from the Control Room by three-position, OPEN-CLOSE (spring return to center) control switches with red (open), green (closed), and white (damper position change demand) indicating lights on the Building Service Panel (2BSC). Banana lockout plugs, located on the Building Service Panel, are used to remove power from the contactor to prevent damper movement.

Operation of [2HVR*MOD23A] is described below. The operation of [2HVR*MOD23B] is similar.

Containment purge discharge isolation damper [2HVR*MOD23A(23B)] is opened by turning its control switch to the OPEN position, and if the following conditions are met, the damper will open:

a. No high radiation signal in the containment purge exhaust from radiation monitor [2HVR*RQ104A(104B)].

b. No electric protection trip.

c. Banana plug installed.

Containment purge discharge isolation damper [2HVR*MOD23A(23B)] is closed by turning its control switch to the CLOSE position, and if the following conditions exist, the damper will close:

a. No electric protection trip.

b. Banana plug installed.

Containment purge discharge isolation damper [2HVR*MOD23A(23B)] will close automatically if the following condition occurs, provided there is no electric protection trip.

a. High radiation signal in the containment purge exhaust, from radiation monitor [2HVR*RQ104A(104B)].

Containment purge discharge isolation damper [2HVR*MOD23A(23B)] will fail as is on loss of normal power.

5. 2HVR*MOD25A, 25B - Containment Purge Supply Isolation Dampers

Containment purge supply isolation dampers [2HVR*MOD25A(25B)] are controlled from the Control Room by three-position, OPEN-CLOSE (spring return to center) control switches with red (open), green (closed) and white (damper position change demand) indicating lights on the Building Service Panel (BSC). Banana lockout plugs, located on 2BSC, are used to remove power from the contactor to prevent damper movement.

Operation of [2HVR*MOD25A] is described below. The operation of [2HVR*MOD25B] is similar.

Containment purge supply isolation damper [2HVR*MOD25A(25B)] is opened by turning its control switch to the OPEN position, and if the following conditions are met, the damper will open:

a. No high radiation signal in the containment purge exhaust from radiation monitor [2HVR*RQ104A(104B)].

b. No electric protection trip.

c. Banana plug installed.

Containment purge supply isolation damper [2HVR*MOD25A(25B)] is closed by turning its control switch to the CLOSE position, and if the following conditions exist, the damper will close:

a. No electric protection trip.

b. Banana plug installed.

Containment purge supply isolation damper [2HVR*MOD25A(25B)] will close automatically from the following condition provided there is no electric protection trip:

a. High radiation signal in the containment exhaust from radiation monitor [2HVR*RQ104A(104B)].

Containment purge supply isolation damper [2HVR*MOD25A(25B)] will fail as is on loss of normal power.

All of the valves/dampers described in Items 1 through 5 above require the use of a banana plug to operate the valve/damper. Therefore, the operator intends to change the valve/damper position when the banana plug is inserted. Illumination of the white light is not determined by the insertion of the banana plug but rather the position of the valve/damper with respect to the position of the valve control switch being activated by the operator. If the valve/damper is OPEN and the operator turns the control switch to the CLOSE position(or vice versa) the white light will illuminate indicating a valve/damper position change demand. It is important to note that the valve has not actually changed position. If the white light is lit and the banana plug is inserted, the valve will stroke to the opposite position. This is of no consequence since the operator made a deliberate move to effect the change in valve position.

6. CREBAPS - Control Room Emergency Bottled Air Pressurization System

CREBAPS is initiated by a Control Room Radiation Signal, Containmnet Isolation Phase B signal or 2/3 chlorine detector signals. The five indicating lights located on the BV-2 Building Service Panel (2BSC) indicate the injection of air into the Control Room from each of the 5 air bottles. When the air bottles begin to inject, a loud rush or air can be heard in the Control Room. Additionally, 5 redundant indicating lights are located on the BV-1 Building Service Panel. During CREBAPS initiation, each of the 5 indicating lights on both BV-1 and BV-2 Building Service panels illuminate. Verification of bulb failure on BV-2 can be determined by operator communication with the BV-1 Control Room personnel. Failure of redundant indication will cause the operator to determine the system discharge problem. Illumination of the corresponding redundant light indicator on BV-1 will simply indicate bulb failure to the BV-2 operator and require no further action other than normal bulb replacement.

Because redundant indication is readily available on BV-1 and indicator illumination status can be easily communicated between the BV-1 and BV-2 control areas, a testing capability is not necessary on the CREBAPS system.

7. 2HCS*HA100A, 100B and 2HCS*PNL100A, 100B - Hydrogen Analyzer and Hydrogen Analyzer Remote Control Panel

   The Hydrogen Analyzer [2HCS*HA100A(100B)] can be controlled from two locations; by an ON-OFF switch on the Hydrogen Analyzer Remote Control Panel [2HCS*PNL100A(100B)] in the Service Building, or by an ON-OFF switch in the Control Room. The initiation of a safety injection signal will also activate the hydrogen analyzer. Actuation of the switch in the Control Room or the presence of a S.I. signal will cause the analyzer to automatically start regardless of the position of the ON-OFF switch on the Remote Control Panel. In addition, the Containment sample source is automatically selected overriding previous commands.

   The sample source is chosen by an auto/manual sequencer operated from the Remote Control Panel. In the event of an automatic start signal (SI), the sequencer will automatically select the number one inlet sample (Containment). The sequencer can then be changed manually to sample any one of the three sample sources; the Containment or the suction or return lines of the hydrogen recombiner. Two additional sample sources are supplied as spares and are capped off and the indicator lights have been removed and the holes are covered on the main control board. The single amber indicating lights represent the sample source selected. Each sample source has redundant Train A and Train B indication. Because one of these sample source indicating lights must be illuminated during hydrogen analyzer operation and because redundant indication exists, testing of these indicator lights is not necessary.

8. Cooling Tower Pump Stop Permissive

   The cooling tower pump stop permissive is not a safety-related component and a test capability will not be provided in the Control Room.

<u>Turbine Control Panel Differentiation between Lighted Pushbuttons and Indicators</u>

DLC's justification for not changing the existing turbine control panel to enhance the identification of lighted control pushbuttons and indicator to better enable the operator to recognize the difference between the two was not accepted by the NRC. DLC indicated that the operators are trained to recognize that indicating lights are back lit by a red and a green indicating light meaning open or closed respectively and control push buttons are back lit by one color only. An illustration is provided below.

Indicator		Pushbutton Control
GV-1 OPEN	Red	GV-1 OPEN
GV-1 CLOSE	Green	

Additionally, two or more operator actions are required to activate the pushbutton controls. The turbine control must be placed in the manual control mode and a reference load must be set. Depression of the pushbutton will then activate the valves to the required load. Operator observation of the load change to the previously set reference load will indicate proper valve actuation. These controls are not fast acting and do not require a rapid response by the operator and, therefore, an inadvertent depression of an indicator light rather than the pushbutton control will result in no observed change by the operator. A further check by the operator of the device being depressed will indicate whether an indicator or a pushbutton control is being depressed by observing the method of backlighting. For the reasons presented above, further differentiation between lighted indicators and pushbutton controls on the Turbine Control Panel is not necessary.

Steam Generator Nomenclature

All nameplates which reference the steam generators refer to a standard nomenclature SG 21A, SG 21B, and SG 21C.

During DLC's review of meter faceplates which resulted in the resolution to HED 2BA4-2502, a decision was made to eliminate the reference to equipment identification numbers for those faceplates which required replacement. If the nomenclature on a faceplate referenced a steam generator and was not consistent with the designation indicated above, a faceplate change was required. All faceplates have been reviewed and replacement requests in the form of Maintenance Work Requests (MWRs) have been initiated to replace the faceplates prior to start-up following the first refueling outage. At this time, the following nine indicators still reference the three steam generators as SG 1A, SG 1B and SG 1C.

Steam Generator Level Set Point

2MSS-FI478	SG 1A
2MSS-FI488	SG 1B
2MSS-FI498	SG 1C

Steam Generator Flow Indication

2MSS-FI474, 475	SG 1A
2MSS-FI484, 485	SG 1B
2MSS-FI494, 495	SG 1C

Upon completion of the MWRs associated with these 9 faceplates, the steam generator nomenclature inconsistencies on the control board will be eliminated.

The NRC has requested more information and clarification regarding concerns which were identified during their February 11 and 12, 1986 audit of the CRDR and subsequently addressed by DLC in the Supplemental Summary Report. DLC's response on the hierarchical labeling and HED resolution tracking issues is provided below.

Hierarchical Labeling

The layout of the BV-2 control boards is not conducive to an ideal hierarchical labeling scheme as defined in NUREG 0700. The control switch spacing on the benchboard allows approximately 3/4 of an inch clearance between the control switch and the indicating lights making application of varying letter sizes for a hierarchical scheme impractical from a legibility standpoint.

The vertical board indicator tags can only be 1 1/2 inches wide and 3/4 of an inch high in many locations due to the space restrictions determined by the location of adjacent controls and indicators. As on the benchboard a hierarchical labeling scheme is impractical in many locations due to space restrictions and from a legibility standpoint.

In addition to the space restrictions, the arrangement of many indicators on the vertical board is determined by the emergency power source and their location relative to associated benchboard controls. Therefore, although a logical control board arrangement has been accomplished, adjacent indicators may not be functionally related, in some cases due to required separation criteria, and consequently do not lend themselves to an ideal hierarchical labeling scheme.

For the reasons presented above DLC indicated in the DCRDR-SSR that hierarchical labels were used "where possible" and in conjunction with functional demarcation.

System related functional demarcation applies a color coded system identification label that is located within or adjacent to the corresponding demarcation. The DLC Plant Identification Guidelines and a sample photograph which were included in the DCRDR-SSR as Attachments 4.1 and 4.2 respectively provide a description of control board demarcation. This color coded system identification label has lettering which is 3/4 of an inch in height and is considered to be a "Major label" per NUREG 0700 Guideline 6.6.1.2.a(1).

Although many adjacent indicators on the vertical board are not functionally related and cannot use any further hierarchical labeling, subordinate labels per NUREG 0700 Guideline 6.6.1.2.a(2) have been applied to associated adjacent indicators. These subordinate labels utilize lettering which is 3/16 of an inch in height.

As a final note every control board component is individually labeled using lettering which is 1/8 of an inch in height and in accordance with NUREG 0700 guideline 6.6.1.2.a(3).

HED Resolution Tracking - Clarification

Section 2.3.2.E of Appendix S, the Technical Evaluation Report requested clarification of 8 HEDs identified in Table 4.4 of the DCRDR-SSR. The following discussion provides the requested information.

2VA6-2010 - Replacement of the meter scaleplates in question has been completed. Verified - December 17, 1987

2***-1105, 1107, 1108, 1116 - Application of hierarchical labeling has been completed. The preceding discussion in response to the NRC concern addressed in Section 2.3.2A of Appendix S provides a more comprehensive description of the hierarchical labeling and demarcation scheme. Verification - December 17, 1987.

2BA4-2502 - The resolution to this HED was to make the drum counter consistent with BV-1. The drum counters on BV-1 do not have a decimal point or comma to separate the digits, therefore, no separation of characters is required on the BV-2 drum counters.

2***-2213 and 2220 - The two HEDs inadvertently appeared in two places because the HEDs in Table 4.4 were grouped by change category (e.g. labeling, procedure, equipment). Each HED has two parts to the resolution.

1. Labeling - Application of normal zones and setpoints to the meter scales has been completed in accordance with the CRISM methodology provided to the NRC in DCRDR-SSR Attachment 4.2. Verification - July 7, 1987.

2. Procedures - The setpoints have been revised to the most conservative readable value. This change was completed prior to the application of the normal zones and setpoints and verification was completed on December 7, 1987.

The HED Resolution Tracking Document Table 4.4 will be revised and included in DLC's submittal of the DCRDR Second Supplemental Summary Report. Additionally, those HEDs identified in Table 5.1 which require some type of corrective action to implement the resolution have been added to Table 4.4 and included as an Attachment to this report. The HED Resolution Tracking Document will be maintained and updated and also included in DCRDR SSR-2.

2CIC-5225 - DLC has re-assessed the application of color meaning to the Safety Parameter Display System (SPDS) and has decided to establish consistency between computer systems. Green will be substituted for yellow on the SPDS where yellow is used to depict normal conditions. Additionally, yellow will be substituted for magenta where magenta is used to depict suspect (manual, poor, bad) values. Revision 1 to HED 2CIC-5225 has been generated and approved to reflect this change which is scheduled to be implemented prior to start-up following the first refueling outage.

HED 2V**-2014 documented various scaleplate discrepancies associated with Westinghouse Type VX-252 vertical meters. An evaluation of all VX-252 meter scaleplates has been conducted and replacement of the scaleplates and/or meters is in progress. A total of 447 meters were identified on the main control board of which 279 were determined to require replacement for various reasons.

a. Lettering size too small to be readable

b. Scale multipliers

c. Improper scale range

d. Inconsistency between scale units and procedures

e. Scaleplate-meter pointer incompatibility

As of the date of this report 176 scaleplates/meters have been replaced leaving 103 which require and are scheduled for replacement prior to start-up following the BV-2 first refueling outage. The remaining scaleplates/meters are Category II as priority was given to resolution of the Category I scaleplate discrepancies.

The DCRDR HED Resolution Tracking Document has been updated to reflect the HED clarifications provided above. Additionally, this document will be maintained and periodically revised to reflect HED Resolution Status Updates. The HEDs which were generated during the second phase of the DCRDR which required a Control Room or procedure change have been added to Table 4.4 and a copy of the updated document is attached for your review.

In response to SSER-6 Section 18.2, DLC will generate HEDs to document the results of the NRC human factors evaluation conducted during the February 1987 SPDS Audit. These HEDs will be included in DLC's submittal of the DCRDR Second Supplemental Summary Report.

A final DCRDR related issue concerns the NRC Operational Readiness Assessment Team Inspection Report 50-412/87-56 observation of numerous lighted annunciators. The DCRDR Supplemental Summary Report indicated in Table 3.3 on page 3-12 that the BVPS-2 annunciator satisfied NUREG 0700 guideline 6.3.3.2.e. At the time of the survey DLC believed that the annunciator design was such that a "dark board" concept was a reality, however, at the time of the survey the plant was not operating. In response to the NRC observation, DLC provided a description of a program in existence at BVPS-2 to reduce the number of unnecessary alarms in the Control Room in a submittal dated December 15, 1987.

Table 3.3 of the DCRDR SSR will be revised and included in the Second Supplemental Summary Report and an HED will be generated to document the condition.

A T T A C H M E N T

HED RESOLUTION TRACKING DOCUMENTED

TABLE 4.4

NOTES: 1. "BV-2 1R" in schedule column refers to a schedule3d completion date of prior to startup following the first BVPS-2 refueling outage.

2. The abbreviations used in panel section beginning with 2CIC-5102 refer to the following computer systems.

- PCS-Plant Computer System
- ERF/SPDS - Emergency Response Facility/Safety Parameter Display System
- PSMS - Plant Safety Monitoring System
- DRMS - Digital Radiation Monitoring System

DCRDR HED RESOLUTION TRACKING DOCUMENT

TABLE 4.4

HED NO.	PANEL SECTION	ITEMS	IMPL	VERIFIED	SCHEDULE	DESCRIPTION
2**-1201A	BA-2/3	640, 644	Yes	12/02/86	N/A	Position of controllers exchanged to arrange Steam Gen. A-B-C
2***-1201b	BA-4	714, 715, 716 722, 729, 730 731	Yes	12/02/86	N/A	Rearranged switches
2***-1201d	BA-4	709, 710, 711 717, 979	Yes	12/02/86	N/A	Rearranged switches
2***-1201g	BC-2	AFW ISOL Valve HICs	Yes	12/02/86	N/A	MCB Controls rearranged to Match ESP Order L to R SG-A, B, C
2***-2005	MCR	MCR Clock	Yes	12/17/87	N/A	Control Room clock installed
2*C*-2217	BC-3	Synch Meters 3A & 3B	Yes	12/02/86	N/A	Change scale and delete 0-26kv
2AB*2017	ASP	Clock	Yes	12/17/87	N/A	Clock added to wall in ASP Area IRNPNL will not be added, no wires
2R**-3403	BB-2 BC-3	335 170	Yes	12/02/86	N/A	Push button conform pull to start push to stop
2BB2-3301	BB-2	329B	Yes	12/02/86	N/A	Rod control reverse in - out operation
2ES-1001	ESP N/A	Clock	Yes	12/17/87	N/A	Clock added to wall in ESP Area
2ES2-3002	ESP-2	207-210	Yes	12/02/86	N/A	Rearranged switches
2ES4-3023 Rev. 1	ESP-4	Switches	Yes	12/02/86	N/A	Transfer switches normal OT-2's "J" handles not used. Rev. 1 to HED included in Appendix A

TABLE 4.4

HED NO.	PANEL SECTION	ITEMS	IMPL	VERIFIED	SCHEDULE	DESCRIPTION
2V**-2014	Vertical Board	Various	No		BV-2 1R	As of 01/22/88. 447 vertical meters identified on MCB. 279 require replacement. 176 complete. 103 Cat II remaining require replacement
2VA6-2010	VA-6	879 A-C	Yes	12/17/87	N/A	Meter scales have been replaced
2VA9-2043	VA-9	86313	Yes	12/02/86	N/A	Replaced with 0-1 gpm recorder
2VB6-2404	VB-6	488	Yes	07/07/87	N/A	Label reworked for green pen - Tref, red pen - Tave
2VC6-2402	VC-6	281	Yes	12/02/86	N/A	Scale now reads 0-100%
2VC2-2012 Rev. 1	VC-6	273A, 273B	Yes	07/07/87	N/A	Consistency between procedures, indicators and computer has been established
2BB1-3026	BB-1	344, 347, 360 361	Yes	12/04/86	N/A	Block switch rearrangement Intermediate Source
2VC5-2405	VC-6	276	Yes	12/02/86	N/A	Scale graduations changed to progress by 5
2BB*-3015 Rev. 1	BB2	352A, 354A	Yes	12/02/86	N/A	Installed guard on switches Revision to HED
2***-1101	BA1-3	571, 616, 627	Yes	07/07/87	N/A	Demarcation and labeling applied to distinguish fill and drain valve
2***-1103	All	- - -	Yes	07/07/87	N/A	Hierarchical labeling completed. Discussion provided in Response to SSER-6.
2***-1105	All	- - -	Yes	12/17/87	N/A	Hierarchical labeling has been completed. Discussion of methodology provided in Response to SSER-6
2***-1107	All	- - -	Yes	12/17/87	N/A	Functionally related color coded lines of demarcation have been installed. Description in Plant Ident. Guidelines (SSR Attachment 4.1)

TABLE 4.4

HED NO.	PANEL SECTION	ITEMS	IMPL	VERIFIED	SCHEDULE	DESCRIPTION
2***-1108	All	- - -	Yes	12/17/87	N/A	Functionally related color coded lines of demarcation have been installed. Description in Plant Ident. Guidelines (SSR Attachment 4.1)
2***-1116	All	- - -	Yes	12/17/87	N/A	Component emergency positions have been identified per HED and Plant Indent. Guidelines (SSR Attachment 4.1) Color coded plastic "top hats"
2***-1201f	VA-5, 6, 8 BB-1, BC-5, 6	PAM Sets I & II	Yes	07/07/87	N/A	PAM demarcation completed
2***-3002	BC-2	789, 792	Yes	07/07/87	N/A	SLI switches demarcated, trains identified on labels, procedure has been modified
2AB*-1121	ASP	- - -	Yes	07/07/87	N/A	Hierarchical labeling discussion and plant identification guidelines applicable to ASP. Installation complete
2VC6-2008	VC-6	920, 921	Yes	07/07/87	N/A	The meters have been functionally enclosed with lines of demarcation
2***-2213	All	Indicators	Yes	12/17/87	N/A	Normal zones and setpoints have been applied to meters Setpoints have been conservatively rounded to the nearest readable value. See SSR Attachment 4.2 CRISM
2***-2220	All	Indicators	Yes	12/17/87	N/A	Normal zones and setpoints have been applied to meters Setpoints have been conservatively rounded to the nearest readable value. See SSR Attachment 4.2 CRISM
2***-1109	Various	Various	Yes	12/02/86	N/A	Row and column axes labeled on status panels
2***-1111	Labels	Text	Yes	12/02/86	N/A	Standard abbrev/acronyms in Chap 48 have been applied to developement of nameplate engraving list
2***-1113	Labels	Controls Displays	Yes	12/04/86	N/A	Standard abbreviations/acronyms in Chapter 48 Procedures have been reviewed for consistency

DCRDR HED RESOLUTION TRACKING DOCUMENT

TABLE 4.4

HED NO.	PANEL SECTION	ITEMS	IMPL	VERIFIED	SCHEDULE	DESCRIPTION
2***-1115	BA-2	1501, 1502 406 196, 198, 166	Yes	12/04/86	N/A	1) Chemical injection pump 2) QS Chem Add pump 3) OCB
2***-1117	All	Auto-Man Controllers	Yes	Labels Installed 12/15/86	N/A	"Open" and "Closed" indication added.
2ES1-1119	ESP-1	1085, 111T	Yes	12/02/86	N/A	Name plate to identify associated controls added.
2B**-1104	Bench Board	Various Indicators	Yes	12/02/86	N/A	Labels installed above indicators. Plant identification guidelines. See Attachment 4.1
2B**-2302	VC-6	Legend Lights	Yes	07/07/87	N/A	Engraving on status panel labels have been centered.
2BA4-2502	BA4	720, 733, 991 992	No	No Change Required	N/A	Resolution is to maintain consistency with BV-1. BV-1 drum counter has no decimal or comma, therefore, no change is required.
2ES*-1118	ESP	Labels	Yes	12/02/86	N/A	Labels above components per plant identification guidelines. See Attachment 4.1
2ES*-1120	ESP	303, 304	Yes	07/07/87	N/A	Train designation has been added to each label for emergency power. Placement in lower left hand corner.
2V**-1112	Annunciator	Tile Engraving	Yes	07/07/87	N/A	Abbreviations Standards in OM Chap. 48 applied to tiles. Tiles installed.
2VA9-2406	VA-9	864A, B	Yes	07/07/87	N/A	Recorder point labels have been reviewed and changed.
2BB1-2215	BB-1	325	Yes	12/02/86	N/A	PRZR Level Control Channel Selector for Item 325
2***-3006	N/A	21AC-DRY21	Yes	12/03/86	N/A	Procedure revised for local control E-0, 38, ES-1.1 5, E-3, 11

TABLE 4.4

HED NO.	PANEL SECTION	ITEMS	IMPL	VERIFIED	SCHEDULE	DESCRIPTION
2AB*3207	ASP	Control Switches	Yes	12/02/86	N/A	Reference to targets eliminated in AOP 2.33.1.
2B**-3206	Bench Board B	Controllers	Yes	12/03/86	N/A	E-1 Attachment 1, S/G blowdown throttle locally. No pull to lock for 4KV-ACB
2BA*-3014	BA	2MSS*PK101, A, B, C	Yes	12/02/86	N/A	Label added to control board provides demand % set-point vs. press PSIG
2ES2-3208	ES-2	2CHS*P22A, B	Yes	12/02/86	N/A	Eliminated ref. to "fast" speed AOP-2.33.1 pp 3/14
2BAH-3205	BA-4	2CHS*P22A, B	Yes	12/03/86	N/A	Same as 2ES2-3208 (MCB)
2ES*-1001	ESP	- - - -	Yes	07/07/87 1, 2, 3 No Change	N/A	1) FW Pump Control, 2) FW flow indication, 3) T average = (TH & TC)/2, 4) Clock and Item 3 provide cooldown rate
2VC6-2218	VC-6	Aux Feed	Yes	12/03/86	N/A	Procedure now reads "Maintain Flow of 100 gpm Minimum"
2***-3018	MCB	Various Controls	Yes	07/07/87	N/A	Nameplate list has been revised. Procedures have been made consistent with position label
2V**-2115 Rev. 1	Annunciator	Tile Windows	N/A	N/A	N/A	Reassessed by CRDR Core Team & DLC Management. Documented in Revision 1 to HED and Sections 3.3 and 4.0 of DCRDR-SSR.
2V**-2108 Rev. 1	Annunciator	Tile Windows	Yes	07/07/87	N/A	Tile legends have been reviewed and messages have been made consistent with standard list OM Chapter 48 HED Revision 1.
2V**-2106	Annunciator	Tile Windows	Yes	07/07/87	N/A	Tile message enhancement has been addressed in prioritization and review per 2V**-2108.
2***-1106	All	Label	N/A	N/A	N/A	Continuation of annunciator review found labels readable. RT concurs Reference HED 2***-1123. No change required.

TABLE 4.4

HED NO.	PANEL SECTION	ITEMS	IMPL	VERIFIED	SCHEDULE	DESCRIPTION
2B**-1402	Benchboard	Various Controls	N/A	N/A	N/A	RT review concurs with management disposition. Administrative Controls preclude incidental operation. No change required.
2V**-1405	Vertical Board	Recorders	N/A	N/A	N/A	RT review concurs with management disposition. Recorders used for trending purposes only. Information available on other indication.
2***-2002	MCB	Meters and Recorders	N/A	N/A	N/A	RT review of actual meters indicates that meterfaces are readable. Black lettering on light background. No change required.
2V**-2006	Vertical Board	Recorders	N/A	N/A	N/A	RT concurs with management disposition. Parameters on trend recorder label and readily readable. No change.
2VCB-2011	Vertical Board	Emergency Generator	N/A	N/A	N/A	Scale compatability has been verified to be consistent with range required and procedures.
2V**-2112	Vertical Board	Annunciator	N/A	N/A	N/A	RT concurs with management disposition annunciator tiles are easily readable. No change required.
2***-2121	Vertical Board	Annunciator	N/A	N/A	N/A	Annunciator alarm permissives. RT concurs with management color code and label not required.
2V**-2202	Vertical Board	Annunciator	N/A	N/A	N/A	RT concurs with management. No change required. Recorders used for trending at startup, shutdown, post-accident.
2***-2204	MCB	Indicators	N/A	N/A	N/A	RT concurs with management. Negative sign not necessary. Only used to determine criticality during startup.
2V**-2211	Vertical Board	Indication	N/A	N/A	N/A	RT concurs with management. Streamline "Delta P" indication not necessary. Information available from existing indication.

TABLE 4.4

HED NO.	PANEL SECTION	ITEMS	IMPL	VERIFIED	SCHEDULE	DESCRIPTION
2VAS-2216	MCB	Contmt Press	N/A	N/A	N/A	RT concurs with management that pressure indicators in question should read 0-15 psia subatmospheric pressure indication.
2***-2305	MCB	Status Lights	N/A	N/A	N/A	Status light legends 3 lines per label messages to be reviewed abbrev/acronym standards. RT concurs. No change required.
2BC*-3008	Local	Control & Indication	N/A	N/A	N/A	RT concurs with management. Manual valves referenced in HED not in procedure.
2***-3012	MCB	Source Range Detector	N/A	N/A	N/A	RT concurs with management. Operator verification by available indication.
2BB1-3013 Rev. 1	BB-1	2RCS-MOV-535, 536, 537	Yes	01/06/88	N/A	Procedure checked and contains a note on the use of arm/block switch during depressurization. HED has been revised.
2BV4-3016	BV-4	2CHS-HVC-168	N/A	N/A	N/A	Label reads RCP seal injection flow control valve. No action required, RT concurs with wording.
2BA*-3017	Bench Board Section A	289 and 310	N/A	N/A	N/A	RT concurs with management disposition location is proper.
2***-3101	MCB	Hagan Controllers	N/A	N/A	N/A	RT concurs all Hagans are demand and operators are trained as such.
2***-3204	Bench Board	Controllers	Yes	01/06/87 Revise HED	06/01/88	Labels are located below controller to ensure readability. HED will be revised.
2***-2219	MCB	RPM Meters	N/A	N/A	N/A	RT concurs with management. Operation verfiable by flow indication and steam supply valves open.
2CIC-5102	PCS	Dialogue	Yes	02/27/87	N/A	A list of prompts has been included in Operator's Manual.

TABLE 4.4

HED NO.	PANEL SECTION	ITEMS	IMPL	VERIFIED	SCHEDULE	DESCRIPTION
2CIC-5103	PCS	Dialogue	Yes	10/08/86	N/A	Standardized list of abbreviatios/acronyms finalized and applied to output text.
2CIC-5107	PCS	Labels	No	- - -	BV-2 1R	Display/key label consistency is being established.
2CIC-5109	PCS	Display Data	Yes	07/02/87	N/A	Software has been revised so displayed values reflect data accuracy.
2CIC-5111	PCS	Oper. Manual	Yes	07/07/87	N/A	Operator Manual is written and has been human factor reviewed by CRDR CT member.
2CIC-5114	PCS	Display Maint	Yes	07/07/87	N/A	Technicians are available and admin controls established for periodic CRT adjustment.
2CIC-5117	PCS	Display	Yes	07/07/87	N/A	Data descriptions have been revised applying abbreviation standards to maintain character separation.
2CIC-5121	PCS	Display	Yes	03/23/87	N/A	Consistent display title high-lighting has been established.
2CIC-5124	PCS	Printer Maint	Yes	07/07/87	N/A	Technicians are available and admin cortrols established for printer maintenance.
2CIC-5126	PCS	Dialogue	Yes	07/07/87	N/A	Standard abbreviation list applied and consistency established between annunciator and printer.
2CIC-5129	PCS	Display Maint	Yes	07/13/87	N/A	Maintenance procedure provides for periodic CRT adjustment to ensure legibility.
2CIC-5132	PCS	Security	Yes	07/07/87	N/A	Operator instructions and admin. controls established for reset control operation.

TABLE 4.4

HED NO.	PANEL SECTION	ITEMS	IMPL	VERIFIED	SCHEDULE	DESCRIPTION
2CIC-5138	PCS	Displays	Yes	07/07/87	N/A	P&ID color application revision completed. Astrisks appear only for yellow data.
2CIC-5139	PCS	Displays	Yes	07/07/87	N/A	P&ID text labels have been changed from yellow to white.
2V**-5141	PCS Annunc.	Display Annunc.	Yes	03/23/87	N/A	Alarm-red and clear-green messages have been separated on CRT. Red above - green below.
2V**-5142	PCS Annunc.	Display Annunc.	Yes	03/23/87	N/A	Application of standard abbreviations has accomplished columnar data alignment.
2V**-5144	PCS Annunc.	Display Annunc.	Yes	07/07/87	N/A	Application of standard abbreviations has accomplished annunc. tile - CRT message consistency.
2CIC-5201	ERF/SPDS	Label	No	- - -	- - -	Currently being re-evaluated.
2CIC-5202	ERF/SPDS	Dialogue	Yes	07/07/87	N/A	A list of prompts has been included in the Operators Manual.
2CIC-5208	ERF/SPDS	Label Display	Yes	01/11/88	N/A	Consistency has been established between function key labels and display titles.
2CIC-5209	ERF/SPDS	Display Data	Yes	07/07/87	N/A	Software has been revised so displayed values reflect data accuracy.
2CIC-5211	ERF/SPDS	Operator Manual	Yes	07/07/87	N/A	Hard copy index of access codes has been added to Operators Manual.
2CIC-5219	ERF/SPDS	Cursor	Yes	07/07/87	N/A	Cursor operation has been modified to provide more logical operation.
2CIC-5220 Rev. 1	ERF/SPDS	Display	N/A	N/A	N/A	Revision 1 to HED determined no change required. Submitted to NRC 04/30/87, 2NRC-7-100. Reference 2CIC-5122, consistent with PCS.

TABLE 4.4

HED NO.	PANEL SECTION	ITEMS	IMPL	VERIFIED	SCHEDULE	DESCRIPTION
2CIC-5225 Rev. 1	SPDS	Color Application	No	- - -	*BV-2 1R	Green to depict normal conditions. Yellow to depict suspect conditions.
2CIC-5302 Rev. 1	PSMS	Display Abbrev.	N/A	N/A	N/A	Revised disposition to no change required. Submitted to NRC on 04/30/87, 2NRC-7-100.
2CIC-5304 Rev. 1	PSMS	Label Display	N/A	N/A	N/A	Revised disposition to no change required. Submitted to NRC on 04/30/87, 2NRC-7-100.
2CIC-5308 Rev. 1	PSMS	Display Data	N/A	N/A	N/A	Revised disposition to no change required. Submitted to NRC on 04/30/87, 2NRC-7-100.
2CIC-5501	DRMS	Display Flicker	Yes	01/11/88	N/A	Display flicker has been eliminated by CRT adjustment.
2CIC-5503	DRMS	Display Maint	Yes	07/07/87	N/A	Technicians are available for periodic adjustment.
2CIC-5513	DRMS	High Chair	Yes	07/07/87	N/A	A high chair has been provided in the Control Room for use at DRMS sit/stand console.
2MCR-2018	Miscell	Setpoint Unit	No	- - -	BV-2 1R	Review for setpoint unit consistency of meters vs. procedures vs. computer complete 07/07/87.
2V**-2122	Annunc PCS CRT	Alarm Clear	Yes	12/17/87	N/A	The CRT message flashes green for each cleared point. Acknowledgement by operator required.
2V**-2124	Annunc PCS CRT	Alarm Location	Yes	07/07/87	N/A	Location of CRT messages has been revised for proximity to related annunciator window.
2V**-2125	Annunc Tiles	Tile Engraving	Yes	07/07/87	N/A	Problem tiles have been replaced. Consistency of engraving established.
2V**-2126	Annunc Tiles	Tile Brightness	Yes	07/07/87	N/A	Bulb replacement has been completed and problem resolved.

*BV-2 1R - Prior to start up following BV-2 first refueling outage.

TABLE 4.4

HED NO.	PANEL SECTION	ITEMS	IMPL	VERIFIED	SCHEDULE	DESCRIPTION
2V**-2127	Annunc Tile	Panel Location	Yes	07/07/87	N/A	Improperly located tile has been moved to appropriate Panel A2.
2***-1122	Labels	Spelling	Yes	07/07/87	N/A	All labels reviewed and incorrect labels have been replaced.
2***-1123	Vertical Board	Label Char. Size	Yes	07/07/87	N/A	Hierarchical labeling has been completed to accommodate readability.
2V**-2407	Chart Recorders	Paper Compatible	Yes	12/17/87	N/A	Paper compatibility has been established. Admin controls identify correct paper for recorders.
2MCR-1701	Chart Recorder	Paper Supply	Yes	07/07/87	N/A	Storage area has been provided reorder levels have been established.
2MCR-1702	Control Room Equipment	Spare Parts Control	Yes	07/07/87	N/A	Coding of spare parts by recorder has been established.
2MCR-1703	Control Room Equipment	Spare Parts Control	Yes	07/07/87	N/A	Methodology for coding spare parts and recorder levels has been established.
2MCR-1705 Rev. 1	Single Indicator Lights	Test Capability	N/A	N/A	N/A	Justification for not testing single filament/single bulb lights has been established.