Florida Power
CORPORATION

September 28, 1988
3F0988-17

U. S. Nuclear Regulatory Commission
Attention: Document Control Desk
Washington, D.C. 20555

Subject: Crystal River Unit 3
Docket No. 50-302
Operating License No. DPR-72
ATWS Implementation (10 CFR 50.62)

Dear Sir:

Florida Power Corporation (FPC) is submitting the attached "Review Summary" as the plant-specific submittal requested in the ATWS Safety Evaluation Report (SER) provided in the NRC letter "NRC Evaluation of BWOG Generic Report- "Design Requirements For DSS and AMSAC" and ATWS Implementation at Crystal River Unit 3" dated June 30, 1988. The installation of an ATWS System at Crystal River Unit 3 (CR-3) will be based upon the design described in B&W Document 47-1159091-00, "Design Requirements for Diverse Scram System (DSS) and ATWS Mitigation System Actuation Circuitry (AMSAC)" and the additional guidance described in the SER.

The submittal describes the CR-3 conceptual design and is composed of two parts which provide a detailed discussion of how the CR-3 installation will meet each of the areas discussed in the SER. The first part is a "Review Summary" which ties the SER paragraphs, the ATWS Conceptual Design Document, and the B&W Document 47-1159091-00 together. The second part is the ATWS Conceptual Design Document prepared by B&W for FPC which utilized B&W Document 47-1159091-00 as the basis. FPC found this approach to be the best way to describe the CR-3 ATWS design in order to expedite the NRC's design review so that the ATWS System can be installed during the next refueling outage.

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The issue of diverse power supplies discussed in SER Section 5.6 was the subject of an August 17, 1988 NRC/BWOG meeting. In this meeting and in a subsequent NRC letter (G. Holahan (NRC) to L. C. Stalter (BWOG)) dated September 7, 1988 which provided the meeting minutes, the NRC described three options acceptable to the NRC for the licensees to resolve the power supply independence issue. FPC is selecting Option 1 which will have the DSS/AMSAC logic circuitry powered via a non-vital 480 volt bus. This design incorporates an independent (i.e., not associated with the RTS), non - Class 1E battery, rectifier, and charger that will provide 120 VAC to the ATWS logic circuitry for a limited time on a loss of offsite power. FPC considers the adoption of Option 1 as a satisfactory means to achieve the regulatory staff position for resolving SER Section 5.6.

FPC commits to install the DSS/AMSAC system during Refuel VII which is scheduled to begin in September 1989. This commitment is subject to the following: The August 17th meeting minutes state that the NRC will review the plant specific "conceptual" design package within 30 days and approve or disapprove with comments, the proposed design. This action is to be followed by the issuance of a safety evaluation upon receipt of a more detailed design package. FPC is proceeding on the detailed design package now. The 30 day review schedule for this "conceptual" design submittal will end on November 1, 1988. To complete the ATWS installation in the next refueling outage, FPC must have approval of the "conceptual" design package by December 1, 1988.

If serious issue differences prevent approval of the package by this date, FPC will have to delay implementation. While we do not expect this to occur, FPC believes, as did the NRC in its letter dated March 11, 1987, that "... a sound and thorough engineering approach to resolve ATWS concerns is preferred to a rushed effort forced by schedular constraints ...".

The Supplementary Information provided with the final ATWS rule (49FR26036) states "... the Commission has concluded that a reduction in the frequency of challenges to plant safety systems should be a prime goal of each licensee, and the Commission believes that ATWS risk reductions can also be achieved by reducing the much larger frequency of transients which call for the reactor protection system to operate. Challenges to the reactor protection system may arise from such things as: Unreliable components, inadequate post-trip reviews, testing, and tolerance of inadequate or degraded control systems." FPC considers that the BWOG Safety and Performance Improvement Program (SPIP) will continue to assure that CR-3 meets the intent and the spirit of the ATWS rule in this regard.

While this submittal commits FPC to install an ATWS System in accordance with 10 CFR 50.62, FPC does not consider that it has waived the provisions of 10 CFR 50.109 for any ATWS issues pending acceptance of FPC's design. FPC has participated as a member of the BWOG ATWS Committee in the development of the ATWS design for B&W plants; however, this submittal does not in any manner commit other B&W Owners Group licensees to similar design solutions.

FPC and the B&W Owners have aggressively pursued resolution of this generic issue. The process has not been as smooth as it could have been in our view, but we anticipate that the efforts expended will be a valuable lesson learned as we face other generic issues. FPC and the B&W Owners have demonstrated our willingness to go beyond minimal regulatory requirements in the development and implementation of SPIP. We are just as committed to the effective implementation of the letter and intent of 10CFR50.109 and will continue to speak up when we believe Staff positions exceed regulatory requirements. We are confident that NRC management generally shares this commitment.

Sincerely,

Walter S. Wilgus

Walter S. Wilgus
Vice-President, Nuclear Operations

WSW/JWT/sdr

Attachments

xc: Regional Administrator, Region II

Senior Resident Inspector

REVIEW SUMMARY

The purpose of this Review Summary is to provide the paragraph to paragraph relationship between the SER, the BWOG generic ATWS Design, and the FPC Conceptual Design. Where the ATWS Conceptual Design will require revision because of the SER, additional clarification will be provided in this Review Summary along with, or instead of, providing a reference to the applicable FPC Conceptual Design section. A copy of the FPC Conceptual Design document is attached with this submittal.

5.1 Diversity From Existing RPS

B&W Document 47-1159091-00, the generic design requirements for DSS and AMSAC, describes this requirement in Paragraph 3.A.3.

The FPC Conceptual Design describes the equipment to be used in Section I.C. Project Design Basis - Identification of Major Equipment, Paragraphs 1 through 6. Specific components are listed in the project Bill of Material (BOM), Attachment 6.

The following clarifications of the Conceptual Design are necessary in this area.

Paragraph I.C.1 The transmitters that will be used to supply the wide range R.C. Pressure signals to the DSS logic are those used to provide the RG 1.97 indication in the Control Room. These transmitters are Rosemount p/n 1153GD9 and are tag numbers RC-158-PT and RC-159-PT. The RTS pressure transmitters are Rosemount p/n 1154GP9RA and are tag numbers RC-3A-PT1, RC-3A-PT2, RC-3B-PT1 and RC-3B-PT2. There are no interconnections between the RG 1.97 and RTS signal loops. The RG 1.97 signals use Foxboro Model Spec 200 signal conditioning equipment (Bill of Material Item No. 17) while the RTS signals use Bailey Model 880 equipment for signal conditioning.

Paragraph I.C.2 The Gamma Metrics channels provide the RG 1.97 neutron flux signals in the Control Room. The Gamma Metrics channels use fission chambers and are tag numbers NI-014-NE and NI-15-NE. The RTS channels use uncompensated ion chambers, Westinghouse p/n WL 23636B, and are tag numbers NI-005-A13, NI-006-B13, NI-007-C15 and NI-008-D15. There are no interconnections between the RG 1.97 and RTS signal loops.

Paragraph I.C.3 The DSS and AMSAC logic circuitry will not be located in the NNI cabinets as described in the

FPC Conceptual Design; but will use NNI type equipment, Bailey Meter Co. Model 820 (Bill of Material Items 1 through 4). The exact location of this equipment will be determined during the detail design process. The RTS logic circuitry is Bailey Meter Co. Model 880. Model 820 equipment uses a -10 to +10 volt signal range while Model 880 equipment uses a 0 to +10 volt signal range. The MFW flow signals used by AMSAC to determine loss of main feedwater will be supplied from the NNI cabinets as described in the Conceptual Design Document through Bailey Meter Co. Model 820 buffer modules. The sources of these signals are transmitter tag numbers SP-008A-dPT1, SP-008A-dPT2, SP-008B-dPT1 and SP-008B-dPT2, all of which are Rosemount p/n 1152DP6E22PB. The RTS does not use Main Feedwater Flow as an input signal and the Emergency Feedwater Initiation and Control (EFIC) System uses Main Feedwater Pump control oil pressure to determine loss of main feedwater. The EFIC system inputs are from ASCO pressure switches, tag numbers FW-320-PS through FW-327-PS. These pressure switches use Bailey Model 880 logic circuitry in the RTS cabinets to provide a Main Feed Pumps tripped input to EFIC. There are no interconnections between the EFIC (RTS) and NNI signal loops.

Paragraph I.C.4 The existing relays used by the RTS to interrupt the SCR gate circuits are Potter & Brumfield p/n KHU17A11-120VAC. The Conceptual Design identifies Potter & Brumfield R10-E1 120VAC relays, (Bill of Material item #47) as those to be used for DSS. However, FPC plans on incorporating a relay from a different manufacturer in the detail design.

Paragraph I.C.5 The existing relay used to provide a turbine trip from the RTS system is a G. E. Model HEA. The Conceptual Design identifies Potter & Brumfield PRDA11AJA relays (Bill of Material Item No. 10) as those to be used for providing the turbine trip input from AMSAC. Potter & Brumfield KRP11AG120 relays which are available in FPC stock may be substituted for the PRDA11AJA relays.

Paragraph I.C.6 As described in the discussion for Paragraph I.C.3 above the DSS/AMSAC logic circuitry will not be located in the NNI cabinets. Therefore, the AMSAC trip inputs to the EFIC system will be from a location remote to the NNI cabinets. These trip inputs will be in parallel with the existing EFIC trip inputs from the logic circuitry resident in the RTS cabinets. This RTS logic circuitry determines loss of Main Feedwater from pressure switches monitoring Main Feedpump control oil pressure. The RTS and AMSAC logic trip inputs will both use the circuitry resident in the EFIC system cabinets to start the Emergency Feedwater Pumps and control Emergency Feedwater flow by modulating the Emergency Feedwater control valves.

5.2 Electrical Independence from Existing RPS

B&W Document 47-1159091-00, the generic design requirements for DSS and AMSAC, describes this requirement in Paragraph 3.A.4.

(Ref: Attached FPC Power Distribution Sketch) The FPC Conceptual Design Document specifies the system interfaces and interface requirements in section I.G. The transmitters, associated signal conditioners and signal isolators used to provide the RCS Pressure and Neutron Flux signals to the DSS/AMSAC logic are powered from the same vital busses used to provide power to the RTS, but are electrically isolated from the RTS circuitry by individual Class 1E circuit breakers.

The transmitters, associated signal conditioners and signal isolators used to provide the Feedwater Flow signals to the AMSAC logic are powered from non-vital busses which are supplied from offsite power. However, an automatic transfer capability to the battery backed vital busses used for the RTS is provided for this equipment to protect against the loss of offsite power.

The 1E to non-1E interfaces specified in Section I.G. will have signal isolation provided by existing 1E isolators previously installed for RG 1.97 and EFIC (REF: Attachment 4 sheet 4 of 12 and Attachment 5 sheet 7 of 7 of the Conceptual Design Document).

Electrical isolation of the DSS/AMSAC logic circuitry will be provided by powering this circuitry via a dedicated Uninterruptable Power Supply (UPS) which in turn will be connected to a bus powered from off-site power.

Electrical isolation of the final actuation relays for DSS will be provided by powering these relays from the same off-site power bus which supplies Control Rod Drive Power. (REF: Attachment 4 sheets 9 and 10 of the Conceptual Design Document).

Electrical isolation of the final actuation relays for the turbine trip portion of AMSAC will be by powering these relays from the dedicated UPS for the DSS/AMSAC logic.

Electrical isolation of the final actuation device EFIC for the Emergency Feedwater initiation portion of AMSAC is not required. However, EFIC circuitry is isolated from RTS circuitry by Class 1E circuit breakers.

The SER suggests that the plant-specific submittal should use Appendix A of the SER to provide information that the existing 1E to non-1E electrical isolators will function under the maximum worst case fault conditions. The CR-3 ATWS system will utilize the same 1E to non-1E isolation devices which are in use for isolating the Emergency Feedwater Initiation and Control System (EFIC) and the Regulatory Guide 1.97 equipment. FPC believes that this commitment, which is consistent with the licensing basis for CR-3, fully satisfies the requirements of 10CFR50.62.

5.3 Physical Separation from Existing RPS

B&W Document 47-1159091-00, the generic design requirements for DSS and AMSAC, describes this requirement in Paragraph 3.A.5.

The FPC Conceptual Design specifies the locations of the major components of the ATWS system in Section I.C. As evidenced by this section none of the ATWS equipment will be located in the RTS cabinets. (NOTE: As discussed above under 5.1, the functions described in Paragraph I.C.3 of the Conceptual Design as being provided by the NNI cabinets are being moved to a remote location separate from both the RTS and NNI equipment).

5.4 Environmental Qualifications

B&W Document 47-1159091-00, the generic design requirements for DSS and AMSAC, describes this requirement in Paragraph 3.A.6 and 3.A.7.

The FPC Conceptual Design provides environmental specifications for the locations of ATWS equipment in Section I.N. and in Item 3 of the Design Input Record. Although the ATWS logic circuitry is being moved from the NNI cabinets on the 145 ft. level of the Control Complex, it will remain within the Control complex boundaries and should be subject to essentially the same environment as specified for Zone #43 elevation 108". The FPC design will address seismic concerns.

5.5 Quality Assurance for Test, Maintenance, and Surveillance

The ATWS System will be controlled in accordance with the general requirements of the FPC Quality Program in a manner similar to that currently employed for other non-safety-related systems and equipment. Testing, maintenance, and any specified surveillances will be conducted and controlled in accordance with approved procedures. Collectively, the controls applied to the ATWS System will meet or exceed the "Quality Assurance Guidance for ATWS Equipment That Is Not Safety-Related" as set forth in Generic Letter 85-06.

5.6 Safety-Related (1E) Power Supplies

B&W Document 47-1159091-00, the generic design requirements for DSS and AMSAC, discusses this requirement in Paragraph 3.A.8.

The FPC Conceptual Design specifies the Power Sources for ATWS in Section I.I. Since the ATWS logic circuitry is being relocated outside of the NNI cabinets to facilitate incorporation of a UPS for power in the design, the statement in Paragraph I.I.3, AMSAC, that power will be provided from both vital and regulating sources is no longer correct. This circuitry will be powered via the UPS from a bus supplied by off-site power. The UPS will consist of a battery, inverter, and charger; and will provide 120 VAC power to the ATWS logic circuitry for a limited period of time on loss of off-site power.

The specific power sources for the different ATWS circuit components as shown in the schematic diagrams in Attachments 4 and 5 to the Conceptual Design Document are as follows: (REF: Attached FPC Power Distribution Sketch)

1. Wide range RC Pressure as supplied from 1E isolation modules in the Remote Shutdown Auxiliary Equipment (RSAE) Cabinets and shown on Sheets 3, 4 and 5 of Attachment 4. These transmitters and associated Remote Shutdown modules are powered from the station vital busses which are supplied via battery backed inverters.

2. Neutron Flux signals (Reactor Power Level) as supplied from the 1E Gamma Metrics signal conditioning equipment installed in the 480 volt switchgear rooms and shown on Sheets 1, 2 and 4 of Attachment 5. The Gamma Metrics equipment is

powered from the station vital busses which are supplied via battery-backed inverters.

3. Feedwater Flow signals as supplied from the Bailey Meter Co. Model 820 equipment in the NNI cabinets and shown on Sheets 1, 2 and 4 of Attachment 5. The Bailey NNI equipment is powered from an off-site power bus and a non-vital battery-backed bus, but it has automatic transfer capability to station vital busses on loss of off-site power.

4. ATWS Logic Circuitry as shown on Sheets 3, 5 and 7 of Attachment 4 and Sheets 1, 2, 3, 4 and 5 of Attachment 5 will be powered via the dedicated UPS installed for ATWS which in turn will be connected to a bus supplied by off-site power.

5. The turbine trip relay coils shown on sheet 6 of Attachment 5 will be powered via the dedicated UPS.

6. The EFIC input circuitry shown on sheet 7 of Attachment 5 is powered from the station vital busses which are supplied via battery backed inverters.

7. The DSS test and trip circuitry resident in the CRD power supply cabinets as shown on sheets 9, 10 and 12 of Attachment 4 will be supplied from the off-site power bus which also supplies power to the Control Rod Drive Mechanisms (CRDM). This power will be connected to terminals TB10-1 and TB10-2 shown on Sheet 9 of Attachment 4 and to terminals TB9-1 and TB9-2 shown on Sheet 10 of Attachment 4.

5.7 <u>Testability at Power</u>

B&W Document 47-1159091-00, the generic design requirements for DSS and AMSAC, discusses this requirement in Paragraph 3.A.9.

The FPC Conceptual Design shows the logical operation of the DSS circuitry including testing provisions on Sheets 1 and 2 of Attachment 4. The schematic of the circuitry implementing this logic is shown on Sheets 3, 5, 7, 9 and 10 of Attachment 4. The one line diagram of the AMSAC logic is shown on Sheet 1 of Attachment 5 with the supporting schematics shown on Sheets 2 through 7 of Attachment 5.

Testability at power is provided by designing both DSS and AMSAC systems to be 2 out of 2 systems and incorporating provisions to disable the second channel when placing a channel in the test mode.

The preliminary outline for a procedure for functionally testing DSS and AMSAC is provided at the back of the FPC Conceptual Design Document.

5.8 Inadvertent Actuation

B&W Document 47-1159091-00, the generic design requirements for DSS and AMSAC, discusses this requirement in Paragraph 3.A.10.

The FPC Conceptual Design provides for maximum protection from inadvertent actuation by designing a 2 out of 2 system which operates in the energize to trip mode. This is shown by Sheet 2 of Attachment 4 for DSS and by Sheets 2, 3, 4 and 5 of Attachment 5 for AMSAC.

5.9 Maintenance Bypasses

B&W Document 47-1159091-00, the generic design requirements for DSS and AMSAC, discusses this requirement in Paragraph 3.B.6.

The FPC Conceptual Design provides for disabling of a channel for maintenance, testing, repair or calibration by placing the other channel in Test as shown on Sheet 2 of Attachment 4 and Sheet 1 of Attachment 5 of the FPC Conceptual Design. Administrative controls will be provided to require placing a DSS or AMSAC channel in test in order to provide Control Room annunciation anytime work is to be performed which would disable operation of the other channel. These administrative controls will also prohibit personnel from working on more than one DSS or AMSAC channel simultaneously.

5.10 Operating Bypasses

B&W Document 47-1159091-00, the generic design requirements for DSS and AMSAC, discusses this requirement in Paragraph 3.B.8.

The FPC Conceptual Design provides for automatically bypassing the AMSAC logic below a Reactor Power level of 25%. This provision is shown by the operation of H/L module 27/NF on Sheets 2, 3, 4 and 5 of Attachment 5 of the FPC Conceptual Design. The DSS system does not require an operational bypass and none is provided as evidenced by Sheets 1 and 2 of Attachment 4 of the FPC Conceptual Design.

5.11 Indication of Bypasses

B&W Document 47-1159091-00, the generic design requirements for DSS and AMSAC, discusses this requirement in Paragraph 3.B.7.

The FPC Conceptual Design provides for indication of DSS and AMSAC status including maintenance bypasses in the Control Room by providing inputs to the Sequence of Events Recorder (SER). These inputs are those labeled "To SER" on Sheets 9 and 10 of Attachment 4 and Sheets 3 and 5 of Attachment 5 of the FPC Conceptual Design.

The SER displays alarm status to the operators via a color CRT mounted above the center of the Main Control Board. Annunciation of the status of the Operational bypass of Main Feedwater Flow based on Reactor Power is not provided for in the FPC Conceptual Design. Annunciation of these Operational bypasses will be provided in the Detail Design by connecting a spare set of contacts from modules 27/NF at locations 5-4-13 and 6-3-14, as shown on Sheets 2 and 4 of Attachment 5 of the FPC Conceptual Design, to the SER.

5.12 Means for Bypassing

This item is not specifically addressed in B&W Document 47-1159091-00, the generic design requirements for DSS and AMSAC.

The FPC Conceptual Design provides bypass capability for maintenance and testing by means of installed test modules. The layout and schematics of this installed bypass capability are shown on Sheets 5, 7, 9 and 10 of Attachment 4 for DSS and on Sheets 2, 3, 4 and 5 of Attachment 5 for AMSAC. The Test Outline attached to the back of the FPC Conceptual Design specifies use of these installed test modules.

5.13 Completion of Protective Action

B&W Document 47-1159091-00, the generic design requirements for DSS and AMSAC, discusses this requirement in Paragraph 3.B.5

The FPC Conceptual Design provides lock up of the DSS trip functions as described in Paragraph I.H.2.b and shown on Sheets 9 and 10 of Attachment 4. Reset of the DSS trip function requires manual operator action and is accomplished using the Reset switch S1 shown on Sheets 9 and 10 of Attachment 4.

Lock-up of the AMSAC trip function has not been incorporated in the FPC Conceptual Design since it was not identified as a requirement in B&W Document 47-1159091-00. Lock-up capability of the AMSAC trip function requiring manual operator action to reset will be provided in the Detail Design.

5.14 Information Readout

This item is not specifically addressed in B&W Document 47-1159091-00, the generic design requirements for DSS and AMSAC.

The FPC Conceptual Design provides indication of DSS and AMSAC system status both remotely by means of the SER and locally on the DSS and AMSAC test modules by means of indicating lights. These indications are shown on Sheets 5, 7, 9 and 10 of Attachment 4 for DSS and on Sheets 3 and 5 of Attachment 5 for AMSAC.

5.15 Safety-Related Interfaces

B&W Document 47-1159091-00, the generic design requirements for DSS and AMSAC discusses this requirement in Paragraph 3.A.1.

The FPC Conceptual Design lists the required interfaces for ATWS in Section I.G. Since the FPC ATWS design does not interface with existing RTS and ESFAS protection systems, there is no possibility of compromising the safety criteria for these systems.

5.16 Technical Specifications

This SER section requests that Technical Specifications be adopted on surveillance and testing of the DSS and AMSAC systems. FPC's position is that any potential technical specifications must be addressed as a part of the Technical Specification Improvement Program (TSIP). It was acknowledged by the NRC during the August 17th meeting that this position was reasonable in light of the continuing TSIP discussions between the NRC and the industry. FPC can not speak for the entire industry; but as the B&W lead plant for TSIP and a principal contributor to the AIF and NUMARC efforts, we must note that such features fall well outside the intent and letter of the TSIP Policy Statement. FPC will test, maintain, and perform surveillances as described in our response to SER Section 5.5.

6.5 Input Parameters

B&W Document 47-1159091-00, the generic design requirements for DSS and AMSAC discusses this requirement in paragraphs 3.B.2 and 3.B.9.

The FPC Conceptual Design provides for DSS actuation based on wide range (0-3000 psig) RC pressure and AMSAC actuation based on Main Feedwater flow. These inputs are shown on sheets 5 and 7 of Attachment 4 and on Sheets 2 and 4 of Attachment 5 of the FPC Conceptual Design. The DSS setpoint is specified in Paragraph I.H.2.c as 2450 ± 25 psig and will be implemented using adjustable signal monitor modules 59 DRT shown on Sheets 5 and 7 of Attachment 4 of the FPC Conceptual Design.

The AMSAC setpoint is specified in Paragraph I.H.3.b of the FPC Conceptual Design as that representative of complete (100%) loss of feedwater flow. Since zero flow is not an operationally realistic setpoint, the actual setpoint will be at some flow level greater than zero and will be determined during the detail design process. AMSAC will actuate, provided Reactor Power is greater than 25%, when both Main Feedwater flow signals are below this minimum flow level. This actuation will be implemented using adjustable signal monitor module 27/FWF (location 6-3-13) as shown on Sheet 4 and 5 of Attachment 5 of the FPC Conceptual Design.