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Davis-Besse Nuclear Power Station SP 1105.04

Unit No. 1

SP 1105.04

Integrated Control System Operating Procedure

Record of Approval and Changes

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1. PURPOSE

1.1 To detail the procedure necessary to operate the integrated control system (ICS) cabinets and operating stations in the following modes:

Energizing the ICS	Section 4
Operation of the Manual and Hand/Auto Selector Stations	Section 5
Deenergizing the ICS	Section 6
Deenergizing the ICS Fans	Section 7
Abnormal Operating Conditions-ICS In Tracking Mode	Section 8

Description: The ICS receives analog and digital inputs from various sources within the main electrical generation cycle. From these sources the ICS sends signals to the turbine, control rods, steam generator feedwater control, and steam dump equipment to meet the electrical demand placed on it by the operator without exceeding various limiting conditions.

Since the details of operating the turbine, reactor, etc., are covered in the appropriate system, this procedure only addresses itself to the ICS Instrumentation. A detailed description is given in Volume 4 (DWG. 01-0173-01 B&W) Bailey Meter Instruction manual. Setpoints and limits are given in PP 1101.02, "NSSS Setpoints".

2. PRECAUTIONS AND LIMITATIONS

9| 2.1 Safety Tagging Procedures, AD 1803.00 and the TED General Safety Manual are to be followed at all times.

2.2 The ICS must be energized for plant operation.

2.3 When energizing the cabinets, turn the power source on first (AC) and then the power supplies (DC) in the cabinets. Follow the reverse order when deenergizing the cabinets.

2.4 Prior to placing the Diamond Power rod control station in AUTO, the following conditions must be met.

2.4.1 The ICS must be energized.

2.4.2 No large neutron error may exist (error +/-1 percent inhibits transfer to auto control).

2.5 When operating any of the ICS control stations in hand, do not exceed any of the setpoints of PP 1101.01, "NSSS Limits and Precautions".

2.6 Do not exceed the unit load and rate of load change limits for the operating conditions specified in PP 1102.04, "Power Operation".

2.7 Match demand and measured values for any given control parameter, as closely as possible, before switching any ICS control module from HAND to AUTO. This is done to facilitate bumpless transfer to AUTO control.

2.8 When operating with one or more ICS control stations in MANUAL, care must be exercised to avoid introducing process upsets which could not be compensated for by the controller in MANUAL, and would thereby exceed built-in limits, resulting in a reactor trip.

5 2.9 For operation below 5% power and with RCS temperature greater than 180°F, the main feedwater nozzles must be supplied with a continuous minimum feedwater flow of >32 GPM to reduce thermal cycling.

For operation less than 190°F RCS temperature, the main feedwater nozzles must be submerged. SG level should be maintained between 97 and 99 percent on the operating range level indication to ensure that the nozzles are submerged. Wide range level indication should be used to ensure that OTSG level remains below the steam outlet connection.

With RCS temperature greater than 190°F OTSG level will normally be 250" ± 50" on the full range, or 35% to 70% on the operate range except as required by plant startup, shutdown or trip recovery procedures. At all times above 200°F RCS temperature (Modes 1-4) OTSG must be maintained between 18 and 348 inches.

(TS 3.4.5)

2.10 If a control station is in MANUAL, the operator must provide the necessary control station inputs for unit runback should plant limits be exceeded.

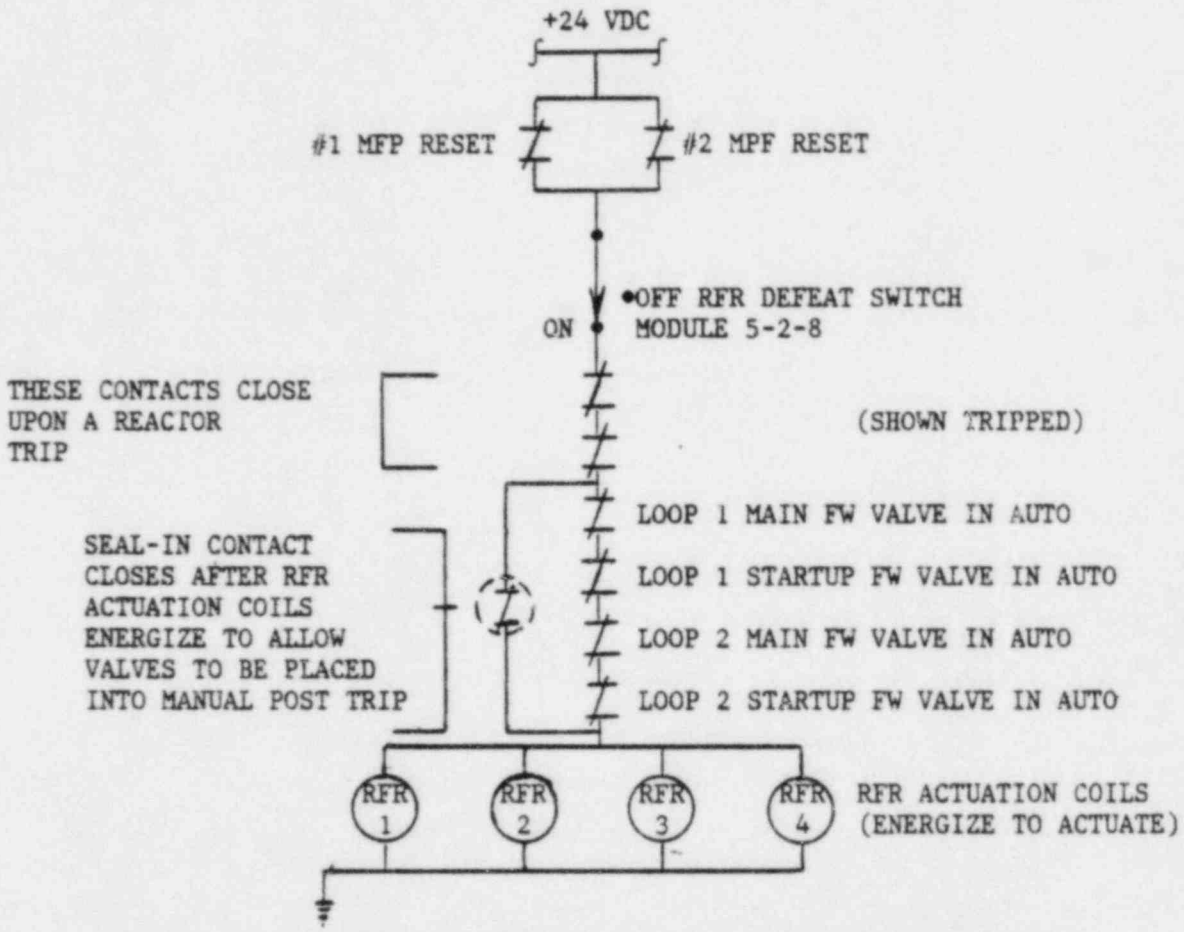
NOTE: In effect, the operator must perform those functions that would otherwise be performed automatically.

2.11 The ICS does not necessarily go into the tracking mode with feedwater pumps or valves in MANUAL. If the remainder of the ICS is in automatic feedwater control may become difficult during load changes. Except for plant startup and shutdown, do not put more than one feedwater pump or more than valves of one loop in manual unless absolutely necessary.

2.12 If control of a main feedwater valve is in MANUAL, control of the corresponding startup feedwater valve should also be in MANUAL.

2.13 While in manual control at either the reactor demand control station or the rod control station, do not exceed 100 percent indicated neutron power.

7 2.14 RAPID FEEDWATER REDUCTION (RFR) INTERLOCKS



To initiate rapid feedwater reduction the following must be met:

1. At least one MFP not tripped.
2. All control valves in auto.
3. RFR defeat switch in "ON" position.
4. Reactor trip.

NOTE: After RFR has been initiated, any or all of the main or startup control valves may be placed in manual without a loss of RFR control to the valves in "Auto".

9 Proper actuation of RFR is indicated by both main FW valves going shut and both startup FW valves closing to the point that allows OTSG level to decrease until low level limits are reached. The MFP's will target their speed to approximately 4600 RPM as indicated on the control room panel.

The RFR will remain turned on (Activated) for approximately 2.5 minutes or until low level limits (both loops) have been reached, whichever occurs first.

NOTE: If low level limits have been reached on one loop and not the other while RFR is still activated, the loop reaching low level limits will go on level control and the other will remain on RFR until low level limits have been obtained or 2.5 minutes have expired at which time it will go on level control.

3. REFERENCES

3.1 Instruction Book for Integrated Control and Non-Nuclear Instrumentation Systems, B&W Dwg. Nos: 01-0172-01, 01-0173-01, 01-0174-01, 01-0186-01, 01-0187-01 and Toledo Edison Dwgs. 26206-26228.

3.2 NSSS Setpoints, PP 1101.02.

3.3 Instrument AC, SP 1107.09.

3.4 Drawing E6, Revision 2, 250/125V DC and Instrumentation AC One-Line Diagram - Bechtel.

3.5 USAR - Section 7.7.

3.6 SP 1102.02, Plant Startup Procedure.

3.7 SP 1102.04, Power Operations Procedure.

4. ENERGIZING THE ICS

4.1 Prerequisites

_____4.1.1 No maintenance is being performed on the ICS which would preclude system operation.

_____4.1.2 Uninterruptible instrumentation distribution panel YBU is energized, and circuit breaker YBU 50, in uninterruptible instrumentation distribution panel YBU, ICS X power is open. (See SP 1107.09)

_____4.1.3 Uninterruptible instrumentation distribution panel YAU is energized, and circuit breaker YAU 25, is uninterruptible

instrumentation distribution panel YAU, ICS Y power is open (See SP 1107.09).

____4.1.4 Regulated instrumentation distribution panel YBR is energized, and circuit breaker YBR 13 in panel YBR, ICS power to fan is open. (See SP 1107.09)

____4.1.5 The Shift Supervisor has given permission to energize the ICS cabinets.

CAUTION: Do not close the disconnect breakers to the ICS, NI, and RPS, and SFAS cabinets, prior to closing the main vital bus disconnect breakers. The combined inrush of current for all three of these loads may damage the vital bus inverter. Any two of these loads may be started simultaneously with no concern due to inrush effects.

4.2 Procedure

____4.2.1 Close circuit breaker YBR 13 in the regulated instrument distribution panel YBR.

____4.2.2 Close circuit breaker YBU 50 in the uninterruptible instrumentation distribution panel YBU.

____4.2.3 Close circuit breaker YAU 25 in the uninterruptible instrumentation panel YAU.

____4.2.4 Turn on the four (4) DC power supplies, Cabinet 2, row 1, 2, 3, & 4 (front).

5 ____4.2.5 Close the AC breakers S1 and S2 in Cabinet 1, row 0 (X and Y power respectively (front)).

____4.2.6 Close fan switches in ICS Cabinet 2, row 0 (rear). Check fan is running.

____4.2.7 Verify that all power supply monitor (PSM) lamps are on (Cab. 2, Row 6, Pos. 2), indicating that all DC supplies and DC busses are operating normally. If any of the PSM lamps are not on, determine cause of difficulty and rectify it before proceeding.

____4.2.8 Verify fuse panel for blown fuse indications. If any fuses are blown, determine cause of fault and rectify, or contact I&C personnel to see if further proceedings are permissable with the existing conditions.

____4.2.9 Allow ICS to warm up and stabilize for one (1) hour before proceeding with unit startup.

Section 4 completed by_____Date_____

5. OPERATION OF THE MANUAL AND HAND/AUTO SELECTOR STATIONS

5.1 Prerequisites

____5.1.1 The ICS cabinets are energized in accordance with Section 4.

5.2 Operation of the Manual Stations

____5.2.1 ICS 2-MS "MAX LIMIT - MW" - This manual selector allows the selection on the maximum unit load to be maintained by adjusting the setpoint knob to indicated load limit desired. The setpoint reading is in percent load (0-100%).

____5.2.2 ICS 3-MS "MIN LIMIT - MW" - This manual selector allows the selection of the lowest load to be maintained, by adjusting the knob of the setpoint to the indicated load limit desired. The setpoint indication is in percent load (0-100%).

4 ____5.2.3 ICS 4-MS "RATE OF CHANGE-MW/MIN" - This manual selector allows the operator to select the rate of change of the load. It has an adjustable rate of 0.25% to 10% of full load, thus enabling the operator to select the rate of change, plus the length of time for change. However, the ICS does limit power change rates over some portions of the load range regardless of the load rate setting.

With the load frequency control (LFC) in auto, the pulses from the rate of load change help to determine ULD (Unit Load Demand) and are integrated to the target load.

The "rate of load change" is taken from the operator during the limiting condition and becomes a function of the condition that exists.

____5.2.4 ICS 10-MS "TURB HEADER PRESS" - This manual station is used by the operator to establish the turbine header setpoint. The setpoint scale engraving is 0-100% which corresponds to 6-12 (psig x 100) on the measured varible scale. The setpoint scale is 6 psi per percent which means that

$$870 \text{ psi} = \frac{(870 \text{ psi} \quad 600 \text{ psi})}{6 \text{ psi}/\%} = 45\% \text{ on the setpoint indicator.}$$

The turbine header pressure is compared to this setpoint as modified by megawatt error, and the error drives a pulser, these pulses are sent to the turbine governor valve motor control, and integrated into a speed setpoint. With the turbine control station and the steam generator/reactor control station (ICS-13-MCS) in auto (integrated mode) the setpoint is modified by a megawatt or frequency error.

5.3 Operation of the Hand/Auto Stations

5.3.1 Operation of the following hand/auto stations is as follows:

_____1. The light below the pushbutton indicates the mode of operation, white - manual, red - auto.

_____2. To change from Hand to Auto depress and hold the auto (red) pushbutton until the red light comes on and the white light goes off.

_____3. To change from Auto to Hand depress and hold the manual (white) pushbutton until the white light comes on and the red light goes off.

NOTE: Balancing is not required for these stations as the circuitry always maintains the system balanced (auto-balance). If a "bump" is experienced there is a problem.

_____4. To change output when in the hand mode hold the raise-lower toggle in the appropriate position (raise or lower) until the desired output is obtained and then release the toggle.

_____5.3.2 ICS 1-MCS " UNIT MASTER" - This hand/auto station establishes the load at which the unit is to operate. The scale reading (0-100%) indicates 0-1000 MW_e.

In manual the operator establishes the load at which the unit is to operate. In "auto" the demand is controlled by dispatch system which is established by load frequency control (LFC). In the tracking mode, the unit establishes the demand and the control station becomes interlocked, preventing both manual and auto control. Both manual and auto lights will be on in the tracking mode.

5.3.3 ICS 12A & B-MCS "TURB BYPASS VALVES 2(1) - This hand/auto station controls the turbine Loop 2 (1) bypass valves, which permit the unit to operate at low steam flow. The bypass valves serve four (4) functions: Control at low loads, high pressure relief, high pressure relief proportionally operated to steam generator pressure, and pressure control after a reactor trip.

In the manual mode, the operator regulates steam flow through the bypass valves. In auto, and after the turbine synchronizes and steam flow increases, the bypass valves close as the turbine valves open. The bypass valves are used after the turbine is in auto as a pressure relief at the setpoint plus 50 psi when 8| demand is greater than 17%.

NOTE: In the auto mode the TBV's and atmospheric exhaust valves control on individual steam generator pressures until the main turbine stop valves are opened.

In "meas var", with the station in either hand or auto, the scale (0-100%) indicates the header pressure error after modification by the bias, output of IC 8| 18.8 (IC 18.10). A 50 psi bias is added when 17% load and all BPV's are closed, when reactor tripped, steam 8| generator outlet pressure error is modified by 145 psi bias. During normal operation with actual header pressure of 870 psi, the TBPV's assume overpressure control at 920 psi. Since actual pressure is 870 psig the meter wll indicate 8.3% low (8.3% x 6 psi/% equals 50 psi) to desired setpoint because the modified setpoint equals desired setpoint (870 psig) plus 50 psi.

$$X\%_{\text{on meter}} = \frac{\text{actual press - desired setpoint - bias}}{6\ \text{psi}/\%}$$

where: 870 psi - desired setpoint
8| 50 psi - bias when 17% or 100% load
145 psi - bias when reactor tripped

During normal operation 0% on meter + 620 psi, 41.7% on meter equals 870 psi. 50% = 920 psi and 100% = 1220 psi. During a reactor trip 0% on meter = 715 psi, 50% = 1015 psi and 100% = 1315 psi.

In "pos", whether in hand or auto, the scale (0-100%) indicates the loop 2(1) demand signal to the turbine bypass valve actuators, input to IC 21.8 (IC 21.10), where 0% = full close and 100% = full open.

8| NOTE: Under certain conditions; condenser vacuum low (17" HgA), loss of circulating water, or either MSIV closed (≥10% closed), the bypass valves are closed (override) and the atmospheric exhaust valves (loop 1 and 2) are controlled in the same manner as the bypass valves usually are.

____5.3.4 ICS 13-MCS "STM GEN/REACTOR" - This hand/auto station controls the generation of the turbine or the turbine pressure, depending on the position of the control station. In the manual position it will establish the turbine generation (turbine control station in auto). In the auto position it is responsible for turbine pressure control (turbine control station in manual).

8| When in AUTO, and the turbine control station is in manual, with switch in "Pos", the scale reading (0-100%) indicates the modified ULD signal (0-100%) or (0-1000 MWe) input to IC 8.11 and IC 10.11, which is corrected for turbine throttle pressure and long term turbine throttle pressure discrepancies. When in Auto and the turbine control station is in Auto, with the switch in "POS", the scale reading (0-100%) indicates the modified ULD signal (0-100%) or (0-1000 MWe) input to IC 8.11 and IC 10.11 which is corrected for turbine throttle pressure and long term megawatt error discrepancies.

When in hand, with switch in "POS", the scale reading (0-100%) indicates the manual ULD signal (0-100%) or (0-1000 MWe).

In "meas var", whether in hand or auto, the scale (0-100%) indicates the unit load demand (0-100%) or (0-1000 MWe) input to IC 10.6, 8.6.

____5.3.5 ICS 20-MCS "REACTOR DEMAND" - This hand/auto station controls the neutron power demand. In the manual mode this station establishes neutron demand which is maintained by the control rods. In the auto mode neutron power demand becomes a function of reactor demand (reactor demand is a function of steam generator/reactor demand) and modified by T_{ave} error and FW X-limits.

In auto it is also limited between 20% and 103% of full power. The setpoint indicator is in degrees Fahrenheit (520-620°F) and it is set to maintain the reactor average temperature (T_{ave}) with reactor demand station in auto along with control rod drive station (CRD Diamond Power) in auto.

The scale reading (0-100%) in "meas var", whether in hand or auto, indicates the reactor average temperature (i.e., 0% on scale = 520°F, 50% = 570°F, and 100% = 620°F. The scale reading in "pos", in the hand/auto mode with the CRD station in auto, indicates the manual/auto reactor demand signal (0-100% of 111% reactor power). An 80% reactor demand equals 100% neutron power. When the reactor demand and CRD stations are in manual the scale reading (0-100%) indicates (0-125%) neutron power demand, input to RC 15.9.

With the reactor demand and control rod drive station (Diamond Power) in manual, the reactor demand station output tracks the neutron power signal. Therefore, a zero neutron error is maintained and with a CRD transfer to auto, the ICS will not initiate an immediate rod change.

____5.3.6 ICS 30-MCS "STM GEN LOAD RATIO (ΔTC)" - This hand/auto station controls the Tc ratioing circuit of feedwater flow to the steam generators. In manual, through proportional action, it maintains the Tc error close to the Tc setpoint set by the operator, and through a slow calibrated integral corrects the ratio for small and long term changes in the steam generators. In auto it anticipates a Tc error as a result of reactor coolant pump loss. The difference between the reactor coolant flow in the two (2) loops in proportionally applied to the ratio control.

In "meas var", whether in hand or auto, the scale reading (0-100%) or (±10°F) indicates the reactor inlet temperature error, output of FW 9.1. When the scale indicates 50%, the Tc ratio is less than the setpoint. When the scale reads 50%, this means "0" error or that the Tc ratio is equal to the setpoint. When the scale reads 50%, the Tc ratio setpoint. In "pos", whether in hand or auto, the scale reading (0-100%) indicates the load ratio of loop FW temperatures, input to FW 9.8. When the scale is 50%, loop 2 Tc loop 1 Tc. When scale is 50% loop 2 Tc equals loop 1 Tc and when scale 50%, loop 2 Tc loop 1 Tc.

____5.3.7 ICS 32 A & B - MCS "FEEDWATER DEMAND 2(1)" - These hand/auto stations control the feedwater loops 2(A) and 1(B) demand. In manual, it controls the feedwater demand to the respective steam generator. In auto, it follows the feedwater loop demand. The loop demand can be varied by a high level limit (82.5% ops range), which decreases feedwater demand, a low level limit

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8| (35" start up level) which increases feedwater demand, or a BTU limit. If the BTU limit is less than the demand, it becomes the demand for the loop.

In manual, the scale reading (0-100%) in "meas var" indicates the error between the auto FW demand and the manual FW demand, i.e., if 50% manual FW demand auto FW demand, if equal to 50%. "0" error or FW demands are equal and if 50%, manual FW demand auto FW demand. In auto, the "meas var" indicates the auto FW demand, output of FW 7.6 (loop 2) and FW demands are equal. In "pos", whether in hand or auto, the scale reading (0-100% of 118% FW demand) indicates the loop FW demand, input to FW 14.6 (loop 2) and FW 14.10 (loop 1). i.e., if ICS 32A indicator 50% and ICS 32B indicator 50%, this indicates that the FWD loop 2 FWD loop 1, and vice versa.

NOTE: Approximately the first 15% of the loop demand modulates the startup valve from 0% to 100% open, and from 12% (80% open startup valve) to 100% loop demand modulates the loop main valve (0-100% open).

____5.3.8 ICS 33 A & B-MCS "STARTUP FW VALVE 2(1) - These hand/auto stations control the loop 2 and 1 startup FW valves respectively. In manual, it is the loop demand signal, and varies demand between 0% to approximately 15% of full flow (0-100% valve opening). In auto it follows the auto loop demand signal output of FW 21.3 (loop 2) and output of FW 21.12 (loop 1) respectively, between 0% to 15% of full flow (0-100% valve opening).

In hand operation the scale reading (0-100%) in "meas var" indicates the error between the auto startup FW valve demand and manual demand signal, i.e., if scale 50%, auto valve demand actual hand demand. If scale equals 50% then there is "0" error or auto valve demand equals actual demand and 50% auto valve demand actual hand demand. In auto operation, "meas var" indicates the difference across the analog memory FW 19.6B (loop 2) and FW 19.10B (loop 1) the startup valve loop demand, i.e., auto balance, which should read 50%. In auto or hand operation, "pos" indicates the startup FW valve demand signal (0-100% or full close to full open).

____5.3.9 ICS 35 A & B-MCS "MAIN FW VALVE 2(1)" - These hand/auto stations control the loop 2 and 1 main FW valves respectively. In manual it is the loop demand signal and varies loop demand between 15% (approximately) to

100% full flow. In auto, it follows the auto loop demand, output of FW 21.4 (loop 2) and FW 21.11 (loop 1), between 15% (approximately) to 100% of full flow.

When the startup FW valves are in auto the main FW valves are in hand, the scale reading (0-100%) in "meas var" indicates the error between the auto FW valve demand and the actual (hand) demand signal. When the startup FW valves are in hand and the main FW valves are in either auto or hand, "meas var" indicates the difference across the analog memory FW 19.6B (loop 2) and FW 19.10B (loop 1) respectively for level error. When the startup and main FW valves are both in auto the scale reading in "meas var" indicates the FW flow error, i.e., auto balance which should read 50%. The scale reading (0-100%) in "pos" indicates the main FW valve demand signal, full close to full open.

____5.3.10 ICS 36 A & B-MCS "MAIN FEEDPUMP 2(1) SPEED" - These hand/auto stations control the loop FW pump speed and maintain a minimum differential across the valve (44 psid). In manual it is the loop demand signal. In auto, it follows the modified total FW demand signal, output of FW 22.7 to (loop 2) and (loop 1). 8

The scale reading (0-100%) in "meas var", whether in hand or auto, indicates the square of the selected P error. If the scale indicates 50%, the P is less than the setpoint. If equal to 50%, the P is greater than the setpoint. In hand or auto, the scale reading (0-100%) in "pos" indicates the FW pump loop demand from FW 25.6 (loop 2) and FW 24.10 (loop 1).

NOTE: ICS-36B "MAIN FEEDPUMP 1 SPEED" hand/auto station is equipped with a bias signal, which allows the pump to be manually loaded in auto, thus characterizing the pump demand signal.

8 ____5.3.11 ICS 34 A & B-MCS "AUX FEEDPUMP 2(1) SPEED" NOTE: Operation in this mode is prohibited by a mechanical stop on the switch, since the ICS is not a safety related system. - These hand/auto stations control the speed of the auxiliary FW pumps. In manual this station can increase or decrease the auxiliary feedpump speed. In auto, it follows the monitored signals of conditions that exist, or otherwise are blocked.

Conditions that can exist are: loss of all four (4) reactor coolant pumps, auxiliary feedpumps start, and

8| the steam generators startup levels are maintained at approximately 44" through the output of FW 20.3 (loop 2) and FW 21.10 (loop 1). On a loss of both feedwater pumps, the auxiliary feedpumps start and the steam generators minimum startup level of approximately 30" is maintained by the output of FW 20.2 (loop 2) and FW 20.13 (loop 1).

The scale reading (0-100%) in "meas var", whether in hand or auto, indicates either OSTG startup level if four (4) RCP's are tripped or OSTG S/U level if both MFP's are tripped. i.e.,:

NOTE: In "meas var", this is an error signal to the Aux Feed Pump speed control which constitutes an indirect level measurement.

When 4 RCP's are tripped, ICS 34A indicator: 34% = 0" S/U Level, 50% = 40" S/U Level, 100% = 165" S/U Level

ICS 34B indicator: 34% = 0" S/U Level, 50% = 40" S/U Level, 100% = 165" S/U Level

When both MFP's are tripped, ICS 34 A & B indicators: 38% = 0" S/U Level, 50% = 30" S/U Level, 100% = 155" S/U Level. The scale reading (0-100%) in "pos", whether in hand or auto, indicates the OSTG S/U Level (0-100% or 0-250").

NOTE: Even through these hand/auto stations exist in the ICS, they will NOT be used to control the Auxiliary Feedwater Pumps. The Auxiliary Feedwater Pumps will only be controlled by Auto Essential or Manual as selected by the orange T-handle switches, HIS 520B and HIS 521B, on Control Room C5709.

____5.3.12 ICS 11 A & B-MCS "ATMOSPHERIC VENT VALVE 2(1)" These hand/auto stations are used to manually control the atmospheric vent valves. In Auto, the hand/auto station passes a vent signal from IC 24.7 Atmospheric Vent Valve 2 or IC 24.11 Atmospheric Valve 1. Upon a loss of condenser vacuum, circulating water or either MSIV closed, the inputs to the Atmospheric Vent Valves Hand/Auto stations are transferred to the outputs of IC 20.8, Atmospheric Vent Valve 2 and IC 20.10, Atmospheric Vent Valve 1. In manual, it generates the atmospheric vent valve demand signal.

In auto, the scale reading (0-100% in "MEAS VAR") indicates either the TBV demand (0-100% or full close

to full open) when the condenser is inoperable. In auto or hand, the scale reading (0-100%) in "POS" indicates the atmospheric exhaust valve demand signal (0-100%). In auto, the scale reading (0-100%) in "DEV." will indicate 50% since the demand signal is passed through the hand/auto station and the meter indicates the difference between the input and output of the station. In manual, the scale reading (0-100%) in "DEV." indicates the difference between the actual demand signal and the manual demand signal.

____5.3.13 PIC - RC2 Pressurizer Heaters

This hand/auto station controls the Group #1 SCR Heaters. When in hand or auto, the scale reading (0-100%) in "MEAS VAR" indicates the RCS pressure error signal. 0% on scale is 2055 psi RCS pressure, 50% is 2155 psi and 100% is 2255 psi. When in hand or auto, the scale reading (0-100%) in "POS" indicates the demand signal to the SCR's (0-100%) or 0-126 KW).

____5.3.14 LIC - RC14 Pressurizer Level

This hand/auto stations is used to establish the pressurizer level setpoint. The setpoint scale ingraving is 0" to 320" and is set at 200" (normal operating level). The temperature compensated pressurizer level is compared to the setpoint and a MU flow demand signal is generated by LI-RC14 (NNI 3-7-5) which is then applied to FY-MU32 (RC make up flow control). In hand, the scale reading (0-100%) in "MEAS VAR" indicates the auto demand signal to FV-MU32 (0-100% or full close to full open). In auto, the scale reading (0-100%) in "MEAS VAR" indicates the auto balance which should read 50% since it is indicating the difference between the auto flow demand signal and the output memory module (NNI 3-7-7) which is tracking the auto flow demand signal. In hand or auto, the scale reading (0-100%) in "POS" indicates the manual or auto demand signal to FV-MU32 (0-100%).

____5.3.15 FIC - MU19 RCP Seal Injection Flow

This hand/auto station is used to establish the RC pump seal injection flow setpoint. The setpoint scale engraving is 0-80 GPM and is set at 32-40 GPM (normal operating flow). The RCP seal injection flow, from FT-MU19, is compared to the setpoint and a RCP seal injection flow demand signal is generated by FIC-MU19 (NNI 4-9-12) which is then applied to FY-MU19-2 (RCP seal injection flow controller). In hand, the scale

reading (0-100%) in "MEAS VAR" indicates the auto demand signal to FV-MU19 (0-100% or full close to full open). In auto, the scale reading (0-100%) in "MEAS VAR" indicates the auto balance which should read 50% since it is indicating the difference between the auto flow demand signal and the output of memory module (NNI 4-9-14) which is tracking the auto flow demand signal. In hand or auto, the scale reading (0-100% in "POS") indicates the manual or auto flow demand signal to FV-MU19 (0-100% or full close to full open).

NOTE: When "Meas Var" is showing error:

High Error - operator decrease manual demand to eliminate error
Low Error - operator increase manual demand to eliminate error

6. DE-ENERGIZING THE ICS

6.1 Prerequisites

_____6.1.1 The reactor is in a shutdown condition and the feedwater system is shutdown.

_____6.1.2 Components which must be controlled to minimize process upsets after de-energizing the ICS should be placed in local manual operation, and set in condition which will allow process stability.

_____6.1.3 The Shift Supervisor has given permission to de-energize the ICS cabinets.

6.2 Procedure

_____6.2.1 Turn off and tag the DC power supply Cab 2, Row 1. Verify power supply positive lamp goes out.

_____6.2.2 Turn off and tag the DC power supply Cab 2, Row 2. Verify power supply negative lamp goes out.

_____6.2.3 Turn off and tag the DC power supply Cab 2, Row 3. Verify buss positive lamp goes out.

_____6.2.4 Turn off and tag the DC power supply Cab 2, Row . Verify that all power supply monitor (PSM) lamps are out (Cab 2, Row 6, Pos. 2) indicating that all DC supplies and DC busses are off.

_____6.2.5 Open and tag the AC breakers S1 and S2 in Cabinet 1, Row 0. (AC redundant supplies to DC power supplies Y & X power respectively).

_____6.2.6 Open and tag circuit breaker YAU 25 in the uninterruptible instrumentation panel "YAU".

_____6.2.7 Open and tag circuit breaker YAU 50 in the uninterruptible instrumentation panel "YAU".

_____6.2.8 Open and tag circuit breaker YBR 13 in the regulated instrument distribution panel "YBR".

Section 6 completed by_____Date_____

7. DE-ENERGIZING THE ICS CABINET FAN

7.1 Prerequisites

_____7.1.1 A condition exists which requires the ICS cabinet fan to be de-energized.

_____7.1.2 The Shift Supervisor has given permission to perform this section.

7.2 Procedure

_____7.2.1 Open the cabinet door on cabinet #2 (second from west end), front and rear.

_____7.2.2 Open and tag the fan switch in cabinet 2, row 0 (rear).

_____7.2.3 Open and tag the circuit breaker YBR 13 for "Y" power in regulated instrument distribution panel "YYBR".

_____7.2.4 Monitor cabinet temperature and install a portable fan, if temperatures get hot to the touch.

Section 7 completed by_____Date_____

8. ABNORMAL OPERATING CONDITIONS (ICS IN THE TRACKING MODE)

Tracking is defined as the mode of operation when, due to some abnormal NSSS condition, the unit is being limited in its production of megawatts. In order to maintain coordination of all control variables, the unit must track, or follow, that condition.

8.1 Prerequisites

Any one or more of the following conditions will cause the unit master to go into the tracking mode.

8.1.1 Reactor cross limit - difference between reactor power and reactor demand exceeds ±5 precent of full power.

8.1.2 Feedwater cross limit - feedwater demand exceeds feedwater flow by plus 5 percent.

8.1.3 Transfer of both feedwater loop demand control stations to manual.

8.1.4 Transfer of the diamond rod control station to manual.

8.1.5 Transfer of the reactor demand control station to manual.

8.1.6 Transfer of the reactor/steam generator control station to manual.

8.1.7 Transfer of the turbine control station to manual.

8.1.8 Tripping open of both turbine-generator output breakers.

8.1.9 Reactor tripped.

8.2 Procedure

8.2.1 Unit operating under reactor cross limit.

_____1. If the reactor power level, regardless of unit load demand, is changed to a point that the neutron power is greater than +5%, -10% of full power different from the neutron power demand, the feedwater control will respond to this change by increasing ordecreasing feedwater flow to be compatable with neutron power.

_____2. With both feedwater demand control stations in manual, this automatic control of feedwater flow will not function, and the operator must adjust feedwater flow as necessary to correspond with the neutron power.

8.2.2 Unit operating under feedwater cross limits.

_____1. If the feedwater flow, regardless of unit load demand is changed so that the feedwater flow is more than 5 percent of full flow below the feedwater demand, the reactor control will respond by decreasing neutron power automatically. An increase in feedwater flow of more than 5 percent of full flow above the feedwater demand will not automatically increase neutron power.

_____2. With the reactor control in manual at either the rod control staton or reactor demand control station, this automatic control of reactor power will not function, and the operator must adjust reactor power as necessary to correspond with feedwater flow.

8.2.3 Unit operating with both feedwater loop demand control stations in manual.

_____1. The unit load will respond to changes at either feedwater demand control station. The steam generator load ratio (delta Tc) control will be in manual and will remain in manual until one or both feedwater control station are placed in auto and transfer of delta Tc control to auto is initiated. While delta Tc control is in manual delta Tc should be monitored.

_____2. If a system upset occurs while both feedwater demand control stations are on manual, match the loop feedwater flows with the existing generated megawatts until a steady state condition exists.

NOTE 1: If, while controlling both loop feedwater demand control stations in hand, a reactor cross limit occurs, adjust the total feedwater flow to be compatable with reactor power.

NOTE 2: If a BTU limit occurs while in manual control of feedwater demand, reduce the feedwater demand until the BTU limiting condition just clears and investigate the reason for the limiting condition.

8.2.4 Unit operating with diamond rod control station or reactor demand control station in manual.

_____1. If the rod control station is in automatic, the reactor power may be controlled from the reactor demand station.

_____2. The reactor power may be controlled from the diamond rod control station with the reactor demand station in any mode.

_____3. The reactor power must be maintained consistent with feedwater flow.

_____4. The rod control station, if in manual, cannot be transferred to automatic if a neutron error greater than plus or minus 1.0 percent of full power exists. If the rod control station is in automatic, neutron error should be maintained less than 1.0 percent of full power by the ICS.

_____5. The rod control station should not be switched to auto unless Tave error is reduced to near zero.

NOTE: This precaution is necessary because, when either rod control or reactor demand control stations are on manual, feedwater controls Tave. When the reactor control stations are both switched to automatic the reactor assumes Tave control. If Tave is not balanced a process upset in both feedwater and reactor control is produced.

_____6. If a system upset occurs while the reactor demand control station or the rod control station is in manual, match the neutron power with the existing generated megawatts until a steady state condition exists.

NOTE: If, while controlling the reactor from either the reactor demand control station or the rod control station, a feedwater cross limit occurs, reduce reactor power to be compatible with the total feedwater flow.

8.2.5 Unit operating with reactor/steam generator control in manual.

_____1. This places the control in a turbine following mode where steam generation is under operator control and the turbine control (assuming it is in automatic) has responsibility for maintaining turbine header pressure. An increase in steam generation corresponds to an increase in turbine output because the turbine header pressure is maintained while steam flow rate is increased. Likewise, a reduction in steam generation will result in a reduction in turbine output.

_____2. The reactor and feedwater controls respond in parallel to manually-initiated load changes at the reactor/steam generator demand station. This control mode is characterized by relatively slow system response, but very accurate and rapid turbine header pressure control.

8.2.6 Unit operating with turbine control station in manual.

_____1. This places control in the reactor/steam generator following mode where the reactor/steam generator maintains the correct steam conditions (turbine header pressure) as the turbine output responds to manual control inputs. A rapid response to loads changes in characteristic of this control mo e.

8.2.7 Unit operating with both turbine generator output breakers tripped.

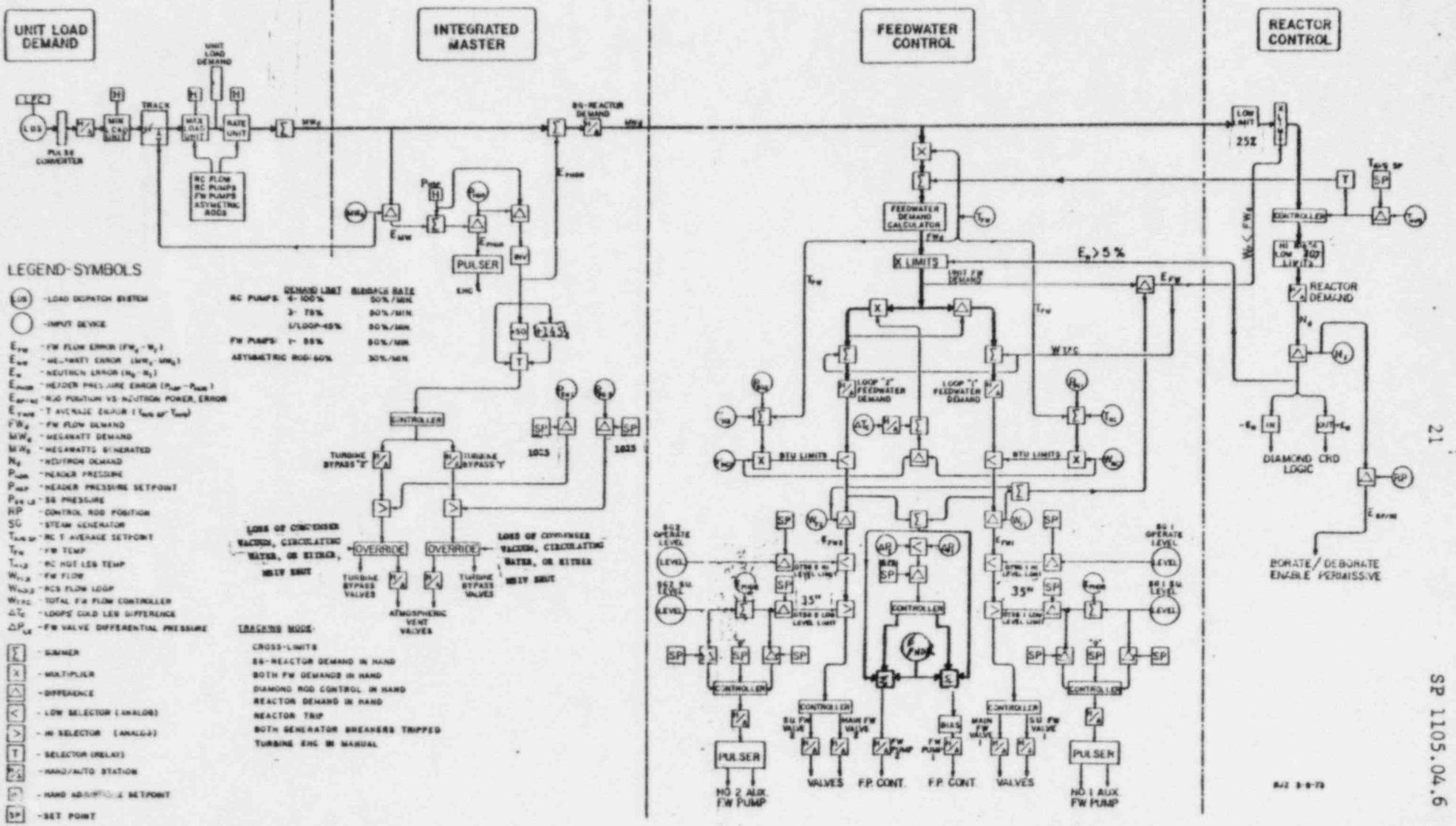
_____1. With both generator breakers open, the unit is removed from the grid. The unit master goes into the tracking mode at a 20 percent/minute runback rate, following the turbine generator output.

8.2.8 Reactor trip

_____1. The ICS goes into the tracking mode.

_____2. The rodcontrol station will revert to manual upon receipt of a reactor trip signal.

DAVIS-BESSE NUCLEAR POWER STATION UNI 1
INTEGRATED CONTROL SYSTEM



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