Davis-Besse Nuclear Power Station

Unit No. 1

Abnormal Procedure AB 1203.03

Cooldown Without the BWST and No Off-Site Power

NUCLEAR SAFETY RELATED

Record of Approval and Changes

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Cooldown Without the BWST and No Offsite Power

This procedure is written strictly as a guide for the operator and is in no way intended to be detailed in actions to be taken. No real detail can be provided since the plant conditions at the time are in themselves unpredictable. This procedure is intended to suggest to the Shift Supervisor and/or Reactor Operator what sources of makeup water are available when there is no BWST regardless of whether or not offsite power may be available. Guidance for cooldown with no offsite power is provided in AB 1203.04, Depressurization of the RCS with Only Safety Grade Equipment. This procedure, AB 1203.03, would be used to supplement AB 1203.04 should the BWST not be available.

CAUTION: Whenever possible, reactivity effects on the RCS due to makeup to the RCS/Makeup Systems should be calculated prior to boron addition using SP 1103.04, Boron Concentration Control, and SP 1103.15, Reactivity Balance Calculation. However, during the initial phases of an accident such as this when time is of the essence and it may not be possible to calculate ahead of time, use the highest possible or available concentration of boric acid solution. Keep track of how much of what concentration of BA solution was used so that a rough estimate of reactivity effects can be made until the C&HP Department can make an accurate RCS Boron Sample.

4 NOTE: A loss of offsite power or onsite AC power capability constitutes an Unusual Event and requires actions be taken per Unusual Event, EI 1300.02.

4 NOTE: A loss of offsite power and all onsite AC power lasting more than 15 minutes constitutes a Site Emergency and requires actions be taken per Site Emergency, EI 1300.03.

I. Sources of Borated Water

A. Pressurizer

1. The pressurizer must provide the initial cooldown volume accompanying a Reactor Trip. Makeup volume must be provided to the RCS and Pressurizer immediately to prevent losing heater control capability or, even worse, complete loss of pressurizer level indication, and consequently the ability to determine RCS inventory.

2. The following calculation for usable volume assumes no makeup and normal pressurizer level:

Normal Operating Level	200	inches
Lo Lvl Htr Cutoff	-40	inches
	160	inches usable level
	x 24	gallons/inch of volume change
	3840	usable gallons

B. Makeup Tank

1. The makeup tank is considered a short term source of borated water for makeup to the RCS on cooldown. It will provide inventory to the RCS immediately following a Reactor Trip if the Makeup Pump(s) remain running or can provide the inventory after the Makeup Pump(s) are restarted on the Diesel Generator(s).

2. At 10 inches in the MU Tank, MU 3971 will automatically shift the makeup pumps suction from the MU Tank to the BWST. At the receipt of the MU Tank low level signal of 10 inches, a 45 second time delay will start and automatically trip the makeup pumps if MU 3971 fails to transfer to the BWST. With the assumption that the BWST is not available, the makeup pumps would be damaged if MU 3971 shifts to the BWST on a low level in the MU Tank. The Makeup pump will, therefore, have to be manually tripped before the MU tank level reaches 10 inches.

3. The following calculation for usable volume assumes normal operating level and a decrease to some point above the automatic transfer to the BWST at 10 inches in the MU tank (say 15 inches):

Normal Operating Level	73	inches
MU Pump Manual Trip	-15	inches
	58	inches usable
	x 30.8	gallons/inch of volume change
	1786.4	usable gallons

4. The makeup tank will be at the same boron concentration as the RCS unless a recent boron concentration change was made.

C. Clean Waste Receiver Tank(s)

1. One Clean Waste Receiver Tank is reserved for storing the 24,000 gallons of borated water generated during the RCS heatup. This source is available only if power is available to a CWRT Transfer Pump: E21A for Transfer Pump 1-1 (BE 2133) or F21C for Transfer Pump 1-2 (BF 2183). Each CWRT Transfer Pump is rated at 140 gpm.

2. The amount of borated water contained in the Clean Waste Receiver Tank to be used should be on the Primary Status Board in the Control Room, but can be obtained from the local indicator at the tank or on the Radwaste Control Panel. To calculate usable volume, subtract 2 ft. from the indicated level since this is the Low Level Cutoff for the CWRT Transfer Pump. A worst case usable volume is shown below and can be used to determine available inventory:

331 gal/ in x 12 in/ft = 3972 gal/ft

24,000 gal would =	6	ft.
Low Level Cutoff =	-2	ft.
	4	ft. usable volume
	x 3972	gal/ft.
	15,888	gal. available inventory

3. The boron concentration for the CWRT to be used will be on the Primary Status Board in the Control Room and shoud be more than the RCS Boron Concentration.

D. Boric Acid Addition Tanks

1. This source will be available unless there is a Total Loss of all AC in the plant because the Boric Acid Transfer Pumps are powered from essential electric busses: E11D for BA Pmp 1-1 (BE 1185) and F11D for BA Pmp 1-2 (BF 1169). Each pump is rated at 40 gpm and if both were run in parallel approximately double the flow should be obtained (70-80 gpm) even if the same discharge line is used.

(TS 3.1.2.8 & 3.1.2.9)

2. The minimum contained volume in the Boric Acid Addition Tanks is governed by Davis-Besse Unit 1 Technical Specifications 3.1.2.8, 3.1.2.9, and Fig. 3.1-1. The actual volume can be read in the Control Room and gallons determined from the tank curves. The worst case available inventory of 5250 gallons occurs at a 7% solution (12,250 ppmB) although Tech Specs would allow 4900 gallons at a 7.5% solution (13,125 ppmB).

3. The boron concentration of the BAAT's will always be somewhere between 5% and 7%, the exact value of which shall be on the Primary Status Board in the Control Room.

E. Core Floods Tanks

1. This source of water would become available at about 600 psig RCS pressure by simply allowing the Core Flood Tank Outlet Isolation Valves CF1A and CF1B to remain open. This available borated water source should be used only if the calculated required makeup cannot be provided in some other manner.

(TS 3.5.1)

2. The Davis-Besse Unit 1 Technical Specifications require the Core Flood Tanks to contain 7555 to 8004 gallons of borated water between 1800 and 3500 ppm boron with a nitrogen cover pressure of between 575 and 625 psig during MODES 1, 2 and 3 (with RCS pressure > 800 psig).

F. Primary Water Storage Tank

1. In an accident which would damage the BWST, the PWST may also be damaged and may, therefore, also be unavailable. If it is, however, it will prove valuable to supplement the inventory of the Boric Acid Addition Tanks and provide pure water to aid in getting the RCS boron concentration closer to a Cold Shutdown concentration rather than the high boron concentrations attained by using only the aforementioned sources of borated water.

2. It is difficult to predict how much water will be available in the PWST, but it is normally controlled at 73,000 gallons (10 ft). The Primary Water Transfer Pumps obtain their power off essential electric busses: E11C for Transfer Pmp 1-1 (BE 1179) and F11B for Transfer Pmp 1-2 (BF 1152).

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(TS 3.5.1.2)

3. Davis-Besse Unit 1 Technical Specifications require a reactor coolant flow rate through the RCS of greater than or equal to 2800 gpm whenever a reduction in RCS boron concentration is made; therefore, do not use the PWST as a source of water until on Decay Heat unless a RCP(s) becomes available.

II. Required Inventory

2 | 1. The purpose of this section is to give the Shift Supervisor guidance as to how much inventory will be required to cooldown the various key temperatures to help make a determination as to what sources of borated water are to be used. These estimates must be verified in detail using SP 1103.04, Boron Concentration Control, whenever the accident reaches the point where a planned and controlled cooldown can be made. At this time, boron concentration changes can also be calculated.

2. This estimate assumes that the operator is manually controlling steam generator pressure at 995 psig using the atmospheric vent valves. Cooldown from 582°F to 546°F requires about 3446 gallons.

3. Cooldown should be avoided, if possible, until the BWST or normal makeup sources are returned to service. Cooldown may be necessary, however, to remain below saturation temperature at RCS pressure.

4. To cooldown from 280°F to 140°F which is the maximum allowable refueling temperature, will require about 4668 gallons.

NOTE: These estimates do NOT include any RCS inventory which may have been lost during the Reactor Trip by the lifting of the Primary Safety Valves.

III. Summary

During the initial phases of an accident involving the Loss of Offsite Power, the inventory losses due to a cooldown of the RCS following a Reactor Trip and possible losses due to the lifting of the Primary Safety Valves must come from the Pressurizer itself. As a result, as covered in AB 1203.04, Depressurization of the RCS with Only Safety Grade Equipment, Pressurizer Level may be lost or at least Pressurizer Heater control. The HPI Pumps may try to start when the Diesel Generators energize C1, D1 Busses. This procedure assumes that there is no BWST either for them or for the Makeup Pumps when they are able to be started. Under these circumstances, it is important to start a Makeup Pump as soon as possible and restore makeup to the RCS. It is also important to commence feeding boric acid to the Makeup/RCS Systems as quickly as possible (40 gpm for on BA Pump; 70-80 gpm for two BA Pumps). If the

accident involves only a loss of the BWST and at least one offsite power soruce can be regained, power should be gotten to a Clean Waste Receiver Tank Transfer Pump to use its 140 gpm capacity to restore Makeup/RCS inventory as quickly as possible.

2 After the plant is stabilized and a controlled cooldown can be made, the Shift Supervisor, based upon SP 1103.04, Boron Concentration Control, SP 1103.15, Reactivity Balance Calculations, and this procedure, AB 1203.03, can make a determination as to what sources of makeup inventory would be the most suitable combination to attain the Cold Shutdown required by Davis-Besse Unit Technical Specifications 3.1.2.9 and 3.5.4 which pertain to the OPERABILITY of the BWST.

CAUTION: With a Loss of Offsite Power accident, assure that sufficient Shutdown Margin is provided to allow cooldown with all rods on the bottom. This is most easily assured by attaining Cold Shutdown boron concentration as soon as possible in the cooldown.

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