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0CAN030101

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

Subject: Arkansas Nuclear One – Units 1 and 2
Docket Nos. 50-313 and 50-368
License Nos. DPR-51 and NPF-6
Additional Information Regarding Condensate Storage Tank Volume Technical Specification Changes (TAC NOS. MA8206 and MA8207)

Gentlemen:

Entergy Operations submitted a proposed change on January 27, 2000 (0CAN010004) to the Arkansas Nuclear One (ANO) Unit 1 and Unit 2 Technical Specifications to modify the requirements for the condensate storage tanks. Based on a review of the submittal, the NRC Staff issued a request for additional information (RAI) on November 13, 2000 (0CNA110003). Entergy Operations' responses to RAI are included in Attachment 1.

Entergy Operations commits to add the necessary tests to the inservice testing program to ensure valves required to align ANO-2 to the QCST are tested.

If you have any questions concerning this submittal, please contact me.

I declare under penalty of perjury that the foregoing is true and correct. Executed on March 1, 2001.

Very truly yours,

Jimmy D. Vandergrift
Director, Nuclear Safety

JDV/dm

A001

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Response to NRC RAIs on ANO CST License Amendment Request

NRC Question 1:

When service water is supplied to the steam generators through the emergency feedwater (EFW) systems, the performance of the steam generators will degrade at a rate that is dependent on the quality of the incoming water. Please describe and provide the results from evaluations that demonstrate that the functions of the EFW systems (i.e., achieving and maintaining safe shutdown conditions) are met if the systems are aligned to the service water systems. Explain how the site-specific water quality of Dardanelle Reservoir and the ANO emergency cooling pond are considered in the evaluation.

Response:

The steam generators are capable of transferring more than 100% of rated thermal power. Only a small fraction of the heat transfer capability would be required by the time that an appreciable accumulation of solids could be deposited in the steam generators from the use of service water. This is why fouling of the steam generators by service water was not an issue when ANO-1 and 2 were licensed even though it is clear that maintaining hot shutdown for more than a day or two would exhaust the water supply in the condensate tank. The amount of water available in the QCST is small compared to the water which would be used in the 30-day mission time of the EFW pumps. Therefore, the change resulting from aligning EFW to the QCST for 30 minutes vs. 4.5 hours will be negligible. In other words the fundamental licensing basis requirements for ANO-1 and 2 inherently recognize the acceptability of using service water in the steam generators for maintaining safe shutdown conditions. Both ANO units were licensed as hot shutdown plants (i.e., hot shutdown is safe shutdown and there was no requirement to be able to achieve cold shutdown).

ANO has performed a conservative estimate of the effect of Lake Dardanelle water as a source of emergency feedwater to the ANO-1 and ANO-2 steam generators. The estimate uses an assumption that the total suspended and dissolved solids in the lake water are 1000ppm, which is higher than that historically measured by ANO. The Lake Dardanelle water is relatively low in total solids when compared to PWR facilities near the coast, which have published total solids concentrations around 35,000ppm. Using the conservative assumption of total solids previously described, heat load for 30 days, and volume of water in the generators, the relative concentration of solids to water mass in the ANO-1 and ANO-2 steam generators would remain below 20%. This would not prevent the steam generators from performing their long term heat removal function.

NRC Question 2:

Please confirm that the sharing of the qualified CST (QCST) will not significantly impair the EFW systems' ability to perform their safety functions for bringing both units to safe shutdown conditions. Describe how the realignment of the Unit 2 EFW system maintains compliance with General Design Criteria 5, "Sharing of Systems, Structures and Components."

Response:

General Design Criteria 5 states: "Structures, systems, and components important to safety shall not be shared among nuclear power units unless it can be shown that such sharing will not significantly impair their ability to perform their safety functions, including, in the event of an accident in one unit, an orderly shutdown and cooldown of the remaining units."

The minimum required protected level in the QCST is calculated based on the inventory needed for both Unit 1 and Unit 2 for 30 minutes. Because the Unit 1 and the Unit 2 EFW pumps have separate suction connections from the QCST and do not share common piping, the ability of the EFW systems on both units to perform their safety functions is not significantly impaired. A low-low level alarm will annunciate in both Unit 1 and Unit 2 control rooms when the QCST level drops to the low level setpoint. This alarm will provide the operations staff a minimum of 30 minutes warning. Upon receipt of the alarms, the operations staff will proceed to realign the suction of the EFW pumps to alternate sources of water.

NRC Question 3:

Please describe the bases for the proposed 32,300 gallons requirement in terms of assumed initiating conditions, setpoints (engineered safety features, alarms, or control system), operator actions, and other factors that ensure the continuous availability of EFW for both units.

Response:

Assumed conditions in the calculation of the condensate water volume requirement are:

1. Reactor trip, turbine generator trip, MFW pump trip, RCP trip and EFW actuation are nearly simultaneous on both units.

2. EFW from the QCST enters the steam generators at 90°F. The heater thermostat turns the heater off at 87°F.

3. For ANO-1 a loss of reactor coolant pumps is assumed. This generates the highest automatic steam generator level control setpoint in EFIC and causes more water to be added to the ANO-1 steam generators than just that necessary to remove decay heat. EFIC will initiate EFW at a level setpoint of 13.5". Proper operation of the EFIC level control function is assumed.

   Only the quantity of EFW necessary to remove decay heat from the RCS is admitted to the ANO-2 steam generators.

4. The tornado missile punctures the QCST just above the missile protection barrier around the tank at the time of reactor trip. All water in the tank above the elevation of the puncture is unavailable to the EFW pumps.

5. No credit is taken for the inventory in the other CST's.

6. Loss of condensate through the recirculation path for ANO-1 is not considered because the recirculation flow is automatically isolated when significant flow is being supplied to the steam generators. In addition, recirculation flow is normally aligned back to the QCST.

   Loss of condensate from the ANO-2 EFW pumps 2P-7A and 2P-7B recirculation lines is considered. This permits the ANO-2 EFW pump recirculation flow to be routed to the ANO-2 condensate storage tanks if desired. The recirculation flow is 32 gpm each for pumps 2P-7A and 2P-7B.

7. The condensate is assumed to boil off in the ANO-1 steam generators at 1065 psia and the condensate is assumed to boil off in the ANO-2 steam generators at 1093 psia. These values correspond to the lift setpoint for the lowest setting on the main steam safety valves.

8. Inadequate water level in the QCST is assumed to occur when water will no longer flow into the suction standpipe at a rate adequate to remove decay heat.

9. Drawings indicate that the vortex breaker is installed over the suction piping in a manner that will not create extra hold up within the tank. Therefore, no volume allowance is needed in the calculation to offset the effects of the vortex breaker.

10. The amount of decay heat to be removed over a 30 minute period has been conservatively estimated based on the standard decay heat curve including a future planned power uprate of 7.5% power on ANO-2.

The acceptance criteria of 30 minutes to accomplish the remote manual switchover to service water were established during the NRC review of ANO-1 compliance with NUREG-0737, II.E.1.1.

NRC Question 4:

Please explain, in terms of design and routine surveillances, how you verify that adequate service water flow will be available during the worst case design basis events (assuming EFW is also supplied by the service water system).

Response:

A service water system flow test is performed every 18 months on both units. The flow test for ANO-1 does not specifically measure or simulate flow for the EFW pumps. However, the flow test is performed with approximately 1250 gpm through the reactor building coolers. In an accident condition where EFW is required, the reactor building coolers would be isolated, therefore, adequate service water flow would be available to the suction of the EFW pumps.

Procedure 2311.002, "Service Water System Flow Test," provides directions for the ANO-2 flow test. The service water flow rates and differential pressures of the safety related heat exchangers are verified greater than the minimum values required to perform design safety related functions. The data collected is used to determine if acceptable flow values exist. Service water flow to the EFW pumps is simulated by increasing flow through the spent fuel pool heat exchanger (2E-27) or the acceptable values are increased to account for the required service water flow to EFW. In either case, the test assures adequate flow is available to the suction of the EFW pumps.

NRC Question 5:

Please describe the effect of the proposed changes on the station blackout analyses for Unit 1 and Unit 2. Is it necessary for continued compliance with 10 CFR 50.63, "Loss of all Alternating Current Power," to maintain a QCST inventory that would be greater than the proposed TS requirements? If so, would the higher volumes be described in the safety analyses reports (i.e., would the higher volume be identified as a part of the design basis for the CST)?

Response:

The ANO-2 Safety Analysis Report states that within 10 minutes of procedurally declaring a station blackout, the operators will start and align the alternate AC power source. Procedure 2104.037, "Alternate AC Generator Operations," provides guidance for aligning the 4160 V ESF buses. The procedure allows energizing any combination of Unit 1 and Unit 2 vital and non-vital loads as long as the total load remains below 4400 kW. The maximum loading capacity of the alternate AC power source is adequate to ensure the EFW and SW pumps can remain in service along with other loads that may be needed to mitigate an accident.

The thirty minute protected inventory in the QCST is sufficient to allow for the restoration of AC power and to switch the EFW pump suctions to the service water systems. A QCST inventory greater than the proposed TS requirement is not necessary for continued compliance with 10CFR 50.63.

NRC Question 6:

Please describe how your procedures or other programs will translate the "analytical limit" into an actual surveillance requirement. Where will factors such as unusable tank volumes and instrument uncertainties be described and how will they be controlled?

Response:

Factors such as unusable tank volumes and instrument uncertainties are contained in the ANO calculations for this parameter. The Technical Specification Bases associated with the QCST volume requirement describe the translation of the safety analysis assumed volume to a tank level. The tank level in the TS bases includes an allowance for the unusable portion of the QCST. Additional allowances for instrument uncertainty will be maintained in the implementing procedures. Changes to the implementing procedures are performed in accordance with the ANO 10 CFR 50.59 program. Changes to the Technical Specification Bases are also performed in accordance with the ANO 10 CFR 50.59 program.

A similar ANO-1 license amendment request has been approved for the sodium hydroxide tank level. By letter dated August 6, 1998 (1CAN089801), Entergy Operations requested changes to the Technical Specifications requirements for the sodium hydroxide tank level and concentration. In this submittal, the value proposed for the tank level in the Technical Specifications was the safety analysis value. The Bases associated with this parameter were revised to require that additional allowances for instrument uncertainty be incorporated in the implementing procedures. The proposed changes were approved by the NRC in a Safety Evaluation dated March 31, 2000 (1CNA030008).

The ANO Improved Technical Specifications submitted for NRC review also establish analytical values for parameters that are not associated with trip or actuation functions. Entergy believes that non-trip or non-actuation parameters are more appropriately controlled as analytical values with appropriate adjustment in the operating procedures.

NRC Question 7:

Please describe the treatment of each of the CSTs in terms of the maintenance rule. What changes in CST volumes have been or would be considered within the context of the maintenance rule? For example, will variations in CST volumes be considered within the evaluations that will be performed in accordance with 10 CFR 50.65(a) (4)? Will maintaining CST volumes (in the safety and non-safety tanks) be included in operating procedures or other administrative controls? Under what conditions would you expect to operate with volumes less than the current TS volumes and how would operation with the reduced volumes be evaluated?

Response:

All of the tanks (QCST, 2T-41A and 2T-41B) are considered available for the maintenance rule if they have a specified volume which is greater than or equal to the current TS level requirement. These maintenance rule volumes are currently administratively controlled and will continue to be with the proposed change.

ANO does not plan to operate with volumes less than the current maintenance rule assumed volume. If at any time in the future, operation with a volume less than the assumed maintenance rule volume is planned, the appropriate risk evaluation will be performed under the maintenance rule guidelines.

NRC Question 8:

How is the flow path from the service water system to the EFW systems tested or inspected to demonstrate that they are free of blockages or silting? Are the valves needed to realign the source of auxiliary feedwater systems to the service water systems tested to demonstrate that they will be capable of performing their intended function? How often are they tested? Does the proposed TS change require changes in your inservice testing program or otherwise require additional equipment to be tested?

Response:

ANO-1

How is the flow path from the service water system to the EFW systems tested or inspected to demonstrate that they are free of blockages or silting?

The flow path from the service water system to the EFW systems for ANO-1 is tested every 18 months using Supplement 6 of Emergency Feedwater Pump Operation procedure (OP-1106.006). This test demonstrates operability of the emergency feedwater pumps' suction piping and check valves from service water by flushing the lines from the service water headers through the service water supply check valves on the EFW pumps suction to the flume. Full stroke

capability of the check valves is assured by verifying flow greater than or equal to 520 gpm through the valves. The test satisfies ANO IST program requirements and ensures a backup supply of makeup to the steam generators is available in an emergency.

Are the valves needed to realign the source of auxiliary feedwater systems to the service water systems tested to demonstrate that they will be capable of performing their intended function? How often are they tested?

Water from either CST is aligned to the suction of each pump through an 8" motor operated gate valve. Water supply to P-7A is isolated by CV-2802 while CV-2800 isolates water to P-7B. These isolation valves are located in the EFW pump room and are normally open. These valves are stroked closed and open each quarter using Supplement 3, Emergency Feedwater Valve Stroke Testing, of 1106.006.

SW loop 2 supplies P-7A through motor operated valve (MOV) CV-3851 and suction supply isolation CV-2806. SW Loop 1 supplies P-7B through motor operated isolation valve CV-3850 and suction supply isolation CV-2803. SW loop and suction supply isolations to EFW are normally closed. These valves are stroked open each quarter using instructions contained in Supplement 3 of 1106.006.

Figure 1 shows that closure of CV-2802 and opening of CV-2806 and CV-3851 will align service water to P-7A. To align service water to P-7B, CV-2800 is closed and CV-3850 and CV-2803 are opened. No other valve manipulations are required.

Does the proposed TS change require changes in your inservice testing program or otherwise require additional equipment to be tested?

No changes will be required to the ANO-1 IST program.

ANO-2

How is the flow path from the service water system to the EFW systems tested or inspected to demonstrate that they are free of blockages or silting?

The flow path from the service water system to the EFW systems for ANO-2 is tested every 18 months using 2305.020, SW to EFW Flush and MOV DP Tests. This procedure provides a method for flushing the piping from the service water system to the emergency feedwater system and full flow stroke testing of the check valves. Full stroke capability of the check valves is accomplished by measuring a flow of greater than or equal to 550 gpm through the valves.

Are the valves needed to realign the source of auxiliary feedwater systems to the service water systems tested to demonstrate that they will be capable of performing their intended function? How often are they tested?

As the attached ANO-2 emergency feedwater simplified system drawing (Figure 2) reflects, opening 2CV-0716-1 and 2CV-0711-2 will align service water to the suction of the EFW pumps and closure of two MOVs (2CV-0798-1 and 2CV-0795-2) will isolate suction from either the QCST (T-41B) or the ANO-2 CSTs (2T-41A or 2T-41B). The hand switches for these valves are located on panels in the Unit 2 control room. These valves are stroke tested quarterly using instructions contained in Supplement 3, Quarterly Emergency Feedwater Valve Stroke Testing. 2CV-0716-1 and 2CV-0711-2 are stroked open and 2CV-0798-1 and 2CV-0795-2 are stroked in the open and closed directions.

Does the proposed TS change require changes in your inservice testing program or otherwise require additional equipment to be tested?

Yes, for ANO-2 additional tests will be added to the inservice testing program before the system is aligned to the QCST. Tests will include as a minimum the performance of:

1) A passive open safety function of manual valves 2CS-816 and 2CS-817, which when open align the QCST to the suction of the EFW pumps.
2) An active safety function to open check valves 2CS-844 and 2CS-845.
3) An active safety function to close check valves 2CS-844 and 2CS-845 unless 2EFW-802 is maintained locked closed when above Mode 4. Disassembly every refueling outage to verify operability may be used.
4) An active safety function to close 2EFW-1 and 2FW-801 when the QCST is aligned to ANO-2 unless 2EFW-802 is maintained locked closed above Mode 4. Disassembly every refueling outage to verify operability may be used. {NRC commitment}

NRC Question 9:

Has it been demonstrated that 30 minutes is sufficient time for operators to realign the EFW systems for all of the accidents or anticipated operational occurrences that rely on the systems? If so, describe how.

Response:

ANO-1

Transfer of the suction source to the EFW from the QCST to service water is normally controlled via motor operated valves that can be operated from the control room. Water supplied from either CST to P-7A is isolated by CV-2802 while CV-2800 isolates water to P-7B. These isolation valves are located in the EFW pump

rooms and are normally open. SW loop 2 supplies P-7A through motor operated isolation valve CV-3851 and suction supply isolation CV-2806. SW Loop 1 supplies P-7B through motor operated isolation valve CV-3850 and suction supply isolation CV-2803. SW loop and suction supply isolations to EFW are normally closed. The limiting stroke times for these valves are contained in the table below.

Valve Description and Number	Test Direction	Limiting Stroke Time for Operability in Seconds
EFW P-7A Suction from CST (CV-2802)	Closed	54.0
EFW P-7A Suction from SW (CV-2806)	Open	46.7
EFW Service Water Loop II Isolation (CV-3851)	Open	58.6
EFW P-7B Suction from CST (CV-2800)	Closed	52.5
EFW P-7B Suction from SW (CV-2803)	Open	69.6
EFW Service Water Loop I Isolation (CV-3850)	Open	14.0

A common hand switch operates CV-2802 and CV-2806. When the hand switch is placed in the service water position, CV-2802 begins to close and CV-2806 begins to open. The same logic is also true for CV-2800 and CV-2803. The longest stroke time for these grouped valves is used to demonstrate 30 minutes is sufficient time for operators to realign the EFW systems. A conservative time of 5 minutes is assumed for the operator to identify the need to realign the valves. To shift P-7A suction to service water will require 1 minute, 52.6 seconds and to align P-7B suction to Service Water will take an additional 1 minute, 13.6 seconds. Therefore, the total time to realign both trains is 9 minutes, 6.2 seconds. It was documented in a July 1984 letter to the NRC (1CAN078402) in response to NUREG 0737 Item II.E.1.1, Emergency Feedwater Reliability that realigning the service water valves, as the suction source to EFW requires approximately 5 minutes.

Electrical buses that are diesel backed supply power to these valves. Therefore, it is assumed that power will be available. However, if power were not available for some reason, these valves can be manually aligned. The need to manually align service water locally to the suction of the EFW pumps would only exist with more than a single failure.

ANO-2

Re-alignment of the suction source of EFW from the QCST to service water is typically controlled via motor operated valves (MOVs) and can be accomplished

from the control room. The MOVs are powered from electrical buses that are diesel backed or DC powered. Therefore, in a degraded power condition one train of valves should be available. Opening 2CV-0716-1 and 2CV-0711-2 will align service water to the suction of the EFW pumps and closure of two MOVs (2CV-0798-1 and 2CV-0795-2) will isolate suction from either the QCST (T-41B) or the ANO-2 CSTs (2T-41A or 2T-41B). The table below provides the maximum allowable stroke time for each valve.

Valve Description and Number	Test Direction	Limiting Stroke Time for Operability in Seconds
2P-7A Suction from CST (2CV-0795-2)	Closed	41.4
2P-7A Suction from SW (2CV-0711-2)	Open	29.7
2P-7B Suction from CST (2CV-0789-1)	Closed	48.6
2P-7B Suction from SW (2CV-0716-1)	Open	31.3

The stroke time for realigning 2P-7A suction sources is 1 minute, 11.1 seconds and the stroke time for realigning 2P-7B suction sources is 1 minute, 19.9 seconds. These times will be added to a conservative assumption that it takes the control room operator 5 minutes to recognize the need to realign EFW suction to service water. Therefore, it will take 7 minutes, 31 seconds to realign the suction source for both EFW trains. Only one train of EFW is needed to provide adequate heat removal and opening of the service water isolation valve will immediately supply water to the suction of an EFW pump. The need to manually align service water locally to the suction of the EFW pumps would only exist with more than a single failure.

NRC Question 10:

It is our understanding that the ANO licensing bases include consideration of Branch Technical Position (BTP) ASB 10-1 which states that each unit have emergency feedwater pumps with diverse power sources and that other powered components also use the concept of separate and multiple source of motive energy. Can service water be supplied to the EFW pumps using a diverse motive energy? If not, explain the implication in terms of ANO continuing to abide by the positions outlined in BTP ASB 10-1.

Response:

On both units the service water pumps are powered from diesel backed 4160 V ESF buses. Therefore, with the loss of offsite power, the emergency diesel generators should be available. Additionally, if a degraded power situation were to occur, the

station blackout diesel at ANO can be manually started and aligned to supply power to service water pumps as needed. The station blackout diesel has greater capacity than any single emergency diesel generator.

Figure 1
ANO – 1 Simplified Drawing

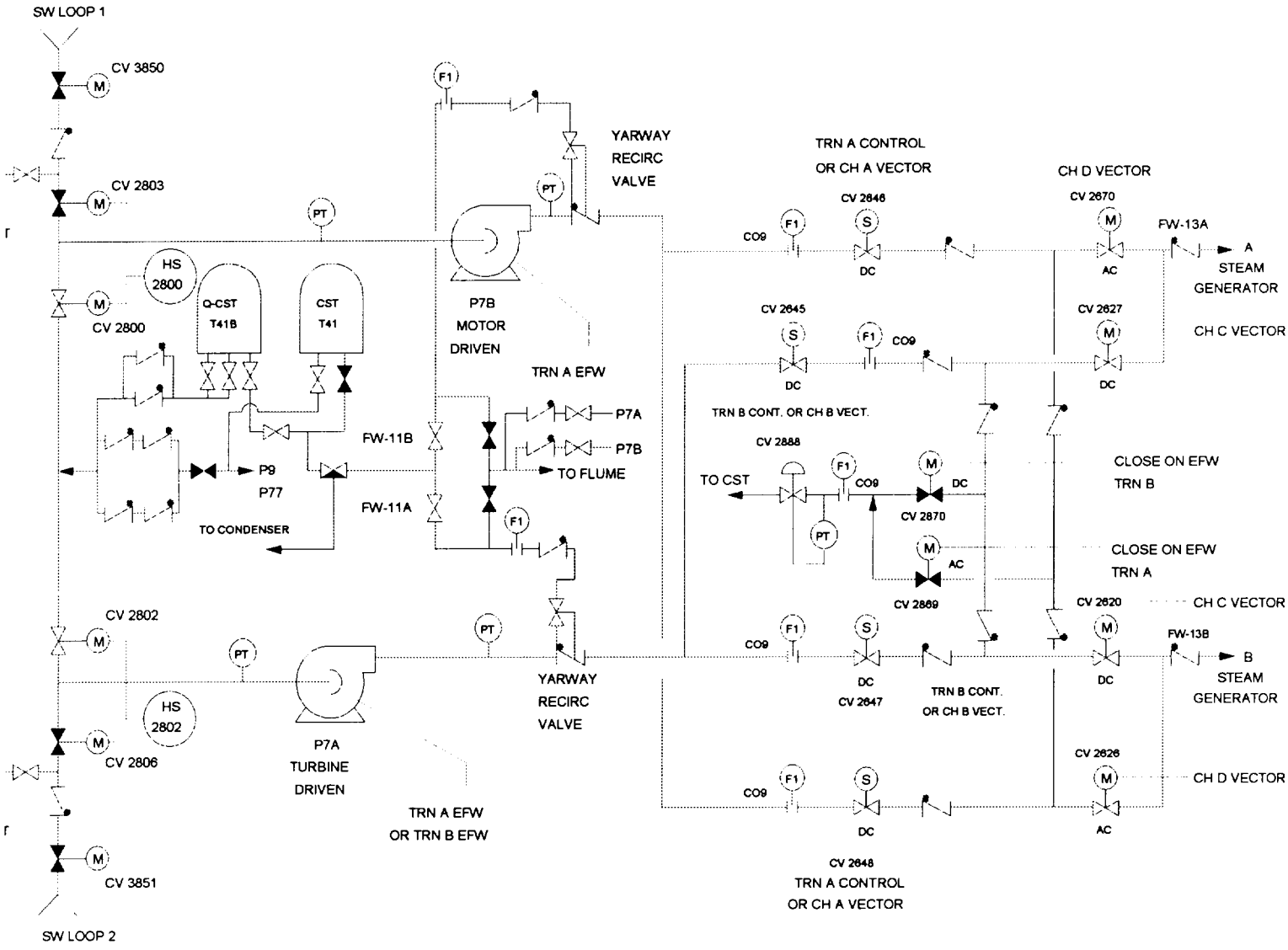

FIGURE 1 – ANO-1 EMERGENCY FEEDWATER SYSTEM

Figure 2
ANO – 2 Simplified Drawing

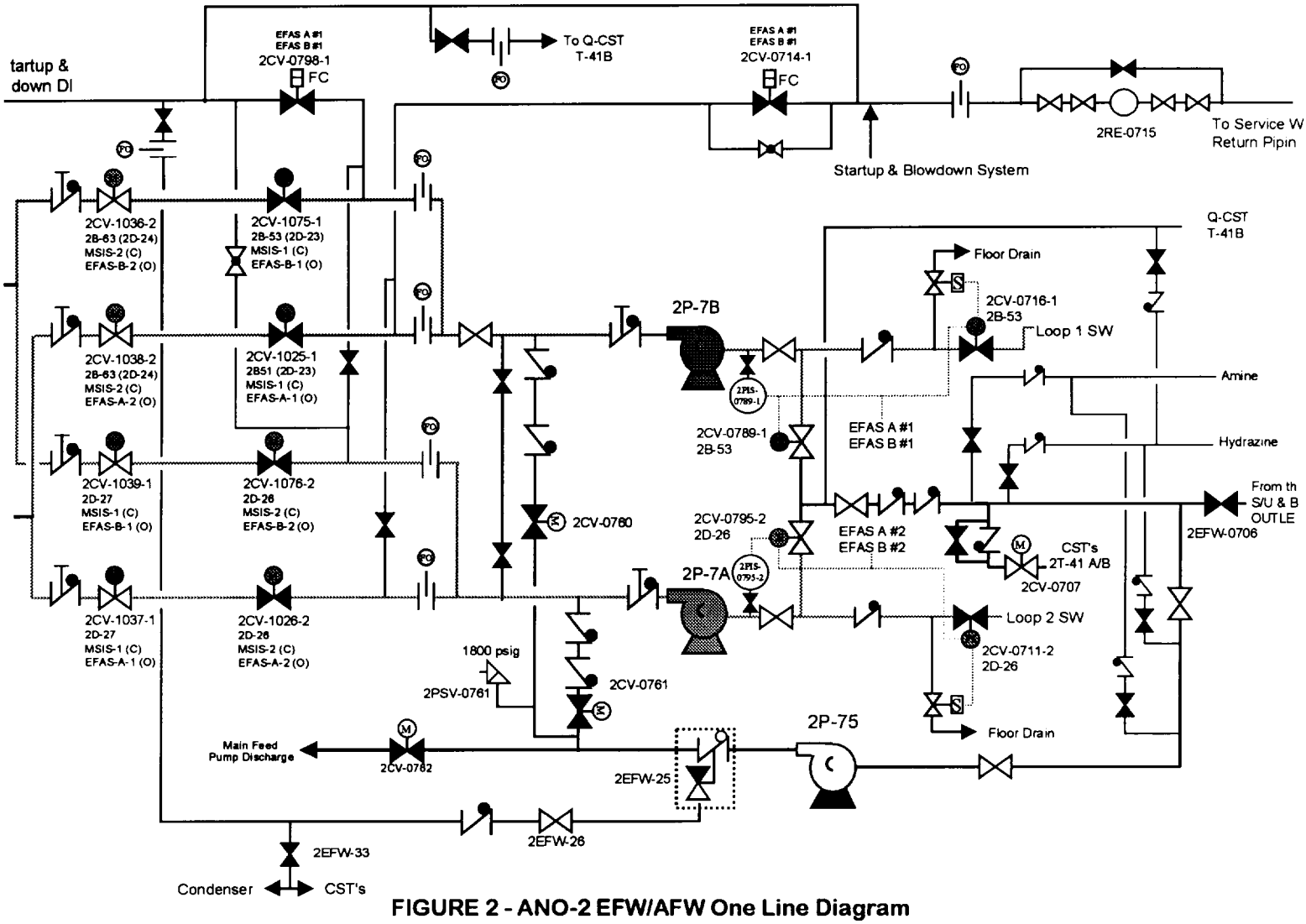

FIGURE 2 - ANO-2 EFW/AFW One Line Diagram