

TASK CLOSE OUT DOCUMENT

Task Scope Risks/Advantages of giving
Natural circulation as is vs
Present Plan.

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Task No. 18

Date Complete 4/24/79

Reason felt task is complete:

Risks and Advantages of
Natural Circulation looked at.

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IAG Memo #IA-18

Risks/Advantages of Going to Natural Circulation
as is vs. Present Plan

Industry Advisory Group

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April 24, 1979

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SUMMARY AND CONCLUSIONS

- Advantages and disadvantages of the current plan and several alternates were examined and are summarized in Table 1. The current plan is preferred; however, it does contain some risks or disadvantages (e.g. extends period of high pressure operation, extends meeting pressure and temp. objectives, risk of losing RCP before implemented, etc.).
- Alternate #1 (going to natural circ. now) reduces heat load, can bring us closer to the pressure objective, and reduce temp. somewhat. The major drawback of doing this now appeared to be the fact that the final secondary heat removal configuration would not be implemented until later and there may be risk of interrupting natural circulation in the process of changing load between SG's or mode of cooling, i.e. steaming vs. solid. Analysis of such possibility may show it is of no concern. Alternately the RCP could be restarted prior to switching secondary modes. Either of these would eliminate the concern.
- In all cases, taking an SG and steam piping water solid needs to be done with care. Preferably filling from low points up with saturated water and doing this slowly. Alternate #2 considers doing this while steaming which has additional risks. We were unable to find any experience with such process, making it suspect. Alternate 3 eliminates this concern but requires modifications and only has merit if it could be accomplished in less time than present schedule.
- The last alternate considers interruption of heat sink while taking "A" solid. Even though the primary system has considerable heat capacity, it appears optimistic to expect the system could be taken solid in time to prevent boiling.
- With regard to primary pressure objective of 50 psie, pressure reductions should closely monitor gas in the system for potential release from coolant as well as the TC and hot leg criteria. Advantages of pressure reduction are reduce leaks, once pressure is in DHR range it could be a viable back-up in a feed and bleed mode, the DHR inboard valves could be tested, etc.
- A final consideration in favor of current plan is that certain backups such as P/V control, D.G., and DHR modifications should be available providing backup capability if problems were encountered.

TABLE 1

ASSESSMENT OF ADVANTAGES AND DISADVANTAGES OF ALTERNATIVES

A. Current Plan to Go to Natural Circulation

Advantages

1. Method has been relatively well planned, understood, and documented for implementation and scheduling.
2. Achieve several alternatives for cooling strategies (solid A & B; A; B) if all hardware successfully implemented.
3. Transition from forced to natural circulation appears to be well behaved.
4. Plant is currently operating well and stable.
5. Backup systems will be available
 - o PV control system
 - o Decay Heat Removal
 - o Emergency Diesels for LOOP
6. Currently have 3 backup RCP's to accommodate loss of 2A pump during implementation.

Disadvantages

1. Current schedule is long (5/11/79); potential for equipment and instrumentation deterioration.
2. Implementation schedule subject to further slippage.
3. Design and construction stages performed under stress; potential for human errors.
4. Potential for damage to secondary system during filling process.
5. Current plan is success oriented; have not considered contingencies for all procedural steps:
 - core configuration shifts
 - lack of reversability
6. No clear presentation on how non-condensable gases will be controlled.
7. Possible flow starvation in core at low pressure due to steam pocket expansion.

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B. Alternate #1

- Scheme: Trip pump
A-SG steaming
Same PCS pressure
Monitor per TC criteria
If doesn't work start RCP

Advantages

1. Reduces heat input to primary and secondary by 5 Mw; reduces temp ~50F.
2. Verifies whether natural circ works sooner and under controlled conditions (as contrasted to potential loss of pumps event prior to completion of base plan).
3. High probability of being reversible, i.e. backup RCP's.
4. Takes advantage of nat. circ. work to support base plan.
5. Implementation schedule is short.
6. Uses existing equipment; don't need additional equipment.
7. Possibility of reducing pressure to ~150 psig since pressure not required to be maintained for RCP operation
 - then in p range where DHR can be used in feed and bleed as backup
 - could test DHR valve in containment
 - reduce leaks - such as to B SG.
8. Can take A, B SG's water solid per current plan.
9. Approaches final objectives; substantial pressure reduction early in time.

Disadvantages

1. Doesn't meet primary system temp objective and only partially meets pressure objective.
2. Only have "B" SG for steaming mode as backup cooling.
3. Don't have planned backup alternatives in place (DHR, P/V control, DG).
4. Would already be in nat. circ. mode when switching to water solid "B" and "A" SG modes are underway which may increase risk of interrupting natural circ.

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C. Alternate #2

-- Scheme: Go solid in "A" SG now - then trip RCP

-- Precaution: Add FW slowly and preheat to saturation the water to fill steam lines

Advantages

1. Meets criteria (P & T) immediately.
2. Makes use of available equipment.
3. Same advantages as Alternate #1.

Disadvantages

1. Filling procedures while in steam mode not developed.
2. Risk of physical damage (in filling) is higher relative to Current Plan and Alternate #1.
3. See disadvantages 2 and 3 of Alternate #1.

D. Alternate #3

-- Scheme: Tap a separate steaming HX loop on "A". Fill B solid with present system using condenser.

- Steps:
1. Continue to steam with A.
 2. Build condenser and install to loop A.
 3. Open A to new condenser and close from current condenser.
 4. Switch to B.
 5. Make A solid.

Advantages

1. Evaluate schedule and if shorter has merit.

Disadvantages

1. Leak through B without intermediate heat exchanger.

E. Alternate #4

-- Scheme: Trip RCP
Isolate A
Go Solid in A (filling from back end)
Open A up again

Advantages

1. Use existing equipment and could be done immediately.
2. Meets technical objectives.

Disadvantages

1. No heat sink (except heat capacity) during changeover so must be accomplished quickly to prevent boiling.