

3.5.2 ECCS - Operating

LC0 3.5.2 Two ECCS trains shall be OPERABLE.

APPLICABILITY: MODES 1 and 2,
MODE 3 with pressurizer pressure \geq 400 psia.

ACTIONS

CONDITION	REQUIRED ACTION	COMPLETION TIME
<p>A. One or more trains inoperable.</p> <p><u>AND</u></p> <p>At least 100% of the ECCS flow equivalent to a single OPERABLE ECCS train available.</p>	<p>A.1 Restore train(s) to OPERABLE status.</p>	<p>72 hours</p>
<p>B. Required Action and associated Completion Time not met.</p>	<p>B.1 Be in MODE 3.</p> <p><u>AND</u></p> <p>B.2 Reduce pressurizer pressure to < 400 psia.</p>	<p>6 hours</p> <p>12 hours</p>

BASES

APPLICABILITY
(continued)

based on full power operation. Although reduced power would not require the same level of performance, the accident analysis does not provide for reduced cooling requirements in the lower MODES. The HPSI pump performance is based on the small break LOCA, which establishes the pump performance curve and has less dependence on power. The charging pump performance requirements are based on a small break LOCA. The requirements of MODES 2, and 3 with RCS pressure ≥ 400 psia, are bounded by the MODE 1 analysis.

The ECCS functional requirements of MODE 3, with RCS pressure < 400 psia, and MODE 4 are described in LCO 3.5.3, "ECCS - Shutdown."

In MODES 5 and 6, unit conditions are such that the probability of an event requiring ECCS injection is extremely low. Core cooling requirements in MODE 5 are addressed by LCO 3.4.7, "RCS Loops MODE 5, Loops Filled," and LCO 3.4.8, "RCS Loops-MODE 5, Loops Not Filled."

MODE 6 core cooling requirements are addressed by LCO 3.9.4, "Shutdown Cooling (SDC) and Coolant Circulation-High Water Level," and LCO 3.9.5, "Shutdown Cooling (SDC) and Coolant Circulation-Low Water Level."

ACTIONS

A.1

If one or more trains are inoperable and at least 100% of the ECCS flow equivalent to a single OPERABLE ECCS train is available, the inoperable components must be returned to OPERABLE status within 72 hours. The 72 hour Completion Time is based on an NRC study (Ref. 4) using a reliability evaluation and is a reasonable amount of time to effect many repairs.

An ECCS train is inoperable if it is not capable of delivering the design flow to the RCS. The individual components are inoperable if they are not capable of performing their design function, or if supporting systems are not available.

The LCO requires the OPERABILITY of a number of independent subsystems. Due to the redundancy of trains and the diversity of subsystems, the inoperability of one component

(continued)

BASES

ACTIONS

A.1 (contineud)

in a train does not render the ECCS incapable of performing its function. Neither does the inoperability of two different components, each in a different train, necessarily result in a loss of function for the ECCS. The intent of this Condition is to maintain a combination of OPERABLE equipment such that 100% of the ECCS flow equivalent to 100% of a single OPERABLE train remains available. This allows increased flexibility in plant operations when components in opposite trains are inoperable.

An event accompanied by a loss of offsite power and the failure of an emergency DG can disable one ECCS train until power is restored. A reliability analysis (Ref. 4) has shown that the impact with one full ECCS train inoperable is sufficiently small to justify continued operation for 72 hours.

Reference 5 describes situations in which one component, such as a shutdown cooling total flow control valve, can disable both ECCS trains. With one or more components inoperable, such that 100% of the equivalent flow to a single OPERABLE ECCS train is not available, the facility is in a condition outside the accident analyses. Therefore, LCO 3.0.3 must be immediately entered.

B.1 and B.2

If the inoperable train cannot be restored to OPERABLE status within the associated Completion Time, the plant must be brought to a MODE in which the LCO does not apply. To achieve this status, the plant must be brought to at least MODE 3 within 6 hours and pressurizer pressure reduced to < 400 psia within 12 hours. The allowed Completion Times are reasonable, based on operating experience, to reach the required unit conditions from full power in an orderly manner and without challenging unit systems.

SURVEILLANCE
REQUIREMENTS

SR 3.5.2.1 and 3.5.2.2

SR 3.5.2.1 verification of proper valve position ensures that the flow path from the ECCS pumps to the RCS is

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BASES

SURVEILLANCE
REQUIREMENTSSR 3.5.2.1 and 3.5.2.2 (continued)

maintained. Misalignment of these valves could render both ECCS trains inoperable. Securing these valves in position by removing power or by key locking the control in the correct position ensures that the valves cannot be inadvertently misaligned or change position as the result of an active failure. These valves are of the type described in Reference 5, which can disable the function of both ECCS trains and invalidate the accident analysis. SR 3.5.2.2 verification of the proper positions of the Containment Emergency Sump isolation valves and ECCS pumps/containment spray pumps miniflow valves ensures that ECCS operability and containment integrity are maintained. Securing these valves in position with power available will provide additional assurance that these valves will operate on a RAS. A 12 hour Frequency is considered reasonable in view of other administrative controls ensuring that a mispositioned valve is an unlikely possibility.

SR 3.5.2.3

Verifying the correct alignment for manual, power operated, and automatic valves in the ECCS flow paths provides assurance that the proper flow paths will exist for ECCS operation. This SR does not apply to valves that are locked, sealed, or otherwise secured in position, since these valves were verified to be in the correct position prior to locking, sealing, or securing. A valve that receives an actuation signal is allowed to be in a nonaccident position provided the valve automatically repositions within the proper stroke time. This Surveillance does not require any testing or valve manipulation. Rather, it involves verification that those valves capable of being mispositioned are in the correct position.

The 31 day Frequency is appropriate because the valves are operated under procedural control and an improper valve position would only affect a single train. This Frequency has been shown to be acceptable through operating experience.

(continued)

BASES

SURVEILLANCE
REQUIREMENTS
(continued)SR 3.5.2.4

With the exception of systems in operation, the ECCS pumps are normally in a standby, nonoperating mode. As such, flow path piping has the potential to develop voids and pockets of entrained gases. Maintaining the piping from the ECCS pumps to the RCS full of water ensures that the system will perform properly, injecting its full capacity into the RCS upon demand. This will also prevent water hammer, pump cavitation, and pumping of noncondensable gas (e.g., air, nitrogen, or hydrogen) into the reactor vessel following an SIAS or during SDC. The 31 day Frequency takes into consideration the gradual nature of gas accumulation in the ECCS piping and the adequacy of the procedural controls governing system operation.

SR 3.5.2.5

Periodic surveillance testing of ECCS pumps to detect gross degradation caused by impeller structural damage or other hydraulic component problems is required by Section XI of the ASME Code. This type of testing may be accomplished by measuring the pump developed head at only one point of the pump characteristic curve. This verifies both that the measured performance is within an acceptable tolerance of the original pump baseline performance and that the performance at the test flow is greater than or equal to the performance assumed in the unit safety analysis. SRs are specified in the Inservice Testing Program, which encompasses Section XI of the ASME Code. Section XI of the ASME Code provides the activities and Frequencies necessary to satisfy the requirements.

SR 3.5.2.6

Discharge head at design flow is a normal test of charging pump performance required by Section XI of the ASME Code. A quarterly Frequency for such tests is a Code requirement. Such inservice inspections detect component degradation and incipient failures. For positive displacement charging pumps Section XI of the ASME Code allows an alternate testing for design flow only.

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BASES

SURVEILLANCE
REQUIREMENTS
(continued)SR 3.5.2.7, SR 3.5.2.8, and SR 3.5.2.9

These SRs demonstrate that each automatic ECCS valve actuates to the required position on an actual or simulated SIAS and on an RAS, that each ECCS pump starts on receipt of an actual or simulated SIAS, and that the LPSI pumps stop on receipt of an actual or simulated RAS. The 24 month Frequency is based on the need to perform these Surveillances under the conditions that apply during a plant outage and the potential for unplanned transients if the Surveillances were performed with the reactor at power. The 24 month Frequency is also acceptable based on consideration of the design reliability (and confirming operating experience) of the equipment. The actuation logic is tested as part of the Engineered Safety Feature Actuation System (ESFAS) testing, and equipment performance is monitored as part of the Inservice Testing Program.

SR 3.5.2.10

Periodic inspection of the containment sump ensures that it is unrestricted and stays in proper operating condition. The 24 month Frequency is based on the need to perform this Surveillance under the conditions that apply during an outage, on the need to have access to the location. This Frequency is sufficient to detect abnormal degradation and is confirmed by operating experience.

REFERENCES

1. 10 CFR 50, Appendix A, GDC 35.
 2. 10 CFR 50.46.
 3. UFSAR, Section 6.3.
 4. NRC Memorandum to V. Stello, Jr., from R. L. Baer, "Recommended Interim Revisions to LCOs for ECCS Components," December 1, 1975.
 5. IE Information Notice No. 87-01, January 6, 1987.
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ATTACHMENT "B"

POST PCN-299 (TECHNICAL SPECIFICATION IMPROVEMENT PROGRAM) SPECIFICATIONS
UNIT 3

3.5.2 ECCS - Operating

LCO 3.5.2 Two ECCS trains shall be OPERABLE.

APPLICABILITY: MODES 1 and 2,
MODE 3 with pressurizer pressure \geq 400 psia.

ACTIONS

CONDITION	REQUIRED ACTION	COMPLETION TIME
<p>A. One or more trains inoperable.</p> <p><u>AND</u></p> <p>At least 100% of the ECCS flow equivalent to a single OPERABLE ECCS train available.</p>	<p>A.1 Restore train(s) to OPERABLE status.</p>	<p>72 hours</p>
<p>B. Required Action and associated Completion Time not met.</p>	<p>B.1 Be in MODE 3.</p> <p><u>AND</u></p> <p>B.2 Reduce pressurizer pressure to < 400 psia.</p>	<p>6 hours</p> <p>12 hours</p>

BASES

APPLICABILITY
(continued)

based on full power operation. Although reduced power would not require the same level of performance, the accident analysis does not provide for reduced cooling requirements in the lower MODES. The HPSI pump performance is based on the small break LOCA, which establishes the pump performance curve and has less dependence on power. The charging pump performance requirements are based on a small break LOCA. The requirements of MODES 2, and 3 with RCS pressure ≥ 400 psia, are bounded by the MODE 1 analysis.

The ECCS functional requirements of MODE 3, with RCS pressure < 400 psia, and MODE 4 are described in LCO 3.5.3, "ECCS - Shutdown."

In MODES 5 and 6, unit conditions are such that the probability of an event requiring ECCS injection is extremely low. Core cooling requirements in MODE 5 are addressed by LCO 3.4.7, "RCS Loops MODE 5, Loops Filled," and LCO 3.4.8, "RCS Loops-MODE 5, Loops Not Filled."

MODE 6 core cooling requirements are addressed by LCO 3.9.4, "Shutdown Cooling (SDC) and Coolant Circulation-High Water Level," and LCO 3.9.5, "Shutdown Cooling (SDC) and Coolant Circulation-Low Water Level."

ACTIONS

A.1

If one or more trains are inoperable and at least 100% of the ECCS flow equivalent to a single OPERABLE ECCS train is available, the inoperable components must be returned to OPERABLE status within 72 hours. The 72 hour Completion Time is based on an NRC study (Ref. 4) using a reliability evaluation and is a reasonable amount of time to effect many repairs.

An ECCS train is inoperable if it is not capable of delivering the design flow to the RCS. The individual components are inoperable if they are not capable of performing their design function, or if supporting systems are not available.

The LCO requires the OPERABILITY of a number of independent subsystems. Due to the redundancy of trains and the diversity of subsystems, the inoperability of one component

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BASES

ACTIONS

A.1 (continued)

in a train does not render the ECCS incapable of performing its function. Neither does the inoperability of two different components, each in a different train, necessarily result in a loss of function for the ECCS. The intent of this Condition is to maintain a combination of OPERABLE equipment such that 100% of the ECCS flow equivalent to 100% of a single OPERABLE train remains available. This allows increased flexibility in plant operations when components in opposite trains are inoperable.

An event accompanied by a loss of offsite power and the failure of an emergency DG can disable one ECCS train until power is restored. A reliability analysis (Ref. 4) has shown that the impact with one full ECCS train inoperable is sufficiently small to justify continued operation for 72 hours.

Reference 5 describes situations in which one component, such as a shutdown cooling total flow control valve, can disable both ECCS trains. With one or more components inoperable, such that 100% of the equivalent flow to a single OPERABLE ECCS train is not available, the facility is in a condition outside the accident analyses. Therefore, LCO 3.0.3 must be immediately entered.

B.1 and B.2

If the inoperable train cannot be restored to OPERABLE status within the associated Completion Time, the plant must be brought to a MODE in which the LCO does not apply. To achieve this status, the plant must be brought to at least MODE 3 within 6 hours and pressurizer pressure reduced to < 400 psia within 12 hours. The allowed Completion Times are reasonable, based on operating experience, to reach the required unit conditions from full power in an orderly manner and without challenging unit systems.

SURVEILLANCE
REQUIREMENTS

SR 3.5.2.1 and 3.5.2.2

SR 3.5.2.1 verification of proper valve position ensures that the flow path from the ECCS pumps to the RCS is

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BASES

SURVEILLANCE
REQUIREMENTSSR 3.5.2.1 and 3.5.2.2 (continued)

maintained. Misalignment of these valves could render both ECCS trains inoperable. Securing these valves in position by removing power or by key locking the control in the correct position ensures that the valves cannot be inadvertently misaligned or change position as the result of an active failure. These valves are of the type described in Reference 5, which can disable the function of both ECCS trains and invalidate the accident analysis. SR 3.5.2.2 verification of the proper positions of the Containment Emergency Sump isolation valves and ECCS pumps/containment spray pumps miniflow valves ensures that ECCS operability and containment integrity are maintained. Securing these valves in position with power available will provide additional assurance that these valves will operate on a RAS. A 12 hour Frequency is considered reasonable in view of other administrative controls ensuring that a mispositioned valve is an unlikely possibility.

SR 3.5.2.3

Verifying the correct alignment for manual, power operated, and automatic valves in the ECCS flow paths provides assurance that the proper flow paths will exist for ECCS operation. This SR does not apply to valves that are locked, sealed, or otherwise secured in position, since these valves were verified to be in the correct position prior to locking, sealing, or securing. A valve that receives an actuation signal is allowed to be in a nonaccident position provided the valve automatically repositions within the proper stroke time. This Surveillance does not require any testing or valve manipulation. Rather, it involves verification that those valves capable of being mispositioned are in the correct position.

The 31 day Frequency is appropriate because the valves are operated under procedural control and an improper valve position would only affect a single train. This Frequency has been shown to be acceptable through operating experience.

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BASES

SURVEILLANCE
REQUIREMENTS
(continued)SR 3.5.2.4

With the exception of systems in operation, the ECCS pumps are normally in a standby, nonoperating mode. As such, flow path piping has the potential to develop voids and pockets of entrained gases. Maintaining the piping from the ECCS pumps to the RCS full of water ensures that the system will perform properly, injecting its full capacity into the RCS upon demand. This will also prevent water hammer, pump cavitation, and pumping of noncondensable gas (e.g., air, nitrogen, or hydrogen) into the reactor vessel following an SIAS or during SDC. The 31 day Frequency takes into consideration the gradual nature of gas accumulation in the ECCS piping and the adequacy of the procedural controls governing system operation.

SR 3.5.2.5

Periodic surveillance testing of ECCS pumps to detect gross degradation caused by impeller structural damage or other hydraulic component problems is required by Section XI of the ASME Code. This type of testing may be accomplished by measuring the pump developed head at only one point of the pump characteristic curve. This verifies both that the measured performance is within an acceptable tolerance of the original pump baseline performance and that the performance at the test flow is greater than or equal to the performance assumed in the unit safety analysis. SRs are specified in the Inservice Testing Program, which encompasses Section XI of the ASME Code. Section XI of the ASME Code provides the activities and Frequencies necessary to satisfy the requirements.

SR 3.5.2.6

Discharge head at design flow is a normal test of charging pump performance required by Section XI of the ASME Code. A quarterly Frequency for such tests is a Code requirement. Such inservice inspections detect component degradation and incipient failures. For positive displacement charging pumps Section XI of the ASME Code allows an alternate testing for design flow only.

(continued)

BASES

SURVEILLANCE
REQUIREMENTS
(continued)SR 3.5.2.7, SR 3.5.2.8, and SR 3.5.2.9

These SRs demonstrate that each automatic ECCS valve actuates to the required position on an actual or simulated SIAS and on an RAS, that each ECCS pump starts on receipt of an actual or simulated SIAS, and that the LPSI pumps stop on receipt of an actual or simulated RAS. The 24 month Frequency is based on the need to perform these Surveillances under the conditions that apply during a plant outage and the potential for unplanned transients if the Surveillances were performed with the reactor at power. The 24 month Frequency is also acceptable based on consideration of the design reliability (and confirming operating experience) of the equipment. The actuation logic is tested as part of the Engineered Safety Feature Actuation System (ESFAS) testing, and equipment performance is monitored as part of the Inservice Testing Program.

SR 3.5.2.10

Periodic inspection of the containment sump ensures that it is unrestricted and stays in proper operating condition. The 24 month Frequency is based on the need to perform this Surveillance under the conditions that apply during an outage, on the need to have access to the location. This Frequency is sufficient to detect abnormal degradation and is confirmed by operating experience.

REFERENCES

1. 10 CFR 50, Appendix A, GDC 35.
 2. 10 CFR 50.46.
 3. UFSAR, Section 6.3.
 4. NRC Memorandum to V. Stello, Jr., from R. L. Baer, "Recommended Interim Revisions to LCOs for ECCS Components," December 1, 1975.
 5. IE Information Notice No. 87-01, January 6, 1987.
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ATTACHMENT "C"

PROPOSED SPECIFICATIONS
UNIT 2

3.5.2 ECCS - Operating

LCO 3.5.2 Two ECCS trains shall be OPERABLE.

APPLICABILITY: MODES 1 and 2,
MODE 3 with pressurizer pressure \geq 400 psia.

ACTIONS

CONDITION	REQUIRED ACTION	COMPLETION TIME
A. One LPSI subtrain inoperable.	A.1 Restore subtrain to OPERABLE status.	7 days
A B. One or more ECCS trains inoperable due to Condition(s) other than Condition A. <u>AND</u> At least 100% of the ECCS flow equivalent to a single OPERABLE ECCS train available.	A B.1 Restore ECCS train(s) to OPERABLE status.	72 hours
B C. Required Action and associated Completion Time of Condition A or B not met.	B C.1 Be in MODE 3. <u>AND</u> B C.2 Reduce pressurizer pressure to < 400 psia.	6 hours 12 hours

BASES

APPLICABILITY
(continued)

based on full power operation. Although reduced power would not require the same level of performance, the accident analysis does not provide for reduced cooling requirements in the lower MODES. The HPSI pump performance is based on the small break LOCA, which establishes the pump performance curve and has less dependence on power. The charging pump performance requirements are based on a small break LOCA. The requirements of MODES 2, and 3 with RCS pressure ≥ 400 psia, are bounded by the MODE 1 analysis.

The ECCS functional requirements of MODE 3, with RCS pressure < 400 psia, and MODE 4 are described in LCO 3.5.3, "ECCS - Shutdown."

In MODES 5 and 6, unit conditions are such that the probability of an event requiring ECCS injection is extremely low. Core cooling requirements in MODE 5 are addressed by LCO 3.4.7, "RCS Loops MODE 5, Loops Filled," and LCO 3.4.8, "RCS Loops-MODE 5, Loops Not Filled."

MODE 6 core cooling requirements are addressed by LCO 3.9.4, "Shutdown Cooling (SDC) and Coolant Circulation-High Water Level," and LCO 3.9.5, "Shutdown Cooling (SDC) and Coolant Circulation-Low Water Level."

ACTIONS

A.1 and B.1

~~If one or more trains are inoperable and at least 100% of the ECCS flow equivalent to a single OPERABLE ECCS train is available, the inoperable components must be returned to OPERABLE status within 72 hours. The 72 hour Completion Time is based on an NRC study (Ref. 4) using a reliability evaluation and is a reasonable amount of time to effect many repairs.~~

An ECCS train is inoperable if it is not capable of delivering the design flow to the RCS. The individual components are inoperable if they are not capable of performing their design function, or if supporting systems are not available.

The LCO requires the OPERABILITY of a number of independent subsystems. Due to the redundancy of trains and the diversity of subsystems, the inoperability of one component

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BASES

ACTIONS

A.1 and B.1 (continued)

in a train does not render the ECCS incapable of performing its function. Neither does the inoperability of two different components, each in a different train, necessarily result in a loss of function for the ECCS. The intent of ~~this Condition is~~ each of Condition A and Condition B is to maintain a combination of OPERABLE equipment such that 100% of the ECCS flow equivalent to 100% of a single OPERABLE train remains available. This allows increased flexibility in plant operations when components in opposite trains are inoperable.

Each of Condition A and Condition B includes a combination of OPERABLE equipment such that at least 100% of the ECCS flow equivalent to a single OPERABLE ECCS train remains available.

Condition A addresses the specific condition where the only affected ECCS subsystem is a single LPSI subtrain. The availability of a least 100% of the ECCS flow equivalent to a single OPERABLE ECCS train is implicit in the definition of Condition A.

If LCO 3.5.2 requirements are not met due only to the existence of Condition A, then the inoperable LPSI subtrain components must be returned to OPERABLE status within 7 days of discovery of Condition A. This 7-day Completion Time is based on the findings of the deterministic and probabilistic analysis that are discussed in Reference 6. Seven days is a reasonable amount of time to perform many corrective and preventative maintenance items on the affected LPSI subtrain. Reference 6 concluded that the overall risk impact of this Completion Time was either risk-beneficial or risk-neutral.

Condition B addresses other scenarios where the availability of at least 100% of the ECCS flow equivalent to a single OPERABLE ECCS train exists but the full requirements of LCO 3.5.2 are not met. If Condition B exists, then inoperable components must be restored such that Condition B does not exist within 72 hours of discovery. The 72 hour Completion Time is based on an NRC reliability study (Ref. 4) and is a reasonable amount of time to effect many repairs.

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BASES

ACTIONS

A.1 and B.1 (continued)

An event accompanied by a loss of offsite power and the failure of an emergency DG can disable one ECCS train until power is restored. A reliability analysis (Ref. 4) has shown that the impact with one full ECCS train inoperable is sufficiently small to justify continued operation for 72 hours.

Reference 5 describes situations in which one component, such as a shutdown cooling total flow control valve, can disable both ECCS trains. With one or more components inoperable such that 100% of the equivalent flow to a single OPERABLE ECCS train is not available, the facility is in a condition outside of the accident analyses. ~~Therefore, In~~ such a situation, LCO 3.0.3 must be immediately entered.

B B
C.1 and C.2

If the inoperable train cannot be restored to OPERABLE status within the associated Completion Time, the plant must be brought to a MODE in which the LCO does not apply. To achieve this status, the plant must be brought to at least MODE 3 within 6 hours and pressurizer pressure reduced to < 400 psia within 12 hours. The allowed Completion Times are reasonable, based on operating experience, to reach the required unit conditions from full power in an orderly manner and without challenging unit systems.

SURVEILLANCE
REQUIREMENTS

SR 3.5.2.1 and 3.5.2.2

SR 3.5.2.1 verification of proper valve position ensures that the flow path from the ECCS pumps to the RCS is maintained. Misalignment of these valves could render both ECCS trains inoperable. Securing these valves in position by removing power or by key locking the control in the correct position ensures that the valves cannot be inadvertently misaligned or change position as the result of an active failure. These valves are of the type described in Reference 5, which can disable the function of both ECCS trains and invalidate the accident analysis. SR 3.5.2.2 verification of the proper positions of the Containment Emergency Sump isolation valves and ECCS pumps/containment

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BASES

SURVEILLANCE
REQUIREMENTSSR 3.5.2.1 and 3.5.2.2 (continued)

spray pumps miniflow valves ensures that ECCS operability and containment integrity are maintained. Securing these valves in position with power available will provide additional assurance that these valves will operate on a RAS. A 12 hour Frequency is considered reasonable in view of other administrative controls ensuring that a mispositioned valve is an unlikely possibility.

SR 3.5.2.3

Verifying the correct alignment for manual, power operated, and automatic valves in the ECCS flow paths provides assurance that the proper flow paths will exist for ECCS operation. This SR does not apply to valves that are locked, sealed, or otherwise secured in position, since these valves were verified to be in the correct position prior to locking, sealing, or securing. A valve that receives an actuation signal is allowed to be in a nonaccident position provided the valve automatically repositions within the proper stroke time. This Surveillance does not require any testing or valve manipulation. Rather, it involves verification that those valves capable of being mispositioned are in the correct position.

The 31 day Frequency is appropriate because the valves are operated under procedural control and an improper valve position would only affect a single train. This Frequency has been shown to be acceptable through operating experience.

SR 3.5.2.4

With the exception of systems in operation, the ECCS pumps are normally in a standby, nonoperating mode. As such, flow path piping has the potential to develop voids and pockets of entrained gases. Maintaining the piping from the ECCS pumps to the RCS full of water ensures that the system will perform properly, injecting its full capacity into the RCS upon demand. This will also prevent water hammer, pump cavitation, and pumping of noncondensable gas (e.g., air, nitrogen, or hydrogen) into the reactor vessel following an

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BASES

SURVEILLANCE
REQUIREMENTS

SR 3.5.2.4 (continued)

SIAS or during SDC. The 31 day Frequency takes into consideration the gradual nature of gas accumulation in the ECCS piping and the adequacy of the procedural controls governing system operation.

SR 3.5.2.5

Periodic surveillance testing of ECCS pumps to detect gross degradation caused by impeller structural damage or other hydraulic component problems is required by Section XI of the ASME Code. This type of testing may be accomplished by measuring the pump developed head at only one point of the pump characteristic curve. This verifies both that the measured performance is within an acceptable tolerance of the original pump baseline performance and that the performance at the test flow is greater than or equal to the performance assumed in the unit safety analysis. SRs are specified in the Inservice Testing Program, which encompasses Section XI of the ASME Code. Section XI of the ASME Code provides the activities and Frequencies necessary to satisfy the requirements.

SR 3.5.2.6

Discharge head at design flow is a normal test of charging pump performance required by Section XI of the ASME Code. A quarterly Frequency for such tests is a Code requirement. Such inservice inspections detect component degradation and incipient failures. For positive displacement charging pumps Section XI of the ASME Code allows an alternate testing for design flow only.

SR 3.5.2.7, SR 3.5.2.8, and SR 3.5.2.9

These SRs demonstrate that each automatic ECCS valve actuates to the required position on an actual or simulated SIAS and on an RAS, that each ECCS pump starts on receipt of an actual or simulated SIAS, and that the LPSI pumps stop on receipt of an actual or simulated RAS. The 24 month Frequency is based on the need to perform these

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BASES

SURVEILLANCE
REQUIREMENTS

SR 3.5.2.7, SR 3.5.2.8, and SR 3.5.2.9 (continued)

Surveillances under the conditions that apply during a plant outage and the potential for unplanned transients if the Surveillances were performed with the reactor at power. The 24 month Frequency is also acceptable based on consideration of the design reliability (and confirming operating experience) of the equipment. The actuation logic is tested as part of the Engineered Safety Feature Actuation System (ESFAS) testing, and equipment performance is monitored as part of the Inservice Testing Program.

SR 3.5.2.10

Periodic inspection of the containment sump ensures that it is unrestricted and stays in proper operating condition. The 24 month Frequency is based on the need to perform this Surveillance under the conditions that apply during an outage, on the need to have access to the location. This Frequency is sufficient to detect abnormal degradation and is confirmed by operating experience.

REFERENCES

1. 10 CFR 50, Appendix A, GDC 35.
2. 10 CFR 50.46.
3. UFSAR, Section 6.3.
4. NRC Memorandum to V. Stello, Jr., from R. L. Baer, "Recommended Interim Revisions to LCOs for ECCS Components," December 1, 1975.
5. IE Information Notice No. 87-01, January 6, 1987.
6. CE NPSD-995, "CEOG Joint Applications Report for Low Pressure Safety Injection System AOT Extension," May 1995.

ATTACHMENT "D"
PROPOSED SPECIFICATIONS
UNIT 3

3.5.2 ECCS - Operating

LCO 3.5.2 Two ECCS trains shall be OPERABLE.

APPLICABILITY: MODES 1 and 2,
MODE 3 with pressurizer pressure \geq 400 psia.

ACTIONS

CONDITION	REQUIRED ACTION	COMPLETION TIME
A. One LPSI subtrain inoperable.	A.1 Restore subtrain to OPERABLE status.	7 days
A B. One or more ECCS trains inoperable due to Condition(s) other than Condition A. <u>AND</u> At least 100% of the ECCS flow equivalent to a single OPERABLE ECCS train available.	A B.1 Restore ECCS train(s) to OPERABLE status.	72 hours
B C. Required Action and associated Completion Time of Condition A or B not met.	B C.1 Be in MODE 3. <u>AND</u> B C.2 Reduce pressurizer pressure to < 400 psia.	6 hours 12 hours

BASES

APPLICABILITY
(continued)

based on full power operation. Although reduced power would not require the same level of performance, the accident analysis does not provide for reduced cooling requirements in the lower MODES. The HPSI pump performance is based on the small break LOCA, which establishes the pump performance curve and has less dependence on power. The charging pump performance requirements are based on a small break LOCA. The requirements of MODES 2, and 3 with RCS pressure ≥ 400 psia, are bounded by the MODE 1 analysis.

The ECCS functional requirements of MODE 3, with RCS pressure < 400 psia, and MODE 4 are described in LCO 3.5.3, "ECCS - Shutdown."

In MODES 5 and 6, unit conditions are such that the probability of an event requiring ECCS injection is extremely low. Core cooling requirements in MODE 5 are addressed by LCO 3.4.7, "RCS Loops MODE 5, Loops Filled," and LCO 3.4.8, "RCS Loops-MODE 5, Loops Not Filled."

MODE 6 core cooling requirements are addressed by LCO 3.9.4, "Shutdown Cooling (SDC) and Coolant Circulation - High Water Level," and LCO 3.9.5, "Shutdown Cooling (SDC) and Coolant Circulation - Low Water Level."

ACTIONS

A.1 and B.1

~~If one or more trains are inoperable and at least 100% of the ECCS flow equivalent to a single OPERABLE ECCS train is available, the inoperable components must be returned to OPERABLE status within 72 hours. The 72 hour Completion Time is based on an NRC study (Ref. 4) using a reliability evaluation and is a reasonable amount of time to effect many repairs.~~

An ECCS train is inoperable if it is not capable of delivering the design flow to the RCS. The individual components are inoperable if they are not capable of performing their design function, or if supporting systems are not available.

The LCO requires the OPERABILITY of a number of independent subsystems. Due to the redundancy of trains and the diversity of subsystems, the inoperability of one component

(continued)

BASES

ACTIONS

A.1 and B.1 (continued)

in a train does not render the ECCS incapable of performing its function. Neither does the inoperability of two different components, each in a different train, necessarily result in a loss of function for the ECCS. The intent of ~~this Condition is~~ each of Condition A and Condition B is to maintain a combination of OPERABLE equipment such that 100% of the ECCS flow equivalent to 100% of a single OPERABLE train remains available. This allows increased flexibility in plant operations when components in opposite trains are inoperable.

Each of Condition A and Condition B includes a combination of OPERABLE equipment such that at least 100% of the ECCS flow equivalent to a single OPERABLE ECCS train remains available.

Condition A addresses the specific condition where the only affected ECCS subsystem is a single LPSI subtrain. The availability of at least 100% of the ECCS flow equivalent to a single OPERABLE ECCS train is implicit in the definition of Condition A.

If LCO 3.5.2 requirements are not met due only to the existence of Condition A, then the inoperable LPSI subtrain components must be returned to OPERABLE status within 7 days of discovery of Condition A. This 7-day Completion Time is based on the findings of the deterministic and probabilistic analysis that are discussed in Reference 6. Seven days is a reasonable amount of time to perform many corrective and preventative maintenance items on the affected LPSI subtrain. Reference 6 concluded that the overall risk impact of this Completion Time was either risk-beneficial or risk-neutral.

Condition B addresses other scenarios where the availability of at least 100% of the ECCS flow equivalent to a single OPERABLE ECCS train exists but the full requirements of LCO 3.5.2 are not met. If Condition B exists, then inoperable components must be restored such that Condition B does not exist within 72 hours of discovery. The 72 hour Completion Time is based on an NRC reliability study (Ref. 4) and is a reasonable amount of time to effect many repairs.

(continued)

BASES

ACTIONS

A.1 and B.1 (continued)

An event accompanied by a loss of offsite power and the failure of an emergency DG can disable one ECCS train until power is restored. A reliability analysis (Ref. 4) has shown that the impact with one full ECCS train inoperable is sufficiently small to justify continued operation for 72 hours.

Reference 5 describes situations in which one component, such as a shutdown cooling total flow control valve, can disable both ECCS trains. With one or more components inoperable such that 100% of the equivalent flow to a single OPERABLE ECCS train is not available, the facility is in a condition outside of the accident analyses. ~~Therefore,~~ In such a situation, LCO 3.0.3 must be immediately entered.

B B
C.1 and C.2

If the inoperable train cannot be restored to OPERABLE status within the associated Completion Time, the plant must be brought to a MODE in which the LCO does not apply. To achieve this status, the plant must be brought to at least MODE 3 within 6 hours and pressurizer pressure reduced to < 400 psia within 12 hours. The allowed Completion Times are reasonable, based on operating experience, to reach the required unit conditions from full power in an orderly manner and without challenging unit systems.

SURVEILLANCE
REQUIREMENTS

SR 3.5.2.1 and 3.5.2.2

SR 3.5.2.1 verification of proper valve position ensures that the flow path from the ECCS pumps to the RCS is maintained. Misalignment of these valves could render both ECCS trains inoperable. Securing these valves in position by removing power or by key locking the control in the correct position ensures that the valves cannot be inadvertently misaligned or change position as the result of an active failure. These valves are of the type described in Reference 5, which can disable the function of both ECCS trains and invalidate the accident analysis. SR 3.5.2.2 verification of the proper positions of the Containment Emergency Sump isolation valves and ECCS pumps/containment

(continued)

BASES

SURVEILLANCE
REQUIREMENTSSR 3.5.2.1 and 3.5.2.2 (continued)

spray pumps miniflow valves ensures that ECCS operability and containment integrity are maintained. Securing these valves in position with power available will provide additional assurance that these valves will operate on a RAS. A 12 hour Frequency is considered reasonable in view of other administrative controls ensuring that a mispositioned valve is an unlikely possibility.

SR 3.5.2.3

Verifying the correct alignment for manual, power operated, and automatic valves in the ECCS flow paths provides assurance that the proper flow paths will exist for ECCS operation. This SR does not apply to valves that are locked, sealed, or otherwise secured in position, since these valves were verified to be in the correct position prior to locking, sealing, or securing. A valve that receives an actuation signal is allowed to be in a nonaccident position provided the valve automatically repositions within the proper stroke time. This Surveillance does not require any testing or valve manipulation. Rather, it involves verification that those valves capable of being mispositioned are in the correct position.

The 31 day Frequency is appropriate because the valves are operated under procedural control and an improper valve position would only affect a single train. This Frequency has been shown to be acceptable through operating experience.

SR 3.5.2.4

With the exception of systems in operation, the ECCS pumps are normally in a standby, nonoperating mode. As such, flow path piping has the potential to develop voids and pockets of entrained gases. Maintaining the piping from the ECCS pumps to the RCS full of water ensures that the system will perform properly, injecting its full capacity into the RCS upon demand. This will also prevent water hammer, pump cavitation, and pumping of noncondensable gas (e.g., air, nitrogen, or hydrogen) into the reactor vessel following an

(continued)

BASES

SURVEILLANCE
REQUIREMENTSSR 3.5.2.4 (continued)

SIAS or during SDC. The 31 day Frequency takes into consideration the gradual nature of gas accumulation in the ECCS piping and the adequacy of the procedural controls governing system operation.

SR 3.5.2.5

Periodic surveillance testing of ECCS pumps to detect gross degradation caused by impeller structural damage or other hydraulic component problems is required by Section XI of the ASME Code. This type of testing may be accomplished by measuring the pump developed head at only one point of the pump characteristic curve. This verifies both that the measured performance is within an acceptable tolerance of the original pump baseline performance and that the performance at the test flow is greater than or equal to the performance assumed in the unit safety analysis. SRs are specified in the Inservice Testing Program, which encompasses Section XI of the ASME Code. Section XI of the ASME Code provides the activities and Frequencies necessary to satisfy the requirements.

SR 3.5.2.6

Discharge head at design flow is a normal test of charging pump performance required by Section XI of the ASME Code. A quarterly Frequency for such tests is a Code requirement. Such inservice inspections detect component degradation and incipient failures. For positive displacement charging pumps Section XI of the ASME Code allows an alternate testing for design flow only.

SR 3.5.2.7, SR 3.5.2.8, and SR 3.5.2.9

These SRs demonstrate that each automatic ECCS valve actuates to the required position on an actual or simulated SIAS and on an RAS, that each ECCS pump starts on receipt of an actual or simulated SIAS, and that the LPSI pumps stop on receipt of an actual or simulated RAS. The 24 month Frequency is based on the need to perform these

(continued)

BASES

SURVEILLANCE
REQUIREMENTSSR 3.5.2.7, SR 3.5.2.8, and SR 3.5.2.9 (continued)

Surveillances under the conditions that apply during a plant outage and the potential for unplanned transients if the Surveillances were performed with the reactor at power. The 24 month Frequency is also acceptable based on consideration of the design reliability (and confirming operating experience) of the equipment. The actuation logic is tested as part of the Engineered Safety Feature Actuation System (ESFAS) testing, and equipment performance is monitored as part of the Inservice Testing Program.

SR 3.5.2.10

Periodic inspection of the containment sump ensures that it is unrestricted and stays in proper operating condition. The 24 month Frequency is based on the need to perform this Surveillance under the conditions that apply during an outage, on the need to have access to the location. This Frequency is sufficient to detect abnormal degradation and is confirmed by operating experience.

REFERENCES

1. 10 CFR 50, Appendix A, GDC 35.
2. 10 CFR 50.46.
3. UFSAR, Section 6.3.
4. NRC Memorandum to V. Stello, Jr., from R. L. Baer, "Recommended Interim Revisions to LCOs for ECCS Components," December 1, 1975.
5. IE Information Notice No. 87-01, January 6, 1987.
6. CE NPSD-995, "CEOG Joint Applications Report for Low Pressure Safety Injection System AOT Extension," May 1995.