APPENDIX A

MARKED-UP TECHNICAL SPECIFICATION PAGES

2.1 Bases:

The abnormal operational transients applicable to operation of the CNS Unit have been analyzed throughout the spectrum of planned operating conditions. The analyses were based upon plant operation in accordance with Reference 3. In addition, 2381 MWt is the licensed maximum power level of CNS, and this represents the maximum steady-state power which shall not knowingly be exceeded.

The transient analyses performed each reload are given in Reference 1. Models and model conservatisms are also described in this reference. As discussed in Reference 2, the core wide transient analyses for one recirculation pump operation is conservatively bounded by two-loop operation analyses and the flow-dependent rod block and scram setpoint equations are adjusted for one-pump operation.

A. Trip Settings

The bases for individual trip settings are discussed in the following paragraphs.

1. Neutron Flux Trip Settings

a. APRM Flux Scram Trip Setting (Run Mode)

The average power range monitoring (APRM) system, which is calibrated using heat balance data taken during steady state conditions, reads in percent of rated thermal power (2381 MWt). Because fission chambers provide the basic input signals, the APRM system responds directly to average neutron flux. During transients, the instantaneous rate of heat transfer from the fuel (reactor thermal power) is less than the instantaneous neutron flux due to the time constant of the fuel. Therefore, during abnormal operational transients, the thermal power of the fuel will be less than that indicated by the neutron flux at the scram setting. Analyses demonstrate that with a 120% scram trip setting, none of the abnormal operational transients analyzed violate the fuel Safety Limit and there is a substantial margin from fuel damage. ~~Therefore, the use of flow referenced scram trip provides even additional margin.~~ Also, the flow biased neutron flux scram provides protection to the Safety Limit MCPR in the unlikely event of a thermal-hydraulic instability.

LIMITING CONDITIONS FOR OPERATION	SURVEILLANCE REQUIREMENTS

3.3.C (Cont'd.)

3. The maximum scram insertion time for 90% insertion of any operable control rod shall not exceed 7.00 seconds.

D. Reactivity Anomalies

At a specific steady state base condition of the reactor actual control rod inventory will be periodically compared to a normalized computer prediction of the inventory. If the difference between observed and predicted rod inventory reaches the equivalent of 1% Δk reactivity, the reactor will be shut down until the cause has been determined and corrective actions have been taken as appropriate.

E. Restrictions

If Specifications 3.3.A through D above cannot be met, an orderly shutdown shall be initiated and the reactor shall be in the Shutdown condition within 24 hours.

F. Recirculation Pumps

1. A recirculation pump shall not be started while the reactor is in natural circulation flow and reactor power is greater than 1% of rated thermal power.

2. With two recirculation pumps in operation and with core thermal power greater than the limit specified in Figure 3.3.1 and total core flow less than 45% of rated, the APRM and LPRM* neutron flux noise levels shall be determined within 2 hours, and:

   a) if the APRM and LPRM* neutron flux noise levels are less than or equal to three times their established baseline levels, continue to determine the noise levels at least once per 8 hours and also within 30 minutes after the completion of a core thermal power increase of at least 5% of rated core thermal power while operating in this region of the power/flow map, or

* Detector levels A and C of one LPRM string per core octant plus detector levels A and C of one LPRM string in the center of the core shall be monitored.

4.3.C (Cont'd.)

D. Reactivity Anomalies

During the startup test program and startup following refueling outages, the critical rod configurations will be compared to the expected configurations at selected operating conditions. These comparisons will be used as base data for reactivity monitoring during subsequent power operation throughout the fuel cycle. At specific power operating conditions, the critical rod configuration will be compared to the configuration expected based upon appropriately corrected past data. This comparison will be made at least every full power month.

F. Recirculation Pumps

1. With two recirculation pumps in operation and with core thermal power greater than the limit specified in Figure 3.3.1 and total core flow less than 45% of rated, establish baseline APRM and LPRM* neutron flux noise levels within 2 hours, provided that baseline values have not been previously established since the last core refueling.

2. a) Prior to operation with one recirculation pump not in operation and core thermal power greater than the limit specified in Figure 3.3.1 establish baseline APRM and LPRM* neutron flux noise levels, provided that baseline values have not been previously established since the last core refueling. Baseline values shall be established with one recirculation pump not in operation and core thermal power less than or equal to the limit specified in Figure 3.3.1.

   b) Prior to operation with one recirculation pump not in operation and core flow greater than 45% of rated, establish baseline core plate ΔP noise levels with core flow less than or equal to 45% of rated, provided that baseline values have not been previously established with one recirculation pump not in operation since the last core refueling.

3.3.F (Cont'd.)

b) if the APRM and/or LPRM* neutron flux noise levels are greater than three times their established baseline levels, immediately initiate corrective action and restore the noise levels to within the required limits within 2 hours by increasing core flow, and/or by initiating an orderly reduction of core thermal power by inserting control rods.

2?. The reactor may be started and operated, or operation may continue with one recirculation loop not in operation provided that;

a. with one recirculation pump not in operation and core thermal power greater than the limit specified in Figure 3.3.1, core flow must be greater than or equal to 45% of rated, and

(i) the Surveillance Requirements of 4.3.F.2.a have not been satisfied, immediately initiate action to reduce core thermal power to less than or equal to the limit specified in Figure 3.3.1 within 4 hours, or

(ii) the Surveillance Requirements of 4.3.F.2.a have been satisfied, continue to determine the APRM and LPRM neutron flux levels at least once per 8 hours and also within 30 minutes after the completion of a core thermal power increase of at least 5% of rated core thermal power while operating in this region of the power/flow map. If the APRM and/or LPRM* neutron flux noise levels are greater than three times their established baseline values, immediately initiate corrective action and restore the noise levels to within the required limits within 2 hours by

* Detector levels A and C of one LPRM string per core octant plus detector levels A and C of one LPRM string in the center of the core shall be monitored.

4.3 (Cont'd.)

G. Scram Discharge Volume

1. The scram discharge volume (SDV) vent and drain valves shall be cycled and verified open at least once every 31 days and prior to reactor start-up.

2. The SDV vent and drain valves shall be verified to close within 30 seconds after receipt of a signal for control rod scram once per refueling cycle.

3. SDV vent and drain valve operability shall be verified following any maintenance or modification to any portion (electrical or mechanical) of the SDV which may affect the operation of the vent and drain vavles.

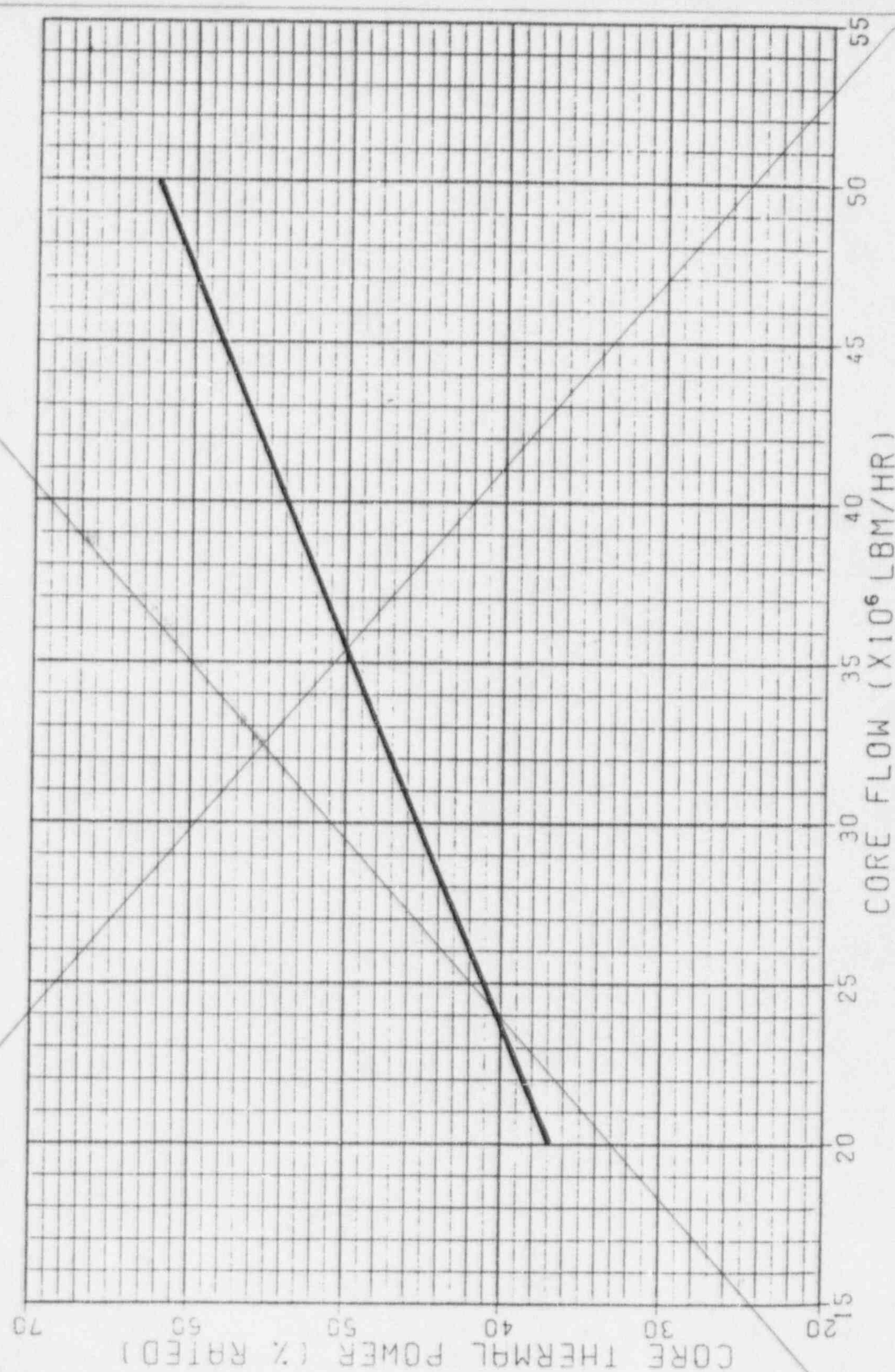

FIGURE 3.3.1.

THERMAL POWER LIMITATIONS DURING OPERATION WITH LESS THAN TWO REACTOR COOLANT SYSTEM RECIRCULATION LOOPS IN OPERATION

LIMITING CONDITIONS FOR OPERATION	SURVEILLANCE REQUIREMENTS

3.3.F (Cont'd.)

increasing core flow and/or initiating an orderly reduction of core thermal power by inserting control rods.

b. With one recirculation pump not in operation and core flow greater than 45% of rated, and

(i) the Surveillance Requirements of 4.3.F.2.b have not been satisfied, immediately initiate action to reduce core flow to less than or equal to 45% of rated within 4 hours, or

(ii) the Surveillance Requirements of 4.3.F.2.b have been satisfied, continue to determine core plate ΔP noise at least once per 8 hours and also within 30 minutes after the completion of a core thermal power increase of at least 5% of rated thermal power. If the core plate ΔP noise level is greater than 1.0 psi and 2 times its established baseline value, immediately initiate corrective action and restore the noise levels to within the required limits within 2 hours by decreasing core flow and/or initiating an orderly reduction of core thermal power by inserting control rods.

a c. The idle loop is isolated electrically by disconnecting the breaker to the recirculation pump motor generator (M/G) set drive motor prior to startup, or if disabled during reactor operation, within 24 hours.

b d. The recirculation system controls will be placed in the manual flow control mode.

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Insert on previous page

LIMITING CONDITIONS FOR OPERATION	SURVEILLANCE REQUIREMENTS
3. With no recirculation loops in operation, the reactor shall be placed in the hot shutdown condition within 12 hours.	

the control rod motion is estimated to actually begin. However, 200 milliseconds is conservatively assumed for this time interval in the transient analyses and this is also included in the allowable scram insertion times of Specification 3.3.C. The time to deenergize the pilot valve scram solenoid is measured during the calibration tests required by Specification 4.1.

D. Reactivity Anomalies

During each fuel cycle excess operative reactivity varies as fuel depletes and as any burnable poison in supplementary control is burned. The magnitude of this excess reactivity may be inferred from the critical rod configuration. As fuel burnup progresses, anomalous behavior in the excess reactivity may be detected by comparison of the critical rod pattern at selected base states to the predicted rod inventory at that state. Power operating base conditions provide the most sensitive and directly interpretable data relative to core reactivity. Furthermore, using power operating base conditions permits frequent reactivity comparisons.

Requiring a reactivity comparison at the specified frequency assures that a comparison will be made before the core reactivity change exceeds 1% Δk. Deviations in core reactivity greater than 1% Δk are not expected and require thorough evaluation. One percent reactivity limit is considered safe since an insertion of the reactivity into the core would not lead to transients exceeding design conditions of the reactor system.

F. Recirculation Pumps

Until analyses are submitted for review and approval by the NRC which prove that recirculation pump startup from natural circulation does not cause a reactivity insertion transient in excess of the most severe coolant flow increase currently analyzed, Specification 3.3.F.1 prevents starting recirculation pumps while the reactor is in natural circulation above 1% of rated thermal power. ~~Specifications 3.3.F.2 and 3 are based upon providing assurance that neutron flux limit cycle oscillations, which have a small probability of occurring in the high power/low flow corner of the operating domain, are detected and suppressed. BWR cores typically operate with neutron flux noise levels of 1%-12% of rated power (peak to peak) due to random boiling and flow noise. These flux noise levels are considered in the thermal/mechanical design of GE BWR fuel, occur in a stable mode, and are found to be of negligible consequence. However, under certain high power/low flow conditions that could occur during a recirculation pump trip and subsequent Single Loop Operation (SLO) where reverse flow occurs in inactive jet pumps, a hydraulic/reactor kinetic feedback mechanism can be enhanced such that sustained limit cycle oscillations of flow noise with peak to peak levels several times normal values are exhibited. Although large margins to safety limits are maintained when these limit cycle oscillations occur, they are to be monitored for, and suppressed when flux noise exceeds the three time baseline value by inserting rods and/or increasing coolant flow. The line in Figure 3.3.1 is based on the 80% rod line below which the probability of limit cycle oscillations occurring is negligible. The thermal power, core flow, and neutron flux noise level limitations are prescribed in accordance with Reference 3.~~

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Operation in natural circulation mode, with no recirculation loops in operation, can place the reactor in a condition closer to the onset of thermal-hydraulic instabilities. Based on operating experience, 12 hours is a reasonable time to reach Hot Shutdown from higher power conditions, in an orderly manner and without challenging plant systems.

LIMITING CONDITIONS FOR OPERATION	SURVEILLANCE REQUIREMENTS
3.11.D. Thermal-hydraulic Stability Core thermal power shall not exceed 25% of rated thermal power without forced recirculation. Insert next page	

Insert on previous page

LIMITING CONDITIONS FOR OPERATION	SURVEILLANCE REQUIREMENTS
3.11.D. Intentional entry into the Stability Exclusion Region of the power/flow map defined in the Core Operating Limits Report (COLR) is prohibited. If entry into the Stability Exclusion Region does occur, immediately perform one or more of the following until the Stability Exclusion Region has been exited: a. Insert control rods, b. Increase the speed of an operating recirculation pump.	

3.11 **Bases**: (Cont'd)

C. Minimum Critical Power Ratio (MCPR)

The required operating limit MCPRs at steady state operating conditions as specified in Specification 3.11C are derived from the established fuel cladding integrity Safety Limit and an analysis of abnormal operational transients (References 2 and 11). For any abnormal operating transient analysis evaluation with the initial condition of the reactor being at the steady state operating limit it is required that the resulting MCPR does not decrease below the Safety Limit MCPR at any time during the transient assuming instrument trip setting given in Specification 2.1.

To assure that the fuel cladding integrity Safety Limit is not exceeded during any anticipated abnormal operational transient, the more limiting transients have been analyzed to determine which result in the largest reduction in critical power ratio (CPR). The models used in the transient analyses are discussed in Reference 1.

Flow-dependent and power-dependent MCPR limits ($MCPR_F$ and $MCPR_P$) are used to define the required Operating Limit MCPR (OLCPR) such that the above Safety Limit MCPR requirement is met for all power/flow conditions. $MCPR_F$ provides the thermal margin required to protect the fuel from transients resulting from inadvertent core flow increases. $MCPR_P$ protects the fuel from the other limiting abnormal operating transients, including localized events such as a rod withdrawal error.

Direct scram on Turbine Stop Valve Closure or Turbine Control Valve fast closure provides the fastest response to an abnormal operating transient such as load rejection, turbine trip, or feedwater controller failure. These direct scrams are bypassed at low power (P_{bypass}), to reduce the frequency of scrams during power ascension. For operation at or above P_{bypass} (30% of rated power), the required OLMCPR is the larger of $MCPR_F$ or $MCPR_P$ at the existing core power/flow state; where $MCPR_F$ and $MCPR_P$ are determined in the Core Operating Limits Report by multiplying the scram time dependent MCPR limit for rated power and flow MCPR(100) by the K_P factor. Below 30% of rated power, when the direct scrams are bypassed, a slightly more severe transient response results. To compensate for the more severe transient response, two power dependent MCPR limits are established, one for high flow (>50% of rated) conditions and one for low flow (≤50% of rated) conditions. These limits are specified in the Core Operating Limits Report. Further information on the MCPR operating limits for off-rated conditions is presented in Reference 11.

Insert next page (Spec. 3.11.D)

References for Bases 3.11

1. "General Electric Standard Application for Reactor Fuel," NEDE-24011-P-A. (The approved revision at the time the reload analyses are performed.) The approved revision number shall be identified in the Core Operating Limits Report.

2. "Supplemental Reload Licensing Submittal for Cooper Nuclear Station," (applicable reload document).

3-8. Deleted

9. Letter (with-attachment), R. H. Buckholz (GE) to P. S. Check (NRC). "Response to NRC Request for Information on ODYN Computer Model," September 5, 1980.

10. "Cooper Nuclear Station Single-Loop Operation," NEDO 24258.

11. "Extended Load Line Limit and ARTS Improvement Program Analysis for Cooper Nuclear Station Cycle 14," NEDC-31892P, Revision 1, May 1991.

Insert next page (Ref. for Bases 3.11.D)

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D. Thermal-Hydraulic Stability

The reactor is designed such that thermal-hydraulic oscillations are prevented or can be readily detected and suppressed without exceeding specified fuel design limits. To minimize the likelihood of a thermal-hydraulic instability, a Stability Exclusion Region , to be avoided during normal power operation, is calculated using the approved methodology of References 12 and 13. Since the Stability Exclusion Region may change each fuel cycle, the Exclusion Region is contained in the Core Operating Limits Report (COLR). Specific directions are provided to avoid operation in this region and to immediately exit upon entry. Entries into the Stability Exclusion Region are not part of normal operation. An entry may occur as the result of an abnormal event, such as a single recirculation pump trip. In these events, operation in the Stability Exclusion Region may be needed to prevent equipment damage, but actual time spent inside the Region is minimized. Although operator action can prevent the occurrence of and protect the reactor from an instability, the APRM flow biased scram function will suppress oscillations prior to exceeding the Safety Limit MCPR. While core-wide reactor instability is the predominate mode and the regional mode oscillations are not expected to occur, the reactor is protected from regional mode oscillations through avoidance of the Stability Exclusion Region and administrative controls on reactor conditions which are primary factors affecting reactor stability.

Insert on previous page (Ref. for Bases 3.11)

12. "BWR Owner's Group Long-Term Stability Solution Licensing Methodology," NEDO-31960 (the approved revision at the time the reload analyses are performed).

13. "BWR Owner's Group Long-Term Stability Solutions Licensing Methodology," NEDO-31960, Supplement 1.

b. The Linear Heat Generation Rate for Specification 3.11.B.

~~c. The K_f core flow MCPR adjustment factor for Specification 3.11.C.~~

c. The minimum critical power ratio (MCPR) for Specification 3.11.C.

d. The rod block monitor upscale setpoint for Table 3.2.C of Specification 3.2.C.

e. The power/flow map, defining the Stability Exclusion Region for Specification 3.11.D ~~3.5.F.2~~.

The analytical methods used to determine the core operating limits shall be those previously reviewed and approved by the NRC in NEDE-24011-P-A, "General Electric Standard Application for Reactor Fuel." (The approved revision at the time the reload analyses are performed.) The approved revision number shall be identified in the Core Operating Limits Report.

The core operating limits shall be determined such that all applicable limits (e.g., fuel thermal-mechanical limits, core thermal-hydraulic limits, ECCS limits, nuclear limits such as shutdown margin, transient analysis limits, and accident analysis limits) of the safety analysis are met.

The Core Operating Limits Report, including any mid-cycle revisions or supplements thereto, shall be provided, upon issuance for each reload cycle, to the NRC Document Control Desk with copies to the Regional Administrator and Resident Inspector.

6.5.2 Reportable Events

A Reportable Event shall be any of those conditions specified in Section 50.73 to 10CFR Part 50. The NRC shall be notified and a report submitted pursuant to the requirements of Section 50.73. Each Reportable Event shall be reviewed by SORC and the results of this review shall be submitted to SRAB and the Nuclear Power Group Manager.

APPENDIX B

REVISED TECHNICAL SPECIFICATIONS PAGES

2.1 Bases:

The abnormal operational transients applicable to operation of the CNS Unit have been analyzed throughout the spectrum of planned operating conditions. The analyses were based upon plant operation in accordance with Reference 3. In addition, 2381 MWt is the licensed maximum power level of CNS, and this represents the maximum steady-state power which shall not knowingly be exceeded.

The transient analyses performed each reload are given in Reference 1. Models and model conservatisms are also described in this reference. As discussed in Reference 2, the core wide transient analyses for one recirculation pump operation is conservatively bounded by two-loop operation analyses and the flow-dependent rod block and scram setpoint equations are adjusted for one-pump operation.

A. Trip Settings

The bases for individual trip settings are discussed in the following paragraphs.

1. Neutron Flux Trip Settings

a. APRM Flux Scram Trip Setting (Run Mode)

The average power range monitoring (APRM) system, which is calibrated using heat balance data taken during steady state conditions, reads in percent of rated thermal power (2381 MWt). Because fission chambers provide the basic input signals, the APRM system responds directly to average neutron flux. During transients, the instantaneous rate of heat transfer from the fuel (reactor thermal power) is less than the instantaneous neutron flux due to the time constant of the fuel. Therefore, during abnormal operational transients, the thermal power of the fuel will be less than that indicated by the neutron flux at the scram setting. Analyses demonstrate that with a 120% scram trip setting, none of the abnormal operational transients analyzed violate the fuel Safety Limit and there is a substantial margin from fuel damage. Also, the flow biased neutron flux scram provides protection to the Safety Limit MCPR in the unlikely event of a thermal-hydraulic instability.

LIMITING CONDITIONS FOR OPERATION

3.3.C (Cont'd.)

3. The maximum scram insertion time for 90% insertion of any operable control rod shall not exceed 7.00 seconds.

D. <u>Reactivity Anomalies</u>

At a specific steady state base condition of the reactor actual control rod inventory will be periodically compared to a normalized computer prediction of the inventory. If the difference between observed and predicted rod inventory reaches the equivalent of 1% Δk reactivity, the reactor will be shut down until the cause has been determined and corrective actions have been taken as appropriate.

E. <u>Restrictions</u>

If Specifications 3.3.A through D above cannot be met, an orderly shutdown shall be initiated and the reactor shall be in the Shutdown condition within 24 hours.

F. <u>Recirculation Pumps</u>

1. A recirculation pump shall not be started while the reactor is in natural circulation flow and reactor power is greater than 1% of rated thermal power.

2. The reactor may be started and operated, or operation may continue with one recirculation loop not in operation provided that;

   a. The idle loop is isolated electrically by disconnecting the breaker to the recirculation pump motor generator (M/G) set drive motor prior to start-up, or if disabled during reactor operation, within 24 hours.

   b. The recirculation system controls will be placed in the manual flow control mode.

3. With no recirculation loops in operation, the reactor shall be placed in the hot shutdown condition within 12 hours.

SURVEILLANCE REQUIREMENTS

4.3.C (Cont'd.)

D. <u>Reactivity Anomalies</u>

During the startup test program and startup following refueling outages, the critical rod configurations will be compared to the expected configurations at selected operating conditions. These comparisons will be used as base data for reactivity monitoring during subsequent power operation throughout the fuel cycle. At specific power operating conditions, the critical rod configuration will be compared to the configuration expected based upon appropriately corrected past data. This comparison will be made at least every full power month.

G. <u>Scram Discharge Volume</u>

1. The scram discharge volume (SDV) vent and drain valves shall be <u>cycled</u> and verified open at least once every 31 days <u>and prior to reactor start-up</u>.

2. The SDV vent and drain valves shall be verified to close within 30 seconds after receipt of a signal for control rod scram once per <u>refueling cycle</u>.

3. SDV vent and drain valve operability shall be verified following any maintenance or modification to any portion (electrical or mechanical) of the SDV which may affect the operation of the vent and drain valves.

the control rod motion is estimated to actually begin. However, 200 milliseconds is conservatively assumed for this time interval in the transient analyses and this is also included in the allowable scram insertion times of Specification 3.3.C. The time to deenergize the pilot valve scram solenoid is measured during the calibration tests required by Specification 4.1.

D. Reactivity Anomalies

During each fuel cycle excess operative reactivity varies as fuel depletes and as any burnable poison in supplementary control is burned. The magnitude of this excess reactivity may be inferred from the critical rod configuration. As fuel burnup progresses, anomalous behavior in the excess reactivity may be detected by comparison of the critical rod pattern at selected base states to the predicted rod inventory at that state. Power operating base conditions provide the most sensitive and directly interpretable data relative to core reactivity. Furthermore, using power operating base conditions permits frequent reactivity comparisons.

Requiring a reactivity comparison at the specified frequency assures that a comparison will be made before the core reactivity change exceeds 1% Δk. Deviations in core reactivity greater than 1% Δk are not expected and require thorough evaluation. One percent reactivity limit is considered safe since an insertion of the reactivity into the core would not lead to transients exceeding design conditions of the reactor system.

F. Recirculation Pumps

Until analyses are submitted for review and approval by the NRC which prove that recirculation pump startup from natural circulation does not cause a reactivity insertion transient in excess of the most severe coolant flow increase currently analyzed, Specification 3.3.F.1 prevents starting recirculation pumps while the reactor is in natural circulation above 1% of rated thermal power. Operation in natural circulation mode, with no recirculation loops in operation, can place the reactor in a condition closer to the onset of thermal-hydraulic instabilities. Based on operating experience, 12 hours is a reasonable time to reach Hot Shutdown from higher power conditions, in an orderly manner and without challenging plant systems.

LIMITING CONDITIONS FOR OPERATION	SURVEILLANCE REQUIREMENTS
3.11.D. Thermal-hydraulic Stability Intentional entry into the Stability Exclusion Region of the power/flow map defined in the Core Operating Limits Report (COLR) is prohibited. If entry into the Stability Exclusion Region does occur, immediately perform one or more of the following until the Stability Exclusion Region has been exited: a. Insert control rods, b. Increase the speed of an operating recirculation pump.	

3.11 Bases: (Cont'd)

C. Minimum Critical Power Ratio (MCPR)

The required operating limit MCPRs at steady state operating conditions as specified in Specification 3.11C are derived from the established fuel cladding integrity Safety Limit and an analysis of abnormal operational transients (References 2 and 11). For any abnormal operating transient analysis evaluation with the initial condition of the reactor being at the steady state operating limit it is required that the resulting MCPR does not decrease below the Safety Limit MCPR at any time during the transient assuming instrument trip setting given in Specification 2.1.

To assure that the fuel cladding integrity Safety Limit is not exceeded during any anticipated abnormal operational transient, the more limiting transients have been analyzed to determine which result in the largest reduction in critical power ratio (CPR). The models used in the transient analyses are discussed in Reference 1.

Flow-dependent and power-dependent MCPR limits ($MCPR_f$ and $MCPR_p$) are used to define the required Operating Limit MCPR (OLCPR) such that the above Safety Limit MCPR requirement is met for all power/flow conditions. $MCPR_f$ provides the thermal margin required to protect the fuel from transients resulting from inadvertent core flow increases. $MCPR_p$ protects the fuel from the other limiting abnormal operating transients, including localized events such as a rod withdrawal error.

Direct scram on Turbine Stop Valve Closure or Turbine Control Valve fast closure provides the fastest response to an abnormal operating transient such as load rejection, turbine trip, or feedwater controller failure. These direct scrams are bypassed at low power (P_{bypass}), to reduce the frequency of scrams during power ascension. For operation at or above P_{bypass} (30% of rated power), the required OLMCPR is the larger of $MCPR_f$ or $MCPR_p$ at the existing core power/flow state; where $MCPR_f$ and $MCPR_p$ are determined in the Core Operating Limits Report by multiplying the scram time dependent MCPR limit for rated power and flow MCPR(100) by the K_p factor. Below 30% of rated power, when the direct scrams are bypassed, a slightly more severe transient response results. To compensate for the more severe transient response, two power dependent MCPR limits are established, one for high flow (>50% of rated) conditions and one for low flow (≤50% of rated) conditions. These limits are specified in the Core Operating Limits Report. Further information on the MCPR operating limits for off-rated conditions is presented in Reference 11.

D. Thermal-Hydraulic Stability

The reactor is designed such that thermal-hydraulic oscillations are prevented or can be readily detected and suppressed without exceeding specified fuel design limits. To minimize the likelihood of a thermal-hydraulic instability, a Stability Exclusion Region, to be avoided during normal power operation, is calculated using the approved methodology of References 12 and 13. Since the Stability Exclusion Region may change each fuel cycle, the Exclusion Region is contained in the Core Operating Limits Report (COLR). Specific directions are provided to avoid operation in this region and to immediately exit upon entry. Entries into the Stability Exclusion Region are not part of normal operation. An entry may occur as the result of an abnormal event, such as a single recirculation pump trip. In these events, operation in the Stability Exclusion Region may be needed to prevent equipment damage, but actual time spent inside the Region is minimized. Although operator action can prevent the occurrence

3.11 Bases: (Cont'd)

of and protect the reactor from an instability, the APRM flow biased scram function will suppress oscillations prior to exceeding the Safety Limit MCPR. While core-wide reactor instability is the predominate mode and the regional mode oscillations are not expected to occur, the reactor is protected from regional mode oscillations through avoidance of the Stability Exclusion Region and administrative controls on reactor conditions which are primary factors affecting reactor stability.

References for Bases 3.11

1. "General Electric Standard Application for Reactor Fuel," NEDE-24011-P-A. (The approved revision at the time the reload analyses are performed.) The approved revision number shall be identified in the Core Operating Limits Report.

2. "Supplemental Reload Licensing Submittal for Cooper Nuclear Station," (applicable reload document).

3-8. Deleted

9. Letter (with attachment), R. H. Buckholz (GE) to P. S. Check (NRC). "Response to NRC Request for Information on ODYN Computer Model," September 5, 1980.

10. "Cooper Nuclear Station Single-Loop Operation," NEDO 24258.

11. "Extended Load Line Limit and ARTS Improvement Program Analysis for Cooper Nuclear Station Cycle 14," NEDC-31892P, Revision 1, May 1991.

12. "BWR Owners' Group Long-Term Stability Solutions Licensing Methodology," NEDO-31960 (the approved revision at the time the reload analyses are performed).

13. "BWR Owners' Group Long-Term Stability Solutions Licensing Methodology," NEDO-31960, Supplement 1.

4.11 Bases:

A&B. Average and Local LHGR

The LHGR shall be checked daily to determine if fuel burnup, or control rod movement has caused changes in power distribution. Since changes due to burnup are slow, and only a few control rods are moved daily, a daily check of power distribution is adequate.

C. Minimum Critical Power Ratio (MCPR) - (Surveillance Requirement)

At core thermal power levels less than or equal to 25%, the reactor will be operating at less than or equal to minimum recirculation pump speed and the moderator void content will be very small. For all designated control rod patterns which may be employed at this point, operating plant experience indicated that the resulting MCPR value is in excess of requirements by a considerable margin. With this low void content, any inadvertent core flow increase would only place operation in a more conservative mode relative to MCPR. During initial start-up testing of the plant, a MCPR evaluation was made at 25% thermal power level with minimum recirculation pump speed. The MCPR margin was thus demonstrated such that subsequent MCPR evaluation below this power level was shown to be unnecessary. The daily requirement for calculating MCPR above 25% rated thermal power is sufficient since power distribution shifts are very slow when there have not been significant power or control rod

changes. The requirement for calculating MCPR when an operating limit MCPR is approached ensures that MCPR will be known following a change in power or power shape (regardless of magnitude) that could place operation at a thermal limit.

Core Operating Limits Report (Continued)

b. The Linear Heat Generation Rate for Specification 3.11.B.

c. The Minimum Critical Power Ratio (MCPR) for Specification 3.11.C.

d. The Rod Block Monitor upscale setpoint for Table 3.2.C of Specification 3.2.C.

e. The power/flow map, defining the Stability Exclusion Region for Specification 3.11.D.

The analytical methods used to determine the core operating limits shall be those previously reviewed and approved by the NRC in NEDE-24011-P-A, "General Electric Standard Application for Reactor Fuel." (The approved revision at the time the reload analyses are performed.) The approved revision number shall be identified in the Core Operating Limits Report.

The core operating limits shall be determined such that all applicable limits (e.g., fuel thermal-mechanical limits, core thermal-hydraulic limits, ECCS limits, nuclear limits such as shutdown margin, transient analysis limits, and accident analysis limits) of the safety analysis are met.

The Core Operating Limits Report, including any mid-cycle revisions or supplements thereto, shall be provided, upon issuance for each reload cycle, to the NRC Document Control Desk with copies to the Regional Administrator and Resident Inspector.

6.5.2 Reportable Events

A Reportable Event shall be any of those conditions specified in Section 50.73 to 10CFR Part 50. The NRC shall be notified and a report submitted pursuant to the requirements of Section 50.73. Each Reportable Event shall be reviewed by SORC and the results of this review shall be submitted to SRAB and the Nuclear Power Group Manager.

Correspondence No: NLS970001

The following table identifies those actions committed to by the District in this document. Any other actions discussed in the submittal represent intended or planned actions by the District. They are described to the NRC for the NRC's information and are not regulatory commitments. Please notify the Licensing Manager at Cooper Nuclear Station of any questions regarding this document or any associated regulatory commitments.

COMMITMENT	COMMITTED DATE OR OUTAGE
None	