ENCLOSURE 1

PROPOSED TECHNICAL SPECIFICATION CHANGES
BROWNS FERRY NUCLEAR PLANT UNITS 1, 2, AND 3
(DOCKET NOS. 50-259, 50-260, 50-296)

UNIT ONE

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3.6.A Thermal and Pressurization Limitations

3. During heatup by non-nuclear means, except when the vessel is vented, cooldown following nuclear shutdown on low-level physics tests, the reactor vessel temperatures shall be at or above the temperatures of curve #2 of figure 3.6-1.

4. The reactor vessel shell temperatures during inservice hydrostatic or leak testing shall be at or above the temperatures shown on curve #1 of figure 3.6-1.

5. The reactor vessel head bolting studs may be partially tensioned (four sequences of the seating pass) provided the studs and flange materials are above 70°F. Before loading the flanges any more, the vessel flange and head flange must be greater than 100°F, and must remain above 100°F while under full tension.

6. The pump in an idle recirculation loop shall not be started unless the temperatures of the coolant within the idle and operating recirculation loops are within 50° F of each other.

7. The reactor recirculation pumps shall not be started unless the coolant temperatures between the dome and the bottom head drain are within 145° F.

4.6.A Thermal and Pressurization Limitations

3. Test specimens representing the reactor vessel, base weld, and weld heat affected zone metal shall be installed in the reactor vessel adjacent to the vessel wall at the core midplane level. The number and type of specimens will be in accordance with GE report NEDO-10115. The specimens shall meet the intent of ASTM E 185-70. Samples shall be withdrawn at one-fourth and three-fourths service life.

4. Neutron flux wires shall be installed in the reactor vessel adjacent to the reactor vessel wall at the core midplane level. The wires shall be removed and tested during the first refueling outage to experimentally verify the calculated values of neutron fluence at one-fourth of the beltline shell thickness that are used to determine the NDTT shift from Figure 3.6-2.

5. When the reactor vessel head bolting studs are tensioned and the reactor is in a cold condition, the reactor vessel shell temperature immediately below the head flange shall be permanently recorded.

6. Prior to and during startup of an idle recirculation loop, the temperature of the reactor coolant in the operating and idle loops shall be permanently logged.

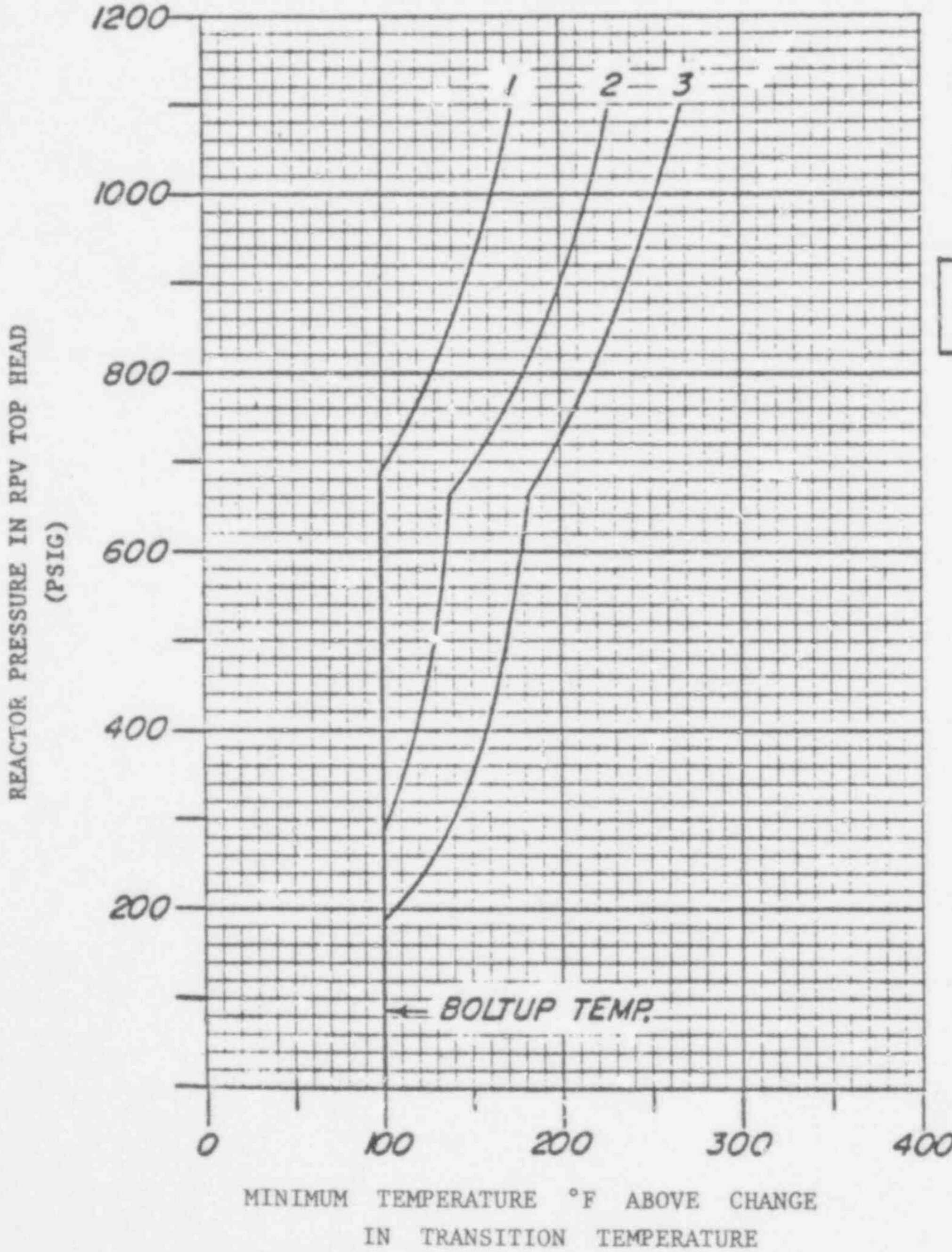
7. Prior to starting a recirculation pump, the reactor coolant temperatures in the dome and in the bottom head drain shall be compared and permanently logged.

FIGURE 3.6-1

CURVE #1
Minimum temperature for pressure tests such as required by Section XI

CURVE #2
Minimum temperature for mechanical heat up or cooldown following nuclear shutdown

CURVE #3
Minimum temperature for core operation (criticality)
[Includes additional margin req'd by 10CFR50 Appendix G]



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3.6.A/4.6.A

The vessel pressurization temperatures at any time period can be determined from the thermal power output of the plant and its relation to the neutron fluence and from figure 3.6-2. For heatup or cooldown and core operation, see curves#2 & #3 on figure 3.6-1. During the first fuel cycle, only calculated neutron fluence values can be used. At the first refueling, neutron dosimeter wires which are installed adjacent to the vessel wall can be removed to verify the calculated neutron fluence. As more experience is gained in calculating the fluence the need to verify it experimentally will disappear. Because of the many experimental points used to derive figure 3.6-2, there is no need to reverify if for technical reasons, but in case verification is required for other reasons, three sets of mechanical test specimens representing the base metal, weld metal and weld heat affected zone metal have been placed in the vessel. These can be removed and tested as required.

As described in paragraph 4.2.5 of the safety analysis report, detailed stress analyses have been made on the reactor vessel for both steady-state and transient conditions with respect to material fatigue. The results of these analyses are compared to allowable stress limits. Requiring the coolant temperature in an idle recirculation loop to be within 50°F of the operating loop temerature before a recirculation pump is started assures that the changes in coolant temperature at the reactor vessel nozzles and bottom head region are acceptable.

The coolant in the bottom of the vessel is at a lower temperaure than that in the upper regions of the vessel when there is no recirculation flow. This colder water is forced up when recirculation pumps are started. This will not result in stresses which exceed ASME Boiler and Pressure Vessel Code, Section III limits when the temperature differential is not greater than 145°F.

The requirements for full tension boltup of the reactor vessel closure are based on the NDT temperature plus 60°F. This is derived from the requirements of the ASME code to which the vessel was built. The NDT temperature of the closure flanges, adjacent head, and shell material is a maximum of 40°F and a maximum of 10°F for the stud material. Therefore, the minimum temperature for full tension boltup is 40°F plus 60°F for a total of 100°F. The partial boltup is restricted to the full loading of eight studs at 70°F, which is stud NDT temperature (10°F) plus 60°F. The neutron radiation fluence at the closure flanges is well below 10^{17} nvt $\geq$ 1 Mev; therefore, radiation effects will be minor and will not influence this temperature.

3.6.B/4.6.B Coolant Chemistry

Materials in the primary system are primarily 304 stainless steel and the Zircaloy cladding. The reactor water chemistry limits are established to prevent damage to these materials. Limits are placed on conductivity and chloride concentrations. Conductivity is limited because it is continously measured and gives an indication of abnormal conditions and the presence of unusual materials in the coolant. Chloride limits are specified to prevent stress corrosion cracking of stainless steel.

UNIT TWO

3.6.A Thermal and Pressurization Limitations

3. During heatup by non-nuclear means, except when the vessel is vented, cooldown following nuclear shutdown on low-level physics tests, the reactor vessel temperatures shall be at or above the temperatures of curve #2 of figure 3.6-1.

4. The reactor vessel shell temperatures during inservice hydrostatic or leak testing shall be at or above the temperatures shown on curve #1 of figure 3.6-1.

5. The reactor vessel head bolting studs may be partially tensioned (four sequences of the seating pass) provided the studs and flange materials are above 70°F. Before loading the flanges any more, the vessel flange and head flange must be greater than 100°F, and must remain above 100°F while under full tension.

6. The pump in an idle recirculation loop shall not be started unless the temperatures of the coolant within the idle and operating recirculation loops are within 50° F of each other.

7. The reactor recirculation pumps shall not be started unless the coolant temperatures between the dome and the bottom head drain are within 145° F.

4.6.A Thermal and Pressurization Limitations

3. Test specimens representing the reactor vessel, base weld, and weld heat affected zone metal shall be installed in the reactor vessel adjacent to the vessel wall at the core midplane level. The number and type of specimens will be in accordance with GE report NEDO-10115. The specimens shall meet the intent of ASTM E 185-70. Samples shall be withdrawn at one-fourth and three-fourths service life.

4. Neutron flux wires shall be installed in the reactor vessel adjacent to the reactor vessel wall at the core midplane level. The wires shall be removed and tested during the first refueling outage to experimentally verify the calculated values of neutron fluence at one-fourth of the beltline shell thickness that are used to determine the NDTT shift from Figure 3.6-2.

5. When the reactor vessel head bolting studs are tensioned and the reactor is in a cold condition, the reactor vessel shell temperature immediately below the head flange shall be permanently recorded.

6. Prior to and during startup of an idle recirculation loop, the temperature of the reactor coolant in the operating and idle loops shall be permanently logged.

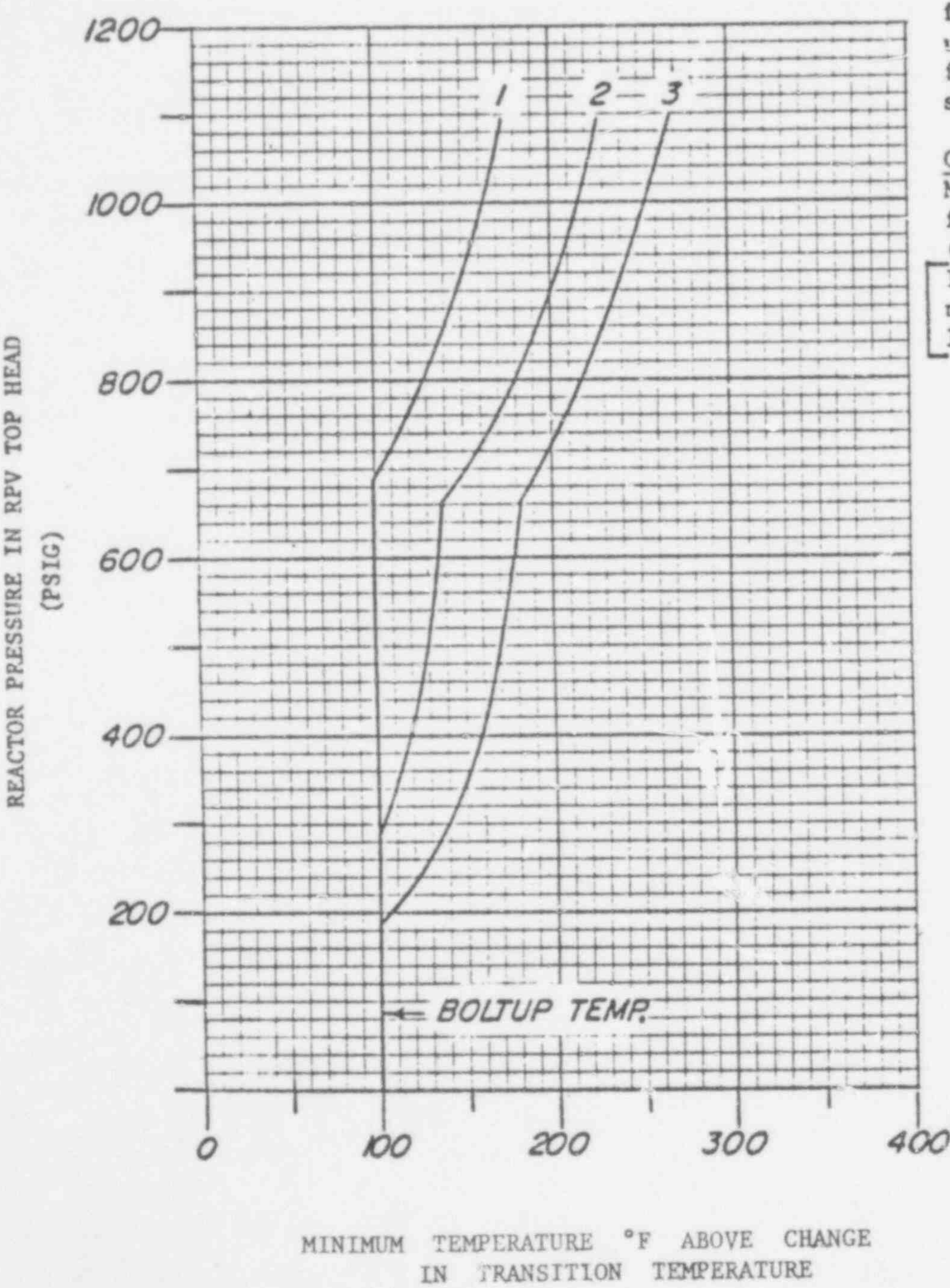
7. Prior to starting a recirculation pump, the reactor coolant temperatures in the dome and in the bottom head drain shall be compared and permanently logged.

FIGURE 3.6-1

CURVE #1
Minimum temperature for pressure tests such as required by Section XI

CURVE #2
Minimum temperature for mechanical heat up or cooldown following nuclear shutdown

CURVE #3
Minimum temperature for core operation (criticality)
[Includes additional margin req'd by 10CFR50 Appendix G]



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3.6/4.6 BASES

3.6.A/4.6.A

The vessel pressurization temperatures at any time period can be determined from the thermal power output of the plant and its relation to the neutron fluence and from figure 3.6-2. For heatup or cooldown and core operation, see curves#2 & #3 on figure 3.6-1. During the first fuel cycle, only calculated neutron fluence values can be used. At the first refueling, neutron dosimeter wires which are installed adjacent to the vessel wall can be removed to verify the calculated neutron fluence. As more experience is gained in calculating the fluence the need to verify it experimentally will disappear. Because of the many experimental points used to derive figure 3.6-2, there is no need to reverify it for technical reasons, but in case verification is required for other reasons, three sets of mechanical test specimens representing the base metal, weld metal and weld heat affected zone metal have been placed in the vessel. These can be removed and tested as required.

As described in paragraph 4.2.5 of the safety analysis report, detailed stress analyses have been made on the reactor vessel for both steady-state and transient conditions with respect to material fatigue. The results of these analyses are compared to allowable stress limits. Requiring the coolant temperature in an idle recirculation loop to be within 50°F of the operating loop temerature before a recirculation pump is started assures that the changes in coolant temperature at the reactor vessel nozzles and bottom head region are acceptable.

The coolant in the bottom of the vessel is at a lower temperaure than that in the upper regions of the vessel when there is no recirculation flow. This colder water is forced up when recirculation pumps are started. This will not result in stresses which exceed ASME Boiler and Pressure Vessel Code, Section III limits when the temperature differential is not greater than 145°F.

The requirements for full tension boltup of the reactor vessel closure are based on the NDT temperature plus 60°F. This is derived from the requirements of the ASME code to which the vessel was built. The NDT temperature of the closure flanges, adjacent head, and shell material is a maximum of 40°F and a maximum of 10°F for the stud material. Therefore, the minimum temperature for full tension boltup is 40°F plus 60°F for a total of 100°F. The partial boltup is restricted to the full loading of eight studs at 70°F, which is stud NDT temperature (10°F) plus 60°F. The neutron radiation fluence at the closure flanges is well below 10^{17} nvt $\geq$ 1 Mev; therefore, radiation effects will be minor and will not influence this temperature.

3.6.B/4.6.B Coolant Chemistry

Materials in the primary system are primarily 304 stainless steel and the Zircaloy cladding. The reactor water chemistry limits are established to prevent damage to these materials. Limits are placed on conductivity and chloride concentrations. Conductivity is limited because it is continously measured and gives an indication of abnormal conditions and the presence of unusual materials in the coolant. Chloride limits are specified to prevent stress corrosion cracking of stainless steel.

UNIT THREE

3.6 PRIMARY SYSTEM BOUNDARY

4. The reactor vessel shell temperatures during inservice hydrostatic or leak testing shall be at or above the temperatures shown on curve Number 1 of figure 3.6-1.

5. The reactor vessel head bolting studs may be partially tensioned (four sequences of the seating pass) provided the studs and flange materials are above 70°F. Before loading the flanges any more, the vessel flange and head flange must be greater than 100°F, and must remain above 100°F while under full tension.

6. The pump in an idle recirculation loop shall not be started unless the temperatures of the coolant within the idle and operating recirculation loops are within 50°F of each other.

7. The reactor recirculation pumps shall not be started unless the coolant temperatures between the dome and bottom head drain are within 145°F.

4.6 PRIMARY SYSTEM BOUNDARY

4. Neutron flux wires shall be installed in the reactor vessel adjacent to the reactor vessel wall at the core midplane level. The wires shall be removed and tested during the first refueling outage to experimentally verify the calculated values of integrated neutron fluence of one-fourth of the belt line shell thickness that are used to determine the NDTT shift from Figure 3.6-2.

5. When the reactor vessel head bolting studs are tensioned and the reactor is in a Cold Condition, the reactor vessel shell temperature immediately below the head flange shall be permanently recorded.

6. Prior to and during startup of an idle recirculation loop, the temperature of the reactor coolant in the operating and idle loops shall be permanently logged.

7. Prior to starting a recirculation pump, the reactor coolant temperatures in the dome and in the bottom head drain shall be compared and permanently logged.

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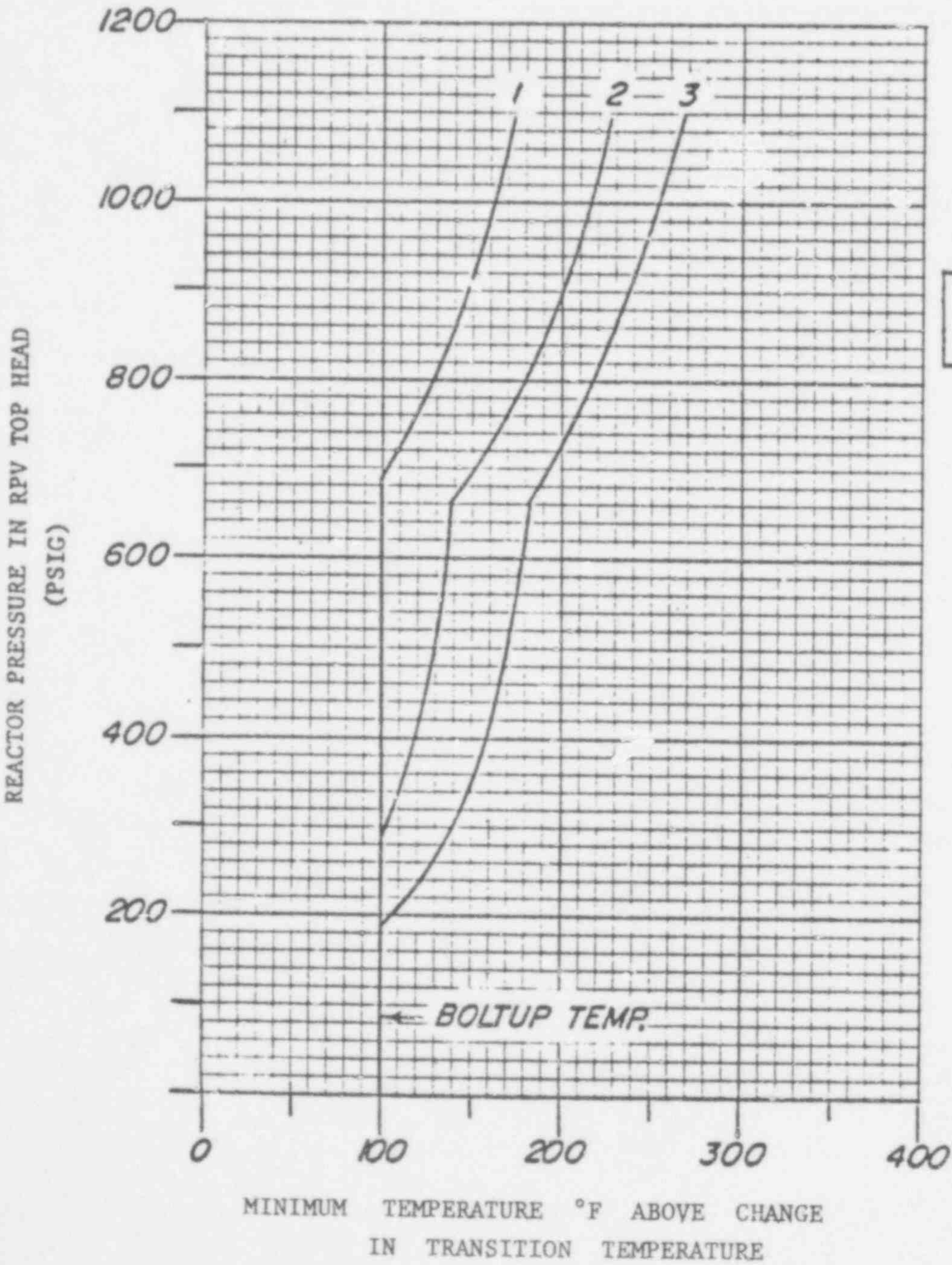
FIGURE 3.6-1



CURVE #1
Minimum temperature for pressure tests such as required by Section XI

CURVE #2
Minimum temperature for mechanical heat up or cooldown following nuclear shutdown

CURVE #3
Minimum temperature for core operation (criticality)
[Includes additional margin req'd by 10CFR50 Appendix G]

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thermal power output if no great changes in core geometry are made.

The vessel pressurization temperatures at any time period can be determined from the thermal power output of the plant and its relation to the neutron fluence and from figure 3.6-2. For heatup or cooldown and core operation, see curves #2 & #3 on figure 3.6-1. During the first fuel cycle, only calculated neutron fluence values can be used. At the first refueling, neutron dosimeter wires which are installed adjacent to the vessel wall can be removed to verify the calculated neutron fluence. As more experience is gained in calculating the fluence the need to verify it experimentally will disappear. Because of the many experimental points used to derive figure 3.6-2, there is no need to reverify if for technical reasons, but in case verification is required for other reasons, three sets of mechanical test specimens representing the base metal, weld metal and weld heat affected zone metal have been placed in the vessel. These can be removed and tested as required.

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The coolant in the bottom of the vessel is at a lower temperature than that in the upper regions of the vessel when there is no recirculation flow. This colder water is forced up when recirculation pumps are started. This will not result in stresses which exceed ASME Boiler and Pressure Vessel Code, Section III limits when the temperature differential is not greater than 145°F.

The requirements for full tension boltup of the reactor vessel closure are based on the NDT temperature plus 60°F. This is derived from the requirements of the ASME code to which the vessel was built. The NDT temperature of the closure flanges, adjacent head, and shell material is a maximum of 40°F and a maximum of 10°F for the stud material. Therefore, the minimum temperature for full tension boltup is 40°F plus 60°F for a total of 100°F. The partial boltup is restricted to the full loading of eight studs at 70°F, which is stud NDT temperature (10°F) plus 60°F. The neutron radiation fluence at the closure flanges is well below 10^{17} nvt $\geq$ 1 Mev; therefore, radiation effects will be minor and will not influence this temperature.

ENCLOSURE 2

1. Proposed Revision to Specification 3.6.A.5

The General Electric Company (GE) has determined that the closure flanges may be preloaded by partial bolt tensioning (either eight bolts under full tension or a greater number of bolts under partial tension to give equivalent loading) in order to seat and seal the O-rings at a temperature of 70°F (Reference 1). Because of the sequence of the boltup procedure, the head seating passes will result in loading the bolts and flanges to meet the above restriction. This change is allowed based on the fact that the stress imposed by partial tensioning is far less than the stress imposed on the flanges by full bolt tensioning. Therefore, at partial tension the limiting factor is the stud NDT which is 10°F. For fracture toughness, the required 60°F safety factor is added to the stud NDT which results in the 70°F restriction on this partial tensioning. As reflected by technical specification Figure 3.6-1, the boltup temperature above this partial tensioning is 100°F minimum.

2. Proposed Revision to Figure 3.6-1

GE Topical Report NEDO-21778, "Transient Pressure Rises Affecting Fracture Toughness Requirements for Boiling Water Reactors," was prepared and submitted for NRC review to provide justification for modifying the requirements for the minimum permissible temperature of the reactor pressure vessel when the core is critical as set forth in paragraph IV.A.2.c of 10 CFR 50, Appendig G. In the topical report evaluation, provided as enclosure to letter from Olan D. Parr to Dr. G. G. Sherwood dated November 13, 1978, the NRC staff agreed with the requested deletion of the criticality limit based on the minimum permissible temperature for the inservice hydrotest. This revision will allow nuclear heat to be utilized above 100°F and will decrease vessel heatup time. NEDO-21778 and the topical report evaluation provide the necessary justification for this revision to Figure 3.6-1.