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INDEX

LIST OF FIGURES

		PAGE
3.1-1A	SHUTDOWN MARGIN VERSUS COLD LEG TEMPERATURE.....	3/4 1-2a
3.1-1	ALLOWABLE MTC MODES 1 AND 2.....	3/4 1-5
3.1-2	MINIMUM BORATED WATER VOLUMES.....	3/4 1-12
3.1-2A	CORE POWER LIMIT AFTER CEA DEVIATION.....	3/4 1-24
3.1-3	CEA INSERTION LIMITS VS THERMAL POWER (COLSS IN SERVICE).....	3/4 1-31
3.1-4	CEA INSERTION LIMITS VS THERMAL POWER (COLSS OUT OF SERVICE).....	3/4 1-32
3.1-5	PART LENGTH CEA INSERTION LIMIT VS THERMAL POWER.....	3/4 1-34
3.2-1A	<i>Azimuthal Power Tilt Limit vs. Thermal Power (COLSS in service)</i>	<i>3/4 2-4a</i>
3.2-1	COLSS DNBR POWER OPERATING LIMIT ALLOWANCE FOR BOTH CEACs INOPERABLE.....	3/4 2-6
3.2-2	DNBR MARGIN OPERATING LIMIT BASED ON CORE PROTECTION CALCULATORS (COLSS OUT OF SERVICE, CEACs OPERABLE).....	3/4 2-7
3.2-2A	DNBR MARGIN OPERATING LIMIT BASED ON CORE PROTECTION CALCULATORS (COLSS OUT OF SERVICE, CEACs INOPERABLE)...	3/4 2-7a
3.2-3	REACTOR COOLANT COLD LEG TEMPERATURE VS CORE POWER LEVEL.....	3/4 2-10
3.4-1	DOSE EQUIVALENT I-131 PRIMARY COOLANT SPECIFIC ACTIVITY LIMIT VERSUS PERCENT OF RATED THERMAL POWER WITH THE PRIMARY COOLANT SPECIFIC ACTIVITY > 1.0 μ Ci/GRAM DOSE EQUIVALENT I-131.....	3/4 4-27
3.4-2	REACTOR COOLANT SYSTEM PRESSURE TEMPERATURE LIMITATIONS FOR 0 TO 10 YEARS OF FULL POWER OPERATION.....	3/4 4-29
4.7-1	SAMPLING PLAN FOR SNUBBER FUNCTIONAL TEST.....	3/4 7-26
B 3/4.4-1	NIL-DUCTILITY TRANSITION TEMPERATURE INCREASE AS A FUNCTION OF FAST (E > 1 MeV) NEUTRON FLUENCE (550°F IRRADIATION).....	8 3/4 4-10
5.1-1	SITE AND EXCLUSION BOUNDARIES.....	5-2
5.1-2	LOW POPULATION ZONE.....	5-3
5.1-3	GASEOUS RELEASE POINTS.....	5-4
6.2-1	OFFSITE ORGANIZATION.....	6-3
6.2-2	ONSITE UNIT ORGANIZATION.....	6-4

POWER DISTRIBUTION LIMITS

3/4.2.3 AZIMUTHAL POWER TILT - T_q

LIMITING CONDITION FOR OPERATION

3.2.3 The AZIMUTHAL POWER TILT (T_q) shall be less than or equal to the AZIMUTHAL POWER TILT Allowance used in the Core Protection Calculators (CPCs) following limits:

APPLICABILITY: MODE 1 above 20% of RATED THERMAL POWER*.

ACTION:

- a. With the measured AZIMUTHAL POWER TILT determined to exceed the AZIMUTHAL POWER TILT Allowance used in the CPCs but less than or equal to 0.10, within 2 hours either correct the power tilt or adjust the AZIMUTHAL POWER TILT Allowance used in the CPCs to greater than or equal to the measured value.

With the measured AZIMUTHAL POWER TILT determined to exceed 0.10.

1. Due to misalignment of either a part-length or full-length CEA, within 30 minutes verify that the Core Operating Limit Supervisory System (COLSS) (when COLSS is being used to monitor the core power distribution per Specifications 4.2.1 and 4.2.4) is detecting the CEA misalignment.
2. Verify that the AZIMUTHAL POWER TILT is within its limit within 2 hours after exceeding the limit or reduce THERMAL POWER to less than 50% of RATED THERMAL POWER within the next 2 hours and verify that the Variable Overpower Trip Setpoint has been reduced as appropriate within the next 4 hours.
3. Identify and correct the cause of the out of limit condition prior to increasing THERMAL POWER; subsequent POWER OPERATION above 50% of RATED THERMAL POWER may proceed provided that the AZIMUTHAL POWER TILT is verified within its limit at least once per hour for 12 hours or until verified acceptable at 95% or greater RATED THERMAL POWER.

* See Special Test Exception 3.10.2.

POWER DISTRIBUTION LIMITS

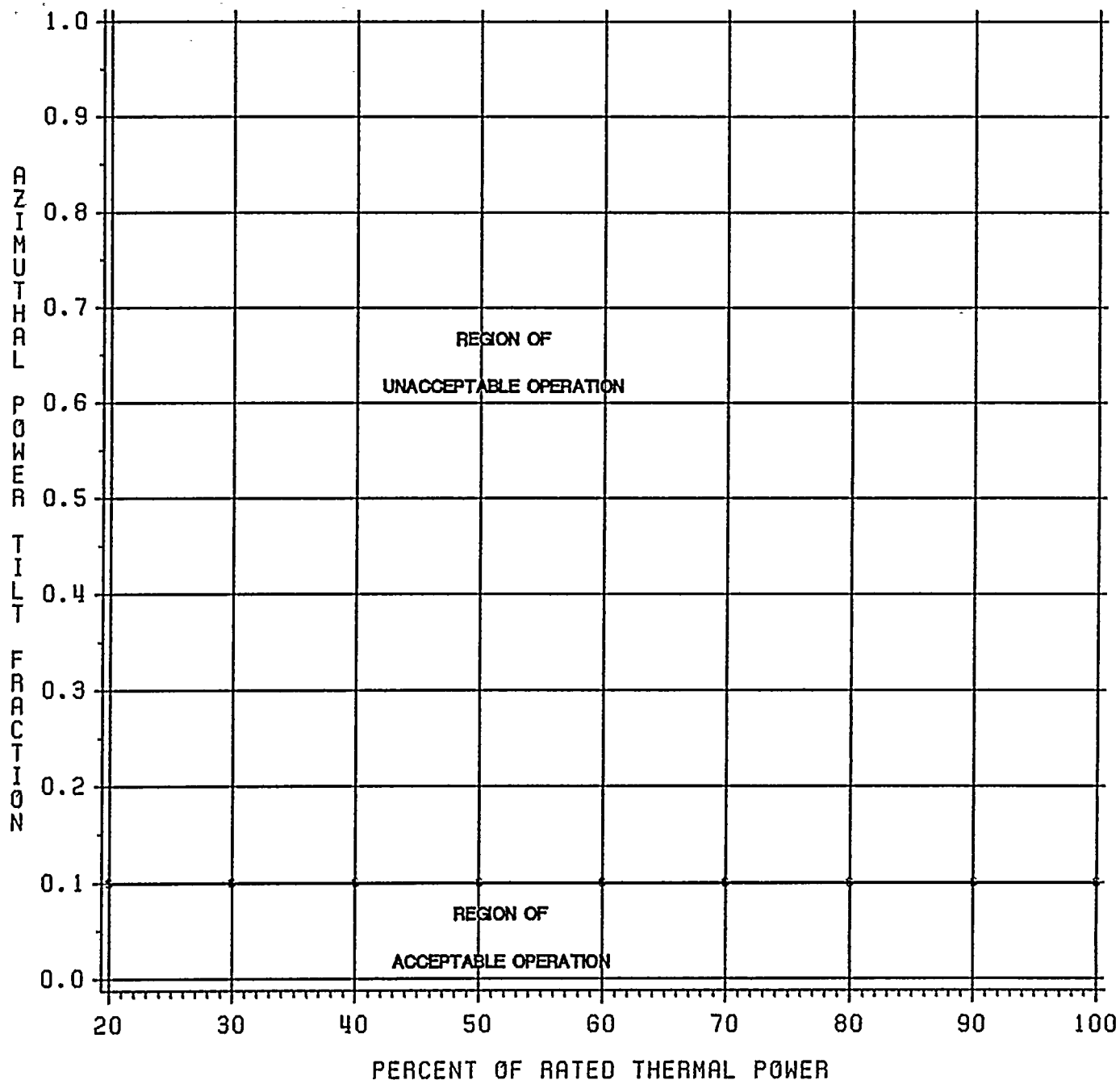
SURVEILLANCE REQUIREMENTS

4.2.3.1 The provisions of Specification 4.0.4 are not applicable.

4.2.3.2 The AZIMUTHAL POWER TILT shall be determined to be within ^{its} ~~the~~ limits above 20% of RATED THERMAL POWER by:

- a. Continuously monitoring the tilt with COLSS when the COLSS is ^{in service,} ~~OPERABLE~~.
- b. Calculating the tilt at least once per 12 hours when the COLSS is ~~inoperable.~~ ^{out of service.}
- c. Verifying at least once per 31 days, that the COLSS Azimuthal Tilt Alarm is actuated at an AZIMUTHAL POWER TILT less than or equal to the AZIMUTHAL POWER TILT Allowance used in the CPCs.
- d. Using the incore detectors, at least once per 31 EFPD to independently confirm the validity of the COLSS calculated AZIMUTHAL POWER TILT.

FIGURE 3.2 - 1A
AZIMUTHAL POWER TILT LIMIT
VS
THERMAL POWER
(COLSS IN SERVICE)



PALO VERDE - UNIT 1

POWER DISTRIBUTION LIMITS

BASES

3/4.2.2 PLANAR RADIAL PEAKING FACTORS

Limiting the values of the PLANAR RADIAL PEAKING FACTORS (F_{xy}^c) used in the COLSS and CPCs to values equal to or greater than the measured PLANAR RADIAL PEAKING FACTORS (F_{xy}^m) provides assurance that the limits calculated by COLSS and the CPCs remain valid. Data from the incore detectors are used for determining the measured PLANAR RADIAL PEAKING FACTORS. A minimum core power at 20% of RATED THERMAL POWER is assumed in determining the PLANAR RADIAL PEAKING FACTORS. The 20% RATED THERMAL POWER threshold is due to the neutron flux detector system being inaccurate below 20% core power. Core noise level at low power is too large to obtain usable detector readings. The periodic surveillance requirements for determining the measured PLANAR RADIAL PEAKING FACTORS provides assurance that the PLANAR RADIAL PEAKING FACTORS used in COLSS and the CPCs remain valid throughout the fuel cycle. Determining the measured PLANAR RADIAL PEAKING FACTORS after each fuel loading prior to exceeding 70% of RATED THERMAL POWER provides additional assurance that the core was properly loaded.

3/4.2.3 AZIMUTHAL POWER TILT - T_q

The limitations on the AZIMUTHAL POWER TILT are provided to ensure that design safety margins are maintained. An AZIMUTHAL POWER TILT greater than ~~0.10~~ is not expected and if it should occur, operation is restricted to only those conditions required to identify the cause of the tilt. The tilt is normally calculated by COLSS. A minimum core power of 20% of RATED THERMAL POWER is assumed by the CPCs in its input to COLSS for calculation of AZIMUTHAL POWER TILT. The 20% RATED THERMAL POWER threshold is due to the neutron flux detector system being inaccurate below 20% core power. Core noise level at low power is too large to obtain usable detector readings. The surveillance requirements specified when COLSS is out of service provide an acceptable means of detecting the presence of a steady-state tilt. It is necessary to explicitly account for power asymmetries because the radial peaking factors used in the core power distribution calculations are based on an untilted power distribution.

The AZIMUTHAL POWER TILT is equal to $(P_{\text{tilt}}/P_{\text{untilt}}) - 1.0$ where:

AZIMUTHAL POWER TILT is measured by assuming that the ratio of the power at any core location in the presence of a tilt to the untilted power at the location is of the form:

$$P_{\text{tilt}}/P_{\text{untilt}} = 1 + T_q g \cos(\theta - \theta_0)$$

where:

T_q is the peak fractional tilt amplitude at the core periphery

g is the radial normalizing factor

θ is the azimuthal core location

θ_0 is the azimuthal core location of maximum tilt

The limit in Figure 3.2-1A with COLSS in service or 0.10 with COLSS out of service.

INDEX

LIST OF FIGURES

		<u>PAGE</u>
3.1-1A	SHUTDOWN MARGIN VERSUS COLD LEG TEMPERATURE.....	3/4 1-2a
3.1-1	ALLOWABLE MTC MODES 1 AND 2.....	3/4 1-5
3.1-2	MINIMUM BORATED WATER VOLUMES.....	3/4 1-12
3.1-2A	PART LENGTH CEA INSERTION LIMIT VS THERMAL POWER.....	3/4 1-23
3.1-2B	CORE POWER LIMIT AFTER CEA DEVIATION.....	3/4 1-24
3.1-3	CEA INSERTION LIMITS VS THERMAL POWER (COLSS IN SERVICE).....	3/4 1-31
3.1-4	CEA INSERTION LIMITS VS THERMAL POWER (COLSS OUT OF SERVICE).....	3/4 1-32
3.2-1A	ALTERNATE POWER TILT LIMIT VS THERMAL POWER (COLSS IN SERVICE)	3/4 2-4a
3.2-1	DNBR MARGIN OPERATING LIMIT BASED ON COLSS (COLSS IN SERVICE).....	3/4 2-6
3.2-2	DNBR MARGIN OPERATING LIMIT BASED ON CORE PROTECTION CALCULATOR (COLSS OUT OF SERVICE).....	3/4 2-7
3.2-3	REACTOR COOLANT COLD LEG TEMPERATURE VS CORE POWER LEVEL.....	3/4 2-10
3.3-1	DNBR MARGIN OPERATING LIMIT BASED ON COLSS FOR BOTH CEAC'S INOPERABLE.....	3/4 3-10
3.4-1	DOSE EQUIVALENT I-131 PRIMARY COOLANT SPECIFIC ACTIVITY LIMIT VERSUS PERCENT OF RATED THERMAL POWER WITH THE PRIMARY COOLANT SPECIFIC ACTIVITY > 1.0 μ Ci/GRAM DOSE EQUIVALENT I-131.....	3/4 4-27
3.4-2	REACTOR COOLANT SYSTEM PRESSURE TEMPERATURE LIMITATIONS FOR 0 TO 10 YEARS OF FULL POWER OPERATION.....	3/4 4-29
4.7-1	SAMPLING PLAN FOR SHUBBER FUNCTIONAL TEST.....	3/4 7-26
B 3/4.4-1	NIL-DUCTILITY TRANSITION TEMPERATURE INCREASE AS A FUNCTION OF FAST ($E > 1$ MeV) NEUTRON FLUENCE (550°F IRRADIATION).....	B 3/4 4-10
5.1-1	SITE AND EXCLUSION BOUNDARIES.....	5-2
5.1-2	LOW POPULATION ZONE.....	5-3
5.1-3	GASEOUS RELEASE POINTS.....	5-4
6.2-1	OFFSITE ORGANIZATION	6-3
6.2-2	ONSITE ORGANIZATION	6-4
PALO VERDE - UNIT 2		XIX
		AMENDMENT NO. 13

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POWER DISTRIBUTION LIMITS

3/4.2.3 AZIMUTHAL POWER TILT - T_q

LIMITING CONDITION FOR OPERATION

3.2.3 The AZIMUTHAL POWER TILT (T_q) shall be less than or equal to the ~~AZIMUTHAL POWER TILT Allowance used in the Core Protection Calculators (CPCs)~~. following limits:

- a. The AZIMUTHAL POWER TILT Allowance used in the Core Protection Calculators (CPCs), and
 - b.1. The limit in Figure 3.2-1A with COLSS in service, or
 - b.2. $T_q \leq 0.10$ with COLSS out of service.

APPLICABILITY: MODE 1 above 20% of RATED THERMAL POWER*.

ACTION:

- a. With the measured AZIMUTHAL POWER TILT determined to exceed the AZIMUTHAL POWER TILT Allowance used in the CPCs ~~but less than or equal to 0.10~~, within 2 hours either correct the power tilt or adjust the AZIMUTHAL POWER TILT Allowance used in the CPCs to greater than or equal to the measured value.
- b. With the measured AZIMUTHAL POWER TILT determined to exceed ~~0.10~~.
 1. Due to misalignment of either a part-length or full-length CEA, within 30 minutes verify that the Core Operating Limit Supervisory System (COLSS) (when COLSS is being used to monitor the core power distribution per Specifications 4.2.1 and 4.2.4) is detecting the CEA misalignment.
 2. Verify that the AZIMUTHAL POWER TILT is within its limit within 2 hours after exceeding the limit or reduce THERMAL POWER to less than 50% of RATED THERMAL POWER within the next 2 hours and verify that the Variable Overpower Trip Setpoint has been reduced as appropriate within the next 4 hours.
 3. Identify and correct the cause of the out of limit condition prior to increasing THERMAL POWER; subsequent POWER OPERATION above 50% of RATED THERMAL POWER may proceed provided that the AZIMUTHAL POWER TILT is verified within its limit at least once per hour for 12 hours or until verified acceptable at 95% or greater RATED THERMAL POWER.

the limit in Figure 3.2-1A with COLSS in service or 0.10 with COLSS out of service.

*See Special Test Exception 3.10.2.

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POWER DISTRIBUTION LIMITS

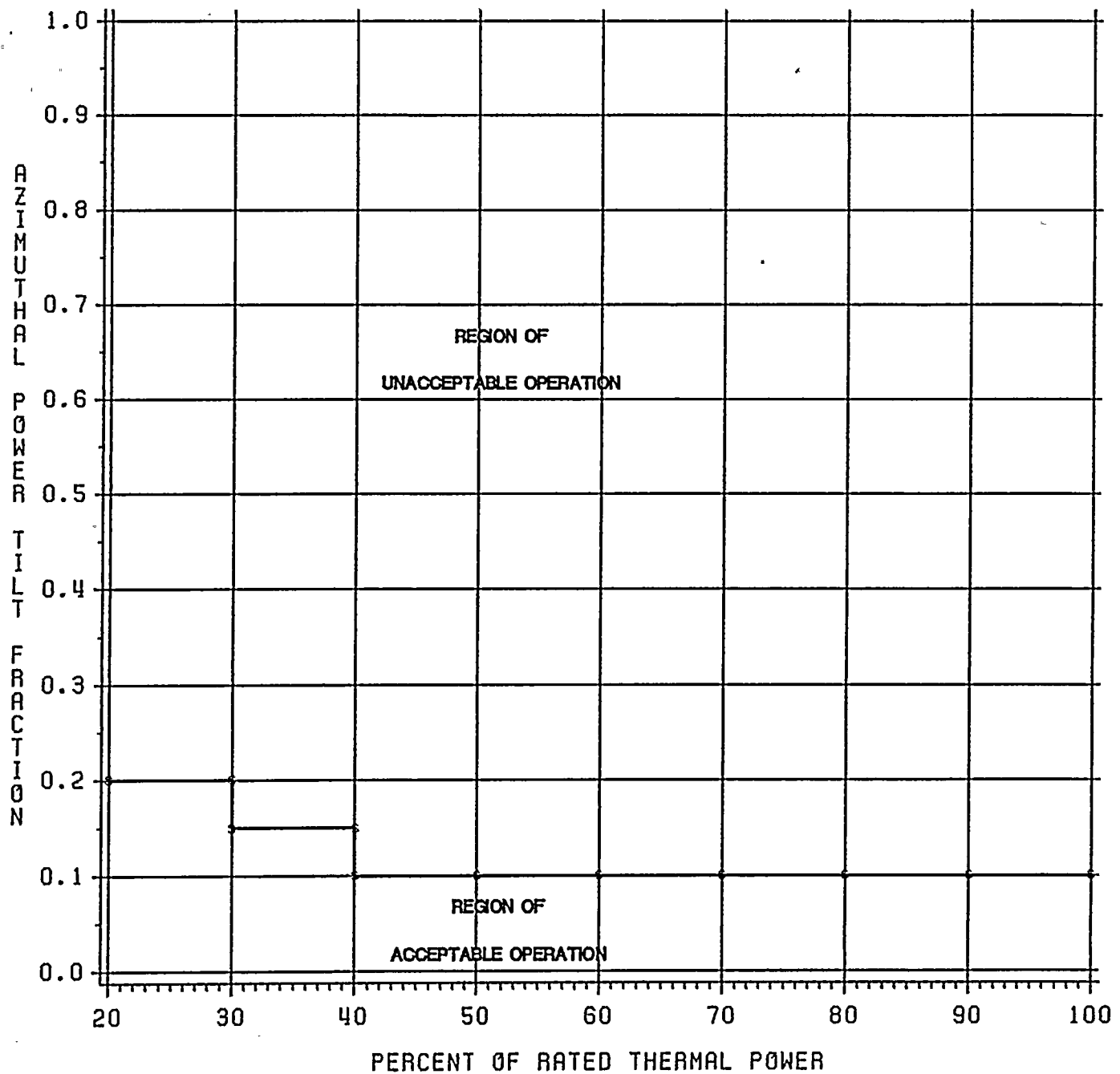
SURVEILLANCE REQUIREMENTS

4.2.3.1 The provisions of Specification 4.0.4 are not applicable.

4.2.3.2 The AZIMUTHAL POWER TILT shall be determined to be within ^{its} ~~the~~ limits [^] above 20% of RATED THERMAL POWER by:

- a. Continuously monitoring the tilt with COLSS when the COLSS is ^{in service} ~~operable~~.
- b. Calculating the tilt at least once per 12 hours when the COLSS is ~~inoperable~~ out of service.
- c. Verifying at least once per 31 days, that the COLSS Azimuthal Tilt Alarm is actuated at an AZIMUTHAL POWER TILT less than or equal to the AZIMUTHAL POWER TILT Allowance used in the CPCs.
- d. Using the incore detectors at least once per 31 EFPD to independently confirm the validity of the COLSS calculated AZIMUTHAL POWER TILT.

FIGURE 3.2 - 1A
AZIMUTHAL POWER TILT LIMIT
VS
THERMAL POWER
(COLSS IN SERVICE)



PALO VERDE - UNIT 2

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POWER DISTRIBUTION LIMITS

BASES

3/4.2.2 PLANAR RADIAL PEAKING FACTORS

Limiting the values of the PLANAR RADIAL PEAKING FACTORS (F_{xy}^c) used in the COLSS and CPCs to values equal to or greater than the measured PLANAR RADIAL PEAKING FACTORS (F_{xy}^m) provides assurance that the limits calculated by COLSS and the CPCs remain valid. Data from the incore detectors are used for determining the measured PLANAR RADIAL PEAKING FACTORS. A minimum core power at 20% of RATED THERMAL POWER is assumed in determining the PLANAR RADIAL PEAKING FACTORS. The 20% RATED THERMAL POWER threshold is due to the neutron flux detector system being inaccurate below 20% core power. Core noise level at low power is too large to obtain usable detector readings. The periodic surveillance requirements for determining the measured PLANAR RADIAL PEAKING FACTORS provides assurance that the PLANAR RADIAL PEAKING FACTORS used in COLSS and the CPCs remain valid throughout the fuel cycle. Determining the measured PLANAR RADIAL PEAKING FACTORS after each fuel loading prior to exceeding 70% of RATED THERMAL POWER provides additional assurance that the core was properly loaded.

3/4.2.3 AZIMUTHAL POWER TILT - T_g

The limit in Figure 3.2-1A with COLSS in service or 0.10 with COLSS out of service

The limitations on the AZIMUTHAL POWER TILT are provided to ensure that design safety margins are maintained. An AZIMUTHAL POWER TILT greater than ~~0.10~~ is not expected and if it should occur, operation is restricted to only those conditions required to identify the cause of the tilt. The tilt is normally calculated by COLSS. A minimum core power of 20% of RATED THERMAL POWER is assumed by the CPCs in its input to COLSS for calculation of AZIMUTHAL POWER TILT. The 20% RATED THERMAL POWER threshold is due to the neutron flux detector system being inaccurate below 20% core power. Core noise level at low power is too large to obtain usable detector readings. The surveillance requirements specified when COLSS is out of service provide an acceptable means of detecting the presence of a steady-state tilt. It is necessary to explicitly account for power asymmetries because the radial peaking factors used in the core power distribution calculations are based on an untilted power distribution.

The AZIMUTHAL POWER TILT is equal to $(P_{\text{tilt}}/P_{\text{untilt}})-1.0$ where:

AZIMUTHAL POWER TILT is measured by assuming that the ratio of the power at any core location in the presence of a tilt to the untilted power at the location is of the form:

$$P_{\text{tilt}}/P_{\text{untilt}} = 1 + T_g \cos(\theta - \theta_0)$$

where:

T_g is the peak fractional tilt amplitude at the core periphery

g is the radial normalizing factor

θ is the azimuthal core location

θ_0 is the azimuthal core location of maximum tilt

INDEX

LIST OF FIGURES

		<u>PAGE</u>
3.1-1A	SHUTDOWN MARGIN VERSUS COLD LEG TEMPERATURE.....	3/4 1-2a
3.1-1	ALLOWABLE MTC MODES 1 AND 2.....	3/4 1-5
3.1-2	MINIMUM BORATED WATER VOLUMES.....	3/4 1-12
3.1-2A	PART LENGTH CEA INSERTION LIMIT VS THERMAL POWER.....	3/4 1-23
3.1-2B	CORE POWER LIMIT AFTER CEA DEVIATION.....	3/4 1-24
3.1-3	CEA INSERTION LIMITS VS THERMAL POWER (COLSS IN SERVICE).....	3/4 1-31
3.1-4	CEA INSERTION LIMITS VS THERMAL POWER (COLSS OUT OF SERVICE).....	3/4 1-32
3.2-1A	<i>Azimuthal Power Tilt Limit vs. Thermal power (colss in service)</i>	<i>3/4 2-4a</i>
3.2-1	DNBR MARGIN OPERATING LIMIT BASED ON COLSS (COLSS IN SERVICE).....	3/4 2-6
3.2-2	DNBR MARGIN OPERATING LIMIT BASED ON CORE PROTECTION CALCULATOR (COLSS OUT OF SERVICE).....	3/4 2-7
3.2-3	REACTOR COOLANT COLD LEG TEMPERATURE VS CORE POWER LEVEL.....	3/4 2-10
3.3-1	DNBR MARGIN OPERATING LIMIT BASED ON COLSS FOR BOTH CEAC'S INOPERABLE.....	3/4 3-10
3.4-1	DOSE EQUIVALENT I-131 PRIMARY COOLANT SPECIFIC ACTIVITY LIMIT VERSUS PERCENT OF RATED THERMAL POWER WITH THE PRIMARY COOLANT SPECIFIC ACTIVITY > 1.0 μ ci/GRAM DOSE EQUIVALENT I-131.....	3/4 4-27
3.4-2	REACTOR COOLANT SYSTEM PRESSURE TEMPERATURE LIMITATIONS FOR 0 TO 10 YEARS OF FULL POWER OPERATION.....	3/4 4-29
4.7-1	SAMPLING PLAN FOR SNUBBER FUNCTIONAL TEST.....	3/4 7-26
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5.1-1	SITE AND EXCLUSION BOUNDARIES.....	5-2
5.1-2	LOW POPULATION ZONE.....	5-3
5.1-3	GASEOUS RELEASE POINTS.....	5-4
6.2-1	OFFSITE ORGANIZATION.....	6-3
6.2-2	ONSITE UNIT ORGANIZATION.....	6-4

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POWER DISTRIBUTION LIMITS

3/4.2.3 AZIMUTHAL POWER TILT - T_q

LIMITING CONDITION FOR OPERATION

- a. The AZIMUTHAL POWER TILT Allowance used in the Core Protection Calculators (CPCs), and
b.1. The limit in Figure 3.2-1A with COLSS in service, or
b.2. $T_q \leq 0.10$ with COLSS out of service.

3.2.3 The AZIMUTHAL POWER TILT (T_q) shall be less than or equal to the AZIMUTHAL POWER TILT Allowance used in the Core Protection Calculators (CPCs) following limits:

APPLICABILITY: MODE 1 above 20% of RATED THERMAL POWER*.

ACTION:

- a. With the measured AZIMUTHAL POWER TILT determined to exceed the AZIMUTHAL POWER TILT Allowance used in the CPCs but less than or equal to 0.10, within 2 hours either correct the power tilt or adjust the AZIMUTHAL POWER TILT Allowance used in the CPCs to greater than or equal to the measured value.
- b. With the measured AZIMUTHAL POWER TILT determined to exceed 0.10.
1. Due to misalignment of either a part-length or full-length CEA, within 30 minutes verify that the Core Operating Limit Supervisory System (COLSS) (when COLSS is being used to monitor the core power distribution per Specifications 4.2.1 and 4.2.4) is detecting the CEA misalignment.
 2. Verify that the AZIMUTHAL POWER TILT is within its limit within 2 hours after exceeding the limit or reduce THERMAL POWER to less than 50% of RATED THERMAL POWER within the next 2 hours and verify that the Variable Overpower Trip Setpoint has been reduced as appropriate within the next 4 hours.
 3. Identify and correct the cause of the out of limit condition prior to increasing THERMAL POWER; subsequent POWER OPERATION above 50% of RATED THERMAL POWER may proceed provided that the AZIMUTHAL POWER TILT is verified within its limit at least once per hour for 12 hours or until verified acceptable at 95% or greater RATED THERMAL POWER.

The limit in Figure 3.2-1A with COLSS in service or 0.10 with COLSS out of service.

*See Special Test Exception 3.10.2.

POWER DISTRIBUTION LIMITS

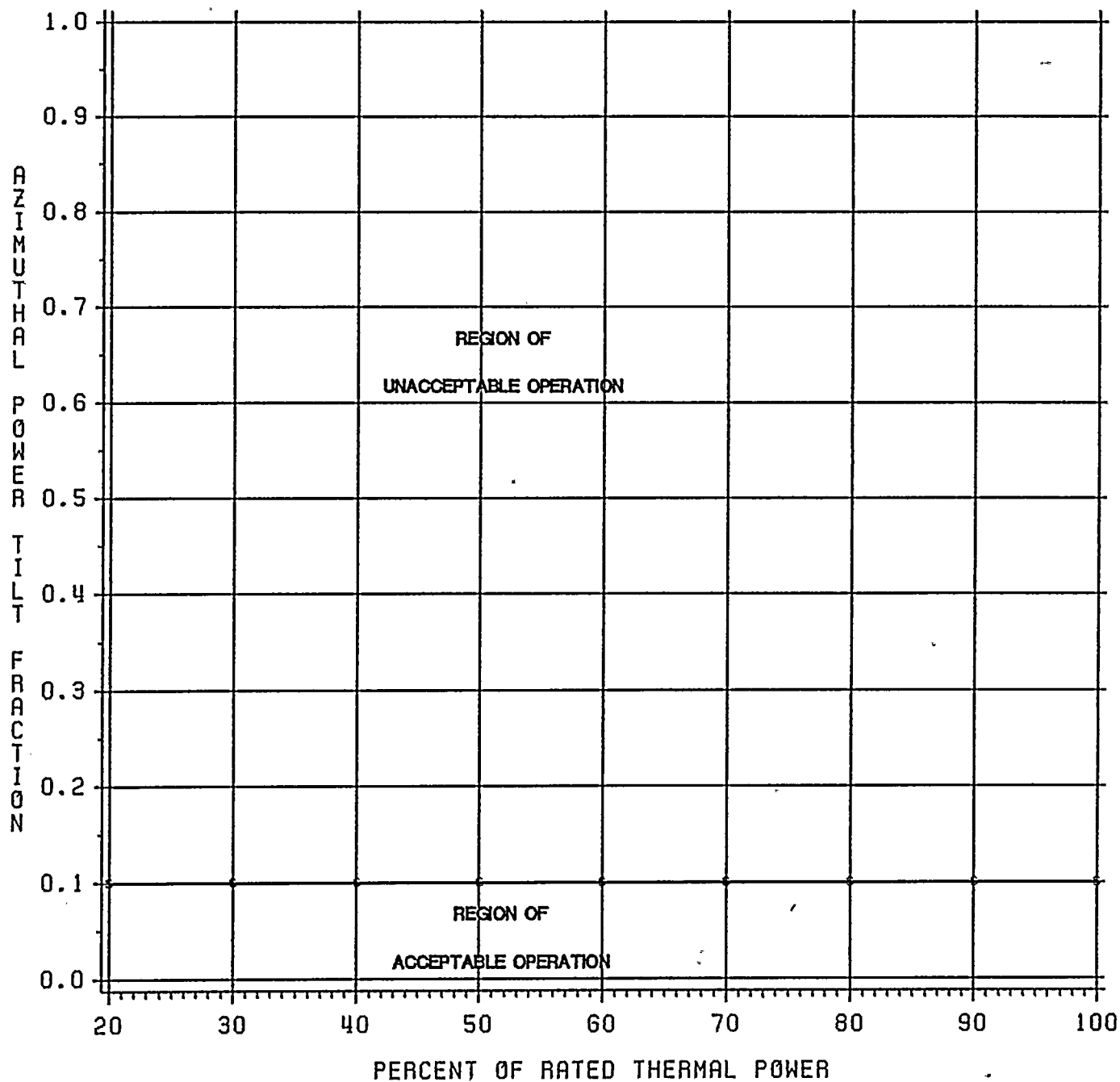
SURVEILLANCE REQUIREMENTS

4.2.3.1 The provisions of Specification 4.0.4 are not applicable.

4.2.3.2 The AZIMUTHAL POWER TILT shall be determined to be within ^{its} ~~the~~ limits above 20% of RATED THERMAL POWER by:

- a. Continuously monitoring the tilt with COLSS when the COLSS is ^{in service,} ~~OPERABLE~~.
- b. Calculating the tilt at least once per 12 hours when the COLSS is ~~inoperable,~~ out of service,
- c. Verifying at least once per 31 days, that the COLSS Azimuthal Tilt Alarm is actuated at an AZIMUTHAL POWER TILT less than or equal to the AZIMUTHAL POWER TILT Allowance used in the CPCs.
- d. Using the incore detectors at least once per 31 EFPD to independently confirm the validity of the COLSS calculated AZIMUTHAL POWER TILT.

FIGURE 3.2 - 1A
AZIMUTHAL POWER TILT LIMIT
VS
THERMAL POWER
(COLSS IN SERVICE)



PALO VERDE - UNIT 3

POWER DISTRIBUTION LIMITS

BASES

3/4.2.2 PLANAR RADIAL PEAKING FACTORS

Limiting the values of the PLANAR RADIAL PEAKING FACTORS (F_{xy}^c) used in the COLSS and CPCs to values equal to or greater than the measured PLANAR RADIAL PEAKING FACTORS (F_{xy}^m) provides assurance that the limits calculated by COLSS and the CPCs remain valid. Data from the incore detectors are used for determining the measured PLANAR RADIAL PEAKING FACTORS. A minimum core power at 20% of RATED THERMAL POWER is assumed in determining the PLANAR RADIAL PEAKING FACTORS. The 20% RATED THERMAL POWER threshold is due to the neutron flux detector system being inaccurate below 20% core power. Core noise level at low power is too large to obtain usable detector readings. The periodic surveillance requirements for determining the measured PLANAR RADIAL PEAKING FACTORS provides assurance that the PLANAR RADIAL PEAKING FACTORS used in COLSS and the CPCs remain valid throughout the fuel cycle. Determining the measured PLANAR RADIAL PEAKING FACTORS after each fuel loading prior to exceeding 70% of RATED THERMAL POWER provides additional assurance that the core was properly loaded.

3/4.2.3 AZIMUTHAL POWER TILT - T_q

The limitations on the AZIMUTHAL POWER TILT are provided to ensure that design safety margins are maintained. An AZIMUTHAL POWER TILT greater than ~~0.10~~ is not expected and if it should occur, operation is restricted to only those conditions required to identify the cause of the tilt. The tilt is normally calculated by COLSS. A minimum core power of 20% of RATED THERMAL POWER is assumed by the CPCs in its input to COLSS for calculation of AZIMUTHAL POWER TILT. The 20% RATED THERMAL POWER threshold is due to the neutron flux detector system being inaccurate below 20% core power. Core noise level at low power is too large to obtain usable detector readings. The surveillance requirements specified when COLSS is out of service provide an acceptable means of detecting the presence of a steady-state tilt. It is necessary to explicitly account for power asymmetries because the radial peaking factors used in the core power distribution calculations are based on an untilted power distribution.

the limit
in Figure
3.2-1A
with COLSS
in service
or 0.10 with
COLSS out
of service

The AZIMUTHAL POWER TILT is equal to $(P_{\text{tilt}}/P_{\text{untilt}}) - 1.0$ where:

AZIMUTHAL POWER TILT is measured by assuming that the ratio of the power at any core location in the presence of a tilt to the untilted power at the location is of the form:

$$P_{\text{tilt}}/P_{\text{untilt}} = 1 + T_q g \cos(\theta - \theta_0)$$

where:

T_q is the peak fractional tilt amplitude at the core periphery

g is the radial normalizing factor

θ is the azimuthal core location

θ_0 is the azimuthal core location of maximum tilt

