Portland General Electric Company

James E. Cross Vice President, Nuclear

February 14, 1991

Trojan Nuclear Plant
Docket 50-344
License NPF-1

U.S. Nuclear Regulatory Commission
Attn: Document Control Desk
Washington DC 20555

Dear Sir:

Request for a Regional Waiver of Compliance

This request for a Regional Waiver of Compliance is to allow the Trojan Nuclear Plant to continue full-power operation for the remainder of its current fuel cycle (i.e., March 27, 1991) without performing the required flux mapping using the incore instrumentation system. The attachment provides justification supporting this continued full-power operation. Because of the unusual circumstances which caused the need for this request, (i.e., the unexpected failure of a thimble tube which occurred on January 22, 1991) and the limited scope and duration of this request, a Waiver of Compliance, instead of a Technical Specification Amendment, is considered appropriate. Alternate monitoring techniques and operational restrictions will be employed to ensure core power distribution remains within limits while the waiver is in effect. Approval of this waiver is requested on or before February 28, 1991 in order to avoid an unnecessary plant shutdown.

This request was reviewed and approved by the Trojan Plant Review Board and the Trojan Nuclear Operations Board.

Sincerely,

W. R. Robinson for J. E. Cross

Attachment

c: Mr. John B. Martin
Regional Administrator, Region V
U.S. Nuclear Regulatory Commission

Mr. David Stewart-Smith
State of Oregon
Department of Energy

Mr. R. C. Barr
NRC Resident Inspector
Trojan Nuclear Plant

A001
'11

121 SW Salmon St, Portland, OR 97204
503/464-8897

REQUEST FOR REGIONAL WAIVER OF COMPLIANCE

Background

The incore instrumentation system is used to measure the flux distribution within the reactor core to periodically verify that certain fuel performance parameters are within acceptable and predicted limits throughout core life. The measured parameters are:

- Nuclear Heat Flux Hot Channel Factor - $F_Q(Z)$

- Nuclear Enthalpy Rise Hot Channel Factor $F^N_{\Delta H}$

The incore instrumentation system is also used to calibrate instruments required for monitoring the following parameters:

- Nuclear Quadrant Power Tilt Ratio

- Axial Flux Difference

In addition, the incore instrumentation system can be used to detect anomalous power distributions which might be caused by a significantly misaligned Rod Cluster Control Assembly (RCCA) or dropped RCCA rodlets.

Trojan Technical Specification (TTS) 3.3.3.2, Movable Incore Detectors, requires various numbers and combinations of the detectors to be operable when they are required to perform the functions listed above. The surveillance requirements associated with TTS 3.2.2, Heat Flux Hot Channel Factor ($F_Q[Z]$), require use of the incore instrumentation system to measure $F_Q[Z]$ at least once per 31 Effective Full Power Days (EFPD). The surveillance requirements associated with TTS 3.2.3, RCS Flowrate and F_R, require use of the incore instrumentation system to measure the Nuclear Enthalpy Rise Hot Channel Factor ($F^N_{\Delta H}$) at least once per 31 EFPD. The most recent date these measurements were completed was January 18, 1991. Recalibration of the excore axial flux offset detection system is required quarterly by the combination of TTS Table 4.3-1, Functional Unit 2 and TTS 4.2.1.3 which is taken to equate the quarter with 92 EFPD. This was completed most recently on January 18, 1991, and will not be required again during this fuel cycle. The axial flux difference indication is required to be verified monthly, using the incore instrumentation system, by TTS Table 4.3-1, Functional Unit 2. The target axial flux difference is also required to be updated at least once per 31 EFPD by TTS 4.2.1.4. These items were also most recently completed January 18, 1991. In order to complete all of these measurements and calibrations, at least 75 percent of the thimbles are required to be operable.

The incore detectors are miniature fission chambers which can be remotely positioned in retractable guide thimbles to provide flux mapping in the reactor core. The retractable thimbles, into which the miniature

detectors are driven, are stainless steel tubes (closed at the leading end) which are pushed into the core through conduits which extend from the bottom of the reactor vessel, down through a shield area and up to a thimble seal table. The thimbles are dry inside and form a pressure barrier between the Reactor Coolant System and the Containment atmosphere. There are 58 thimble locations in the Trojan reactor core. Manual isolation valves are provided at the seal table for each thimble.

The drive system for the insertion of the miniature detectors into the thimble tubes consists of drive assemblies, five-path rotary transfer selector assemblies and ten-path rotary transfer selector assemblies. The drive system pushes drive cables, with the miniature detectors attached, through the path selector assemblies and into the core within the thimble tubes. The path selector assemblies are used to select the core location into which the detector is to be inserted. There are 6 detector and drive assemblies, 6 five-path and 6 ten-path rotary transfer selector assemblies.

In 1989, thimble tube measurements were taken in response to NRC Bulletin 88-09, Thimble Tube Thinning in Westinghouse Reactors. During the 1990 refueling outage, 32 thimble tubes were replaced because of the degree of thinning detected in 1989 or because of tube restrictions due to crud blockages which could not be removed. The replacement tubes were manufactured with a slightly larger diameter and wall thickness than those originally installed in the Plant. The larger tubes were recommended by the Trojan Nuclear Steam Supply System (NSSS) vendor as a potential solution to the thinning problems experienced with the smaller tubes. The larger tubes also provided greater clearance to facilitate passage of the instrument probes. On January 22, 1991, a small leak (approximately 1.1 gpm) developed in one of the new thimble tubes. The leak was isolated by closing the manual isolation valve associated with that thimble tube. Since the time the leak occurred, all 32 of the thimble tubes which were installed during the 1990 refueling outage have been isolated. Isolation of the additional thimble tubes was done as a precautionary measure since it is not known why the failure occurred after only approximately six months of service (the Plant returned to operation on July 14, 1990 following the refueling outage). Portland General Electric Company (PGE) has committed not to open the closed isolation valves without prior discussion with the Nuclear Regulatory Commission. The number of tubes available to perform a full core flux map is less than the minimum number required because of the thimble tube isolation.

Personnel who isolated the leak on January 22, 1991, reported that steam and water were coming from four of the ten-path rotary transfer selector assemblies. Subsequent testing has shown that two of the selector assemblies have developed electrical problems and are not functioning properly. Since water and steam were observed to be coming from the selector assemblies, it is considered likely that borated water from the Reactor Coolant System is in the thimble tubes associated with these assemblies. It is also possible that borated water has entered

additional thimble tubes because the rotary transfer assemblies are connected by tubing which leads to a common drain header. In order to avoid further damage to the incore instrumentation system and to prevent the spread of contamination, cleaning of the thimble tubes is considered necessary prior to further use of the system. The cleaning is also considered necessary to ensure free passage of the detectors through the thimble tubes. Depending upon the extent of system electrical problems and additional thimble tube flooding, the detector drive system may not function properly. Information received from the Trojan NSSS vendor indicates that it is likely that the detector leads could electrically short if they are inserted into thimble tubes containing borated water. This would render the detectors inoperable, and require their replacement. Additionally, there are many carbon steel parts, including the detector drive cables, in the detector drive system. If the detectors are inserted into thimble tubes which contain borated water from the Reactor Coolant System, corrosion damage and spreading of contamination will occur. Industry experience (e.g., NRC Information Notice 84-55) indicates that cleaning of the thimble tubes while the Plant is at power is hazardous. Failure of a thimble tube or its seals during the cleaning process could result in an unisolable reactor coolant leak.

The safety significance associated with not performing flux mapping for the remainder of the fuel cycle has been determined to be minimal. Therefore, PGE believes this waiver of compliance is justified. The economic penalties associated with a Plant shutdown to repair the incore instrumentation system, or with starting the 1991 refueling outage early, are significant. Factors which support these conclusions are discussed in the following sections.

The fuel reload pattern for the next refueling is based upon a target burnup of 9169 MWd/MTU. In order to meet the target burnup, the Plant will have to run close to full power until the March 27, 1991 refueling outage. A shutdown to repair and clean the incore instrumentation system or a Technical Specification required shutdown before the scheduled outage start would result in failure to reach the target burnup. Failure to meet the target burnup will result in the need to perform additional analyses to establish new core reload patterns. The number of new fuel assemblies in the reload may also change. The reload analyses have already been started and the reload fuel has been ordered. Delays which would result from missing the target burnup could result in delaying receipt of the reload safety analysis and impact Plant startup following the 1991 refueling outage. This situation is further complicated because PGE is using a new fuel vendor for the next fuel cycle.

Rescheduling the refueling outage to a different date to accommodate the target burnup is not practical due to the short time available to make the changes. Services and manpower to support the outage have already

been contracted and changes at this late date, if they could be accommodated, would result in economic and other penalties.

Requirement for Which a Waiver is Requested

This Waiver of Compliance is requested to allow continued full power operation until March 27, 1991 (scheduled date for start of the 1991 refueling outage) without performing flux distribution monitoring using the movable incore detectors in accordance with Trojan Technical Specifications 4.2.1.4, 4.2.2.2, 4.2.2.3, 4.2.3.2, and 4.3.1.1 (Table 4.3-1, Functional Unit 2, Notation 3).

Need for Prompt Action

This waiver is needed because the incore instrumentation system, including its drive system, is not considered functional due to damage which occurred on January 22, 1991 when a thimble tube developed a leak. A Plant shutdown and Reactor Coolant System depressurization would be required to perform the necessary repairs and cleaning to restore the incore instrumentation system to operable status. The estimated duration of such an outage is 15 to 17 days. A Plant shutdown will result in unnecessary economic penalties associated with lost generation, outage scheduling and the next fuel cycle startup. If the Plant continues to operate at 100 percent Rated Thermal Power following the expected February 15, 1991 startup, the next flux map will be required on February 21, 1991. This date does not include the 25 percent surveillance extension allowed by Technical Specification 4.0.2. The 25 percent surveillance interval extension allowed by Technical Specification 4.0.2 would require completion of the next flux map by February 28, 1991. Trojan can continue to operate at full power until this date without obtaining relief from performing the required flux mapping. The present situation caused by the January 22, 1991 thimble tube leak could not have been foreseen or reasonably avoided, and until the necessary repairs are made, use of the incore instrumentation system is not prudent.

Compensatory Actions

To help maintain expected core behavior the Plant will be operated to ensure conditions which could affect core power distribution are minimized. Administrative limits will be established to maintain control rod position greater than or equal to 210 steps during full power operation. This limit will keep the control rods above the point where they would have appreciable influence upon the flux distribution. Additional controls include maintaining baseload operation (i.e., no load following operations), as well as maintaining axial flux difference within the target band, adhering to the Quadrant Power Tilt Ratio (QPTR) limits and imposing $F^N_{\Delta H}$ alternate monitoring requirements. If an unexpected Plant trip or other event which results in a rod insertion

beyond the 210-step administrative limit occurs while this waiver is in effect, the subsequent startup or recovery will be made in consultation with the NRC and under the supervision of the Reactor Engineering Staff.

Alternate monitoring techniques will be employed to monitor core power distribution. For $F^N_{\Delta H}$, incore thermocouple maps, normalized to the January 18, 1991 flux map data will be used. Incore thermocouple temperatures are monitored by, and available from, the Plant P-250 computer, the P-2500 computer and the Fluke Data Logger. Core power distribution data obtained from the incore thermocouples will be analyzed on a weekly basis, for the remainder of the cycle, to confirm that peaking factors remain within limits. The thermocouple analysis will provide warning of an unexpected, large power abnormality. The [illegible] QPTR surveillances, adherence to the current axial flux difference value, maintaining the control rod position limits and surveillance of $F^N_{\Delta H}$ with normalized thermocouple maps will ensure the $F_Q(Z)$ value will remain within its limit. For these reasons, a shutdown to repair the incore instrumentation system or a shutdown to avoid exceeding the Technical Specification required surveillance interval is not warranted.

PGE has reviewed scheduled Plant testing and surveillances to identify those which could significantly affect core power distribution, or the limits discussed above. As a result of this review, PGE has deferred testing of the turbine stop and control valves until after the 1991 refueling outage. This was done because a reduction of turbine load below 90 percent power is required to perform the tests. No other scheduled tests or surveillances which could significantly affect core power distribution were identified.

NOTE: On February 11, 1991, the Technical Specification required Moderator Temperature Coefficient measurement at approximately 300 ppm Reactor Coolant System boron concentration was performed at 98 percent Rated Thermal Power. The measurement involved inserting the control rods to 203 steps for a short period of time before returning them to above 210 steps. Performance of this test did not significantly alter the core power distribution.

Safety Significance and Potential Consequences of the Request

Flux mapping data from the current fuel cycle which were obtained before the leak occurred show that hot channel factors and power peaking factors have been decreasing throughout core life (see attached figures). The flux map results indicate that core power distribution and peaking factors are behaving as predicted and that ample margin exists between the measured core peaking factors and their respective Technical Specification limits. Based upon these data it is expected that these factors will continue to decline and remain within limits for the remainder of core life. The predicted end of life axial flux difference

target (assuming all control rods fully withdrawn) is -3.8 percent. The current target is -3.6 percent and is unlikely to change significantly for the remainder of core life. The comparisons between the incore and excore measurements of axial flux difference were reviewed for the current fuel cycle. All comparisons showed that the incore and excore instruments' measured values were within the 3 percent Technical Specification limit. This is expected to remain true for the remainder of the current fuel cycle. Additionally, the incore instrumentation does not perform a reactor protective function or alter core operational characteristics. Therefore, suspension of the requirements to perform flux mapping with the incore instrumentation system, for the remainder of the fuel cycle, will not affect Plant safety. It is concluded that the proposed action will have no effect upon the continued safe operation of the Plant or upon the health and safety of the public.

Duration of Request

This waiver will be effective from February 28, 1991, until the Plant is shut down for the 1991 refueling outage on March 27, 1991.

Significant Hazards Consideration Determination

This waiver of compliance is judged to involve no significant hazards considerations based upon the following information:

1. Does the proposed action involve a significant increase in the probability or consequences of an accident?

   Because of the conservative operational strategy and alternate monitoring techniques, compliance with core peaking factor limits is assured. The consequences of previously analyzed accidents will not be changed as long as peaking factors remain within their limits. Because the Plant will be operated in a more restrictive manner, the probability of creating an accident is not increased.

2. Does the proposed action create the possibility of a new or different kind of accident from any accident previously analyzed?

   An alternate monitoring technique will be employed to compensate for not using the incore instrumentation system to periodically monitor core power distribution. The alternate techniques do not rely upon new equipment or different methods than currently used. Since no new equipment or methods are being proposed, and the Plant will be operated in a manner to avoid large power perturbations, new or different types of accidents will not be created.

3. Does the proposed action involve a significant reduction in a margin of safety?

   The proposed action does not affect the operating characteristics of the reactor core (the incore instrumentation system provides a monitoring function only). Therefore, the core peaking factors will not be affected by the proposed action and are expected to remain within their established limits. Consequently, there is no impact upon safety margin.

The proposed waiver will allow the Trojan Nuclear Plant to continue full power operation without the risk associated with using the incore instrumentation system in its current condition. Considering the previous discussion, and the fact that the incore instrumentation system is only used on an infrequent basis (i.e., every 31 EFPD) and is not directly involved in Plant operation, the proposed waiver does not represent a significant hazard.

Evaluation of Environmental Consequences

The proposed action does not represent a change to the physical configuration of the Plant, a change in the types or amounts of effluents, or a change in the Plant power level or operating characteristics. Therefore, there will be no environmental consequences arising from the proposed action.

Addendum

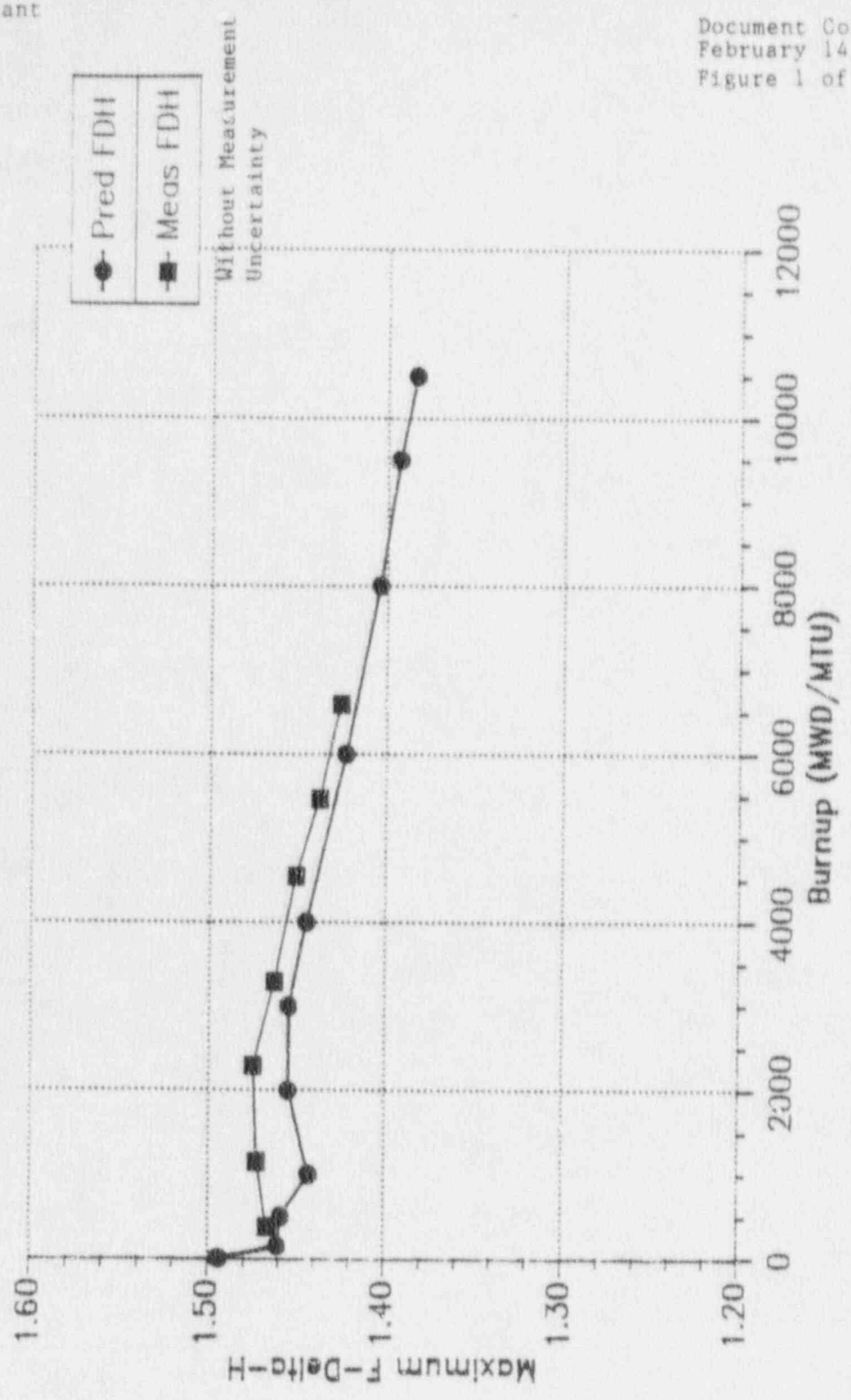
At 1020, on February 12, 1991, the Trojan Nuclear Plant was automatically shutdown when an electrical problem caused the turbine electro-hydraulic control system to trip the turbine. The effect of the trip upon continued operation without the incore instrumentation system was discussed with the Trojan NSSS vendor. Nothing was identified which would impact the contents of this request.

The return to power operation in recovery from this shutdown will proceed following normal plant procedures. No use of the incore instrumentation system would have been made, or required, even if it was available. The surveillances performed in January 1991 using the incore instrumentation are still current.

The Technical Specification limits impacting core performance (e.g., control rod position, quadrant power tilt monitoring and axial flux control) will be observed, as normal. When full power (near equilibrium condition) operation is attained, the incore thermocouple data will be analyzed per Periodic Engineering Test 1-2, Core Power Distribution - Incore Thermocouples.

EWF/bsh
5935W.0291

FIGURE 1


Trojan Cycle 13
Measured and Predicted F-delta-H
Pred FDH
Meas FDH
Without Measurement Uncertainty
Maximum F-Delta-H
1.60
1.50
1.40
1.30
1.20
0
2000
4000
6000
8000
10000
12000
Burnup (MWD/MTU)

Trojan Nuclear Plant
Docket 50-344
License NPF-1

Document Control Desk
February 14, 1991
Figure 2 of 4

FIGURE 2

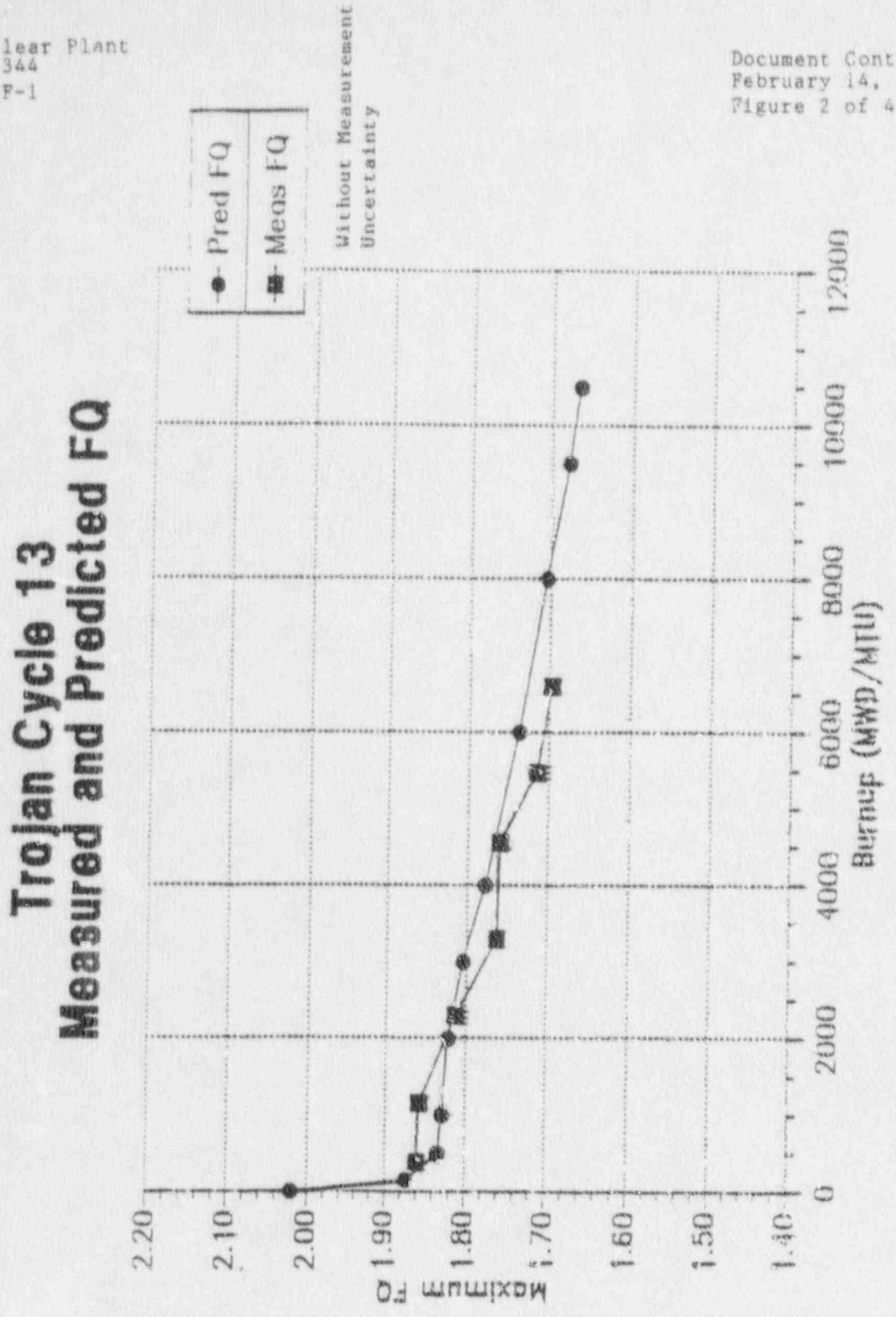
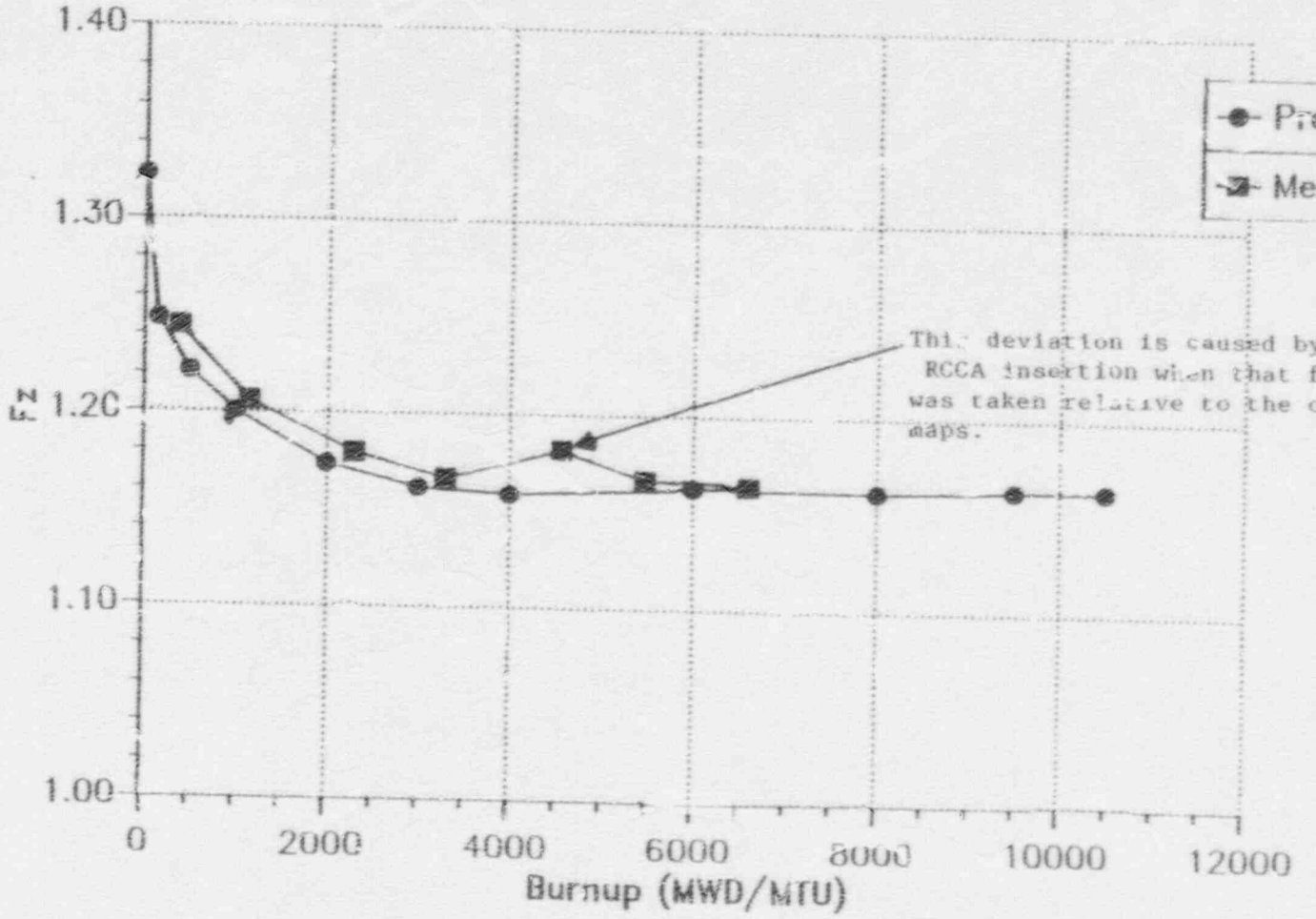


FIGURE 3

Trojan Cycle 13
Measured and Predicted Fz

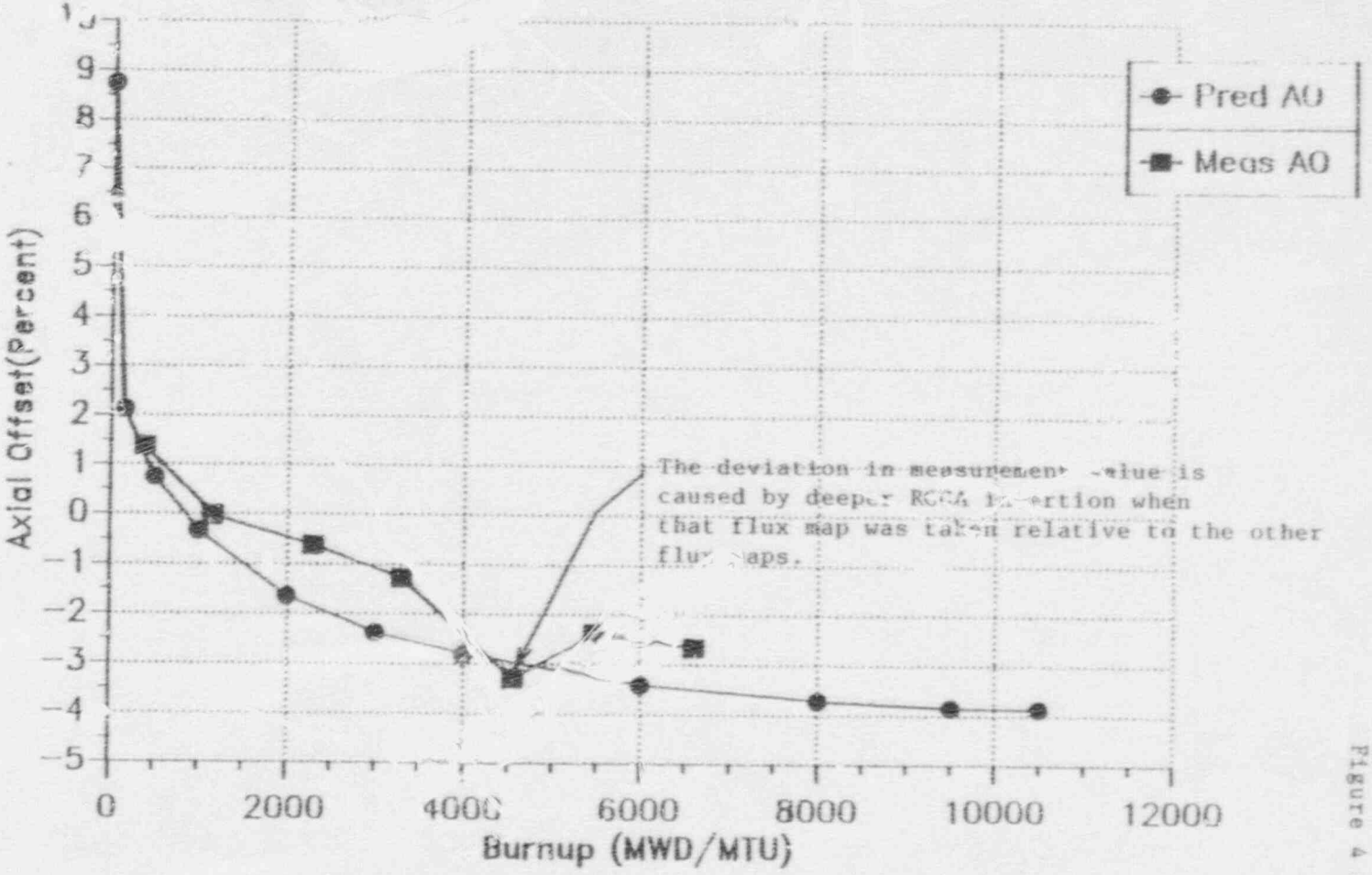


Trojan Nuclear Plant
Docket 50-344
License NPF-1

Document Control Desk
February 14, 1991
Figure 3 of 4

FIGURE

Trojan Cycle 13
Measured and Predicted Axial Offset



Trojan Nuclear Plant
Docket 50-344
License NPF-1

Document Control Desk
February 14, 1991
Figure 4 of 4