Boston Edison

Pilgrim Nuclear Power Station
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BECo 94-126

U. S. Nuclear Regulatory Commission
Document Control Desk
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License DPR-35
Docket 50-293

PROPOSED CHANGES TO THE EMERGENCY
DIESEL GENERATOR (EDG) TECHNICAL SPECIFICATIONS
ALLOWED OUT-OF-SERVICE TIME (3.5.F, 4.5.F.1, and 3.9.B.1 and 2)

In accordance with the requirements of 10CFR50.90, Boston Edison Company proposes changes to Pilgrim Nuclear Power Station (PNPS) Technical Specifications.

The proposed changes increase the current Emergency Diesel Generator (EDG) allowed Out-of-Service (OOS) time in Specification 3.5.F from 72 hours to 7 days, deletes the daily testing of the operable diesel generator in Specification 4.5.F.1, when it is determined that the other diesel generator is inoperable, and revises specification 3.9.B.1 and 2 for EDG operability.

The requested changes are described in Attachment A. The revised Technical Specification pages are provided in Attachment B. Attachment C provides Marked-up Technical Specification Pages.

This request for approval is proposed as a cost beneficial licensing action (CBLA) because the proposed changes would provide savings that meet or exceed the NRC's financial criteria.

Boston Edison Company requests NRC approval of the proposed modification to the Technical Specification by June 1995.

E. T. Boulette

Commonwealth of Massachusetts)
County of Plymouth)

Then personally appeared before me, E. T. Boulette, who being duly sworn, did state that he is Senior Vice President - Nuclear of Boston Edison Company and that he is duly authorized to execute and file the submittal contained herein in the name and on behalf of Boston Edison Company and that the statements in said submittal are true to the best of his knowledge and belief.

My commission expires: March 25, 1999 James D. Keyes

cc: See next page

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ETB/WGL/nas/TS/EDGTS

Attachment A: Description of Proposed Modification
Attachment B: Amended Technical Specification Pages
Attachment C: Marked-up Pages from current Specification Pages

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ATTACHMENT A TO BECO LETTER 94-126
DESCRIPTION TO PROPOSED MODIFICATION TO THE TECHNICAL SPECIFICATION

PROPOSED MODIFICATION TO THE TECHNICAL SPECIFICATION

The proposed change:

(i) Increases the Allowed Out-of-Service (OOS) for the Emergency Diesel Generators (EDGs) from the currently allowed three days to seven days in specification 3.5.F. This change will reinstate the seven day OOS which was previously in effect until March 4, 1991, when Amendment No. 135 became effective;

(ii) Deletes the daily testing of the operable diesel generator from specification 4.5.F.1 when the other EDG is in OOS; and

(iii) Revises specification 3.9.B.1 and 2 by deleting the words "demonstrated to be" for the operability of the EDG and associated emergency buses.

REASON FOR CHANGE

The purpose of returning the EDGs to a 7 day OOS is to provide more flexibility in the maintenance and repair (i.e., corrective maintenance) of the EDGs. A longer allowed repair window avoids the risk of a shutdown transient with an inoperable diesel when repairs take longer than 72 hours but less than 168 hours. In response to Generic Letter 88-20, an Individual Plant Examination (IPE) for Internal Events was submitted in September 1992. A detailed probabilistic risk assessment (PRA) of PNPS, completed to support the IPE, is used here to quantify the overall impact of the proposed change on core damage frequency. This analysis supports the change to seven day OOS time for the EDGs based on no measurable increase in overall risk.

The unavailability of an EDG would potentially increase during the period of an individual LCO because more time is allowed for corrective action. However, the overall unavailability of the EDG should not increase due to this proposed change because EDG unavailability will be monitored and controlled by Maintenance Rule Performance Criteria and trended against the EDG unavailability assumed by the PRA.

The purpose of deleting the daily testing of the operable diesel generator in Specification 4.5.F.1 is to eliminate excessive testing of the operable EDG if it is within the reliability program goal established pursuant to 10CFR50.63, "Station Blackout Rule" and 10CFR50.65, "Maintenance Rule". This deletion is based on the NRC guidance provided in item 10.1 of Generic Letter 93-05, "Line-Item Technical Specification Improvements to Reduce Surveillance Requirements for Testing During Power Operation" and Generic Letter 94-01, "Removal of Accelerated Testing and Special Refueling Requirements for Emergency Diesel Generators".

The purpose of revising the Specification 3.9.B.1 is to verify the operability of the EDG by way of the reliability program consistent with the Station Blackout Rule and GL 93-05.

SAFETY ASSESSMENT

Pilgrim Nuclear Power Station Alternate AC power distribution is shown in Figure A-1.

Each EDG provides emergency onsite AC power to its associated emergency 4.16 KV bus A5 or A6 as shown on Figure A-1. Each of these buses by itself can provide the power required to mitigate a design basis accident. Normally, at 100% reactor power, busses A5 and A6 are supplied from the Unit Auxiliary Transformer (UAT). If the UAT is lost (due to a reactor scram), the emergency buses are automatically transferred to the Startup Transformer (SUT). In the case of a loss of offsite power (LOOP), the SUT will not be available, causing the EDG's to start automatically. Power to the emergency buses will be interrupted for approximately 10 seconds as the EDGs start, come up to rated speed, and then load onto the buses, automatically. In the event that an EDG fails to re-energize its associated bus, the Shutdown Transformer (SDT) will automatically load onto the failed

EDG's emergency bus approximately twelve seconds after the LOOP. The SDT is supplied from the 23 KV Commonwealth Electric line. In the event of a SDT failure, the Station Black-Out Diesel Generator (SBODG) can be manually loaded onto the failed EDG's emergency bus from the control room within 10 minutes. The SBODG is capable of supplying one Core Standby Cooling System (CSCS) pump and all associated 480 V loads.

The current Technical Specifications allow each EDG to be out of service for three days based on the availability of the SUT and SDT and the fact that each EDG carries sufficient engineered safeguards equipment to cover all design basis accidents. With one EDG out of service and a LOOP Condition, the capability to power vital and auxiliary system components remains available via the other EDG, the SDT, and the SBODG for all operating, transient and accident conditions.

Normal Operation: During normal plant operation, emergency busses A5 and A6 are fed from the UAT. When one EDG is out-of-service for repair, continued station operation is carried out in accordance with the Technical Specification 3.5.F if specification 3.9.A.1 and 3.9.A.2a are satisfied, since SUT, and SDT or UAT are available.

Off-Normal Operating Condition: An off-normal operating condition with respect to AC power distribution would be a loss of one 345 KV line to the main switchyard. Since, the main switchyard is fed with two 345 KV lines, UAT and SUT will continue to be available, and compliance with the Technical Specification 4.9.A.1 will be achieved, when one EDG is out-of-service.

Transient Condition: The most severe transient condition is the Station Blackout. In this case, normal off-site would be lost. UAT and SUT are no longer available. One EDG is being repaired; the other EDG fails to start. The SDT attempts to provide power to both emergency Busses A5 and A6. If SDT fails to provide the required power, the operator confirms that the plant is in an SBO transient, and manually starts the SBODG. The SBODG has demonstrated to be available to energize either bus within 10 minutes of an SBO event, and with the control room pull-to-lock switches, the SBO transient can be mitigated, with no equipment or core damage. Thus, during one EDG out-of-service, SBO transient can be mitigated with no adverse consequences.

Accident Condition: The most severe design basis accident condition is the LOCA with concurrent LOOP. When one EDG is out-of-service, if LOCA with LOOP accident occurs, the second EDG, SBODG and SDT are available to mitigate the accident condition. One EDG carries sufficient loads for ESF equipment to cover all design basis accidents. In addition the SDT can provide sufficient loads for ESF equipment.

The PNPS EDGs have shown to be highly reliable. In addition, PNPS is in the process of implementing Reliability Centered Maintenance program for the EDGs. Accelerated testing is not required because of the demonstrated high reliability of the EDG and in fact elimination of the accelerated testing may reduce the probability of failure due to excessive testing.

The 7 day OOS for EDG is practical and does not present undue risk to the plant for compliance with the design basis requirements. As shown in Enclosure A, there is an insignificant increase in risk due to the proposed change.

Testing and Verification of EDG Operability: BECo has implemented an EDG reliability program in compliance with the Station Blackout Rule (10CFR50.63). The reliability program elements meet the NRC Regulatory Guide 1.155 and NUMARC-8700 guidance. The NRC has reviewed and approved the EDG reliability program through the Safety Evaluation Report, dated February 13, 1994, and I&E Inspection Report, 50-293/93-80, dated December 23, 1993.

The EDG target reliability goal is 0.975. Any time an EDG falls below the target goal, a root cause analysis will be performed and the affected EDG will be repaired and tested to verify the reliability of the engine in accordance with the reliability program. The testing and verification of the operability requirements of EDGs are an integral part of the reliability program. In accordance with the NRC recommendations outlined in the Generic Letter 94-01, testing requirements for EDGs are included in the maintenance program. In addition, surveillances are conducted in compliance with specification 4.9.A.1.

Thus, testing of the EDG as currently required by T.S. 4.5.F.1 is not required. This requirement can result in repetitive surveillance testing and corresponding equipment wear and tear. Increased equipment wear and tear and the potential for increased unavailability of equipment tend to offset the added assurance of operability that the "immediate and daily thereafter testing" provides. The reliability program and the regularly scheduled surveillance tests prescribed in Specification 4.9.A.1 adequately determine operability and provide assurance that equipment will be available during the interim period between regularly scheduled surveillances. Further, the deletion of the testing requirement is in accordance with the NRC guidance provided in Generic Letter 93-05, item #10.1, and GL 94-01.

In addition, each time one EDG is out-of-service correct breaker alignment and indicated power availability for each offsite circuit will be verified in accordance with the station procedures. This verification assures AC power availability without compromising the AC power distribution.

By maintaining the EDGs in a highly reliable manner in conformance with the reliability goal, the verification of the EDG operability is demonstrated. Thus, additional testing for demonstrating operability of the EDG per T.S. 3.9.B.1 and 2 is also not required, consistent with the NRC guidance provided in Generic Letters 93-05 and 94-01. Thus the words "demonstrated to be" are deleted. The verification of the operability is done through the surveillances and reliability goal.

NO SIGNIFICANT HAZARDS CONSIDERATION DETERMINATION

The following evaluation demonstrates the proposed amendment does not exceed any of the three significant hazards considerations criteria of 10CFR50.92(C). The three criteria and the no significant hazards consideration determinations are discussed below:

(1) The proposed amendment does not involve a significant increase in the probability of consequences of an accident previously evaluated.

Operation of PNPS in accordance with the proposed license amendment will not involve a significant increase in the probability or consequences of an accident previously evaluated. Implementation of the proposed change is expected to result in an increase in the probability of core damage, from 5.85E-5/year (this is the PNPS IPE core damage frequency) to 5.88E-5/year. This increase is less than one percent and is considered to be insignificant relative to the underlying uncertainties involved with probabilistic risk assessments.

Deleting the testing requirement for an EDG when the other EDG is in repair does not increase the probability or consequences of an accident previously evaluated because the reliability program and Technical Specification required surveillances continue to provide the added assurance sought by the testing. The elimination of this testing might improve the overall reliability of the EDGs.

(2) The proposed amendment does not create the possibility of a new or different kind of accident from any accident previously evaluated.

Operation of PNPS in accordance with the proposed license amendment will not create the possibility of a new or different kind of accident from any accident previously evaluated. No change is being made in the manner in which the EDG's provide plant protection. No new modes of plant operation are involved. Extending the EDG OOS and, deleting the testing requirement for one EDG when the other EDG is in repair does not necessitate physical alteration of the plant or changes in plant operational limits.

(3) The proposed amendment does not involve a significant reduction in a margin of safety.

Operation of PNPS in accordance with the proposed license amendment will not involve a significant reduction in a margin of safety. As shown in Enclosure to Attachment A, incorporation of the proposed change involves an insignificant reduction in the margin of safety.

As previously stated, implementation of the proposed changes is expected to result in an insignificant increase in: (1) power unavailability to the emergency buses (given that a loss of offsite power has occurred), and (2) core damage frequency. EDG reliability improvement is expected due to increased quality and thoroughness of EDG maintenance. Implementation of the proposed changes does not increase the consequences of a previously analyzed accident nor significantly reduce a margin of safety. Functioning of the EDGs and the manner in which limiting condition of operability are established are unaffected.

CONCLUSIONS

The incorporation of these changes: (a) will not significantly increase the probability nor the consequences of an accident or malfunction of equipment important to safety as previously evaluated in the Safety Analysis Report; (b) will not increase the possibility for an accident or malfunction of a different type than any evaluated previously in the Safety Analysis Report; (c) will not reduce the margin of safety as defined in the bases for any Technical Specification; (d) does not constitute an unreviewed safety question; and (3) involves no significant hazards considerations as defined in 10 CFR 50.92.

These proposed changes have been reviewed and approved by the Operations Review Committee and by the Nuclear Safety Review and Audit Committee.

SCHEDULE OF CHANGE

These changes will be implemented within 30 days following BECo's receipt of the Commission's approval.

FIGURE A-1: Alternate AC configuration.

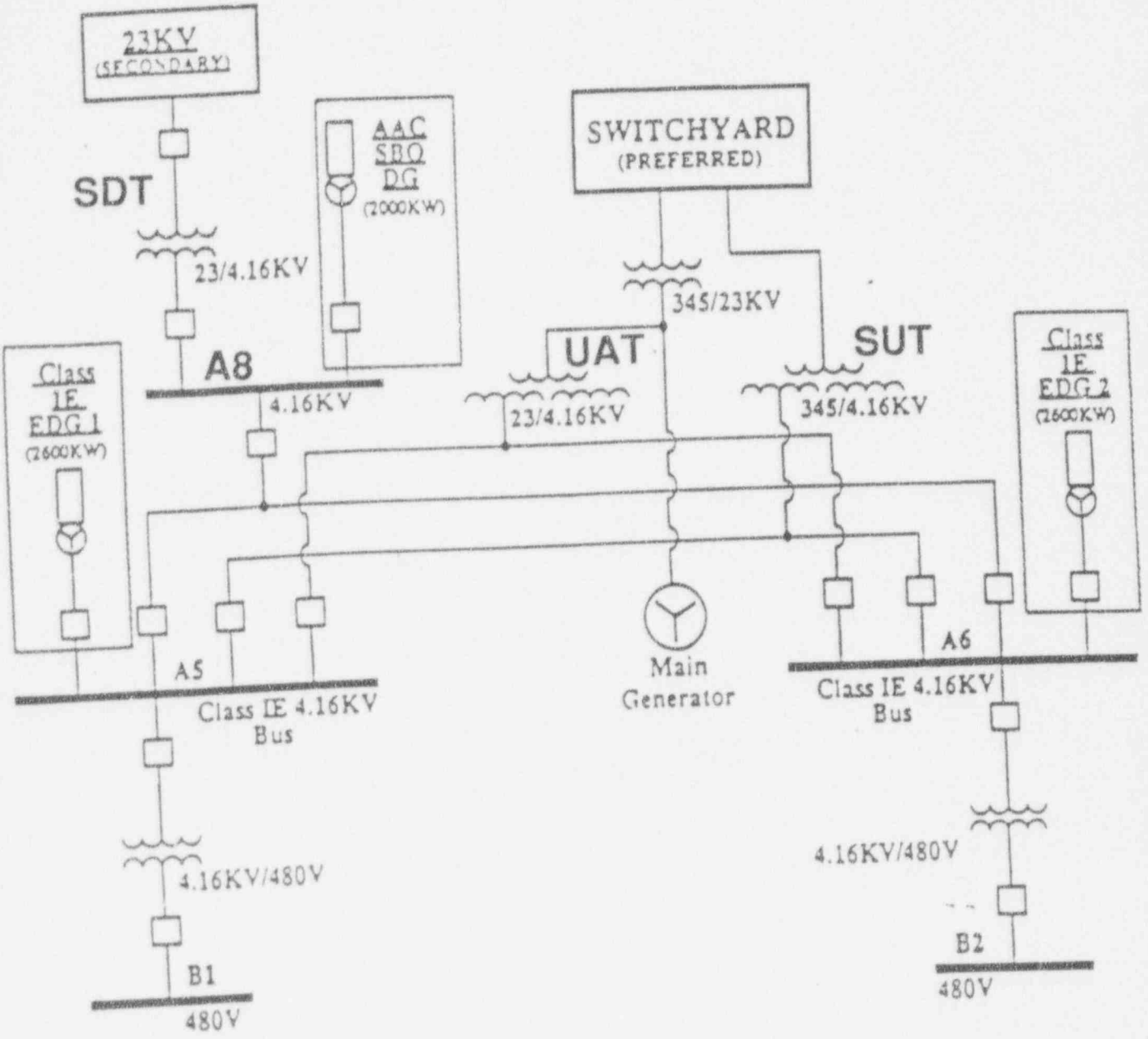

Figure A-1

ALTERNATE AC (AAC) CONFIGURATION

Enclosure to
ATTACHMENT A to BECo Letter 94-126

EDG Out-of-Service Time Probabilistic Risk Analysis

Enclosure to ATTACHMENT A to BECo Letter 94-126

EDG Out-of-Service Time Probabilistic Risk Analysis

The objective of this study is to assess the impact of changes to the Out-of-Service (OOS) for the emergency diesel generators (EDG) (seven days versus three days) on core damage frequency. This was accomplished by modifying the PNPS Probabilistic Risk Assessment (PRA) model, originally developed for the September 1992 response to Generic Letter 88-20,to account for the proposed increase in EDG maintenance unavailability associated with a seven day OOS. Only those accident sequences affected by the EDGs were analyzed as it was not necessary to perform a complete requantification of the PRA to support the conclusions derived from this study.

The only true risk is associated with the potential for more EDG unavailability. The study was restricted to loss of offsite power (LOOP) initiating events as only they require the EDGs to mitigate consequences in the PRA. The LOOP event tree (Figure B-1) was requantified. Only TQUV[1] and TWQUV[2] sequences initiated by a LOOP (herein referred to as TQUVL and TWQUVL, respectively) contain EDG failure cutsets above a truncation level of 1E-9. As a result, only these sequences were analyzed. These sequences were then requantified with a modified EDG maintenance unavailability based upon the extended OOS. The new values were compared with the baseline values for these sequences from the initial PRA model with the difference representing the change in core damage frequency (CDF).

The EDG maintenance unavailability used in the original PRA was derived from PNPS specific operating experience. EDG unavailability is the product of the frequency of maintenance and the average duration of the maintenance. From August 1, 1981 through September 30, 1989, the EDGs have averaged 27.9 hours unavailability per maintenance outage with an outage frequency of 4.1E-4/hour. This evaluation is initially performed assuming that there will be no change in the frequency of maintenance performed on the EDGs if the OOS is changed to 168 hours.

Next a series of sensitivity studies are performed to evaluate the impact on risk if the frequency of maintenance is increased by one, two and three standard deviations. It is reasonable to assert that the EDG maintenance frequency will not change significantly for several reasons. First, the EDGs are overhauled periodically during RFOs which essentially renew them for the subsequent operating cycle. Therefore, they do not experience age degradation, and the increase in failures associated with such degradation. Second, because the preventive maintenance overhauls performed during RFOs typically take longer than 200 hours, these overhauls will not be added to the on-line maintenance work performed on the EDG when it goes to an OOS of 168 hours.

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[1]TQUV - LOOP with loss of all high pressure injection and then all low pressure injection systems

[2]TWQUV - LOOP with loss of all containment cooling and then loss of all low pressure injection (post containment failure) systems

This evaluation assumes that the average length of EDG corrective maintenance will increase if the OOS is changed to 168 hours. For the period of time considered by the PRA data analysis, the average repair time was 27.9 hours. More recent data (1990 -1992) indicates that the average repair time is about 50 hours (even though the average repair time has increased in recent years, the frequency of repairs has decreased during this time. These tend to offset one another, and the resulting EDG unavailability for the most recent time period is therefore similar to the value assumed by the PRA). Since there is no unbiased way of estimating how much average EDG repair time would increase with an OOS of 168 hours, the most conservative assumption was made that all repairs would go to 168 hours. This is not a realistic assumption, but if with this assumption, the increase in core damage frequency can be shown to be modest, then the acceptability of going to an OOS of 168 hours will be demonstrated.

Given no change in maintenance frequency, the worst case scenario maintenance unavailability for a 7 day OOS would be 4.1E-4/hour x 168 hours = 6.9E-2. OOSs of 14 and 21 days were also evaluated. Extending the OOS to 14 and 21 days would result in maintenance unavailabilities of 1.38E-1 and 2.07E-1, respectively.

The results are shown in Table B-1. Extending the EDG OOS to 7 days for the worst case scenario results in a core damage frequency of 5.88E-5. This change represents an increase in core damage frequency of less than one percent. These values are plotted in Figure B-2. A modest 0.56 percent increase in core damage frequency for the worst case maintenance duration certainly demonstrates the acceptability of going to an OOS of 168 hours.

The PRA uses mean values for its failure rates. The mean EDG frequency of corrective maintenance used by the PRA is 4.1E-4/hr. The long term risk of core damage due to EDG unavailability can be determined using this mean value. However, because it is a mean value, with a somewhat symmetrical distribution, there is approximately a 50% chance that at any given time period the frequency could be higher than the mean value. Based on the PRA data base, over any given four month time period, the standard deviation of the corrective maintenance is approximately 3.3E-4/hr. Therefore, over any four month period, there is about a 30% chance that the frequency could be greater than 7.4E-4hr, a 5% chance it could be greater than 1.07E-3/hr, and a 0.03% chance it could greater than 1.4E-3/hr. Given the worst case maintenance duration of 168 hours, the aforementioned frequencies yield core damage frequency increase percentages of 1.24, 2.03, and 2.68, respectively.

Thus, assuming the maximum possible outage duration of 168 hours for every EDG maintenance, and assuming the highest frequency of maintenance (three standard deviations greater than the historical mean value), the resulting risk increase is still acceptable (2.68). However, it is expected that the actual risk increase using realistic data will in fact be marginal.

TABLE B-1

CDF vs. EDG OOS

	Baseline	7 Days				14 Days	21 Days
	MEAN	MEAN	& 1 STDV (68%)	& 2 STDV (95%)	& 3 STDV (99.8%)	MEAN	MEAN
TQUVL/TWQUVL TOTAL	9.24E-07	1.25E-06	1.65E-06	2.11E-06	2.49E-06	1.76E-06	2.29E-06
Delta		3.26E-07	7.26E-07	1.19E-06	1.57E-06	8.36E-07	1.37E-06
TOTAL CDF	5.85E-05	5.88E-05	5.92E-05	5.97E-05	6.01E-05	5.93E-05	5.99E-05
% CDF increase		0.557265	1.241026	2.02735	2.676923	1.42906	2.335043

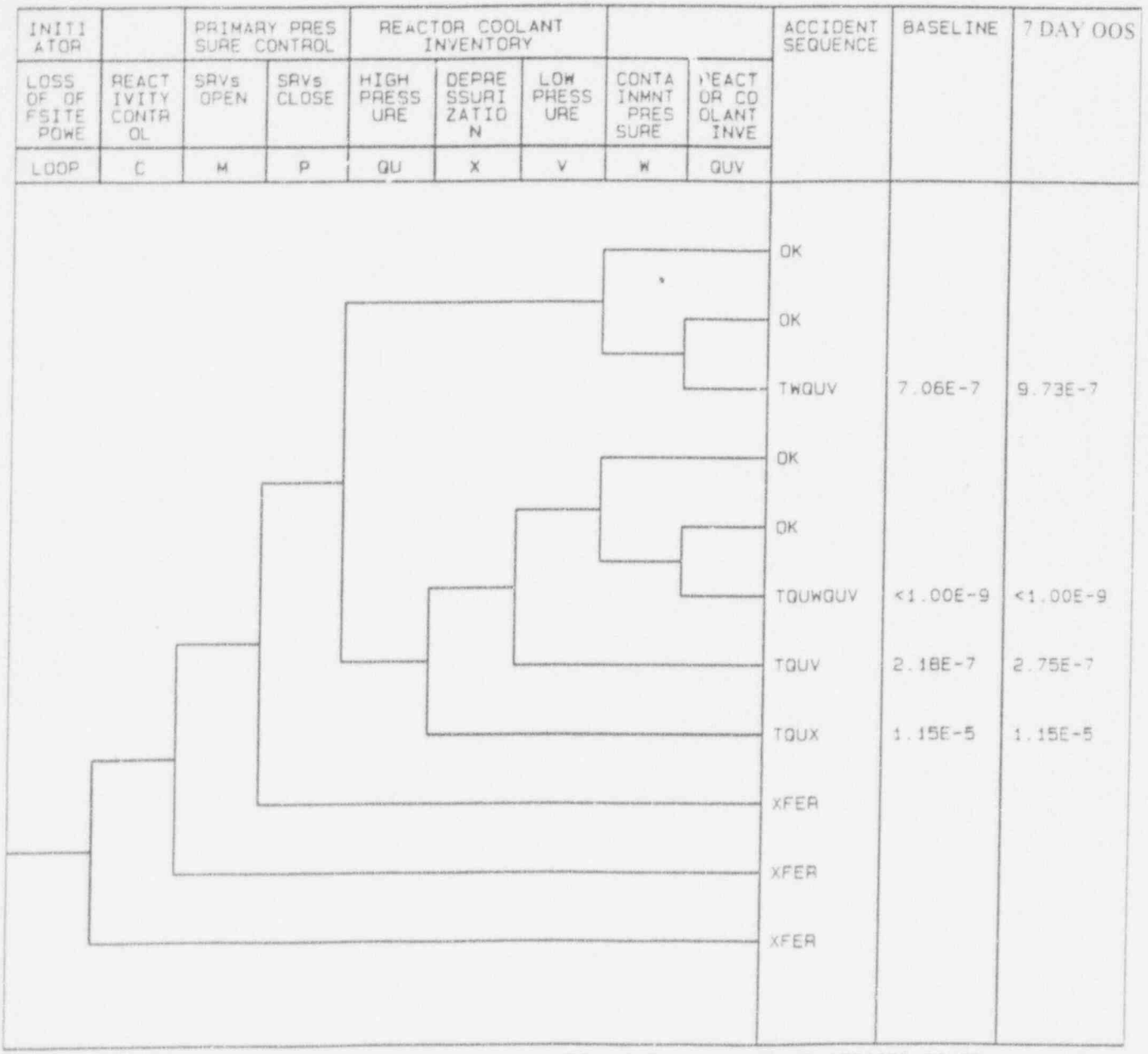

FIGURE B-1 LOSS OF OFFSITE POWER

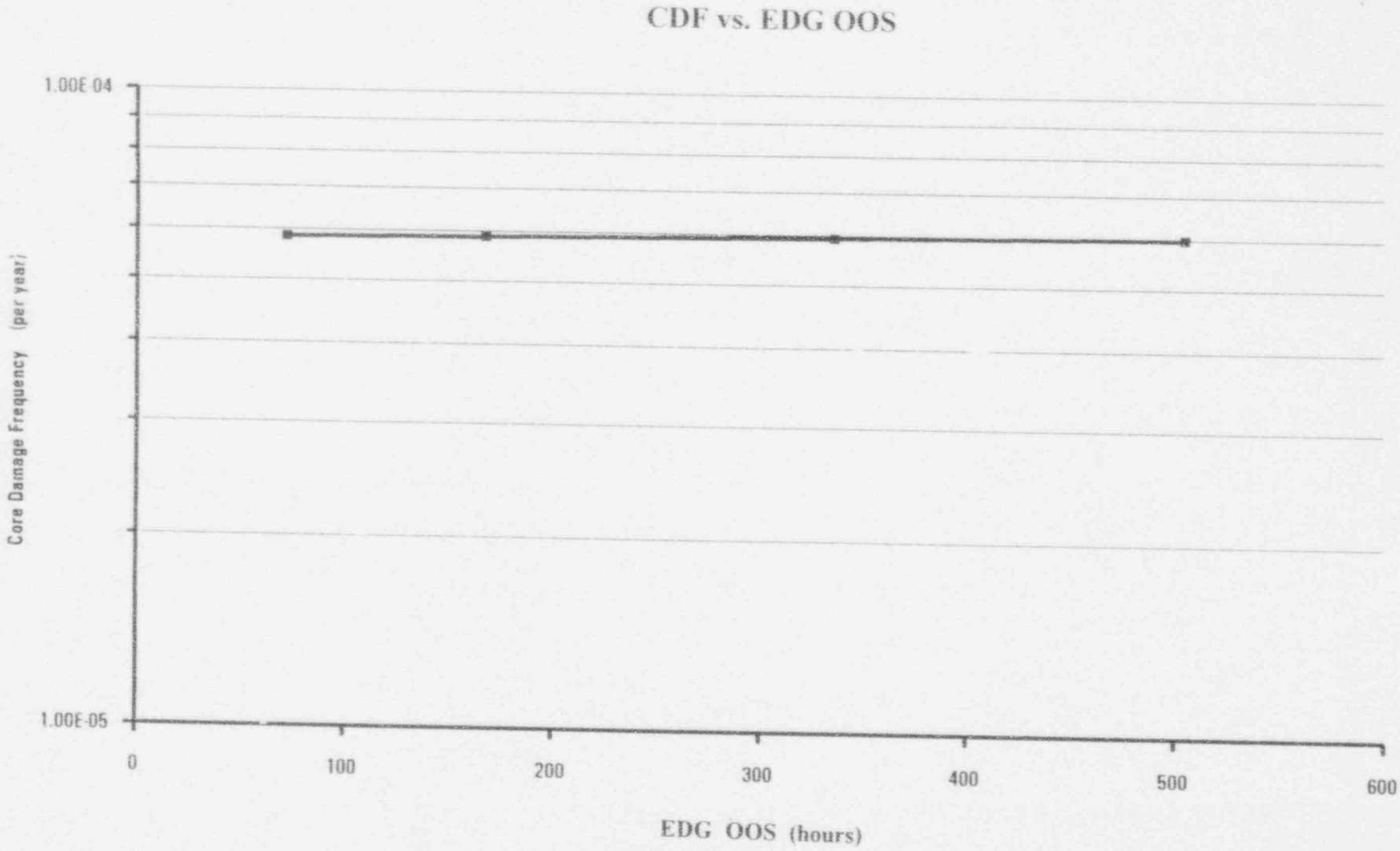
CDF vs. EDG OOS
1.00E-04
1.00E-05
Core Damage Frequency (per year)
0
100
200
300
400
500
600
EDG OOS (hours)

Figure B-2

ATTACHMENT B

to BECo Letter 94-126
Amended Technical Specification Pages