APPL. EX. 35

~~EXHIBIT 6~~

PHILADELPHIA ELECTRIC COMPANY
PEACH BOTTOM 2 AND 3/LIMERICK 1
EMERGENCY PLAN IMPLEMENTING PROCEDURE

EP-C-326 PROCEDURES FOR ESTIMATING CORE DAMAGE DURING ACCIDENT CONDITIONS

1.0 PURPOSE

This procedure provides the method for acquiring on-site radiological data and the use of such data for estimating the extent of core damage during accident conditions.

2.0 RESPONSIBILITIES

2.1 The Core Physics Coordinator is responsible for assuring that this procedure is implemented as required, and the results of the core damage estimates are reported to the Emergency Support Officer.

2.2 The Core Physics Coordinator is responsible for assigning personnel to perform this procedure.

3.0 APPENDICES

3.1 EP-C 326-1 Radiological Data

3.2 EP-C 326-2 Hydrogen Concentration Data

3.3 EP-C 326-3 Containment Radiation Monitor Data

3.4 EP-C 326-4 Metal Water Reaction Figures

3.5 EP-C 326-5 Percent of Fuel Inventory Airborne in Containment vs. approximate Source and Damage Estimate

3.5.1 EP-C 326-5(A) PBAPS Containment Radiation Monitor Curves

3.5.2 EP-C 326-5(B) LGS Containment Radiation Monitor Curves

3.6 EP-C 326-6 Methods for Estimating I-131 concentration in coolant and Xe-133 concentration in containment atmosphere

3.6.1 EP-C 326-6(A) Manual procedure for determining I-131 concentration in coolant

3.6.2 EP-C 326-6(B) Manual procedure for determining Xe-133 concentration in containment atmosphere

3.6.3 EP-C 326-6(C) Corporate Computer Method for determining I-133 concentration in coolant

3.6.4 EP-C 326-6(D) Corporate Computer Method for Determinign Xe-133 concentration in containment atmosphere

3.7 EP-C 326-7 XE-133 Concentration vs. Fuel Damage

3.8 EP-C 326-8 I-131 Concentration vs. Fuel Damage

4.0 PREQUISITES

4.1 Onsite personnel shall have prepared and transmitted the necessary data for conduct of this procedure.

4.2 Station Daily Thermal/Electric Output, A-1 Form Log, shall be updated to current core conditions.

5.0 SPECIAL EQUIPMENT

None

6.0 SYMPTOMS

None

7.0 ACTION LEVEL

An Alert, Site or General Emergency has been declared at Limerick 1 or Peach Bottom 2 or 3.

8.0 PRECAUTION

None

9.0 PROCEDURE

9.1 Actions

9.1.1 Obtain the radiological sample data listed in Appendix EP-C 326-1 from the Health Physics and Chemistry Coordinator at telephone number at the Peach Bottom Emergency Operations Facility or at telephone number ______ at the Limerick Emergency Operations Facility and log the data on this form.

9.1.2 Obtain the hydrogen and oxygen concentration data listed on Appendix EP-C-326-2 from the Health Physics and Chemistry Coordinator and log data on this form.

9.1.3 Perform the manual or computer procedure given in Appendix EP-C 326-6 to estimate the extent of core damage based on the radiological sample data obtained.

9.1.4 Determine Percent Metal Water Reaction.

9.1.4.1 Using the data from 9.1.2 and Appendices EP-C-326-2 and EP-C-326-4, determine the % MW reaction and status of containment atmosphere relative to potential for hydrogen or oxygen burn.

9.1.5 Using Appendix EP-326-3, estimate the extent of core damage based on containment radiation monitors using curves provided in EP-C 326-5.

9.1.6 Return the completed EP-C 326-1, EP-C 326-2, and EP-C 326-3 to the Core Physics Coordinator.

9.1.7 The Core Physics Coordinator shall review the completed Forms from Step 9.1.6 and inform the Emergency Support Officer of the extent of any core damage. The Core Physics Coordinator

shall retain completed forms for future reference during the emergency.

10.0 REFERENCES

10.1 Procedures for Determination of the Extent of Core Damage Under Accident Conditions, NEDO 22215, August 1982 (G.E. Generic Procedure).

10.2 LGS FSAR 11.5.5.4.5 Determination of Extent of Core Damage.

10.3 BLP-28640 Containment Radiation Monitors Post-LOCADose Rates vs. TimeCurves.

10.4 G.E. Document RPE 81 CCL01 dated November 1981, Procedure for Determination of teh Extent of Core Damage Under Accident Conditions.

10.5 Peach Bottom 2, 3 A-1 Form Log (DailyThermal/Electrical Output).

10.6 Limerick, (Daily Thermal/Electrical Output). 10.7 Corporate Emergency Procedure EP-C-226 Core Physics Coordinator

10.8 Bechtel Power Corporation letter BLP21558, dated April 8, 1980, R. H. Elias to E. C. Kistner "Emergency Planning Acceptance Criteria: Modification Request 503."

10.9 Bechtel Power Corporation letter BL28640, "Containment Radiation Monitors Post-LOCA Dose Rates vs Time Curves."

APPENDIX EP-C-326-1

RADIOLOGICAL DATA

PB2 ________ PB3 ________ LGS1 ________

1. Reactor Shutdown Date/Time ________/________

2. Reactor Water Measured Fission Product Concentration, micro-curies/gm
   - I-131 ________
   - Sample Date/Time ________/________

3. Suppression Pool Water Measured Fission Product Concentration, micro-curies/gm
   - I-31 ________
   - Sample Date/Time ________/________

4. Torus Gas Measured Fission Product Concentration, micro-curies/cc
   - Xe-133 ________
   - Sample Date/Time ________/________
   - Vial Temperature, F ________
   - Vial Pressure, psia ________
   - Torus Temperature, F ________
   - Torus Pressure, psia ________

5. Drywell Gas Measured Fission Product Concentration, micro-curies/cc
   - Xe-133 ________
   - Sample Date/Time ________/________
   - Vial Temperature, F ________
   - Vial Pressure, psia ________
   - Drywell Temperature, F ________
   - Drywell Pressure, psia ________

6. Core Damage Estimate Based on I-131 ________

7. Core Damage Estimate Based on Xe-133 ________

APPENDIX EP-C-326-2

PB2 ______ PB3 ______ LGS1 ________

HYDROGEN CONCENTRATION DATA

1. Drywell H2 Measurement
   % of Volume ____________________

2. Torus H2 Measurement
   % of Volume ____________________

3. Average Containment H2
   % of Volume ____________________
   (Average of 1 and 2 or if only one value is given, assume it to be the average for containment).

4. Drywell O2 Measurement
   % of Volume ____________________

5. Torus O2 Measurement
   % of Volume ____________________

6. MWref ____________________
   (metal-water reaction for reference plant using Item 3 and Figure FM-19-1).

7. % MW - Plant Specific* ____________________
   0.568 (MWref)

8. Containment Atmosphere Status ____________________
   (Combustible or Non-Flammable -use Items 3 and 4 and Figure FM-19-2).

$$* \ \% \ MW = MWref \ \frac{(500)(V)}{(N)(350,000)}$$

For Limerick
N=764 assemblies
V=Torus + Drywell Volu[me]
=149, 380 + 235,190
=384,570 ft^3

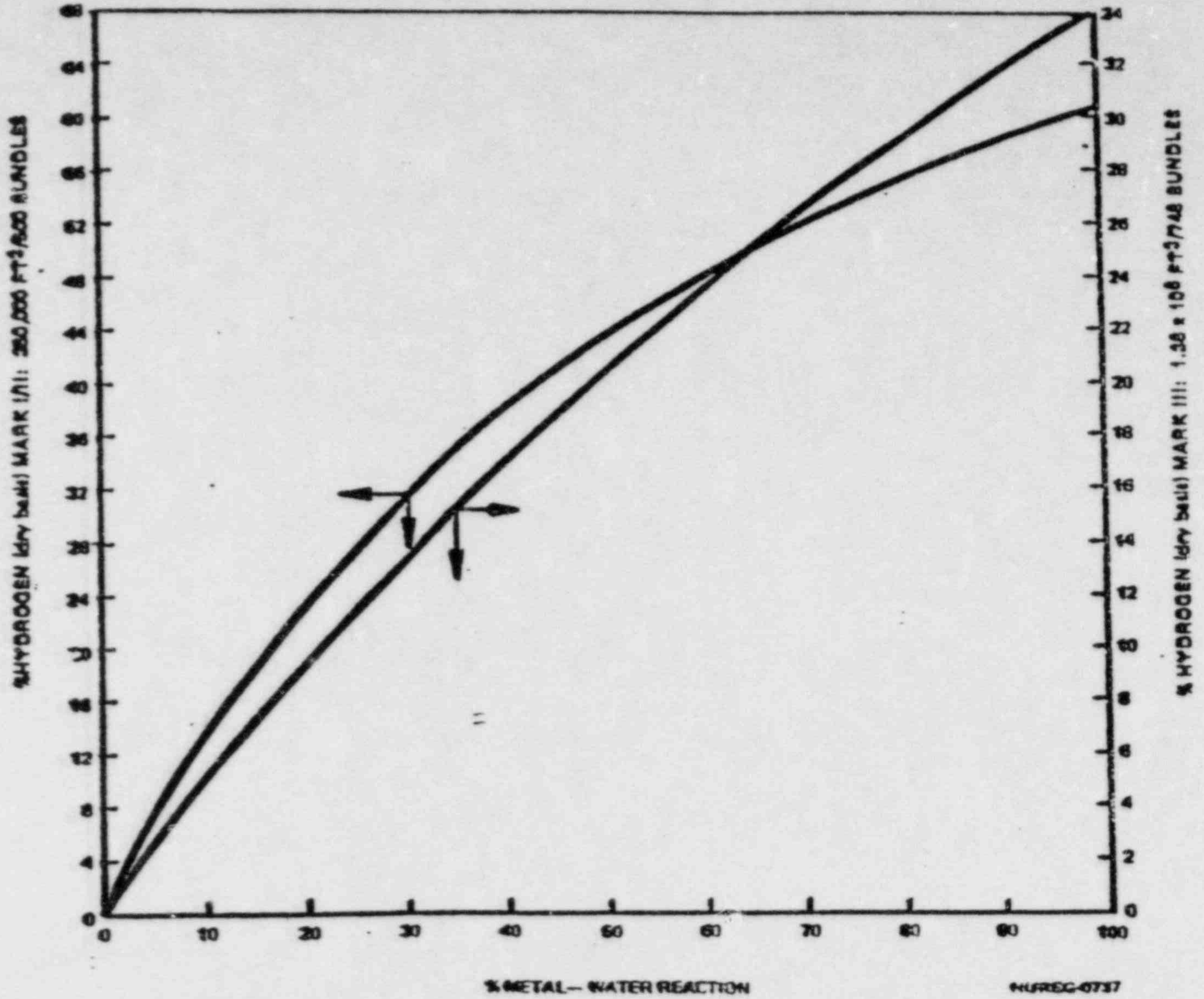
For Peach Bottom 2,3
N = 764 assemblies
V = Torus plus Drywell Volume
= 127,900 + 175,800 = 303,600 ft3

APPENDIX EP-C-326-3

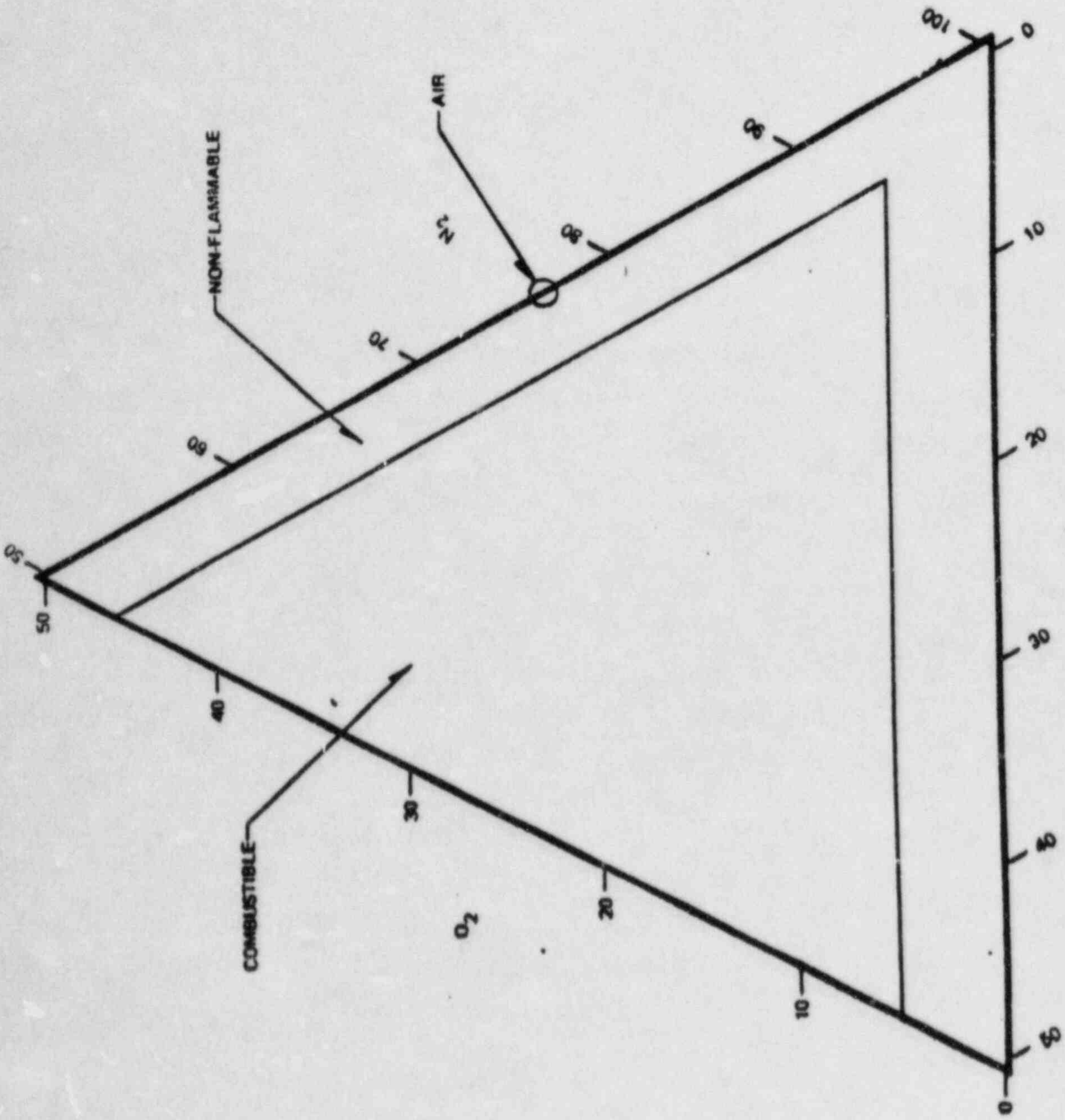
PB2 ______ PB 3 _______ LCS1 __________

CONTAINMENT RADIATION MONITOR DATA

1. Drywell High Range Reading, R/hr ______________
   OR
2. Drywell Low Range Reading/ R/hr ______________
   OR
3. Torus Low Range Reading, R/hr ______________
4. Date/Time of Reading __________/__________
5. Date/Time of Reactor Shutdown __________/__________
6. Time Following Shutdown (4-5), hr ______________
7. % Fuel Inventory Released (from Appendix EP-C-326-5A or B) ______________
8. Core Damage Estimate from Appendix EP-C-326-5 ______________



Hydrogen Concentration for Mark I/II and III Containments as a Function of Metal-Water Reaction



Combustibility of Containment Atmosphere as a Function of $H_2/O_2/N_2$ Composition

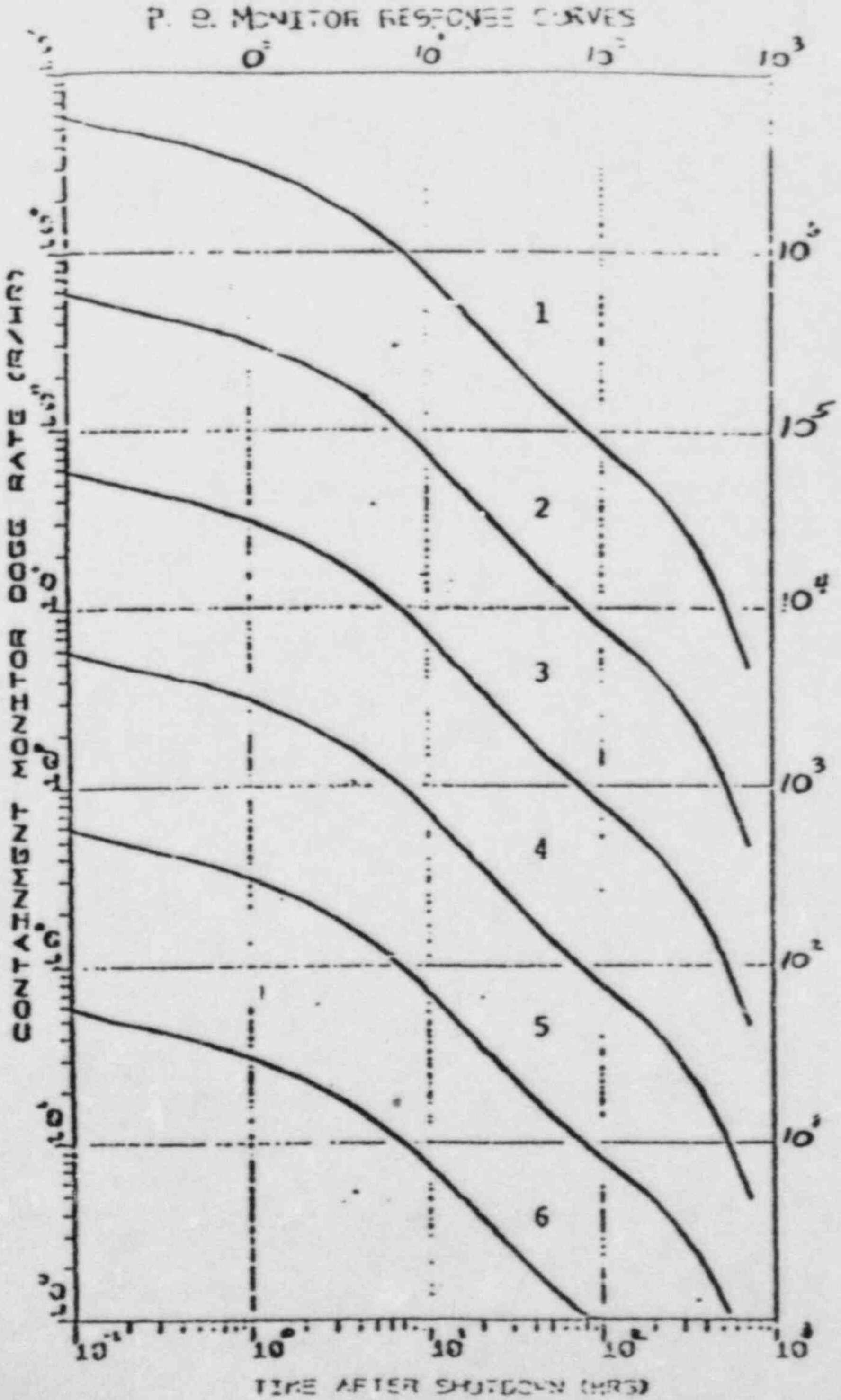
APPENDIX EP-C-326-5

PERCENT OF FUEL INVENTORY AIRBORNE IN THE CONTAINMENT VS. APPROXIMATE SOURCE AND DAMAGE ESTIMATE

Curve No.	% Fuel* Inventory Released	Approximate Source and Damage Estimate
1	100.	100% TID 100% fuel damage, potential core melt.
	50.	50% TID noble gases, TMI source
2	10.	10% TID, 100% NRC gap activity, total clad failure, partial core uncovered.
	3.	3% TID, 100% WASH-1400 gap activity, major clad failure.
3	1.	1% TID, 10% NRC gap, Max. 10% clad failure.
4	.1	.1% TID, 1% NRC gap, 1% clad failure, local heating of 5-10 fuel assemblies.
5	.01	.01% TID, .1% NRC gap, clad failure of 3/4 fuel element (36 rods).
6	1.0N3	.01% NRC gap, clad failure of a few rods.
	1.0N4	100% coolant release with spiking.
7	5.0N6	100% coolant inventory release.
	1.0N6	Upper range of normal airborne noble gas activity in containment.

*100% Fuel Inventory = 100% Noble Gases + 25% Iodines + 1% particulat

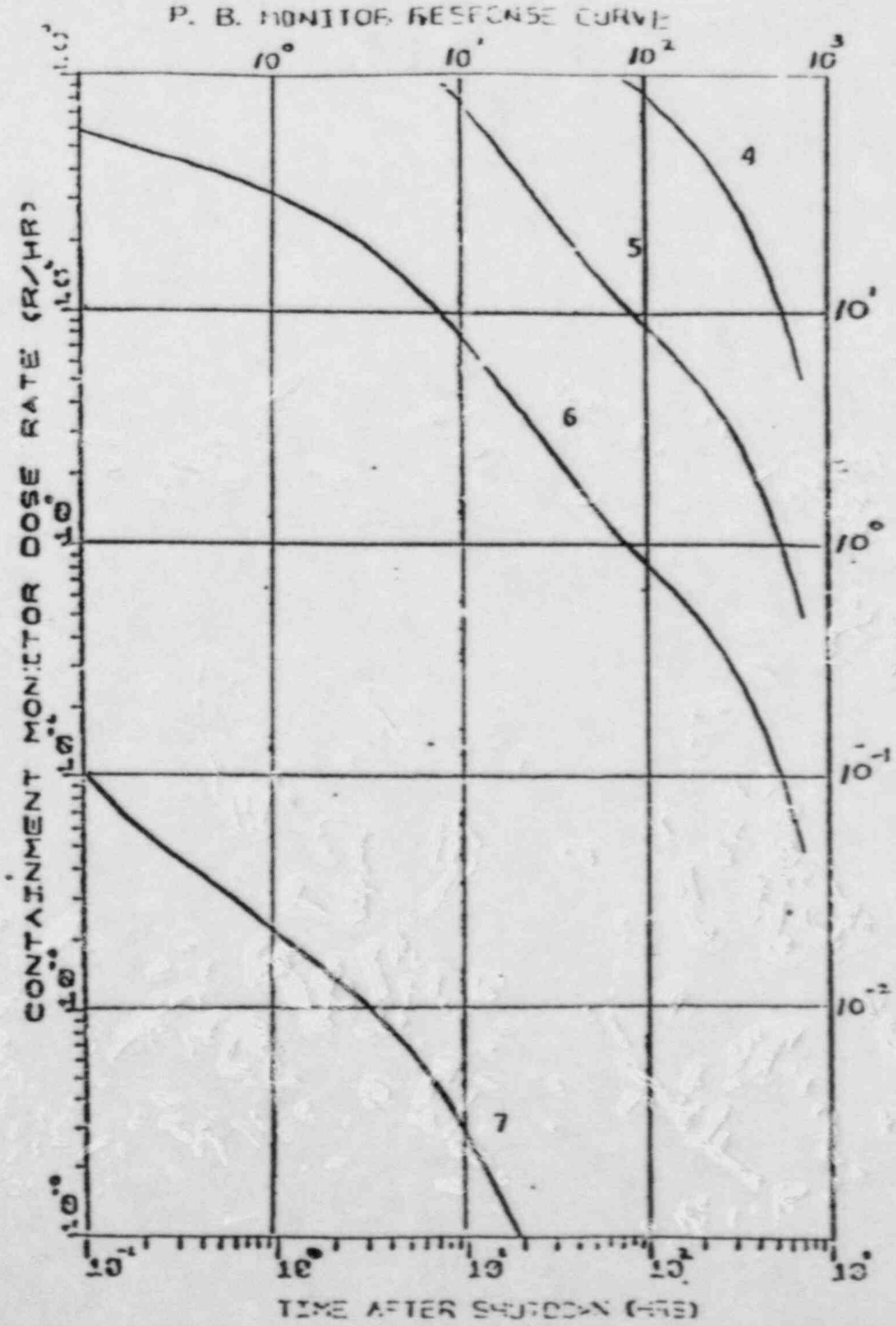
TID = Total Isotopic Distribution



Peach Bottom Monitor Response Curves for Primary Containment High Range Monitors

Curve Index

1. 100% Fuel Inventory (100% TID 14644
2. 10% Fuel Inventory (100% Gap Activity/R.G. 1.25)
3. 1% Fuel Inventory (10% NRC Gap - Clad Failure)
4. .1% Fuel Inventory
5. .01% Fuel Inventory
6. .001% Fuel Inventory



Peach Bottom Monitor Response Curves

for

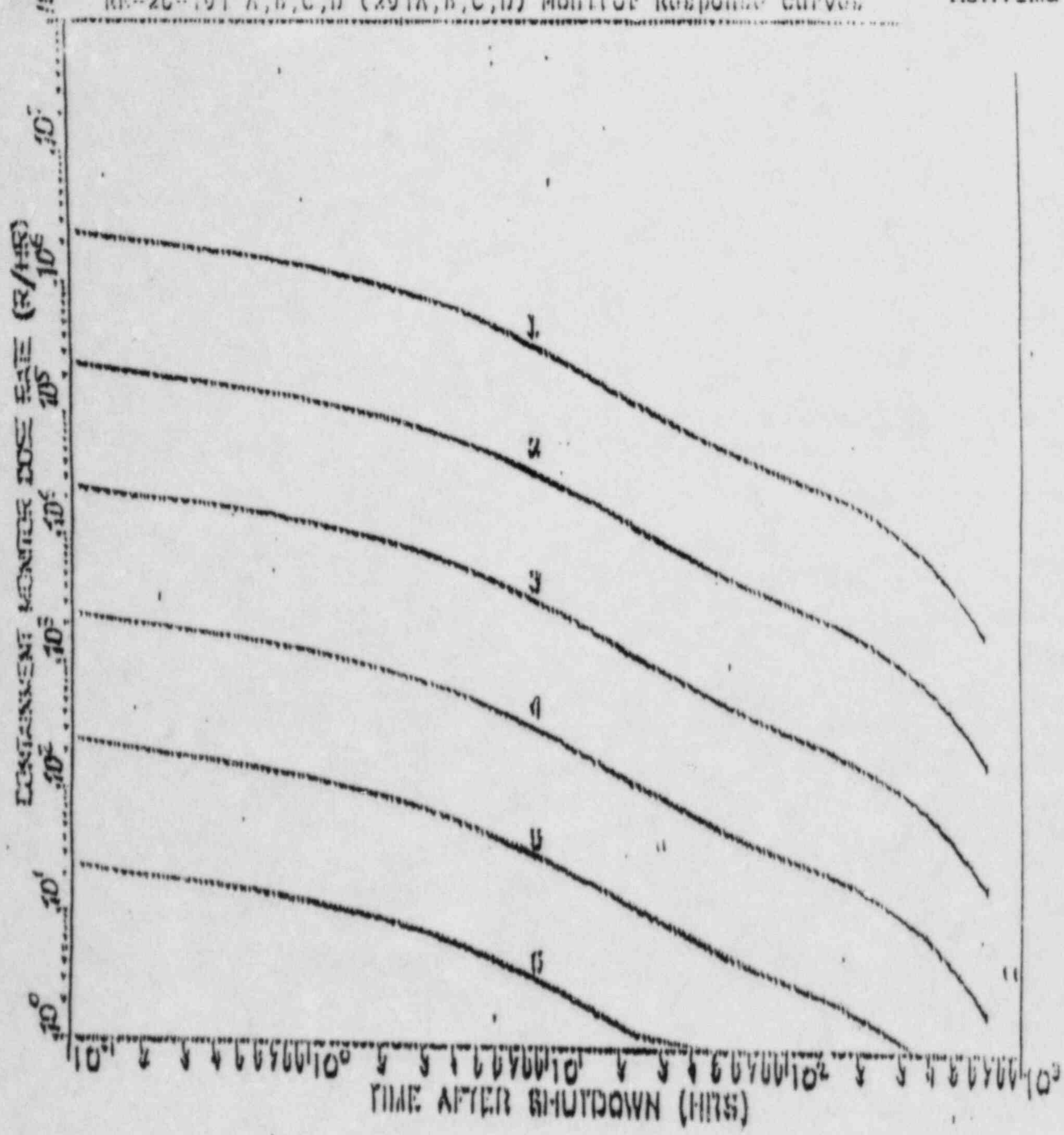
Primary Containment Low Range Monitors

Curve Index

4. .1% Fuel Inventory
5. .01% Fuel Inventory
6. .001% Fuel Inventory

7. 100% Coolant Activity

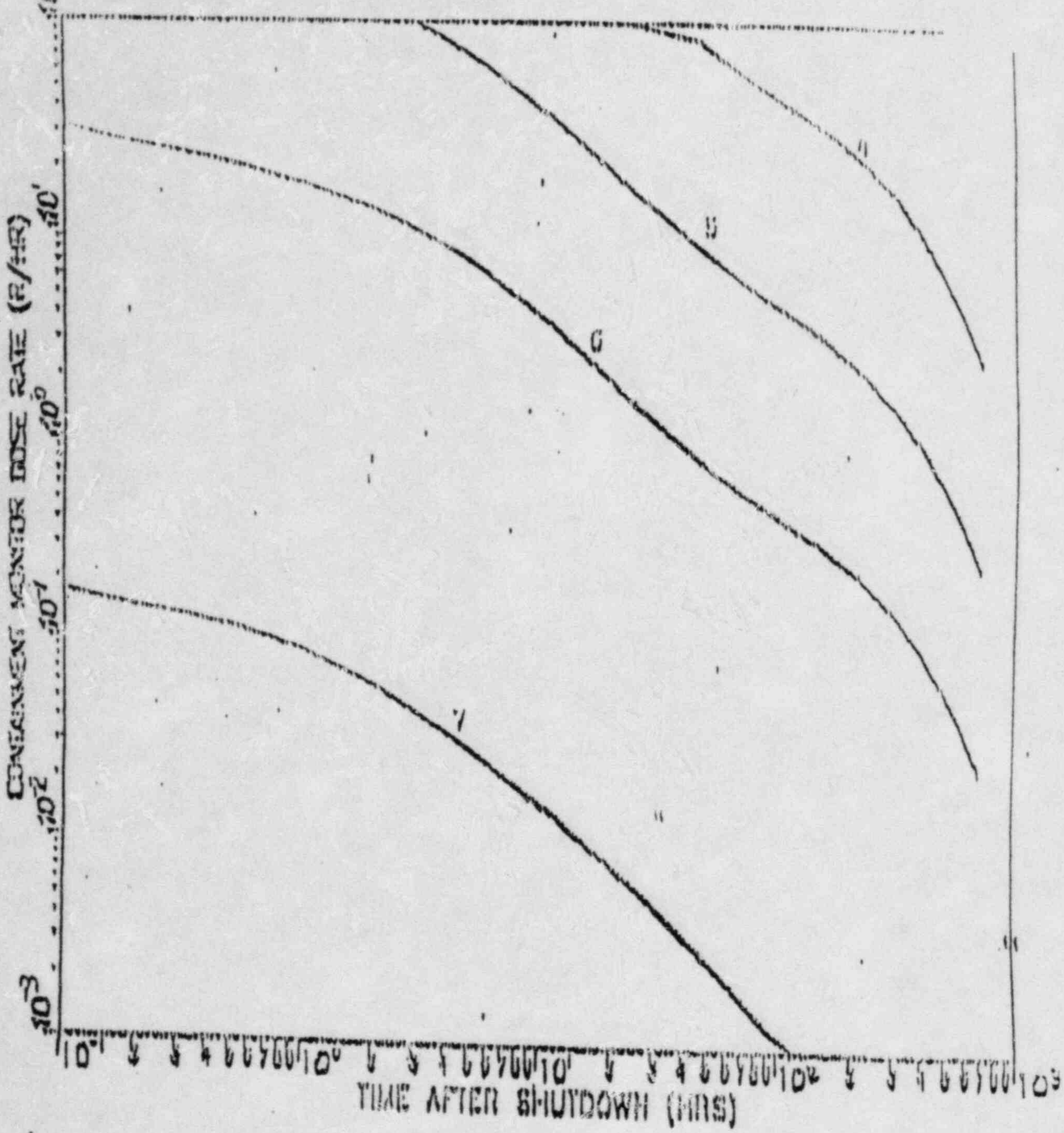
RE-26-191 A,B,C,D (291A,B,C,D) Monitor Response Curves



1 - 100% TID
2 - 10% TID
3 - 1.0% TID
4 - 0.1% TID
5 - 0.01% TID
6 - 0.001% TID

APPENDIX EP-C-326-5

CONTAINMENT AREA RADIATION MONITOR (CHANNEL 14) RESPONSE CURVE



4 = 0.1% TID
5 = 0.01% TID
6 = 0.001% TID
7 = 100% REACTOR COOLANT

APPENDIX EP-C-326-6

A. Procedure for determining fuel damage estimate based on measured I-131 concentrations

1. Calculate F_I (I-131)

$$= \frac{3651}{P_1 \times .4531 + P_2 \times .2478 + P_3 \times .1355 + P_4 \times .0741}$$ Cont'd below

$$\overline{+ P_5 \times .0405 + P_6 \times .0222 + P_7 \times .0121}$$

Where P_1, P_2, P_3, P_4, P_5, P_6, P_7 are the average reactor power output (MWT) during week 1, 2, 3, 4, 5, 6 and 7 respectively prior to shutdown. These values are obtained from the A-1 log sheets maintained for both Peach Bottom 2 and 3.

2. Plant Parameter Correction Factor

For P ____ B ____ $F_W = 0.956$

For Limerick $F_W = 1.001$

3. Calculate the time (t) between reactor shutdown and the I-131 sample time (in days) utilizing information from form EP-C-326-1

4. Calculate C_W^{Ref} (I-131) = C_W (I-131)$e^{0.0862\ t}$ x F_I (I-131)xF_W

Where C_W(I-131) is the measured I-131 concentration from Form EP-C-326-1

a. If a fuel failure estimate is to be based on reactor water sample, utilize the I-131 concentration measured in reactor water as C_W (I-131)

b. If a fuel failure estimate is to be based on suppression pool water, utilize the I-131 concentration measured in suppression pool water as C_W (I-131)

c. If I-131 concentration measurements are available in both reactor water and suppression pool water, determine an average concentration by weighting by the mass of reactor water and mass of suppression pool water.

For Peach Bottom 2,3

$$C_w\ (I\text{-}131) = \frac{C_w \text{ in } R_x \text{ Water} \times 2.67\times10^{8} + C_w \text{ in SP water} \times 3.48 \times}{3.747 \times 10^{9}}$$

For Limerick 1:

$$C_w\ (I\text{-}131) = \frac{C_w \text{ in } R_x \text{ Water} \times 2.93\times10^{8} + C_w \text{ in SP water} \times 3.63\times10^{9}}{3.923\times10^{9}}$$

5. Using C_w Ref. (I-131) and Appendix 7, obtain the fuel damage estimate.

B. Procedure for Determining Fuel Damage Estimate Based on Measured Xe-133 Concentrations

1. Calculate F_I (Xe-133)

$$= \frac{3651}{P_1 \times .613 + P_2 \times .249 + P_3 \times .0975 + P_4 \times .0402}$$

Where P_1, P_2, P_3, P_4 are the average reactor power output (MWt) during the first, second, third, and fourth week respectively prior to shutdown. These values are obtained from the A-1 log sheets maintained for both Peach Bottom 2,3.

2. For Peach Bottom 2,3 — For Limerick 1

$Fg = 0.214$ — $Fg = 0.272$

3. Calculate the time (t) between reactor shutdown and the Xe-133 sample time (in days) utilizing information from Form EP-C-326-1.

4. Calculate Cg^{Ref} (Xe-133) = Cg (Xe-133) $e^{0.132\,t} \times F_I$(Xe-133) × Fg

Where Cg(Xe-133) is the measured Xe-133 concentration from Form EP-C-326-1.

a. If the fuel failure estimate is to be based on the drywell gas sample, utilize the Xe-133 concentration measured in the drywell corrected for pressure and temperature differences between the drywell and sample vial (see FORM EP-C-326-1).

$$Cg(Xe\text{-}133) = Cg(vial) \times \frac{Pdw \times Tvial}{Pvial \times Tdw}$$

b. If the fuel failure estimate is to be based on the torus gas sample, utilize the Xe-133 concentration measured in the torus corrected for pressure and temperature differences between the torus and sample vial (see FORM EP-C-326-1).

$$Cg(Xe\text{-}122) = Cg(vial) \times \frac{P_{tor} \times Tvial}{Pvial \times T_{tor}}$$

c. If Xe-133 concentration measurements are available in both drywell and torus, determine an average concentration by weighting by the volume of the drywell and torus

For Peach Bottom 2,3:

$$Cg(Xe\text{-}133) = \frac{Cg(Xe\text{-}133,\ step\ a \times 4.98 + Cg(Xe\text{-}133)\ step\ b \times}{8.6}$$

For Limerick 1:

$$Cg(Xe\text{-}133) = \frac{Cg(Xe\text{-}133,\ step\ a \times 6.66 + Cg(Xe\text{-}133)\ step\ 6 \times 4.23}{10.89}$$

5. Using Cg Ref. (I-131) and Appendix 8, obtain the fuel damage estimate.

Procedure for determing fuel damage estimate based on measured I-131 concentrations.

1. Logon to the PECO Corporate Computer System using normal logon procedures.

   Using standard processes, enter into the SPF 2 format (Note SPF 2 is used for all editing of datasets information)

2. The necessary dataset and the corresponding member can be found in dataset 'EP.DIAMOND.DATA2' member 'DAMAGE I'. (Note: DATASET 'EP.DIAMOND.DATA2' is controlled by H. J. Diamond, Alternate Core Physics Coordinator; all Datasets and Job Control information are located under his computer identification number.)

3. After entering into the proper dataset member, the necessary data concerning the Post Accident Sampling System (PASS) must be entered into the proper format within the member (Note: A sample member and the format is shown in Appendix 6, Figure 1.)

4. The Description of formating is as follows:

   4.1 First line: Type in "PBAPS" if the procedure is to be run for Peach Bottom reactor or "Limerick" if the procedure is to calculate fuel damage at a Limerick unit.

   4.2 Second line: Type in "UNIT X" where 'X' corresponds to the unit number of the reactor for which this procedure is to be used.

   4.3 Third line: Type in the word "IODINE" which will specify the iodine analysis to be run.

   4.4 Fourth line: Input average power of each of the seven (7) weeks prior to shutdown, P1, P2, P3, P4, P5, P6, P7; where P1 is the first week prior to shutdown and is input first, P2 is input second, etc. The values are obtained from the log sheet maintained for both Peach Bottom Units 2 and 3 and Limerick Unit 1. (Note: Keep the decimal points on line 4 in the same locations as shown in Appendix 6, Figure 1, so the program will run correctly.)

4.5 Fifth line: Type in the phrases "TIME", "RX I-CONC.", and "POOL I-CONC." which corresponds to the time difference between the point in time the vial sample was taken and the time the reactor was shutdown, the reactor water Iodine-131 concentration measurements, and the suppression pool water Iodine-131 concentration measurements respectively. (Note: Remember to keep decimal points in the same locations as in Appendix 6, Figure 1.)

4.6 Sixth line: Input the corresponding values for "TIME" "Rx I-CONC.", and "Pool I-Conc." as found on form EP-C-326-1. Note: If only one I-131 measurement is taken, leave the other blank. Also, remember to keep decimal points and exponentials in the same locations as in Appendix 6, Figure 1.

5. Enter, using the SPFZ option, into dataset "T423HJD.JOB.CNTL" member "DAMAGE" whichis the needed job control to execute the PASS analysis program. Change (on line number FT05F001) the member name enclosed in parentheses to "DAMAGEI". Submit the program by typing "SUB" at the command input located at the top of the job control member.

6. The Output of the iodine program shall show the following data: the inputted post shutdown sample time (Section 4.4), the inputted vial iodine concentration (Section 4.4), the calculated FI (Inventory Correction Factor), the calculated CWREF (Iodine-131 concentration with respect to the reference value), the estimated % of cladding failure and the estimated % of fuel meltdown.

6.1 NOTE: The Program shall estimate the % cladding failed and the % of fuel meltdown that has occurred using the data found on figure 1 & 2, respectively, of Appendix 6. The computer output shall be assumed correct if reactor is in the shutdown mode. If the reactor is not fully shutdown (as is the case of an ATWS), the program will yield a conservative estimation of the relative fuel cladding damage within the reactor.

Procedure for determing fuel damage estimate based on measured Xe-133 concentration.

1. Logon to the PECO Corporate Computer System using normal logon procedures.

   Using standard processes enter into the SPF2 format (NOTE: SPF2 is used for all editing of dataset information.)

2. The necessary dataset and the corresponding member can be found in dataset 'EP.DIAMOND.DATA2' member 'DAMAGE XE'.

3. After entering into the proper dataset member, the necessary data concerning the Post Accident Sampling System (PASS) must be entered into the proper format within the member (NOTE: A sample member and format is shown in Appendix 6, Figure 2.

4. The description of formatting is as follows:

   4.1 First line: Type in "PBAPS" of the procedure is to be run for Peach Bottom reactor or "Limerick" if the procedure is to calculate fuel damage at a Limerick unit.

   4.2 Second line: Type in "Unit X" where 'X' corresponds to the unit number of the reactor for which this procedure is to be used.

   4.3 Third line: Type in the word "Xenon" which will specify the xenon analysis to be run.

   4.4 Fourth line: Input average power of each of the four (4) weeks prior to shutdown, P1, P2, P3, P4. The first week prior to shutdown is input first, P2 is input second, etc. The values are obtained from the A-1 log sheet maintained for both Peach Bottom Units 2 and 3 and Limerick Unit 1. (Note: Keep the decimal points on line 4 in the same locations as shown in Appendix 6, Figure 1, so the program will run correctly.)

   4.5 Fifth line: Type in the phrases "TIME", which corresponds to the time difference between when the

vial sample was taken and the reactor was shutdown;"D/W XE,-CONC." which corresponds to the Xenon-133 concentration measured in the torus; PDW" which corresponds to the pressure of the drywell; "TDW" which is the temperature of the drywell; "PV", which is the temperature of the sample vial; "PT", which is the pressure of the torus; and "TT", which is the temperature of the torus.

4.6 Sixth line: Input the corresponding values for "TIME" "D/W XE-CONC.", "TOR XE-CONC.", "PDW", "TDW", "PV", "TV", "PT", and "TT" as found on EPC 326-1. Note: If only one Xe-133 measurement is taken, leave the other blank. Also, remember to keep decimal points and exponentials in the same locations as in Appendix 6, Figure 1.

5. Enter, using the SPF 2 option, into dataset 'T423HID.JOB.CNTL", member "Damage" which is the needed job control to execute the PASS analysis Program. Change (on line number PT05F001) the member name (which is enclosed in parenthesis) to "DAMAGEXE". Submit the program by typing "sub" at the command input located at the top of the job control.

6. The output of the xenon program shall show the following data: the inputted post shutdown sample time (Section 4.4), the inputted xenon vial concentration (Section 4.4), the drywell xenon sample concentration, drywell pressure and drywell temperature, if inputted (Section 4.4), the torus xenon sample concentration, torus pressure, and torus temperature, if inputted (Section 4.4), the inputted vial pressure and vial temperature (Section 4.4). Also printed will be the calculated corrected concentration of xenon taking into account the difference in pressure and temperature between the vial and the drywell and/or torus, the calculated FI (Inventory Correction Factors), the calculated CgREF (Xenon-133 concentration with respect to the reference value) the estimated % of cladding failure, and the estimated % of fuel meltdown. (See Note in Part A, Section 6.1 of Appendix 6).

```
IODINE
3293.    3293     3293.    3293.    3293.    3293.    3293.
     TIME    I-CONC.
     0.07   1.000E+02
```

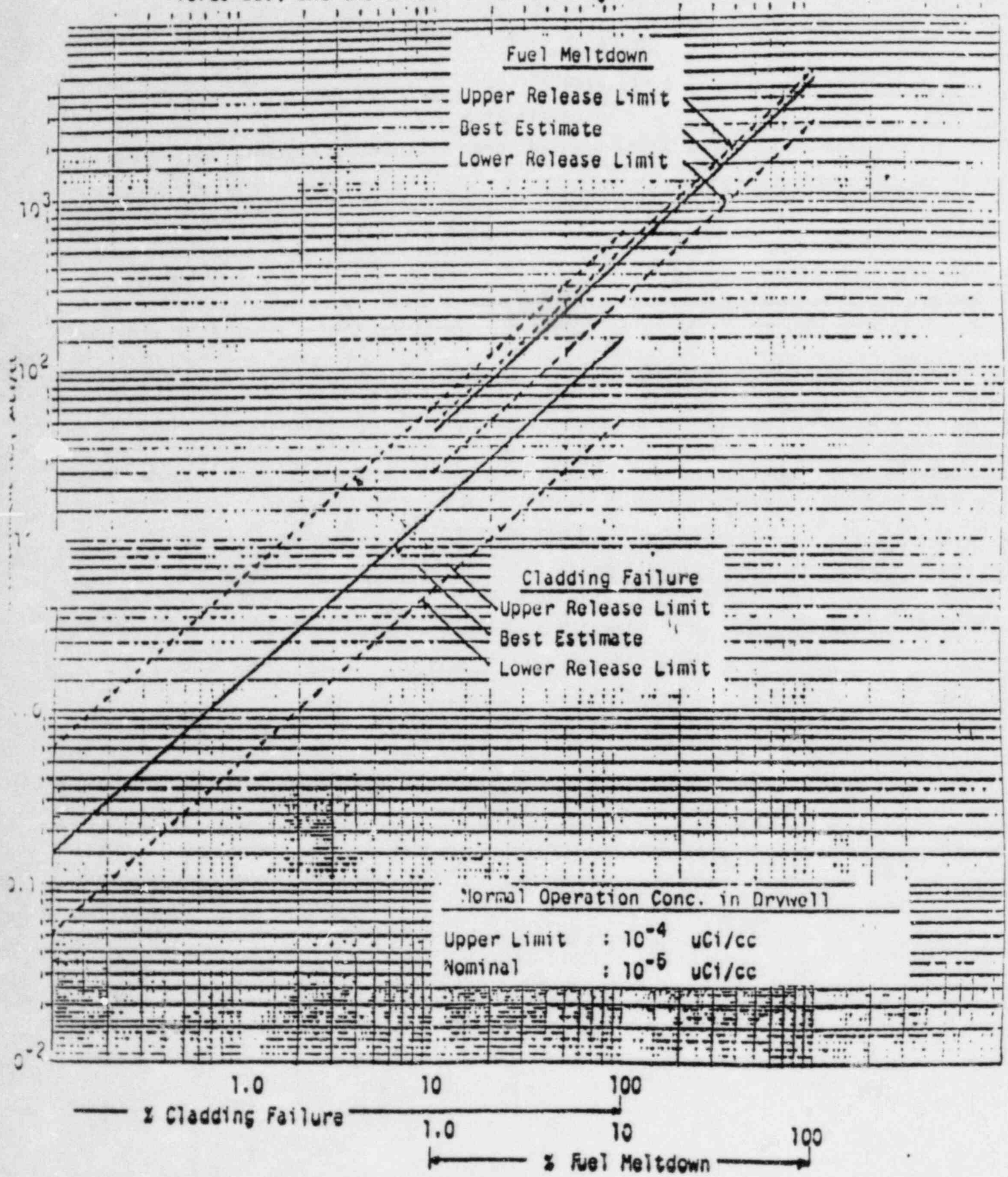
APPENDIX 6 FIGURE 1

```
XENON
3293     3293.    3293     3280
     TIME     XE-VIAL      PDW      T-VIAL      P-VIAL TDW
     0.01   1.000E+05      10        100.        14.7 195.
```

APPENDIX 6 FIGURE 2

Xe-133 Concentration vs Fuel Damage

Relationship between Xe-133 Concentration in the Containment (Torus Gas) and the Extent of Core Damage in Reference Plant



I-131 Concentration vs Fuel Damage

Relationship between I-131 Concentration in the Primary Coolant Water + Pool Water) and the Extent of Core Damage in Reference