



UNITED STATES
NUCLEAR REGULATORY COMMISSION
WASHINGTON, D. C. 20555

AUG 21 1985

MEMORANDUM FOR: William J. Dircks
Executive Director for Operations

FROM: Victor Stello, Jr., Chairman
Committee to Review Generic Requirements

SUBJECT: MINUTES OF CRGR MEETING NUMBER 79

The Committee to Review Generic Requirements (CRGR) met on Wednesday, July 24, 1985 from 12:30 -6 p.m. A list of attendees for this meeting is enclosed (Enclosure 1).

1. N. Randall (RES) presented for CRGR review the proposed Revision 2 of Regulatory Guide 1.99, "Radiation Damage to Reactor Vessel." Enclosure 2 summarizes this matter (Category 2 item).
2. J. Funches (NRR) briefed the CRGR concerning the current request to OMB for approval to continue to impose the reporting and recordkeeping requirements of 10 CFR Part 50, Domestic Licensing of Production and Utilization Facilities.

The Part 50 reporting and recordkeeping burden on reactor permittees/licensees is currently estimated to be around 4-million hours (\$240 million) per year. Approximately 1-million hours of the annual burden involve reactor operating and maintenance staff, which is principally concerned with plant safety. The Part 50 reporting and recordkeeping burden on the NRC is currently estimated to be around 380 thousand hours (\$23 million) per year. The current burden estimate reflects a 2-million-hour reduction from the 1982 estimate. (Enclosure 3, which was used to brief the CRGR, provides summary burden information.) The CRGR strongly encourages NRC efforts to assure that only necessary reporting and recordkeeping requirements are imposed by NRC especially where reactor operating and maintenance staff burden is involved.

3. J. Knight (NRR) briefed the CRGR concerning pressure isolation valve (PIV) test requirements. Enclosure 4 summarizes this matter (Category 2 item).
4. J. Knight (NRR) presented for CRGR review the proposal for improving Fire Protection. Enclosure 5 summarizes this matter (Category 2 item).

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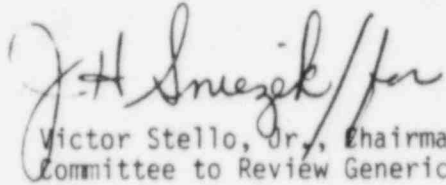
19 pp.

R-00, 11

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Enclosures 2, 4, and 5 contain predecisional information and therefore will not be released to the Public Document Room until the NRC has considered (in a public forum) or decided the matters addressed by the enclosures.

Questions concerning these meeting minutes should be referred to Walt Schwink (492-8639).


Victor Stello, Jr., Chairman
Committee to Review Generic
Requirements

Enclosures: As Stated

cc: Commission (5)
SECY
Office Directors
Regional Administrators
CRGR Members
G. Cunningham
N. Randall
J. Funches
J. Knight

Enclosure 2 to the Minutes of CRGR Meeting No. 79
Proposed Draft of Revision 2 to Regulatory Guide 1.99
"Radiation Damage to Reactor Vessel Materials"

C. Serpan and P. N. Randall (RES) presented for CRGR review a proposed draft of Revision 2 to Regulatory Guide 1.99 now entitled "Radiation Damage to Reactor Vessel Materials." CRGR was requested to recommend in favor of publication of this Regulatory Guide (RG) for public comment. (A copy of the viewgraphs used to brief CRGR is attached.)

Basically, the proposed Revision 2 to RG 1.99 would update the existing staff guidance of RG 1.99 Revision 1, taking into account the experience acquired since 1977 in this matter along with the accumulation of surveillance data from commercial power reactors. The proposed revisions reflects results of studies since 1977 as to the physical basis for neutron radiation damage and the correlations made for effects of the material chemical compositions and neutron fluence. The principal changes being made in RG 1.99 are the separate treatment of the radiation damage to welds and to the reactor vessel base metal. The nickel content of the material is being considered as a variable in the correlations and the phosphorus content because of its small effects is removed. At high fluences, the fluence effects are being adjusted and guidance is given for determining the attenuation of damage through the depth of the reactor vessel wall. These changes in regulatory guidance have been brought about largely by advancements in data and in the science of predicting material damage largely as a result of work begun for the NRC in 1981. This was about the time that the requirements for pressurized thermal shock (PTS) were being developed and these advancements concerning radiation damage correlations have evolved with cognizance of the industry, EPRI, ANS, the ASTM Committee E-10 and the Metal Properties Council on radiation damage. The objective of the proposed Revision 2 to RG 1.99 is to set forth these advancements and from these provide calculational procedures acceptable to the NRC for assuring that an acceptable level of reactor vessel toughness is maintained with margins through plant heat-up, cooldown and hydrotest operations. The package transmitted for CRGR review also includes conforming changes to the Standard Review Plan (SRP) (NUREG-0800, Section 5.3.2). The proposed revisions to RG 1.99 and the SRP would be implemented on all plants (i.e., forward fit and backfit). Operating plants would be given up to 3 years to revise operating procedures and their technical specifications. The overall justification for the guidance of RG 1.99 is set forth by the requirements of 10 CFR 50; Appendix A (General Design Criterion 31), Appendix G and Appendix H.

CRGR was advised that the proposed RG 1.99 Revisions would bring about greater restrictions on the pressure-temperature (PT) operating band for both the BWR and PWR plants. The BWR plants would, for example, be faced with difficulties in carrying out certain post-refueling hydrotest operations required by the ASME code. Although the full BWR implications were not available to CRGR or the staff, CRGR was advised that some of the older BWR plants may be forced into providing additional equipment for heatup, use of unusual system configurations or the use of the RHR pumps for heating, etc. so as to minimize the

chance of damage to the main recirculation pump seals. Additionally, there may also be BWR technical specifications requiring containment isolation for coolant temperatures greater than 200°F that would further complicate the hydrotest requirements - this might be rectifiable by changing the technical specifications.

The PWRs would also be affected by this narrowed pressure-temperature operating band, resulting in a somewhat lesser margin for operation in the low temperature, low pressure region of operations. This could, for example, cause a somewhat more restrictive set point for PORVs used to provide low temperature overpressure protection. CRGR was also advised that RG 1.99 Revision 2 provides a new understanding on the profiles for the radiation damage progression as a function of the material chemistry versus fluence. This could possibly affect the previous understanding of pressurized thermal shock (PTS) risk depending on the particular PWR as it approaches the latter part of its vessel design life.

CRGR concluded that there was insufficient information provided in the RG package to permit a more complete exploration and understanding of this matter. Of particular importance to the CRGR were the implications to the PTS issue. CRGR commented that this new information should have been better integrated with the recent PTS rule and the ongoing PTS work. CRGR recommends that the EDO request NRR and RES to give a priority effort to the integration of these separate actions to the extent required by the new information at hand. ELD should also work closely with NRR and RES on this matter.

Subsequent to the meeting, RES requested that the proposed revision to RG 1.99 be dropped from further CRGR consideration until the issue is fully reviewed by RES and NRR.

DRAFT REGULATORY GUIDE 1.99, REVISION 2
RADIATION DAMAGE TO REACTOR VESSEL MATERIALS

PURPOSE: GET REVISION 2 OUT FOR PUBLIC COMMENT

- I. SAFETY SIGNIFICANCE
 - O NORMAL OPERATION
 - O TRANSIENTS
 - O FUNCTION OF R.G. 1.99 AND APPENDICES G & H IN REGULATING FRACTURE PREVENTION OF R.V.
- II. TECHNICAL UPDATE, REV. 2 VS REV. 1
 - O BETTER DATA BASE
 - O BETTER ANALYSIS
 - O ACCEPTANCE BY TECHNICAL COMMUNITY
- III. VALUE/IMPACT
 - O WHAT PLANTS ARE AFFECTED AND HOW MUCH?
 - O PWRs-SAFETY IMPACT
 - O TRANSIENTS
 - O NORMAL OPERATION -- PNL ANALYSIS
 - O COSTS -- HEATUP
 - O LTOP
 - O BWRs -- HYDROTEST
- IV. RELATIONSHIP TO PTS RULE
- V. IMPLEMENTATION

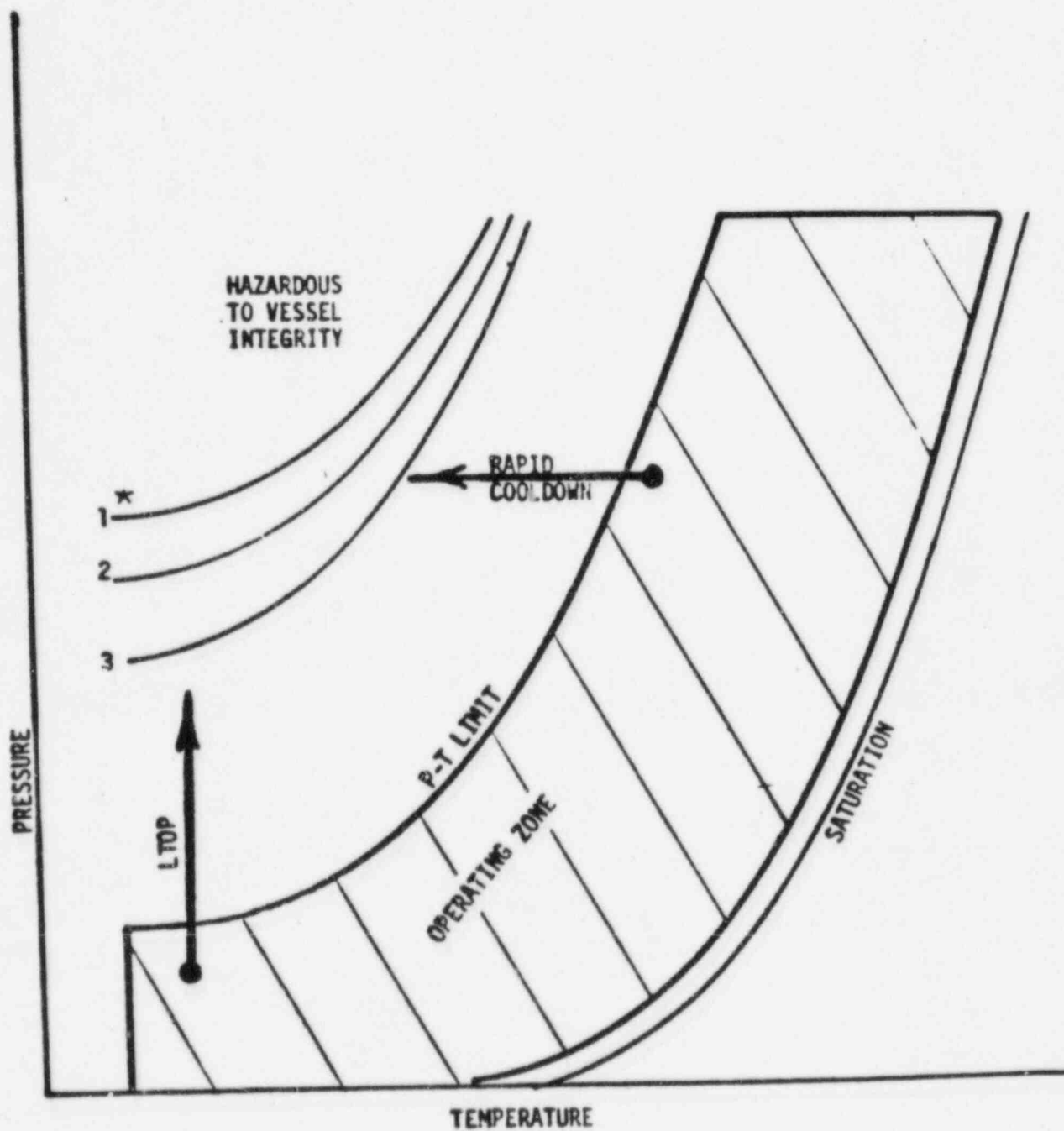


FIGURE 1 SCHEMATIC PRESSURE-TEMPERATURE DIAGRAM

*Note: The three curves represent different cooling rates, Curve 1 being the slowest.

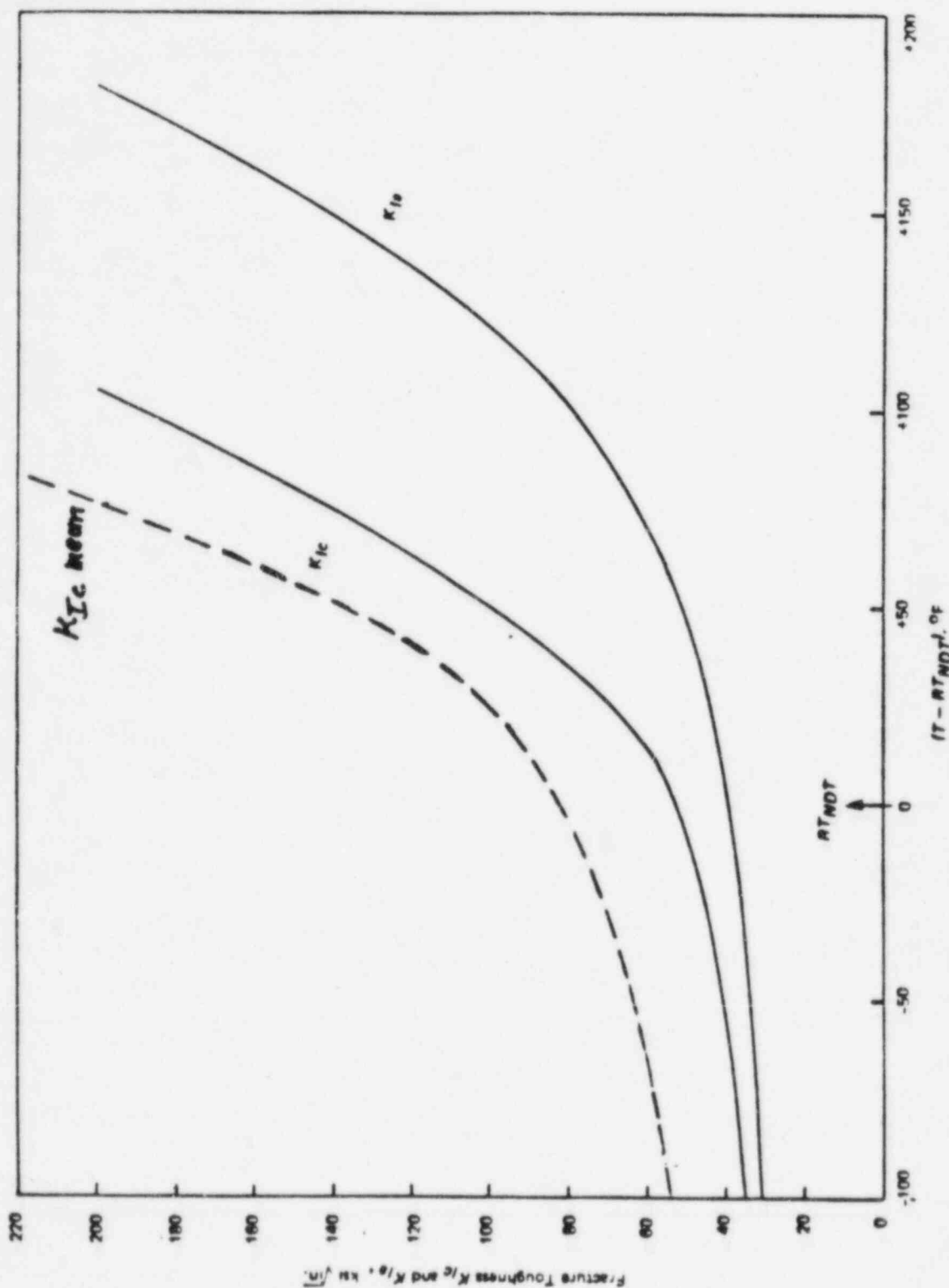


FIG. A-4200-1 LOWER BOUND K_{Ia} AND K_{Ic} TEST DATA FOR SA-533 GRADE B CLASS 1, SA-508 CLASS 2, AND SA-508 CLASS 3 STEELS

FIGURE 5 REFERENCE TOUGHNESS CURVES FROM SECTION XI OF THE ASME CODE. THE K_{Ia} CURVE IS THE SAME AS THE K_{IR} CURVE FROM SECTION III, APPENDIX G.

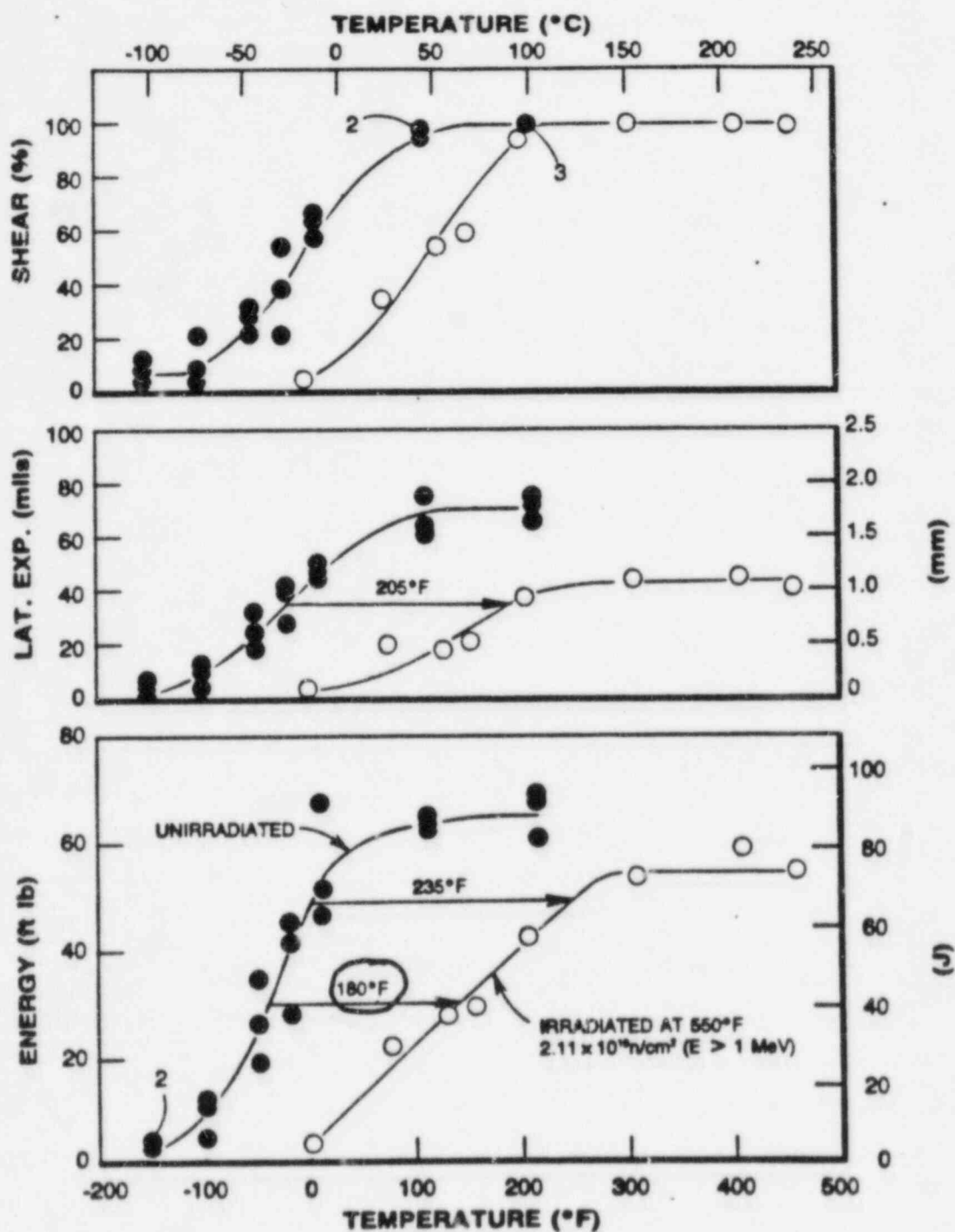


FIGURE 5-3. CHARPY V-NOTCH IMPACT ENERGY FOR THE POINT BEACH UNIT NO. 1 PRESSURE VESSEL WELD METAL

$$\Delta RT_{NDT} = (CF) (F)^{0.28 - 0.1 \log F}$$

CF = CHEMISTRY FACTOR (COPPER AND NICKEL)

- o TABLE I FOR WELDS
- o TABLE II FOR BASE METAL (PLATES AND FORGINGS)

F = FLUENCE, N/CM² (E > 1 MEV)

- o FIGURE 1

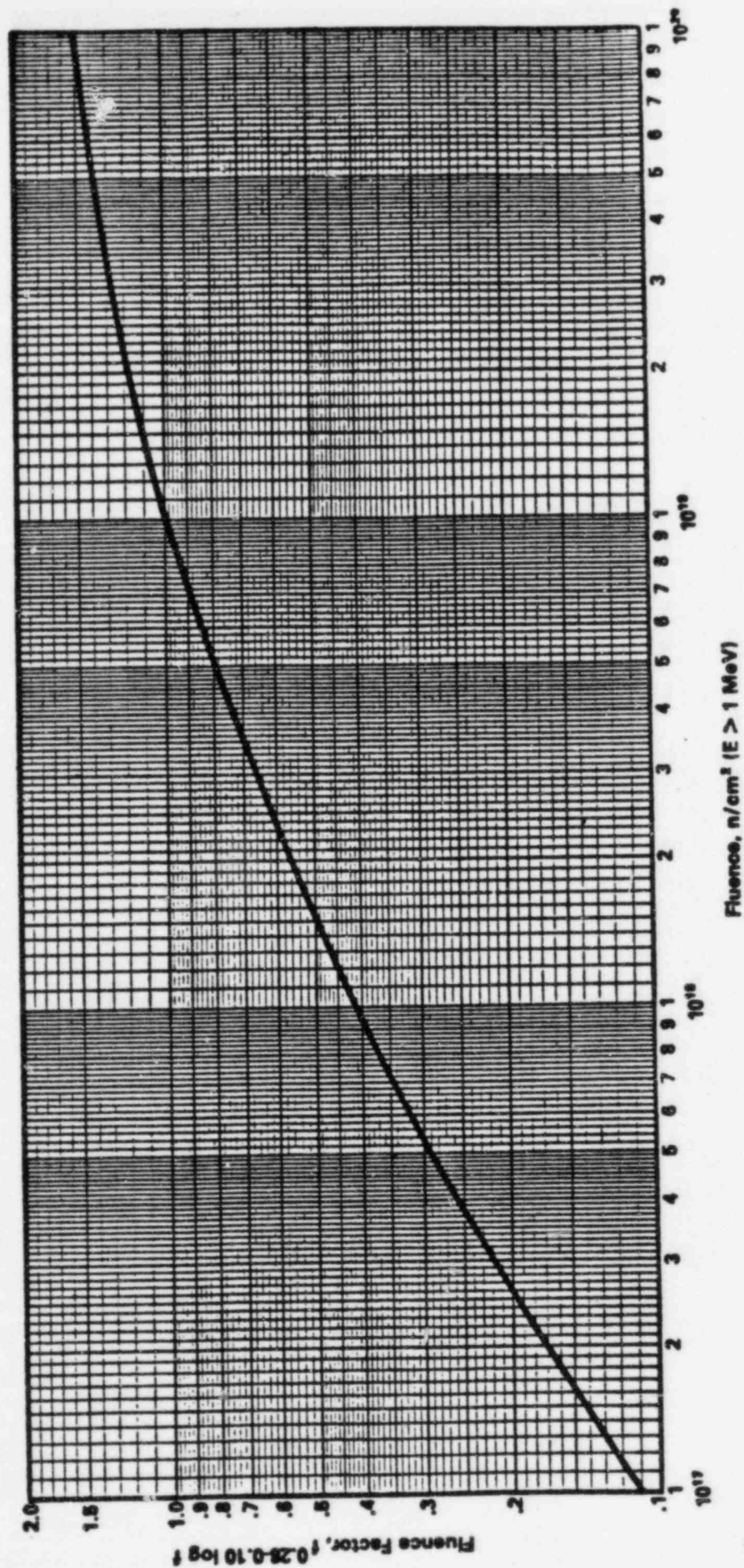


FIGURE 1 FLUENCE FACTOR FOR USE IN EQUATION 2, THE EXPRESSION FOR ΔRT_{NDT}

R6 1.99 Rev. 2

IMPROVEMENTS IN REVISION 2 OVER REVISION 1

- O SURVEILLANCE DATA BASE - 8 YEARS ACCUMULATION
- O REGRESSION ANALYSIS GAVE MEAN CURVES AND A MEASURE OF SCATTER
- O CHEMISTRY FACTOR INCLUDES COPPER AND NICKEL
- O SEPARATE FACTORS FOR WELDS AND BASE METAL
- O AMALGAM OF NRC- AND EPRI-SPONSORED RESEARCH
- O ADOPTION EXPECTED FOR ASTM E900 AND ASME CODE, SECTION XI
- O ATTENUATION EQUATION , *MARGIN*
- O USE OF PLANT SURVEILLANCE DATA

$\Delta RT_{NOT}, ^\circ F, \text{ mean } + \text{ margin}$

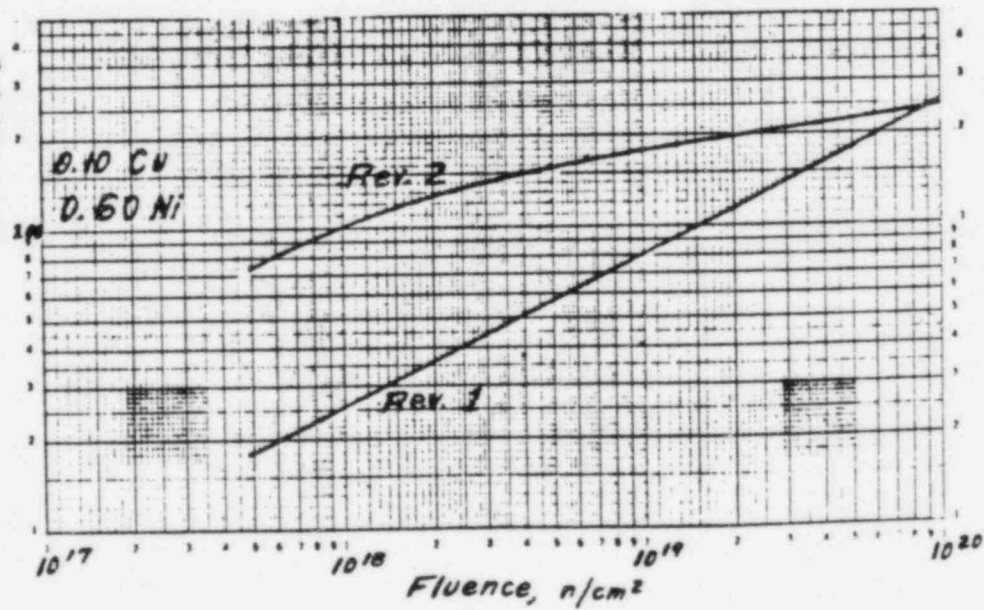
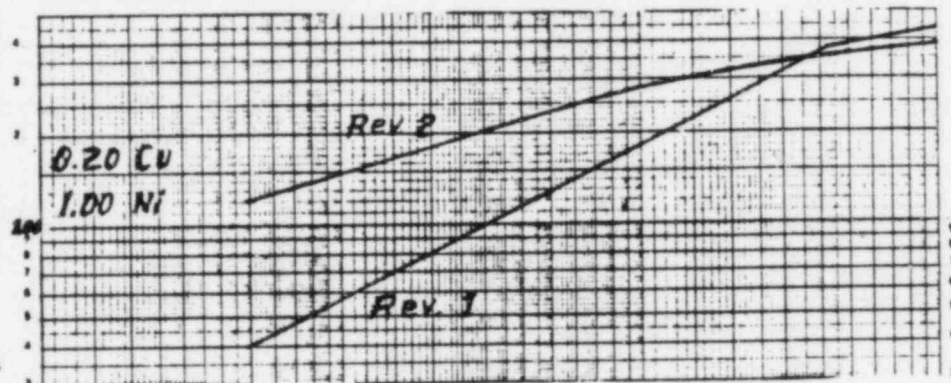
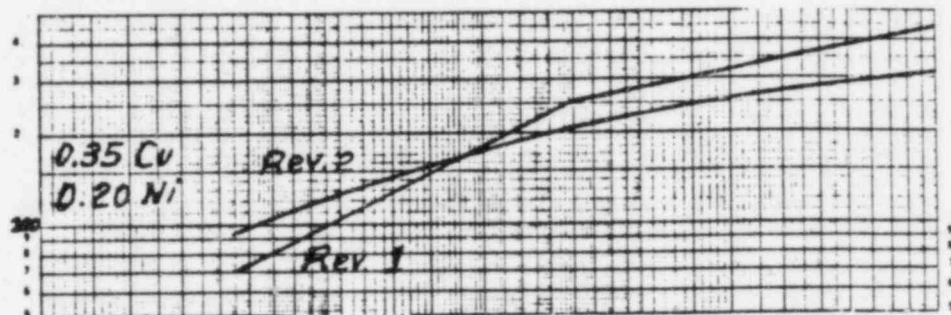
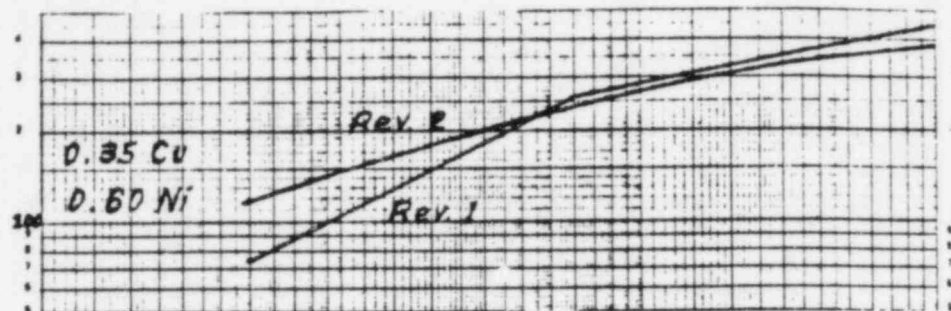
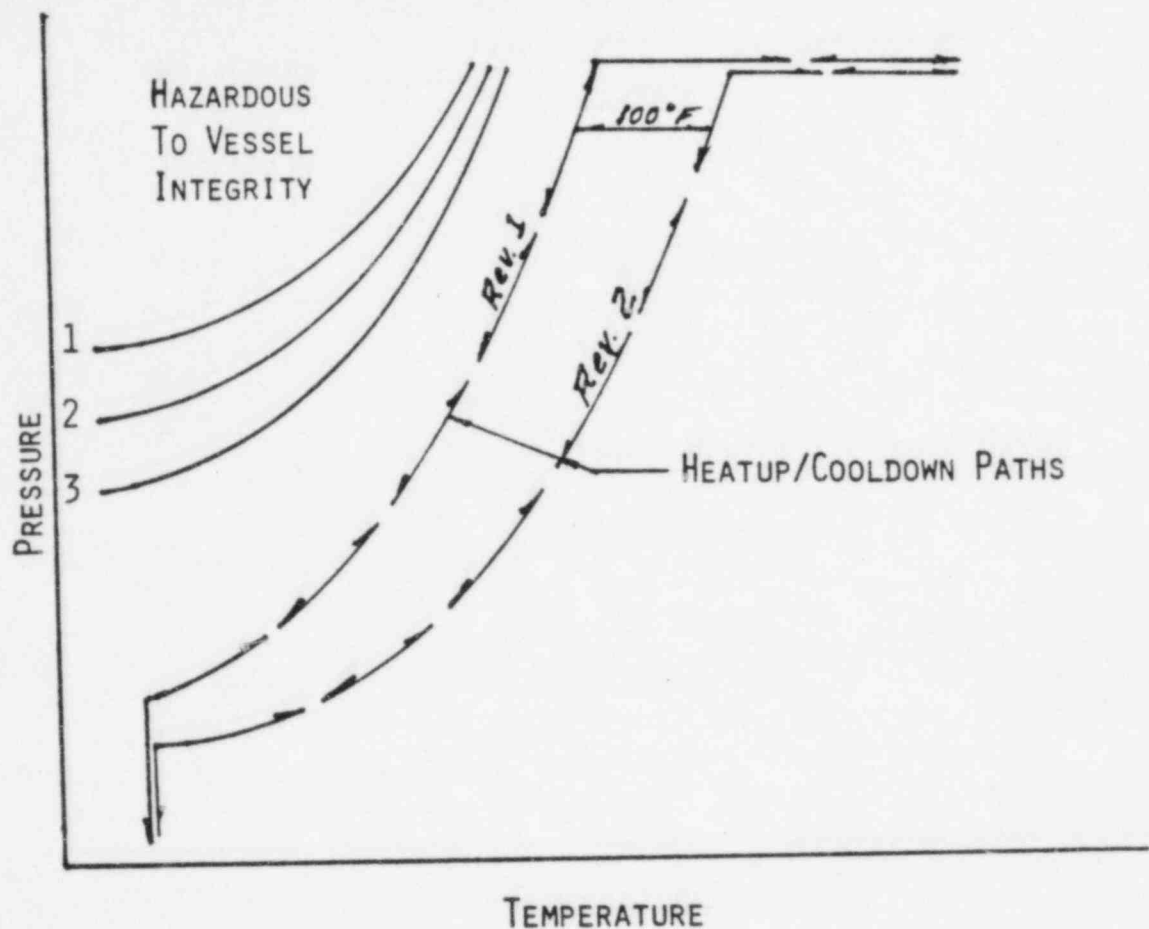


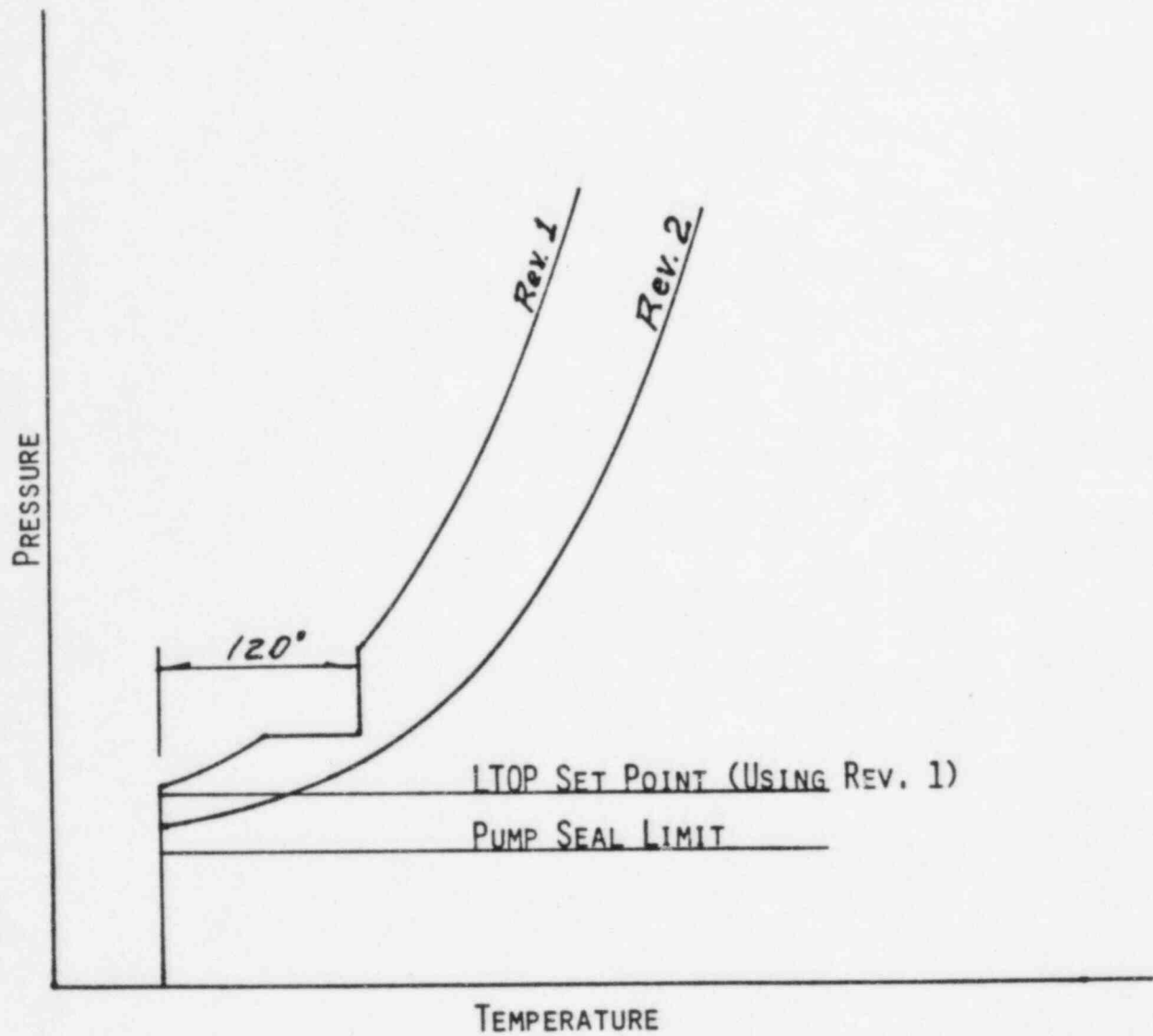
TABLE 1. SUMMARY OF THE CHANGES IN PRESSURE-TEMPERATURE LIMITS EXPECTED TO RESULT FROM A CHANGE FROM REVISION 1 TO REVISION 2 OF REGULATORY GUIDE 1.99

Effect of Change from Rev. 1 to Rev. 2	Operating Reactors			Plants Undergoing Licensing		
	PWR	BWR	Total	PWR	BWR	Total
Ratchet 50-100°	4*	4	8			
Ratchet 20-50°	16	17	33	32	12	44
No Change ($\pm 20^\circ$)	23	7	30	3	0	3
Benefit 20-50°	7	1	8			
Benefit 50-100°	1	0	1			
Benefit 100-150°	1	0	1			
Totals	52	29	81	35	12	47

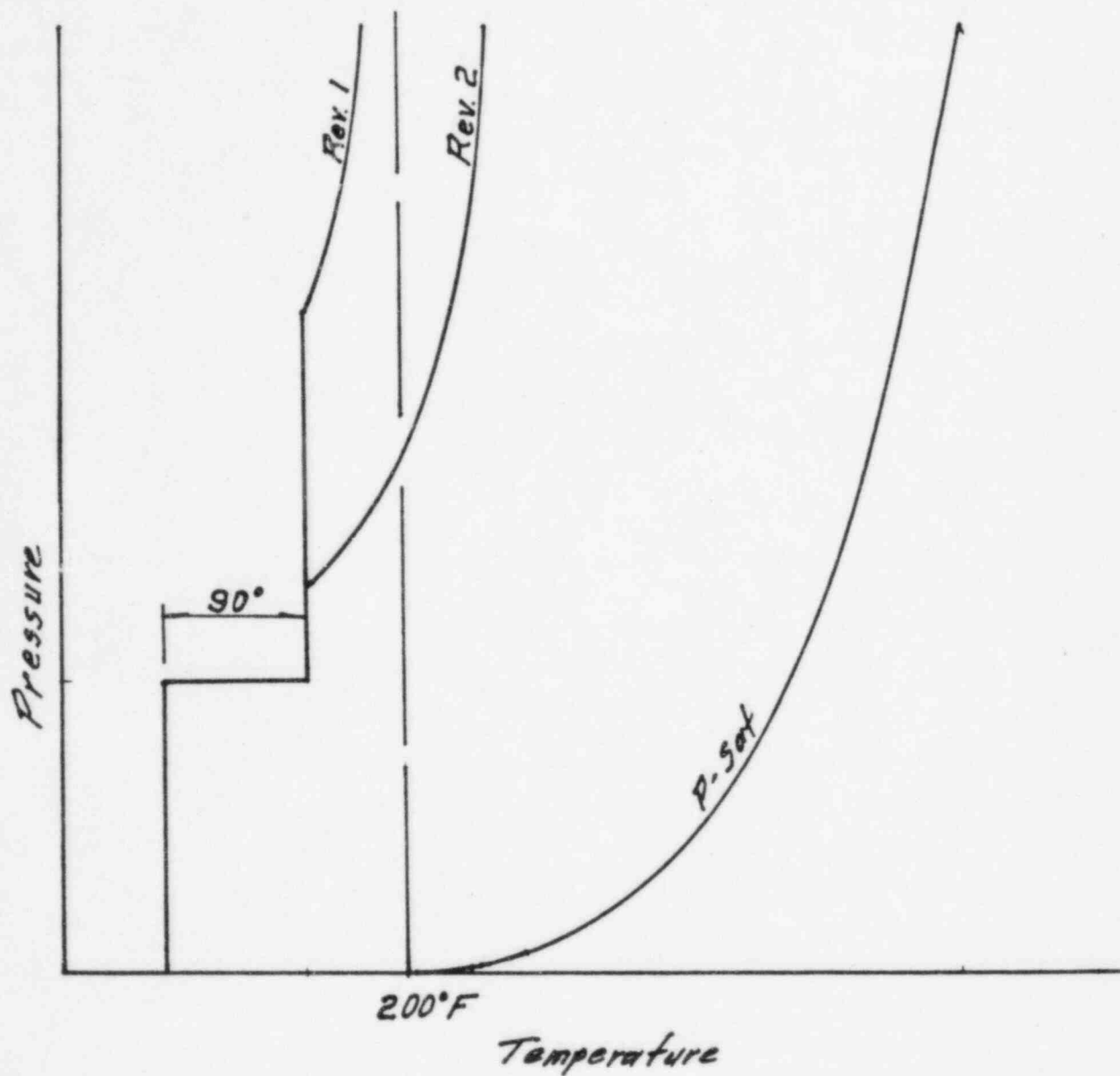
*Values in the table are number of plants.



- o INCREASE IN PROBABILITY OF VESSEL FAILURE → PERSON - REM PUBLIC EXPOSURE
- o DELAY IN STARTUP → COST OF REPLACEMENT POWER
- o OTHER COSTS
- o COSTS AVOIDED
- o PNL ESTIMATE: \$3500-5600 PER PERSON - REM AVOIDED
- o STAFF ESTIMATES (CAG ETC.) \$900-1400



POTENTIAL IMPACT OF REVISION 2 ON THE LTOP SET POINT FOR
PRESSURIZED WATER REACTORS



POTENTIAL IMPACT OF REVISION 2 ON THE PRESSURE-TEMPERATURE
LIMITS FOR HYDROTEST OF BOILING WATER REACTORS

POTENTIAL FUTURE IMPACT ON PTS RULE

0 DATE PLANT WOULD REACH SCREENING CRITERION IF RT_{PTS} WERE CALCULATED PER R.G. 1.99, REV. 2

FT. CALHOUN	1987	(USING UPPER-BOUND CHEMISTRY)
INDIAN POINT 2	1993	(COULD BE > EOL IF CHEMISTRY UPDATED)
PALISADES	1993	
CALVERT CLIFFS	1993	
INDIAN POINT 3	2001	
POINT BEACH 1	2001	
MAINE YANKEE	2002	
COOK 1	2006	
ALL OTHERS	EOL	

IMPLEMENTATION LETTER TO UTILITIES

P-T LIMITS AND ANALYSIS OF TRANSIENTS

1. ALL SUBMITTALS (CP, OL OR OPERATING REACTORS) AFTER (EFFECTIVE DATE OF REV. 2) WILL BE REVIEWED PER REV. 2.
2. DON'T WAIT MORE THAN 3 YEARS TO SUBMIT REVIEW OF P-T LIMITS.

PTS SCREENING CRITERION

1. PTS RULE IS NOT BEING AMENDED AT THIS TIME, BUT
2. RECALCULATE RT_{PTS} USING REV. 2 FOR EARLY WARNING OF NEED FOR FURTHER FLUX REDUCTION OR OTHER ACTION.

REVISION OF UPPER-SHELF ENERGY (USE) TREND CURVES

- O P-T LIMITS NOT AFFECTED
- O TRANSIENT ANALYSIS NOT AFFECTED, EXCEPT ATWS
- O USED IN CP REVIEWS OF BELTLINE MATERIALS
- O USED IN ANALYSIS OF 50 FT LB REQUIREMENT (APP. G)
- O CONTRACTOR'S EFFORT TO UPDATE WAS INCONCLUSIVE