

FLORIDA POWER CORPORATION

CRYSTAL RIVER UNIT 3

PRESSURE/TEMPERATURE LIMITS REPORT

REVISION 2

October 1998

Referencing  
Improved Technical Specifications

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## 1.0 Pressure/Temperature Limits (Ref.4)

This Pressure-Temperature Limits Report for CR3 has been prepared in accordance with the requirements of Technical Specification Section 1.1 and 5.6.2.19. The pressure/temperature (P/T) limits have been developed using the methodology provided in the references (Ref.1, Ref.2, Ref.3). Additional limits have been included which support the LTOP Technical Specification 3.4.11.

The following pressure-temperature limits are included in this report:

1	Allowable plant heatup and cooldown rates
2	Plant heatup P/T curve
3	Plant cooldown P/T curve
4	Plant inservice leak and hydrostatic testing P/T curve
5	LTOP P/T curves
6	Composite P/T curve

## 2.0 Fluence and Limiting Material Information (Ref.5)

T/4 Location	
weld	LNB to US Circ. Weld (ID 40%)
material	SA-1769
fluence	4.27E+18 n/cm <sup>2</sup>
ART	213.0 F

3/4T Location	
weld	LNB to US Circ. Weld (OD 60%)
material	WF-169-1
fluence	1.55E+18 n/cm <sup>2</sup>
ART	144.5 F

## 3.0 PTS Evaluation Summary (Ref.6)

Inside Surface	
weld	LNB to US Circ. Weld (ID 40%)
material	SA-1769
fluence	7.08E+18 n/cm <sup>2</sup>
RTpts	239.9 F

## 4.0 Instrument Uncertainties

The values referenced by this document do not include instrument uncertainties. Uncertainties must be applied based on the specific instruments being used to measure the parameters of interest.

## 5.0 References

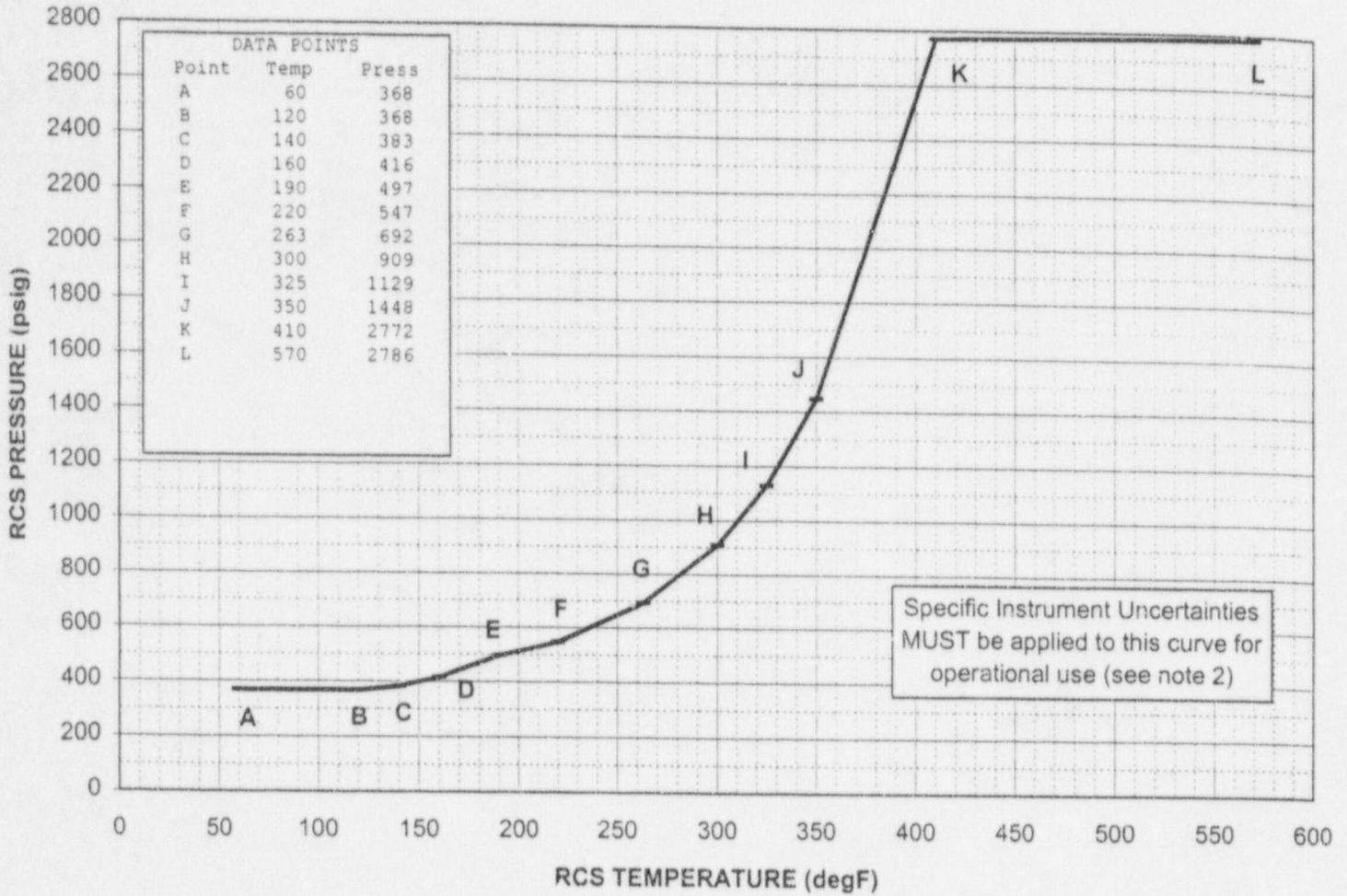
1. B&W Owners Group, topical report BAW-1543A, Rev. 2, "Integrated Reactor Vessel Surveillance Program," May 1985, and Addendum 1, July 1987
2. B&W Owners Group, topical report BAW-10046A, Rev. 2, "Methods of Compliance With Fracture Toughness and Operational Requirements of 10CFR50, Appendix G," June 1986.
3. B&W Owners Group, topical report BAW-2241P, Rev. 0, "Fluence and Uncertainty Methodologies," May 1997.
4. FTI Document 32-5001746-00, "CR-3 32 EFPY PT Limits," August 1998.
5. FTI Document 32-5000218-00, "ART for 32 EFPY for CR-3," June 1997.
6. FTI Document 32-5000303-00, "PTS Evaluation for CR3," June 1997.

## ALLOWABLE HEATUP AND COOLDOWN RATES

- a. For the temperature ranges specified below, the heatup rates are:
- i.  $T > 280^{\circ}\text{F}$   $\leq 70^{\circ}\text{F}$  in any 1 hour period,
  - ii.  $280^{\circ}\text{F} \geq T > 85^{\circ}\text{F}$   $\leq 50^{\circ}\text{F}$  in any 1 hour period,
  - iii.  $85^{\circ}\text{F} \geq T > 60^{\circ}\text{F}$   $\leq 15^{\circ}\text{F}$  in any 1 hour period
- b. For the temperature ranges specified below, the cooldown rates are:
- i.  $T > 280^{\circ}\text{F}$   $\leq 50^{\circ}\text{F}$  in any 1/2 hour period,
  - ii.  $280^{\circ}\text{F} \geq T > 150^{\circ}\text{F}$   $\leq 25^{\circ}\text{F}$  in any 1/2 hour period,
  - iii.  $150^{\circ}\text{F} \geq T$   $\leq 25^{\circ}\text{F}$  in any 1 hour period
- and,
- c. A maximum temperature change of less than or equal to  $5^{\circ}\text{F}$  in any one hour period during hydrostatic testing operations above system design pressure.

These limits are referred to by  
Technical Specification 3.4.3.

## REACTOR COOLANT SYSTEM PRESSURE-TEMPERATURE LIMITS FOR HEATUP FOR FIRST 32 EFY



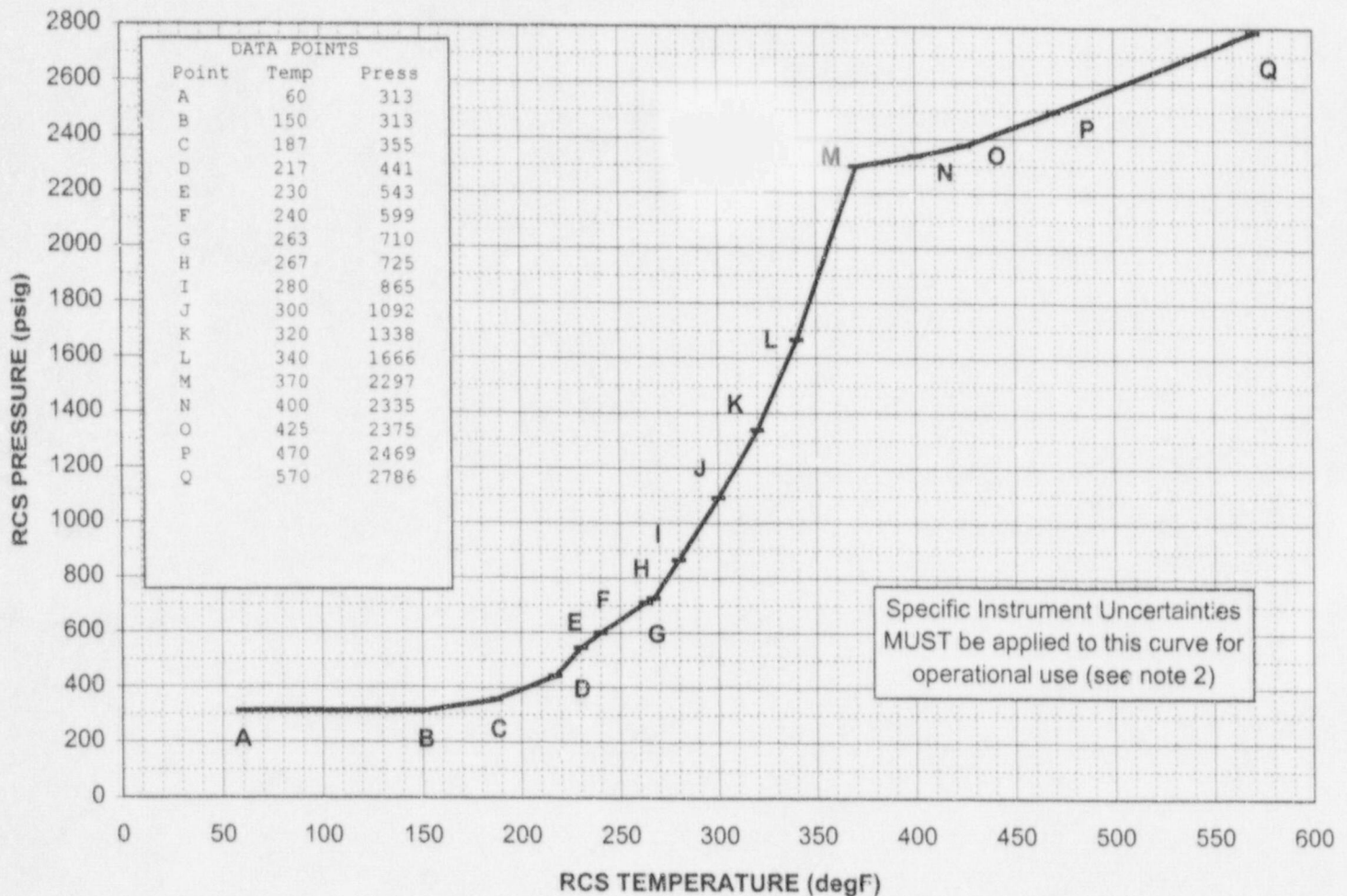
**NOTES:**

1. The regions of acceptable operation are below and to the right of the limit curve.
2. Margins are included for the pressure differential between point of system pressure measurement and the pressure on the reactor vessel region controlling the limit curve. Additional margins for instrument uncertainty are not included and **must** be applied to operating procedures based on the specific instruments being used to monitor the RCS conditions.
3. Applicable for heatup rates of:
 

$T > 280^{\circ}\text{F}$	$\leq 70^{\circ}\text{F}$ in any 1 hour period,
$280^{\circ}\text{F} \geq T > 85^{\circ}\text{F}$	$\leq 50^{\circ}\text{F}$ in any 1 hour period,
$85^{\circ}\text{F} \geq T > 60^{\circ}\text{F}$	$\leq 15^{\circ}\text{F}$ in any 1 hour period
4. RC Pump Constraints for Heatup:
 

$T > 263^{\circ}\text{F}$	None,
$263^{\circ}\text{F} > T \geq 220^{\circ}\text{F}$	No more than 3 RCPs running,
$220^{\circ}\text{F} > T \geq 85^{\circ}\text{F}$	No more than 2 RCPs running,
$85^{\circ}\text{F} > T$	No RCPs running
5. Minimum Temperature for Criticality is  $\geq 525^{\circ}\text{F}$  (Reference Technical Specification 3.4.2).
6. This curve referred to by Technical Specification 3.4.3

## REACTOR COOLANT SYSTEM PRESSURE-TEMPERATURE LIMITS FOR COOLDOWN FOR FIRST 32 EFY



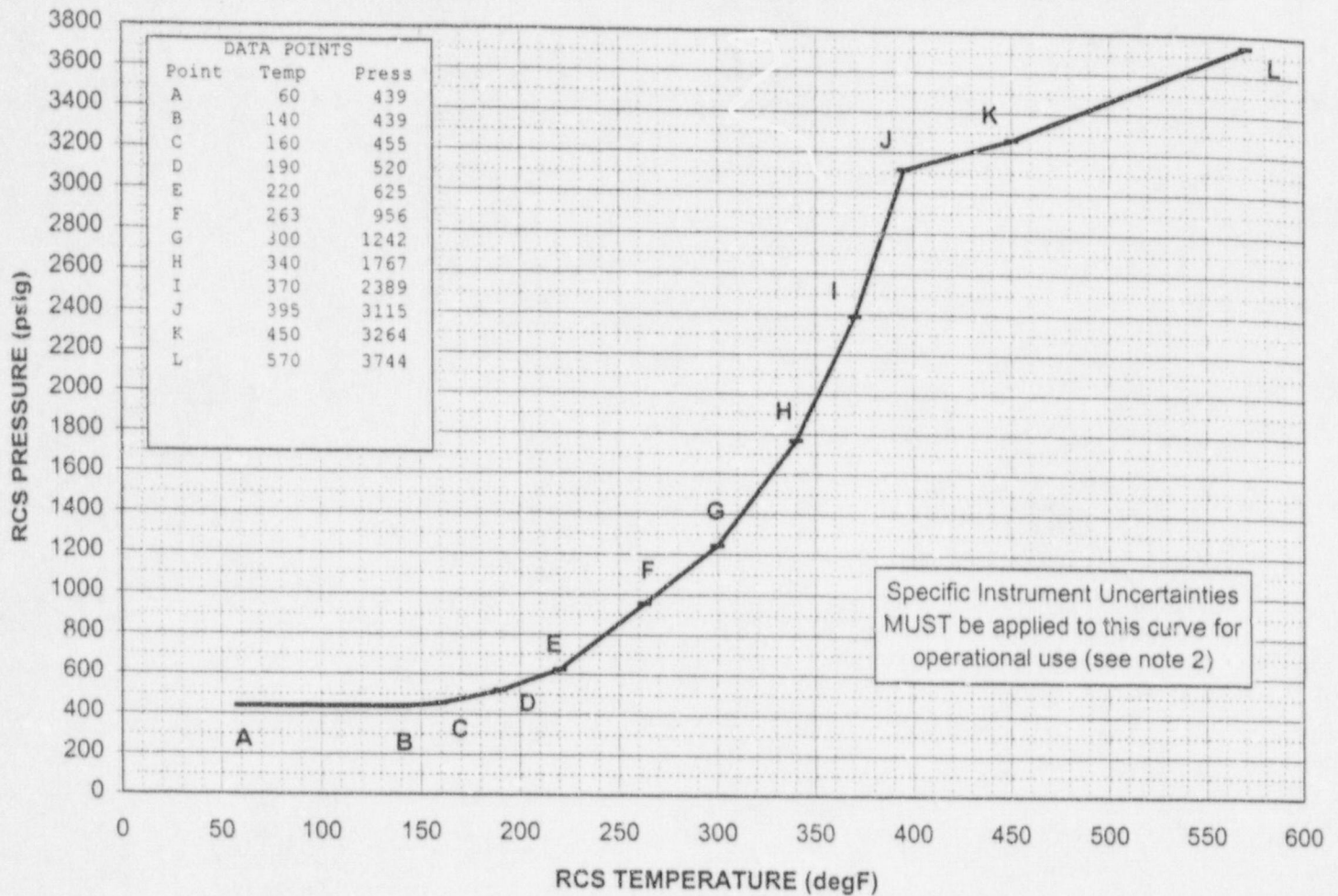
### NOTES:

1. The regions of acceptable operation are below and to the right of the limit curve.
2. Margins are included for the pressure differential between point of system pressure measurement and the pressure on the reactor vessel region controlling the limit curve. Additional margins for instrument uncertainty are not included and **must** be applied to operating procedures based on the specific instruments being used to monitor the RCS conditions.
3. Applicable for cooldown rates of:
 

$T > 280^{\circ}\text{F}$	$\leq 50^{\circ}\text{F}$ in any 1/2 hour period,
$280^{\circ}\text{F} \geq T > 150^{\circ}\text{F}$	$\leq 25^{\circ}\text{F}$ in any 1/2 hour period,
$150^{\circ}\text{F} \geq T$	$\leq 25^{\circ}\text{F}$ in any 1 hour period
4. RC Pump Constraints for Cooldown:
 

$T > 263^{\circ}\text{F}$	None,
$263^{\circ}\text{F} \geq T > 150^{\circ}\text{F}$	No more than 2 RCPs running,
$150^{\circ}\text{F} \geq T$	No RCPs running
5. This curve referred to by Technical Specification 3.4.3

# REACTOR COOLANT SYSTEM PRESSURE-TEMPERATURE LIMITS FOR INSERVICE LEAK HYDROSTATIC TESTS FOR FIRST 32 EFPY

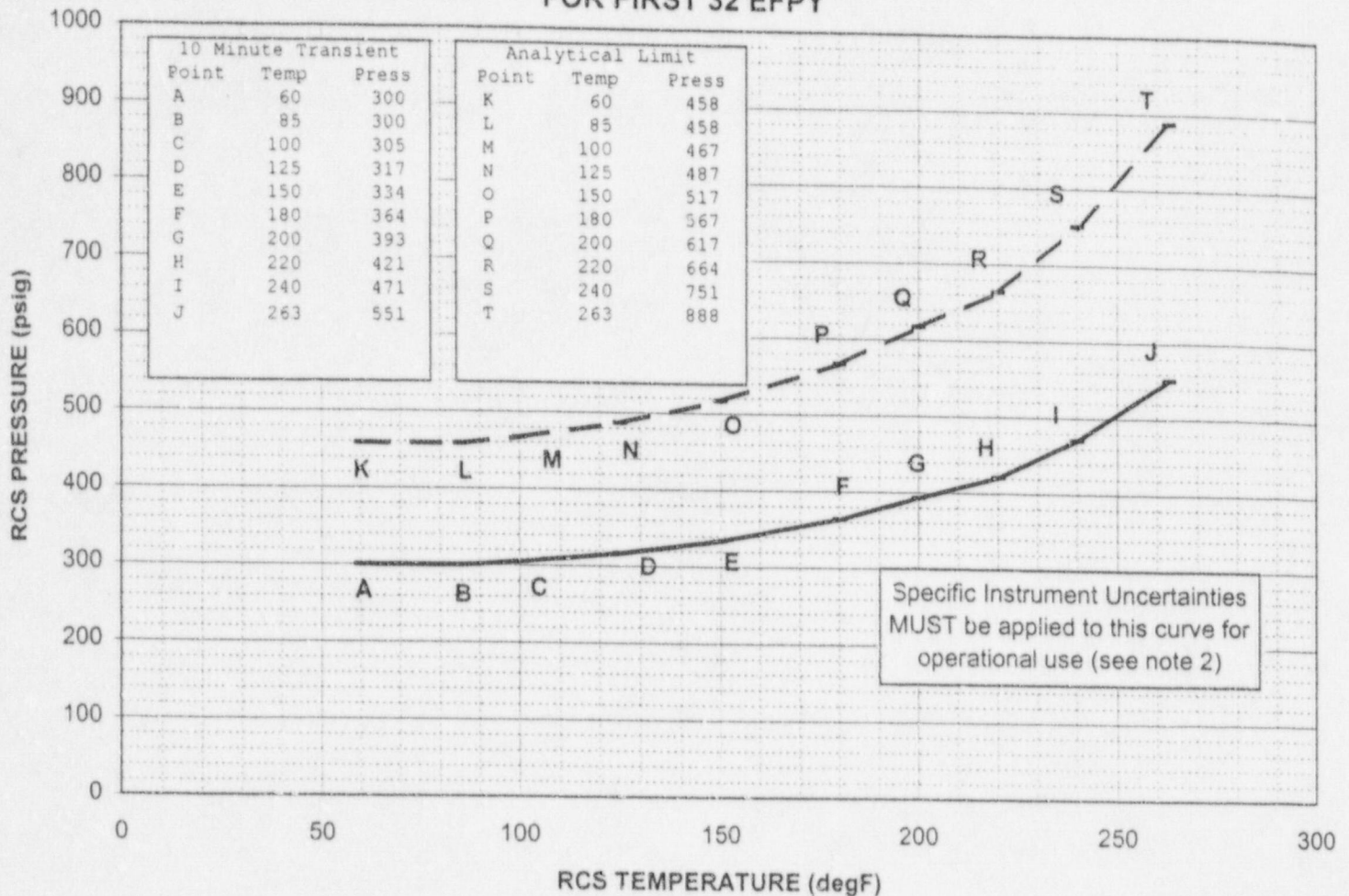


**NOTES:**

1. The regions of acceptable operation are below and to the right of the limit curve.
2. Margins are included for the pressure differential between point of system pressure measurement and the pressure in the reactor vessel region controlling the limit curve. Additional margins for instrument uncertainty are not included and must be applied to operating procedures based on the specific instruments being used to monitor the RCS conditions.
3. Normal heatup and cooldown restrictions should be used with this curve as applicable.
4. This curve referred to by Technical Specification 3.4.3



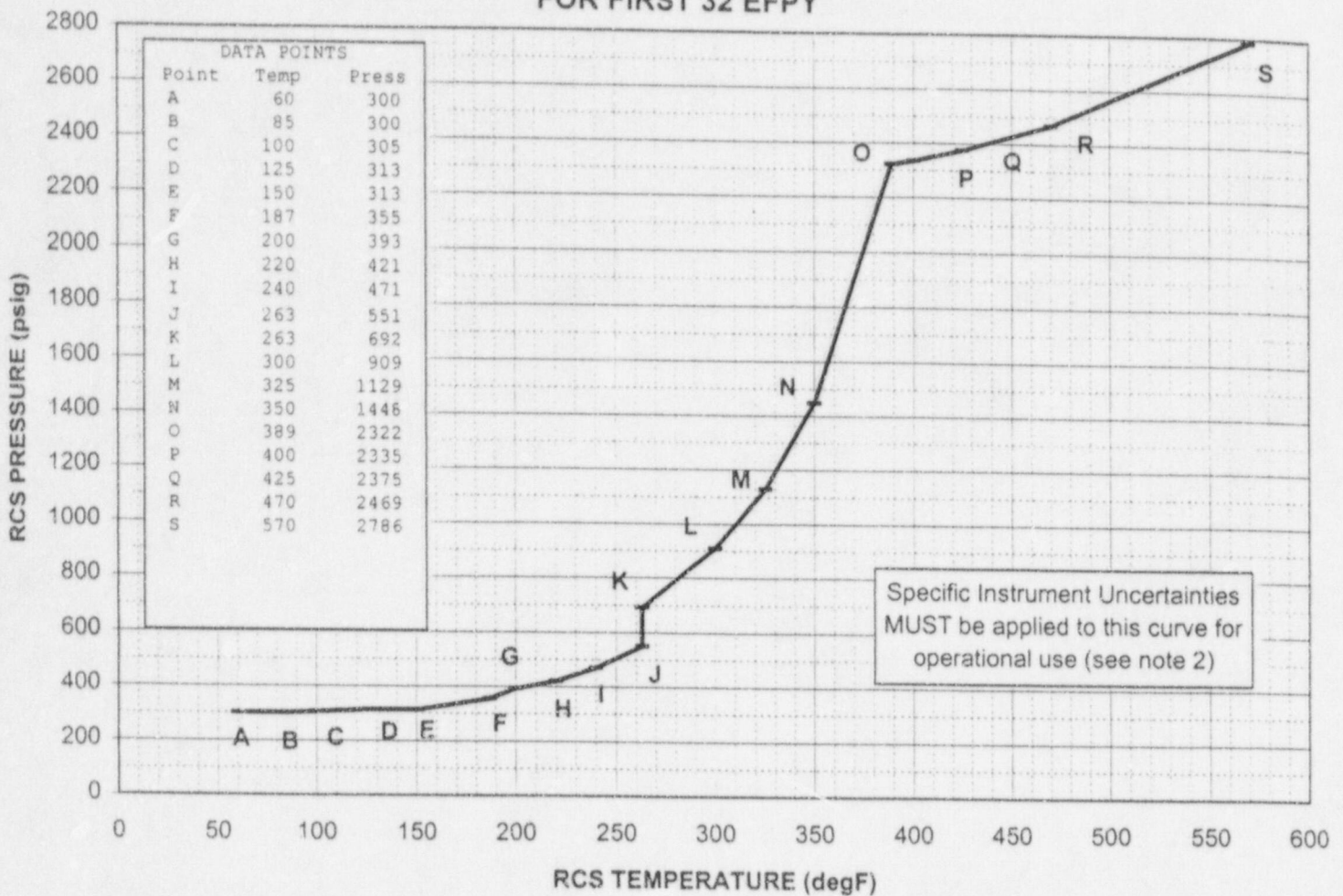
# REACTOR COOLANT SYSTEM LOW-TEMPERATURE OVERPRESSURE PROTECTION LIMITS FOR FIRST 32 EFPY



**NOTES:**

1. The regions of acceptable operation are below and to the right of the limit curve.
2. Margins are included for the pressure differential between point of system pressure measurement and the pressure on the reactor vessel region controlling the limit curve. Additional margins for instrument uncertainty are not included and must be applied to operating procedures and Technical Specification Limits based on the specific instruments being used to monitor the RCS conditions.
3. The LTOP curve applies to operation below the enable temperature of 263°F.
4. The LTOP 10 Minute Transient Curve is established based on at least 10 minutes of operation of the limiting transient without exceeding the LTOP Analytical Limits with an initial pressurizer level of 160 in.
5. The PORV setpoint is established to protect the LTOP Analytical Limit Curve.
6. This curve referred to by Technical Specification 3.4.3.

**REACTOR COOLANT SYSTEM  
COMPOSITE PRESSURE-TEMPERATURE LIMITS  
FOR FIRST 32 EFY**



**NOTES:**

1. The regions of acceptable operation are below and to the right of the limit curve.
2. Margins are included for the pressure differential between point of system pressure measurement and the pressure on the reactor vessel region controlling the limit curve. Additional margins for instrument uncertainty are not included and **must** be applied to operating procedures and Technical Specification Limits based on the specific instruments being used to monitor the RCS conditions.
3. Normal heatup, cooldown, and LTOP restrictions should be used with this curve as applicable.
4. The COMPOSITE curve applies to heatup, cooldown, ISLH, and LTOP.
5. This curve envelopes the heatup, cooldown, ISLH, and LTOP curves referred to by Technical Specification 3.4.3.