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# **TENNESSEE VALLEY AUTHORITY BROWNS FERRY NUCLEAR PLANT**

## **NPSH/COP FOR EPU**

**Rockville, Maryland  
February 26, 2009**

# Agenda

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- Results of Revised NPSH/COP Calculation
- ACRS COP Questions
- Follow-up Questions from Site Visit
- Review of TVA Realistic Fire Analysis
- NRC Request for Gothic Case Inputs

# Revised NPSH/COP SHORT TERM LOCA

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- RHR flow into broken loop reduced from 11,500 gpm to 11,000 gpm
  - NPSH<sub>A</sub> calculation uses 11,500 gpm
  - NPSH<sub>R</sub> calculation uses actual flow – 11,000 gpm
  - Lower flow reduces NPSH<sub>R</sub> from 28.4 feet to 25.6 feet @ 10 minutes
- Initial drywell humidity changed from 100% to 50%
  - Parametric analysis varying the drywell air relative humidity from 0% to 100% was performed
  - Concluded that the drywell humidity cannot exceed 50% without producing condensation in excess of TS allowable unidentified leakage of 5 gpm
  - Change increases amount of noncondensable gases in containment post-LOCA

# Revised NPSH/COP SHORT TERM LOCA

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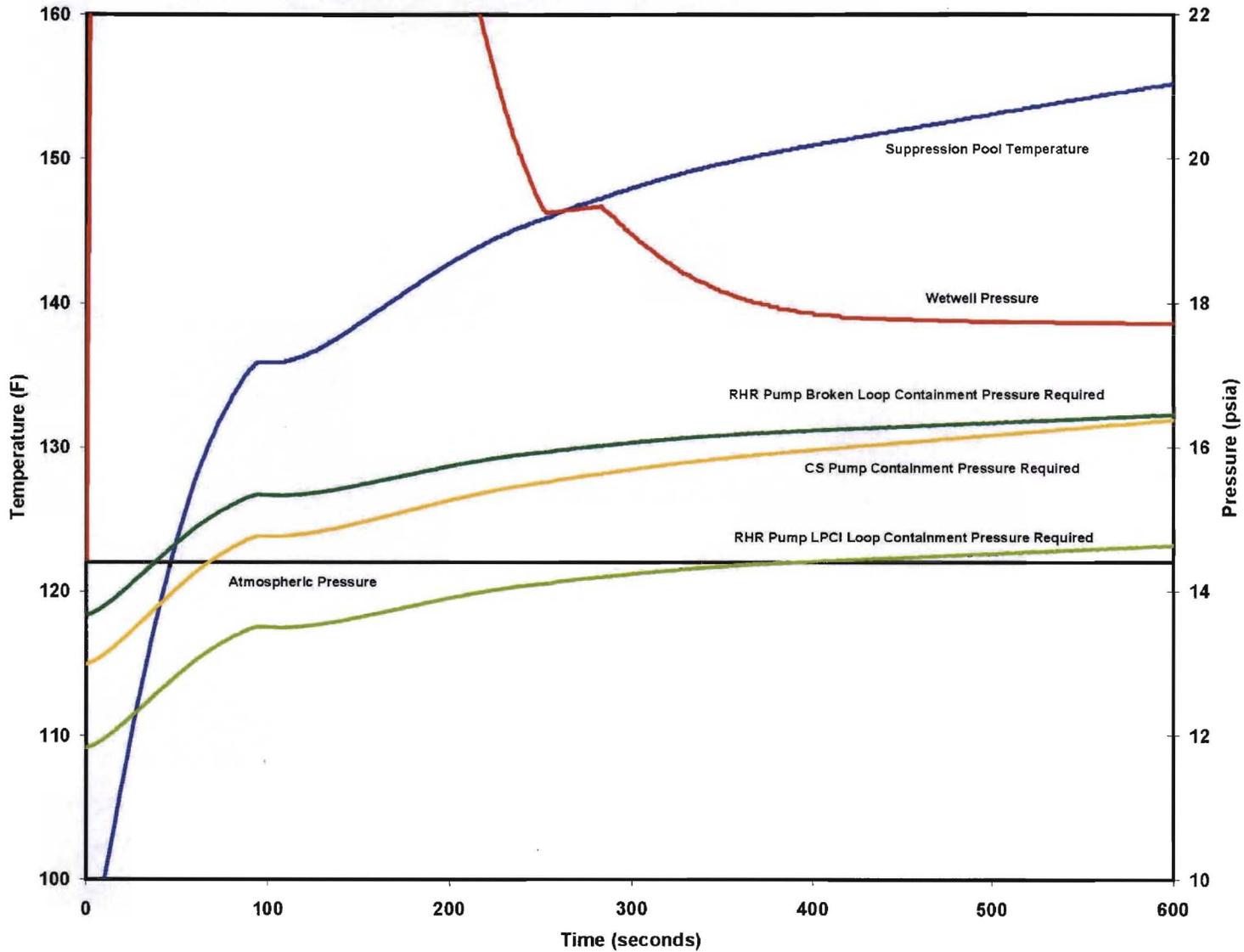
- NPSH<sub>R</sub> for RHR pump Changed from Single Value to Time Dependant Value Provided by Sulzer Report
  - Intact loop @ 10,000 gpm
    - 25.5 feet
    - 25.7 feet → 24.3 feet over 10 minute duration
  
  - Broken Loop @ 11,000 gpm
    - 28.4 feet
    - 27 feet → 25.6 feet over 10 minute duration

# Revised NPSH/COP SHORT TERM LOCA

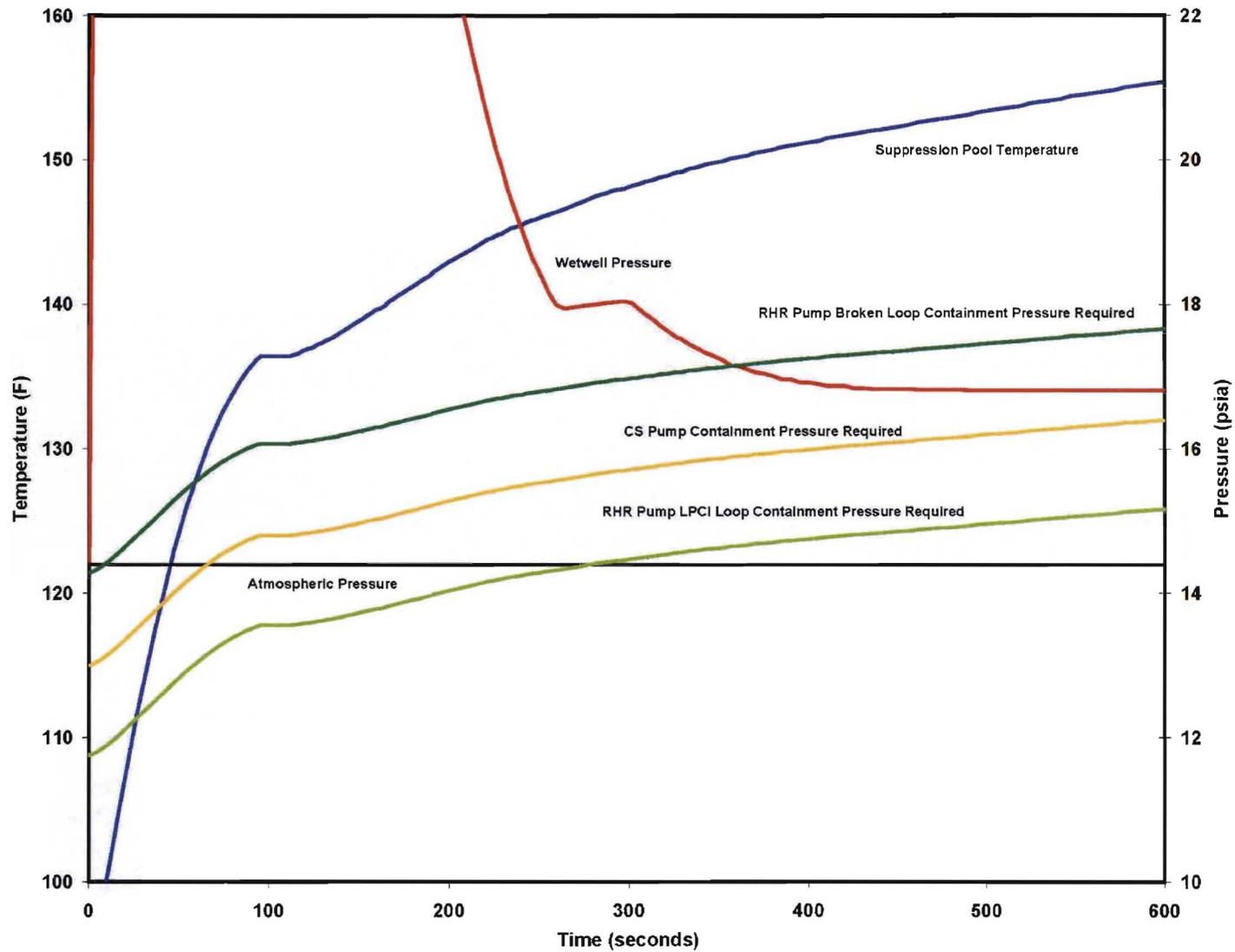


Case	Pump	Maximum Required COP (psi)	Minimum Containment Margin (psi)	Duration COP Needed (minutes)
LOCA ST	CS	2	.4	9
	RHR- IL	.8	1.6	5
	RHR BL	3.3	-0.9	10
<b>Revised Short-Term LOCA Calculation Results</b>				
LOCA ST	CS	2	1.3	8.9
	RHR- IL	.2	2.6	3.2
	RHR BL	2.1	0.7	9.3

# COP Available and COP Required Short-Term LOCA (revised)



# COP Available and COP Required Short-Term LOCA (previous)



J.D.Wolcott

## Revised NPSH/COP Appendix R

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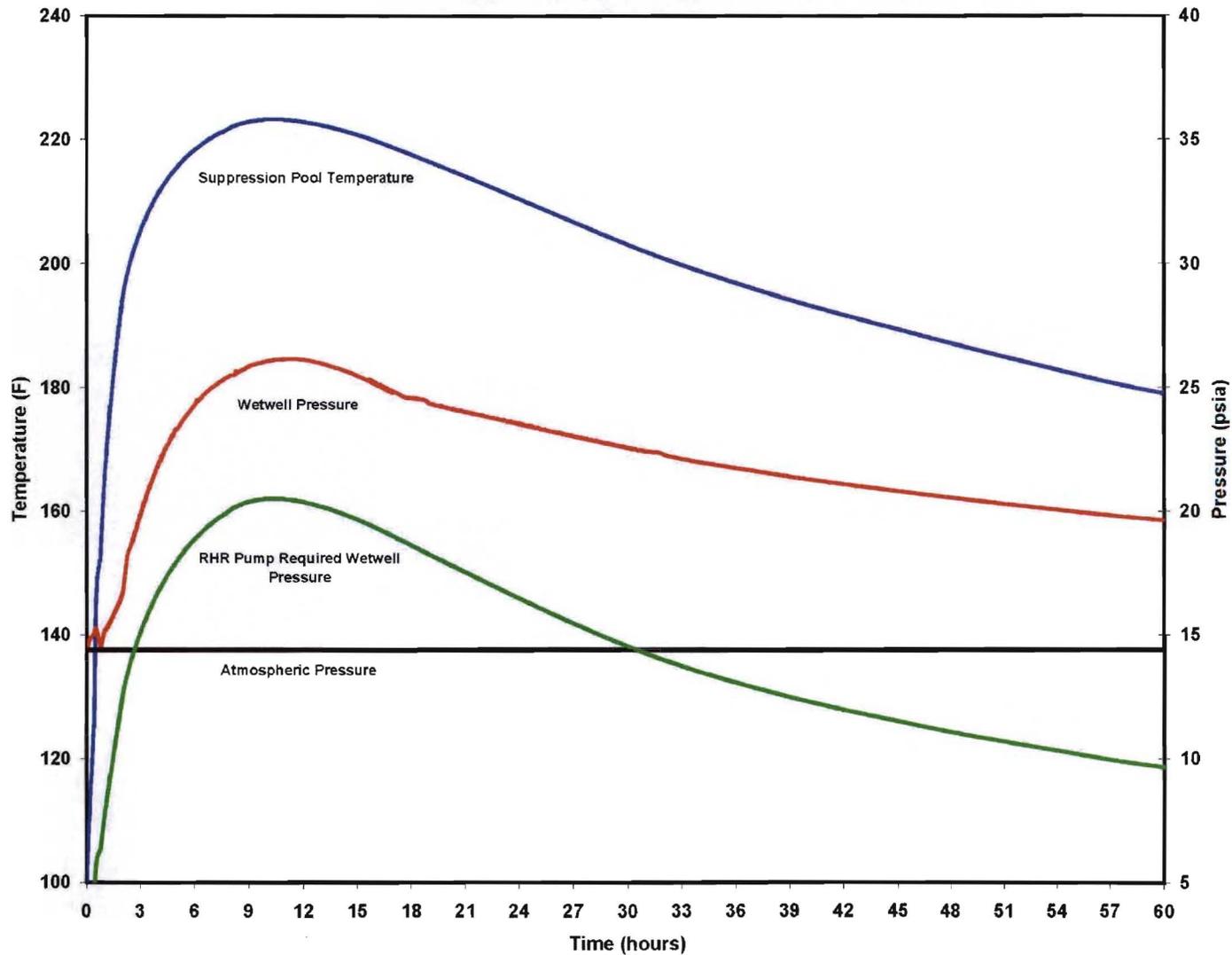
- NPSH<sub>R</sub> Changed from Time-Dependent to Fixed Value Based on 3% Head Loss
  - Hydraulic Institute standard for NPSH<sub>R</sub>
  - 8000 hour time-dependent NPSH<sub>r</sub> is conservative for limited duration Appendix R event (25.2 feet at peak SP temperature)
  - Revised calculation uses a fixed NPSH<sub>R</sub> (17 feet), which is equivalent to 3% loss in TDH
  - 3% curves based on certified tests from BFN and other plants for same model pumps
  - Use is recommended in BWROG COP Topical Report NEDC-33347P



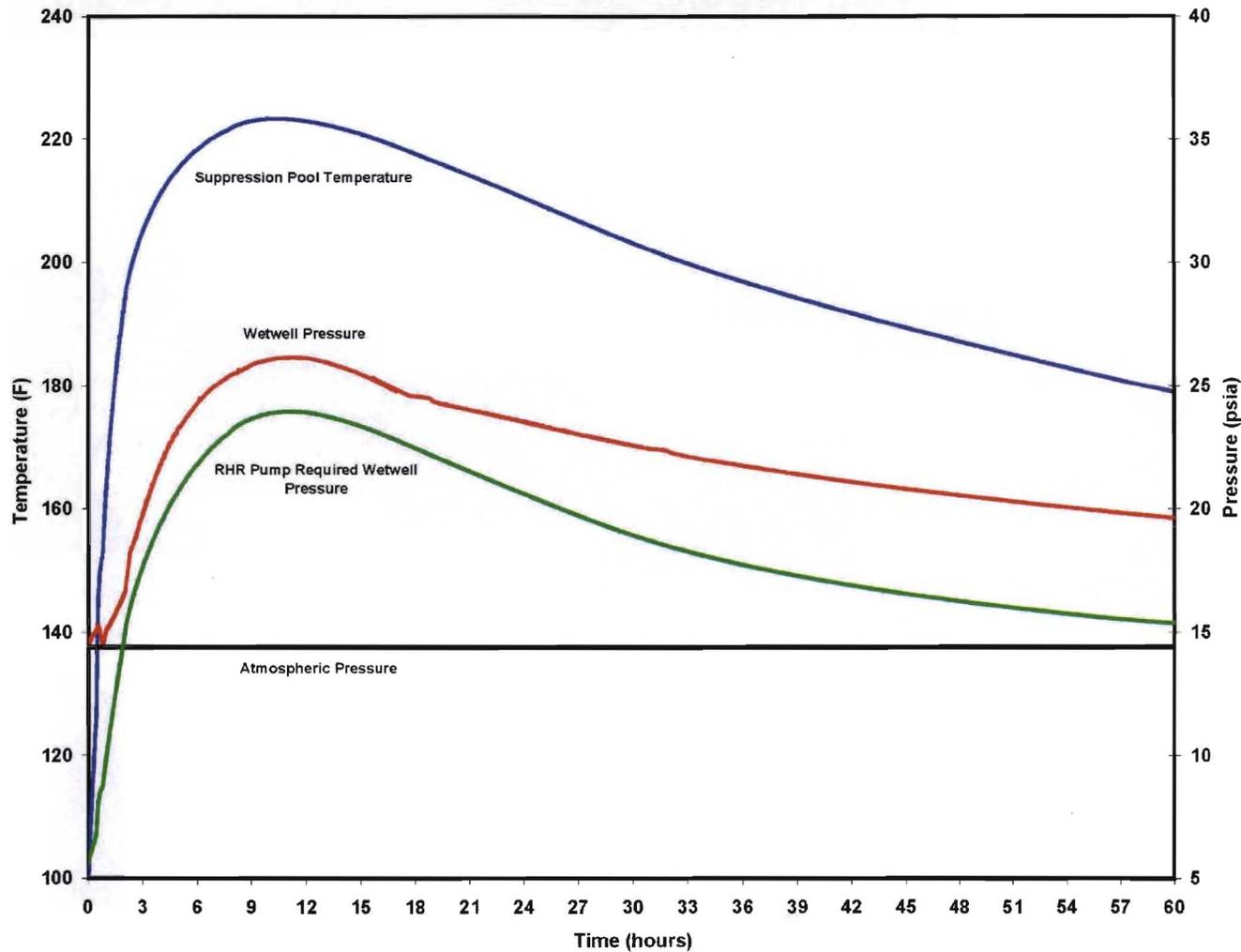
# Revised NPSH/COP Appendix R

<b>Case</b>	<b>Pump</b>	<b>Max Required Containment Pressure (psia)</b>	<b>Minimum Containment Margin (psi)</b>	<b>Duration COP Needed (hours)</b>
<b>Appendix R</b>	<b>RHR</b>	24	1.6	69
<b>Revised Appendix R Calculation Results</b>				
<b>Appendix R</b>	<b>RHR</b>	20.5	4.1	27.8

# COP Available and COP Required Appendix R (revised)



# COP Available and COP Required Appendix R (previous)



# ACRS COP QUESTIONS/SITE VISIT FOLLOW-UP QUESTIONS

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- Review of ACRS COP Questions
  - Additional information needed by NRC Staff
  - Discussion with Sulzer Representative
  
- Follow-up Questions from BFN Site Visit
  - Manual actions for second RHR pump
  - Containment venting
  - Removal from service of drywell blowers
  - Transition from EOIs to SSIs

# Review of TVA Realistic Fire Analysis

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- ACRS Interest
- Status of Staff Review



# NRC Request for Gothic Case Inputs

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- Containment data (OPL-4a) is available
- Decay Heat Assumptions are available
- Identify any additional NRC needs
- Means of submittal to NRC