TENNESSEE VALLEY AUTHORITY
BROWNS FERRY NUCLEAR PLANT

EXTENDED POWER UPRATE
CREDIT FOR CONTAINMENT OVERPRESSURE
ACRS CONCERNS

Rockville, Maryland
May 22, 2008

MEETING PURPOSE

- Review ACRS Concerns - COP
- TVA Approach to ACRS Concerns
- Present BFN Realistic Fire Analysis
- Dry Run ACRS Presentation

ACRS CONCERNS

- Staff ACRS Presentation - COP Satisfactory - EPU
- February 16, 2007 ACRS Letter COP Concerns
  - Too Much – Too Long for Appendix R
  - More Defensible Sensitivity Calcs – Long Term LOCA
  - Feasibility of Protecting Additional RHR Pump
  - Risk-Informed Arguments for Appendix R Should Consider External Initiators
- COP Credit for LOCA, ATWS and SBO Acceptable

APPROACH to ACRS CONCERNS

- Licensing Basis Analysis Complies with Rule
  - No Change to Licensing Basis Appendix R
  - No Change to EPU Licensing Basis Calculations
- Show Risk of COP is Low
  - Use Realistic Deterministic Analysis vs. PRA
  - Similar to Information Provided for LOCA, ATWS and SBO

REALISTIC FIRE ANALYSIS

- Fire Hazards Analysis
  - Consistent with Guidance Documents
    - NRC Manual Chapter 0609, Appendix F
    - NUREG/CR – 6850
    - NEI-00-01
    - IPEEE FIVE
  - 23 of 39 Fire Areas Screen Out
    - 16 Areas + Control Room Evaluated Further
  - Available Equipment and Operator Actions
    - Current EOI Procedures
    - COP Not Needed in 15 of 17 Fire Areas

REALISTIC FIRE ANALYSIS

- Containment Response Analysis - Limiting Case
  - Applies to 2/39 Fire Areas
    - Electrical Board Rooms
  - Reactor Emergency Depressurization
  - 1 RHR Pump Used for Pool Cooling
  - BOP Pumps Used for Core Cooling
  - RHR Alternate Shutdown Cooling Not Used

  - Revised Vendor NPSH Requirement
    - Constant 17 Ft for Appendix R duration 70 Hours

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POWER UPRATE
ACRS

CONTAINMENT OVERPRESSURE

Rockville, Maryland

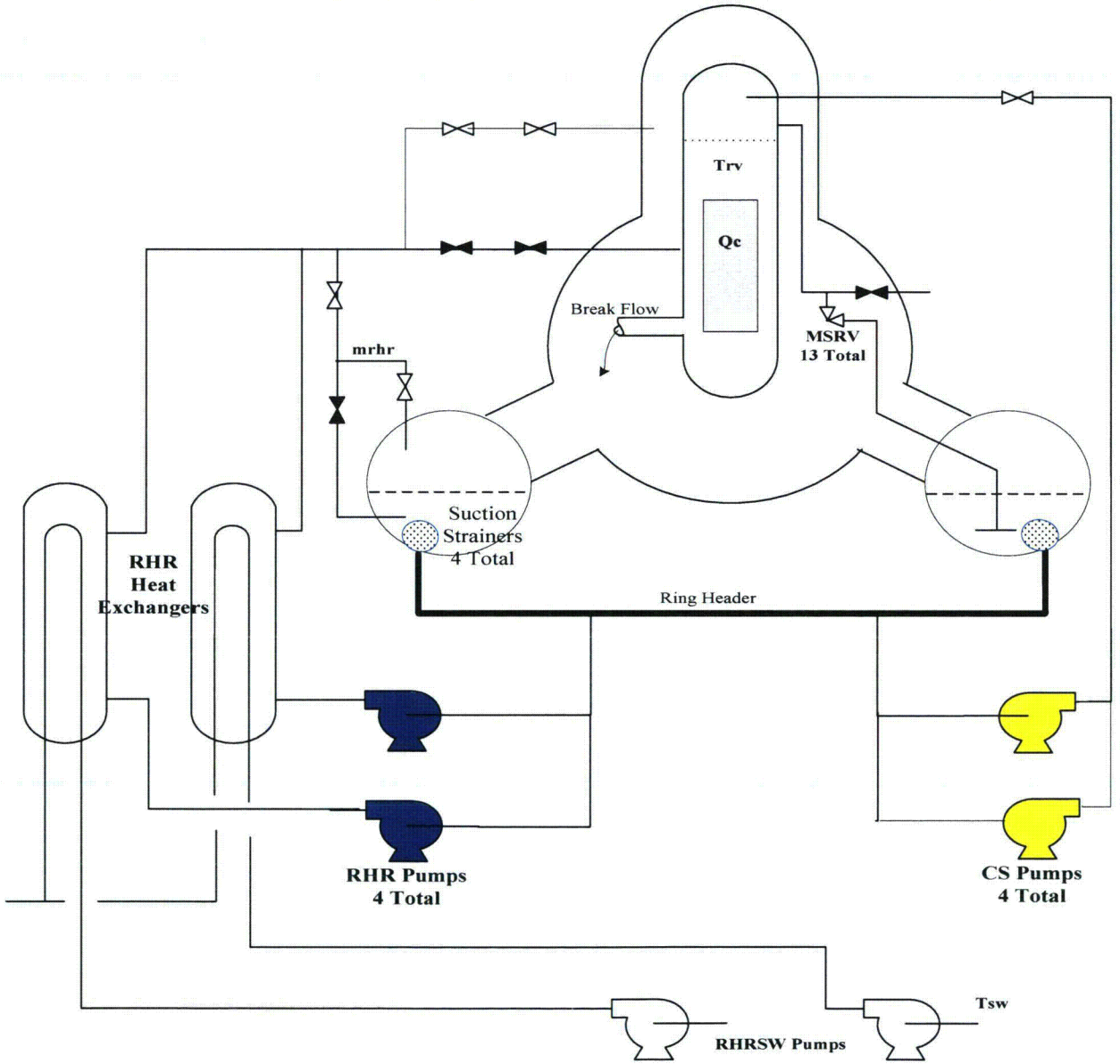
Xxxxxx xx, xxxx

BFN Licensing History

- Credit for containment overpressure for 105% OLTP
  - LOCA - NRC Bulletin 96-03
  - Currently for RHR pumps

    short-term (< 10 min.)
  - Currently for core spray pumps long-term (> 10 min.)
  - Credit for COP in Appendix R

BFN ECCS Schematic



NPSH Licensing Basis Analysis
EPU

- Four events need COP
  - LOCA
  - ATWS
  - SBO
  - Appendix R Fire

Effect of Power Uprate

- Increase in suppression pool temperature
- LOCA peak suppression pool temperature
  - 100% OLTP
    - 177°F
  - 105% OLTP
    - 177 to 180°F (dependent on UHS TS limits)
  - 120% OLTP
    - 187°F

NPSH Licensing Basis Analysis

Elements of NPSH analysis:

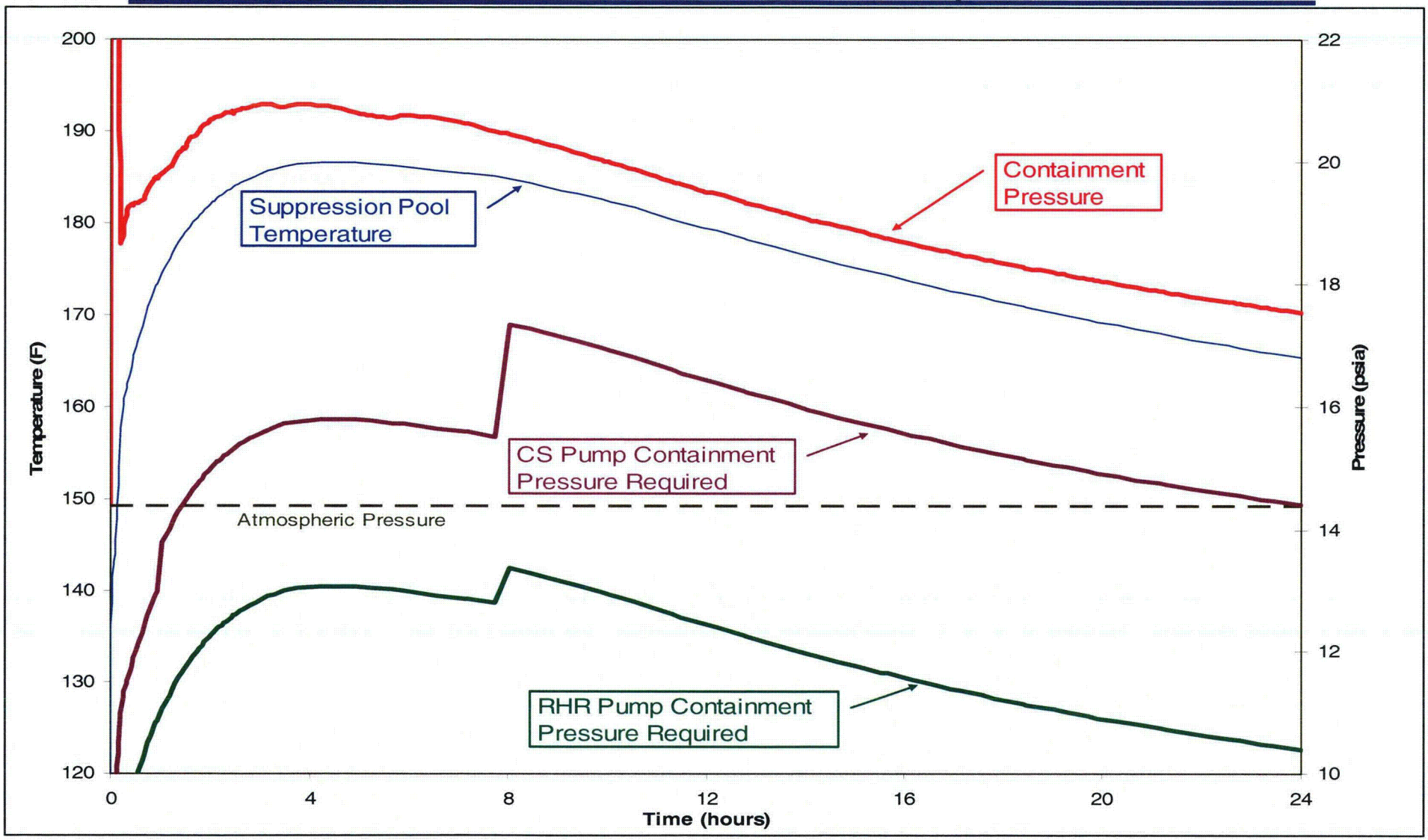
- Suppression pool temperature profile
- Elevation head
- ECCS pump flows
- Suction path pressure drop
  - Suction piping
  - Suction strainer blockage and losses
- Required NPSH
- Wetwell pressure

NPSH Licensing Basis Analysis

- **LOCA short term (< 10 min.)**
  - 4 core spray pumps at maximum system flow
  - 2 RHR pumps at design LPCI flow to intact recirculation loop
  - 2 RHR pumps at maximum system flow to broken loop
  - Debris loading on strainers
  - RHR and core spray pumps need COP

- **LOCA long term (> 10 min.)**
  - 2 core spray pumps at design flow
  - 2 RHR pumps at containment cooling flow
  - Debris loading on strainers
  - Core spray pumps need COP

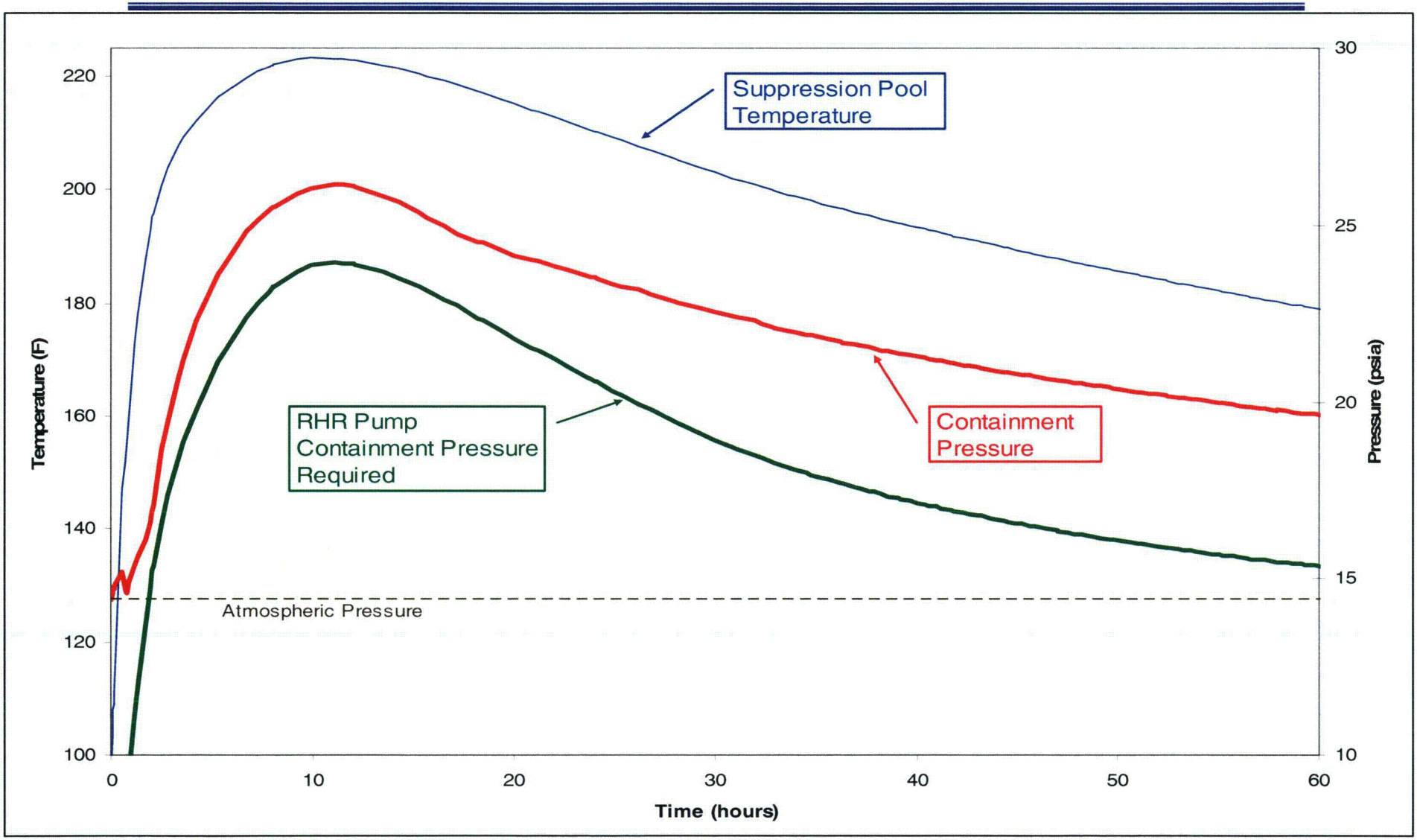
COP Available and COP Required
Long-Term LOCA Analysis



NPSH Licensing Basis Analysis

- **Appendix R Fire**
  - 1 RHR pump injecting to vessel
  - No strainer debris
  - RHR pump needs COP

COP Available and COP Required
Appendix R Fire Analysis



Realistic NPSH Analysis

COP Meets Five Principles of Regulatory Guide 1.174

- Meets current regulations
- Consistent with defense-in-depth philosophy
- Maintains sufficient safety margins
- Results in very small risk increase
- Impact is monitored

Realistic NPSH Analysis

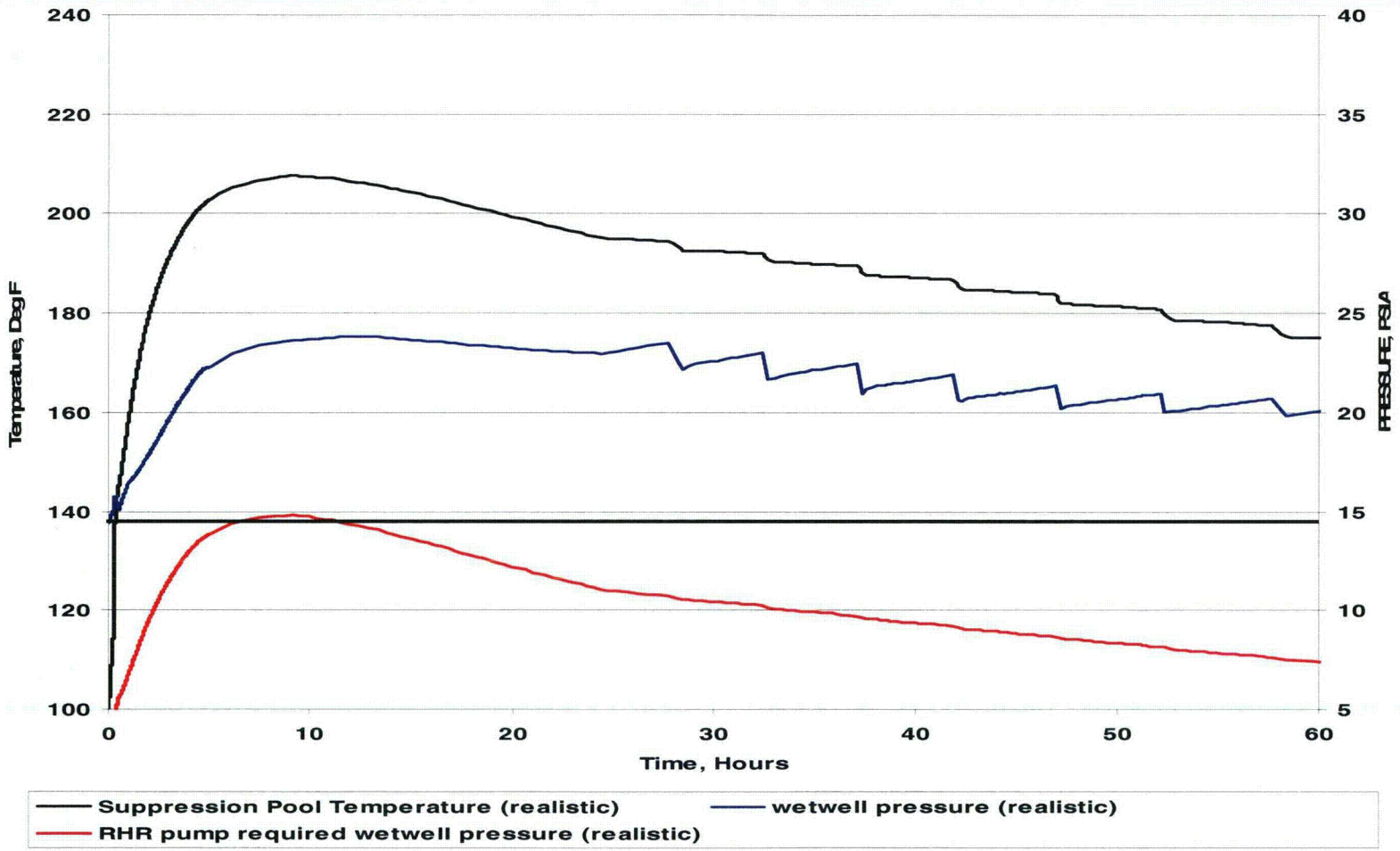
- PSA model for LOCA, ATWS and SBO
  - Probability distribution for suppression pool temperature
    - River temperature
    - Initial suppression pool temperature
    - Suppression pool water level
    - Initial power level
  - Containment failure and containment leakage probability
- Dependence of ECCS on COP vs. No Dependence
  - Very Small Risk Increase for LOCA, ATWS and SBO
    - ΔCDF / ΔLERF 2.4E-8/yr

    Well within acceptance guidelines for ΔCDF and ΔLERF

REALISTIC FIRE ANALYSIS

- **Fire Hazards Analysis**
  - 23/39 Fire Areas Screened Out
    - o No Fire Damage
    - o 16 Areas + Control Room Evaluated Further
  - Available Equipment and Operator Actions Identified
    - o Current EOI Procedures
    - o 15/17 Areas Do Not Need COP
  - 2 Areas Require Some COP – Limiting Case
    - o 1 RHR PUMP/Heat Exchanger for Containment Cooling
    - o BOP Pumps for Core Cooling
    - o Significant COP Margin Available

NPSH Licensing Basis Analysis



Realistic NPSH Analysis

- COP only required for LOCA with specific single failures
- COP not required for ATWS with best estimate code
- Small amount of COP required for Fire Event in warm weather
- COP not required for station blackout for 3 hour vs. 4 hour coping duration

Summary

- Licensing basis NPSH analyses are conservative
- Overpressure credit in-line with industry
- Realistic analyses show reduced or no dependency on COP
- Very low risk following ACRS guidance