

**From:** [Greene, Ken:\(GenCo-Nuc\)](#)  
**To:** [Guzman, Richard](#)  
**Subject:** [External\_Sender] FW: T/H Analysis Presentation  
**Date:** Friday, November 18, 2016 10:17:37 AM  
**Attachments:** [RI GSI-191 TH Analysis Results.pdf](#)

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Rich,

Good morning. Attached is a presentation covering information Steve Smith, NRC, had requested to see.

Have a good Thanksgiving.

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**From:** Sellers, Craig:(Contractor - GenCo-Nuc)  
**Sent:** Friday, November 18, 2016 9:29 AM  
**To:** Greene, Ken:(GenCo-Nuc)  
**Cc:** Drake, Andre S:(GenCo-Nuc); Salehi, Matthew:(GenCo-Nuc); Haydin, John S:(GenCo-Nuc); Lauver, Doug:(GenCo-Nuc)  
**Subject:** T/H Analysis Presentation

Ken,

Please submit the attached presentation to the Calvert Cliffs NRC Project Manager. Inform him that Steve Smith (NRC Staff) wanted to see this data.

Thanks,

Craig

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Craig D. Sellers  
Project Manager  
GSI-191 Resolution/GL 2004-02 Closure  
Calvert Cliffs Nuclear Power Plant  
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# Calvert Cliffs GSI-191 Program

Thermal Hydraulic Analysis of  
Containment Response

Calculation CA10199

November 18, 2016



Exelon Generation®

# Thermal Hydraulic Analysis of Containment

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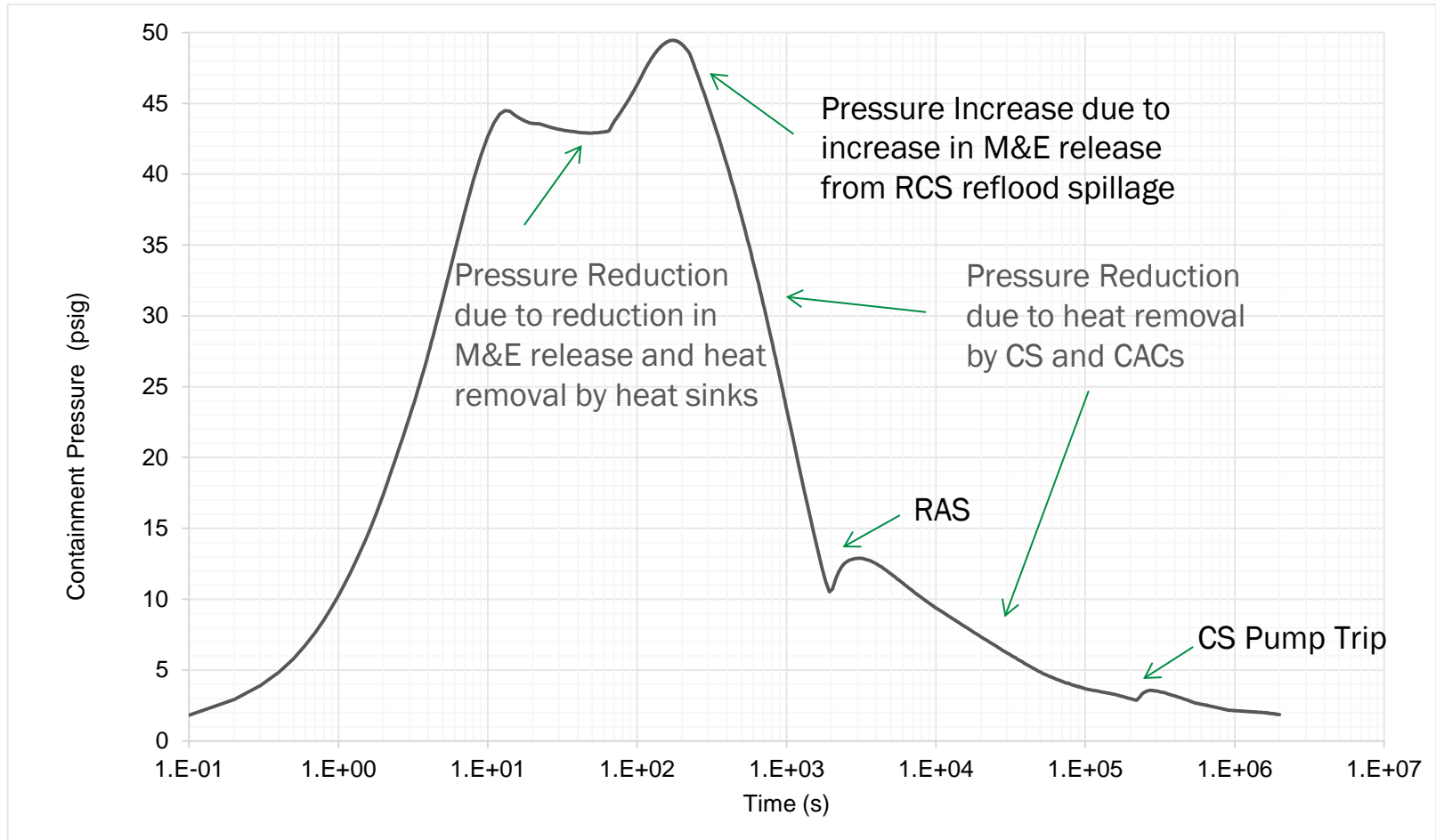
- Investigate Sump Temperature and Containment Pressure
  - Large Break LOCA Events
  - LOCA Scenarios Presented
    - DEGB Cold Leg,
      - 2 Trains of ESF (Maximum SI) – CCX
      - Single Train of ESF (Minimum SI) - CCI
    - DEGB Hot Leg,
      - 2 Trains of ESF (Maximum SI) – HHX
      - Single Train of ESF (Minimum SI) – HHI
      - 2 ft<sup>2</sup> Break, Single Train of ESF – H2I

# Thermal Hydraulic Analysis of Containment (Cont.)

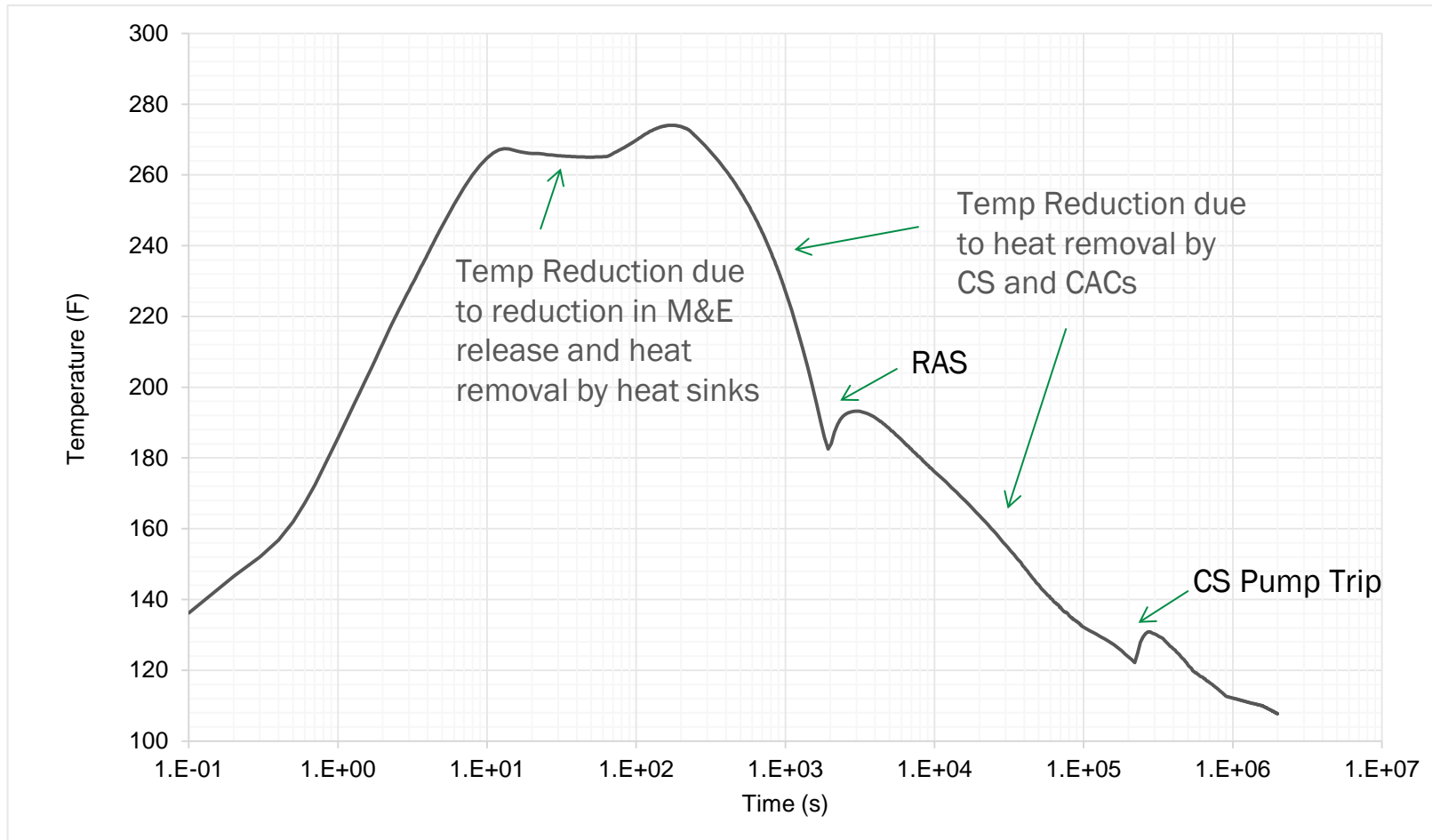
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- Containment Response Scenarios Evaluated
  - Scenario A: 2 Containment Air Coolers (CACs) Operating
    - Determine if containment pressure is reduced to 2.8 psig prior to sump fluid temperature reducing to 140 °F.
    - If both Containment Spray (CS) pumps operating, secure one pump at 2.8 psig.
  - Scenario B: 4 CACs Operating
    - Determine how quickly the containment pressure could drop to sub-atmospheric conditions in the strainer.
    - If both Containment Spray (CS) pumps operating, secure one pump at 2.8 psig.
  - Scenario C: 4 CACs Operating
    - Determine, for the case where no single failures have occurred (4 CACs and 2 Containment Spray Pumps operating), if the containment response profile remains below the EQ profile.
    - When the first CS Pump is secured (at 2.8 psig), the other CS Pump is lost for 30 minutes and two (2) CACs are lost indefinitely.
  - Scenario D: Repeat Scenario C with the following change:
    - When the first CS Pump is secured (at 2.8 psig), the other CS Pump is lost for 30 minutes.
  - Scenario E: Repeat Scenario C with the following change:
    - When the first CS Pump is secured (at 2.8 psig) and one HPSI pump is also secured, the other CS Pump and the other HPSI pump are lost for 30 minutes. Two CACs are also assumed to be lost indefinitely.

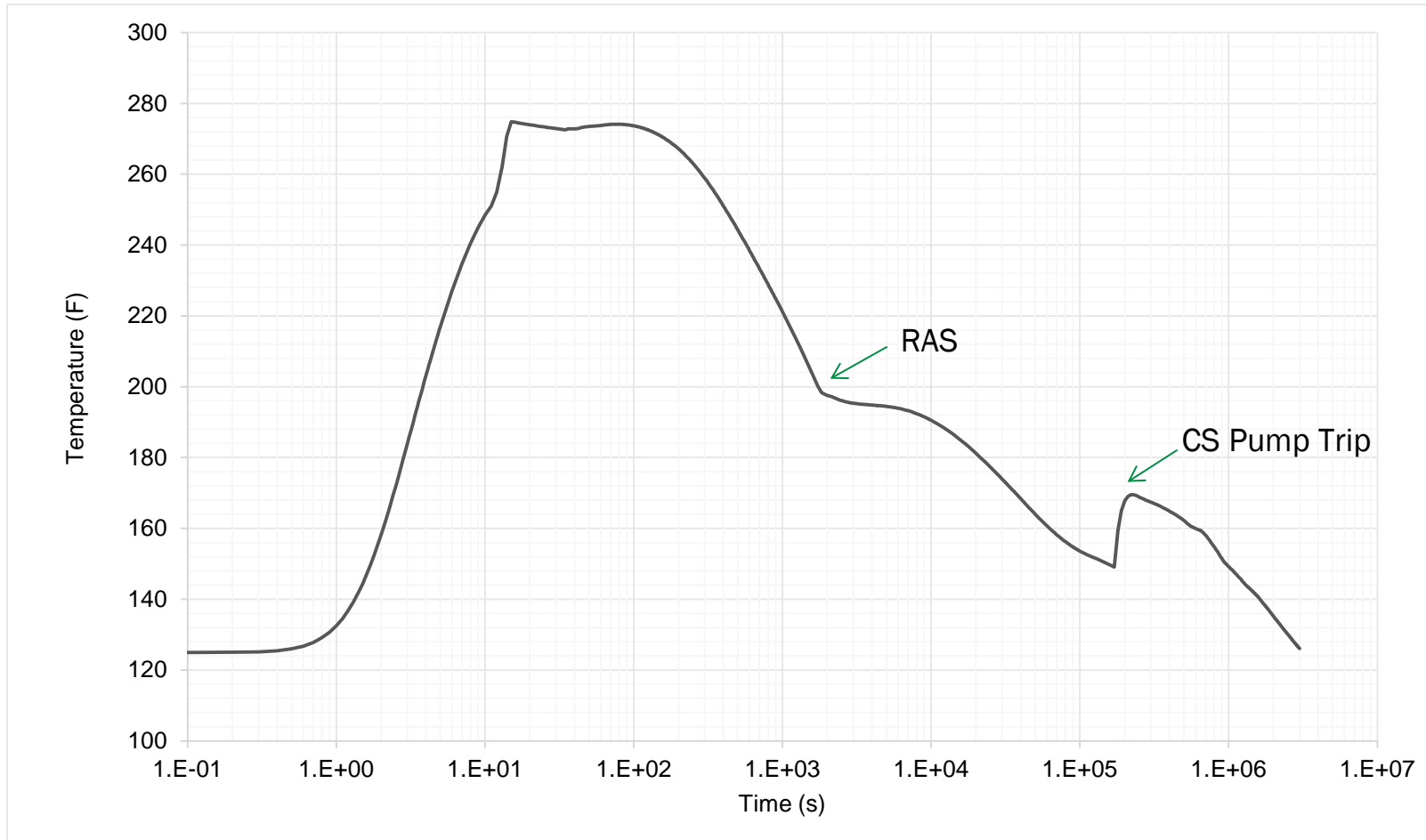
# Typical Containment Pressure Profile



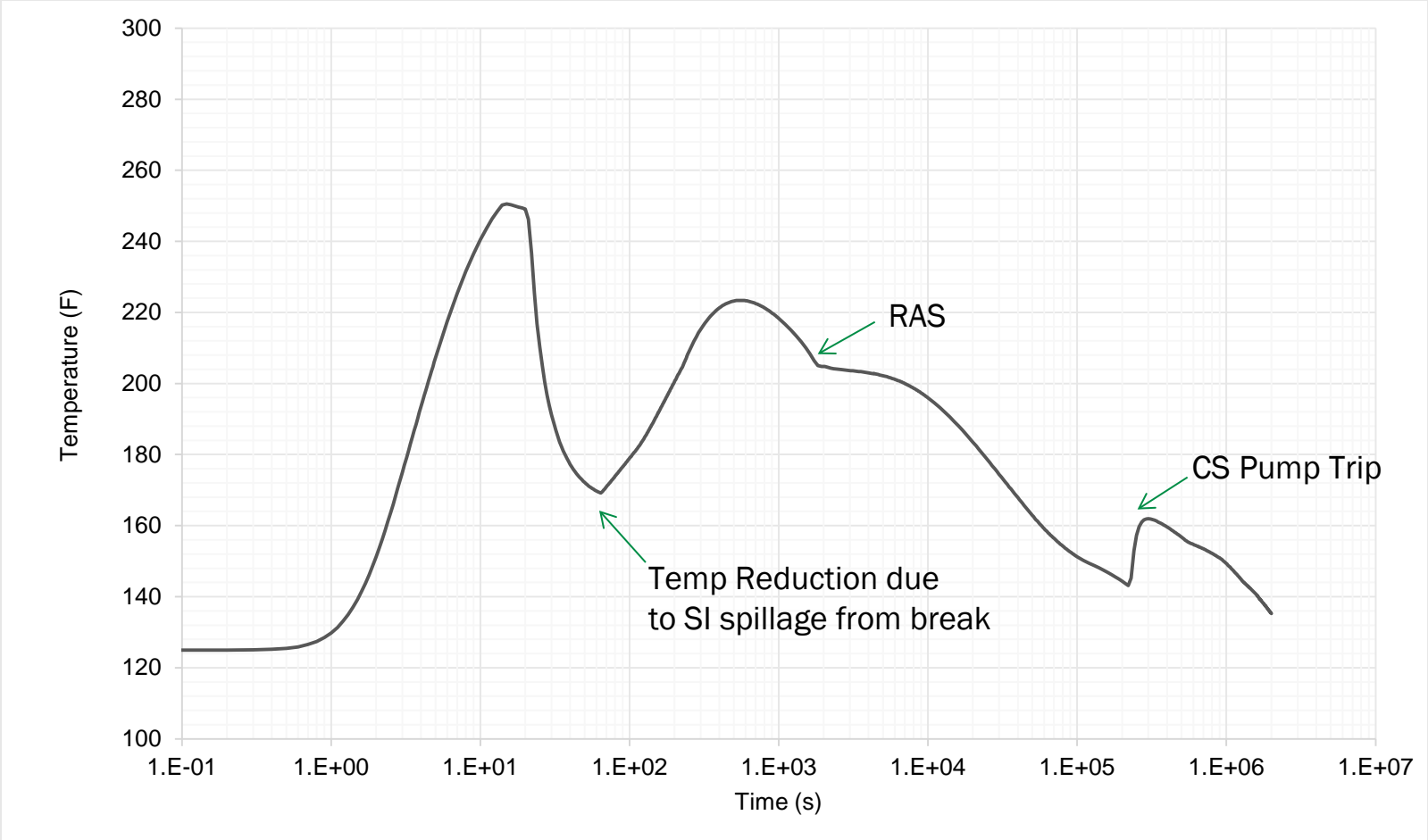
# Typical Containment Air Temperature Profile



# Typical Sump Temperature Profile – Hot Leg Break

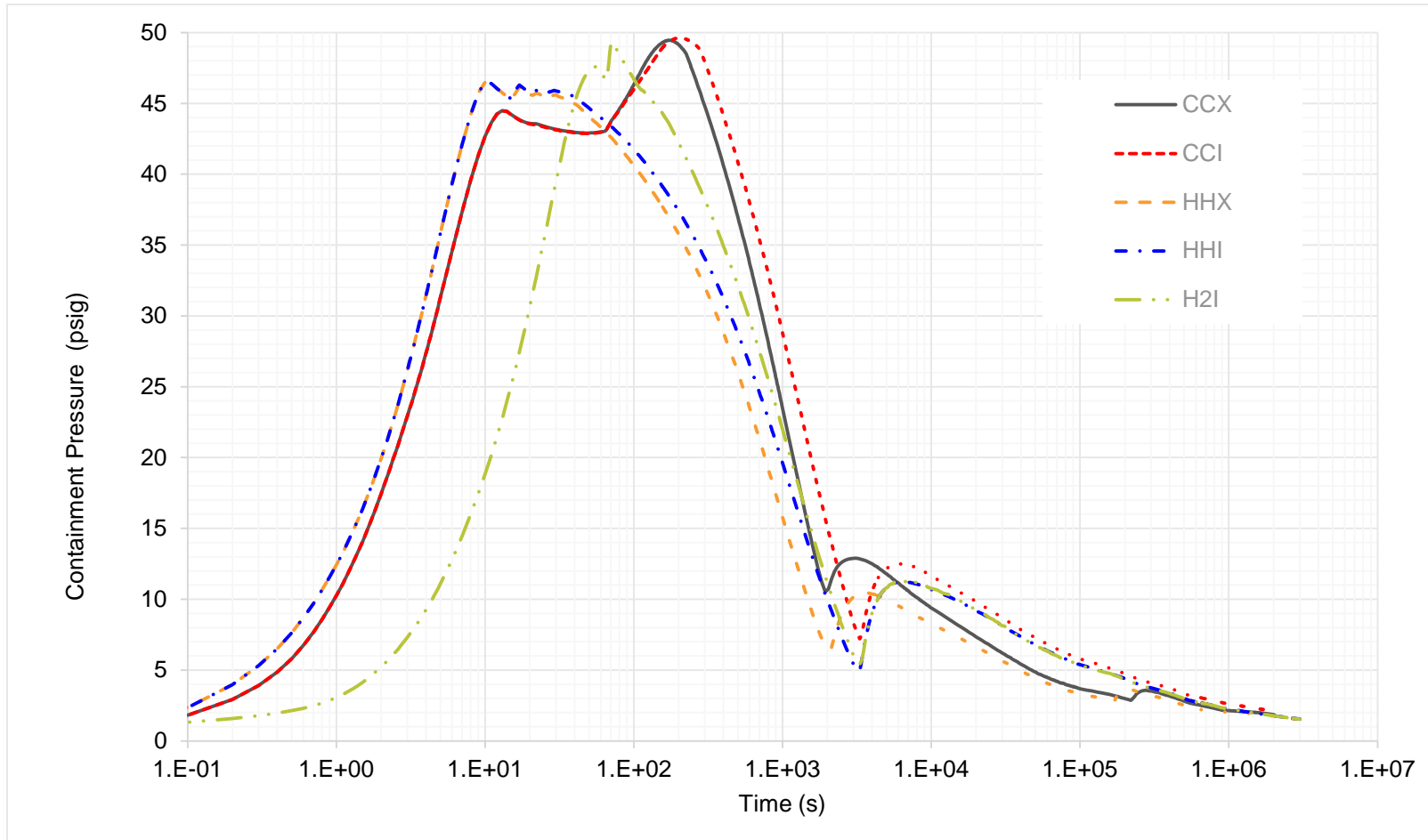


# Typical Sump Temperature Profile – Cold Leg Break

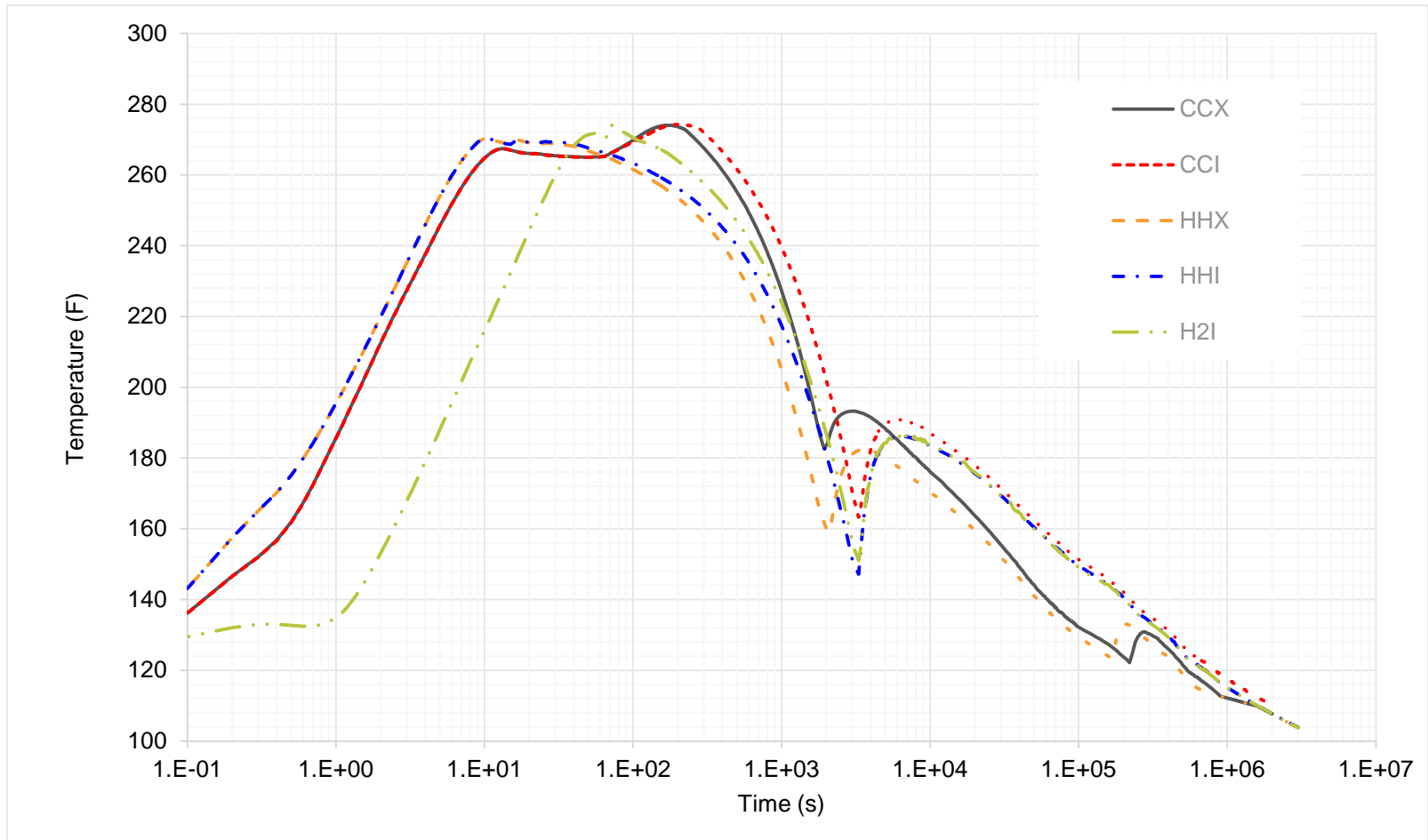




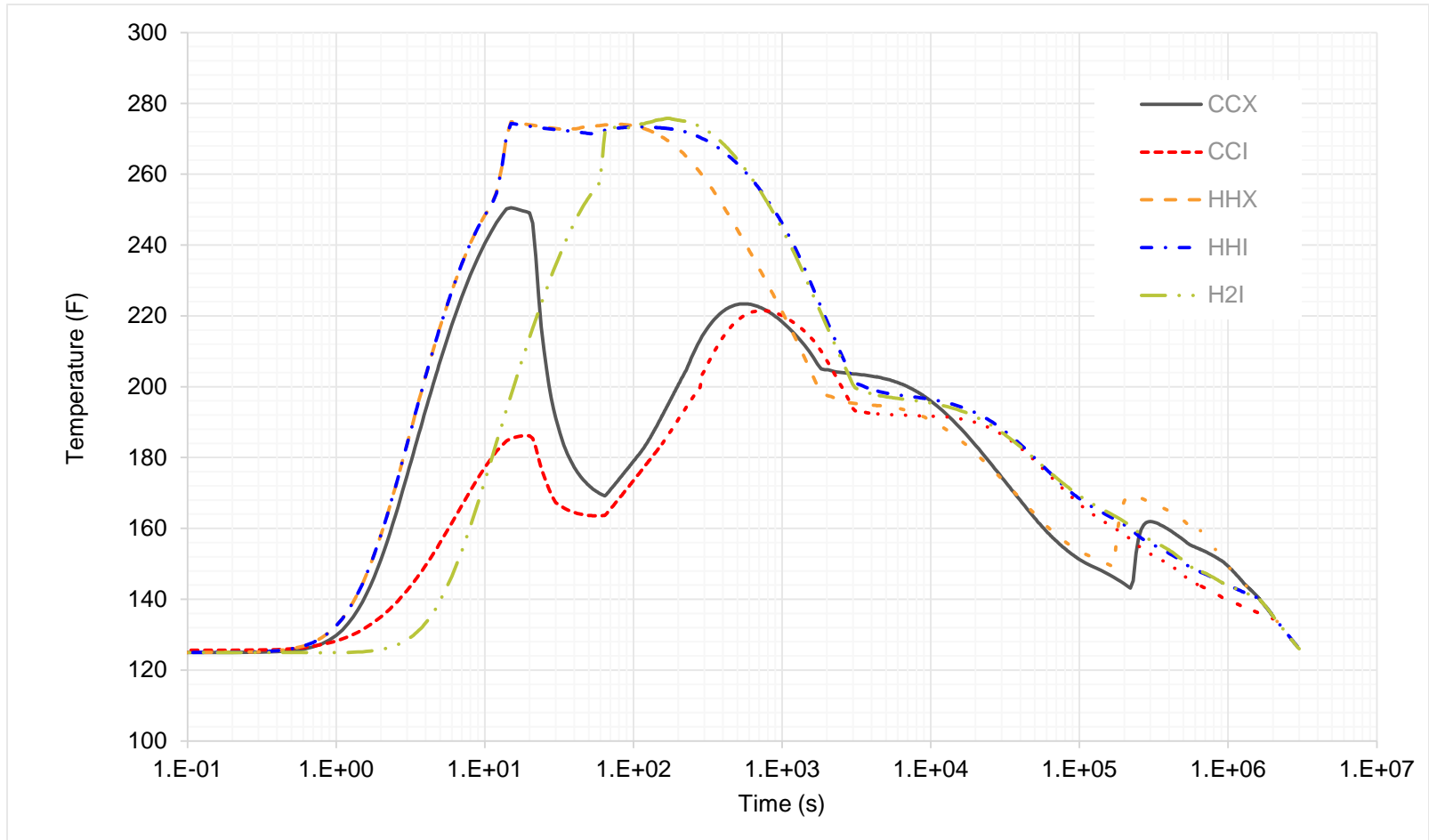
# Scenario A – Containment Pressure



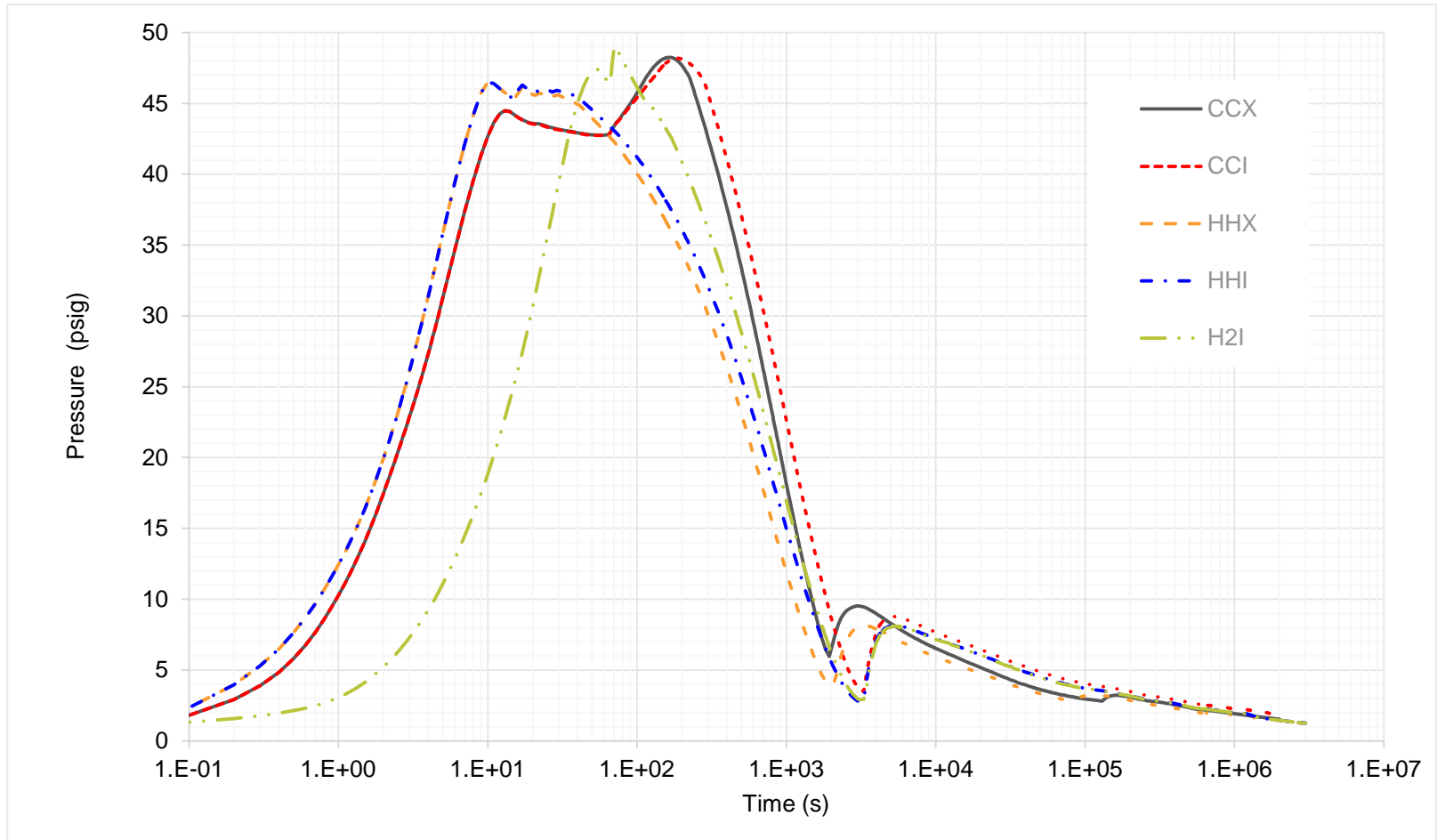
# Scenario A – Containment Air Temperature



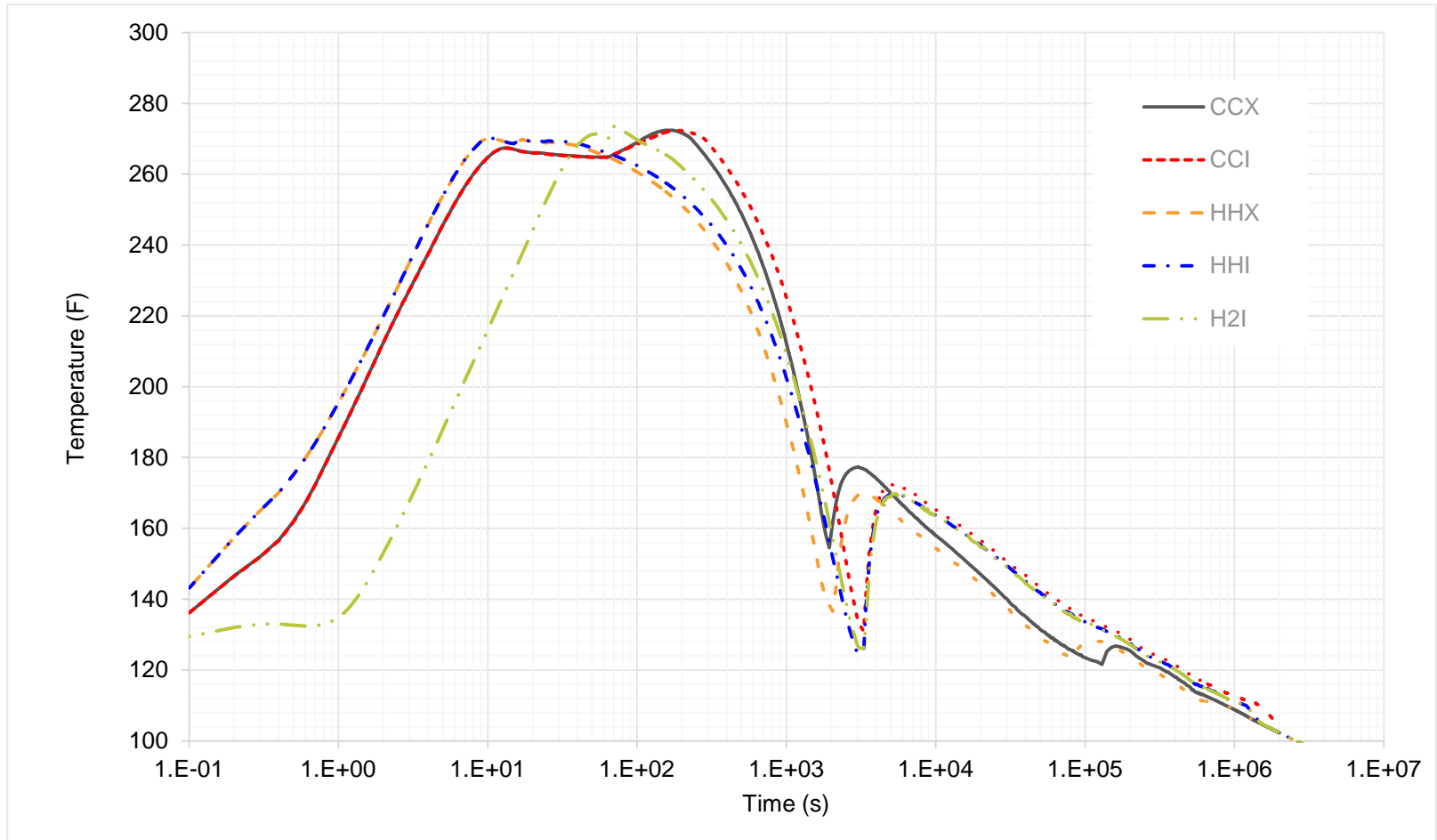
# Scenario A – Sump Temperature



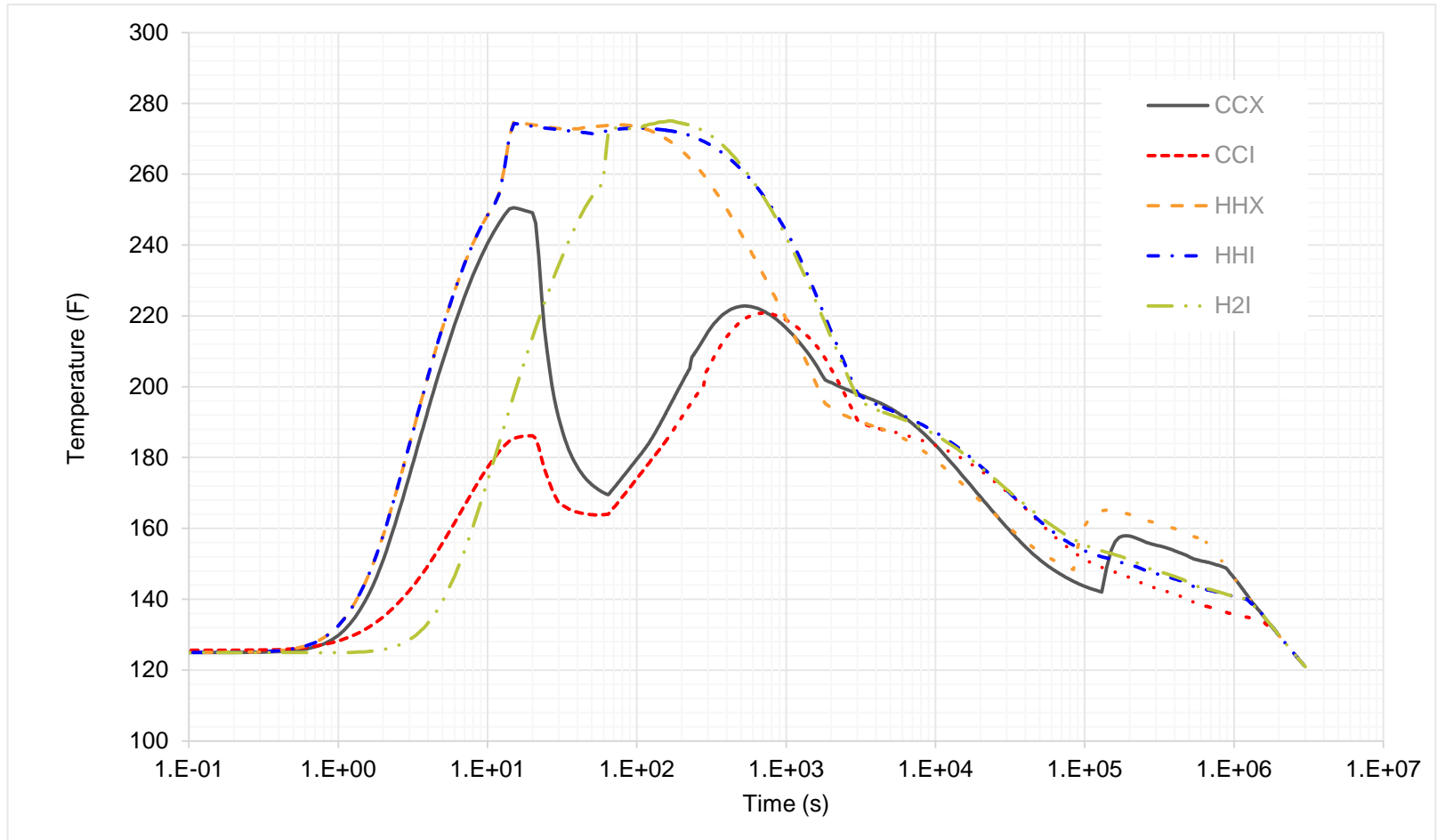
# Scenario B – Containment Pressure



# Scenario B – Containment Air Temperature



# Scenario B – Sump Temperature



# Thermal Hydraulic Analysis Results

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- 2 CS pumps + 2 CACs

- Hot Leg Break

- Time to 140°F = 108.3 hours
- Time to 2.8 psig = 47.2 hours
- Time to secure pump = 61.1 hours
- Pressure @ 140°F = 1.98 psig

- Cold Leg Break

- Time to 140°F = 77.8 hours
- Time to 2.8 psig = 63.9 hours
- Time to secure pump = 13.9 hours
- Pressure @ 140°F = 2.58 psig

- 2 CS pumps + 4 CACs

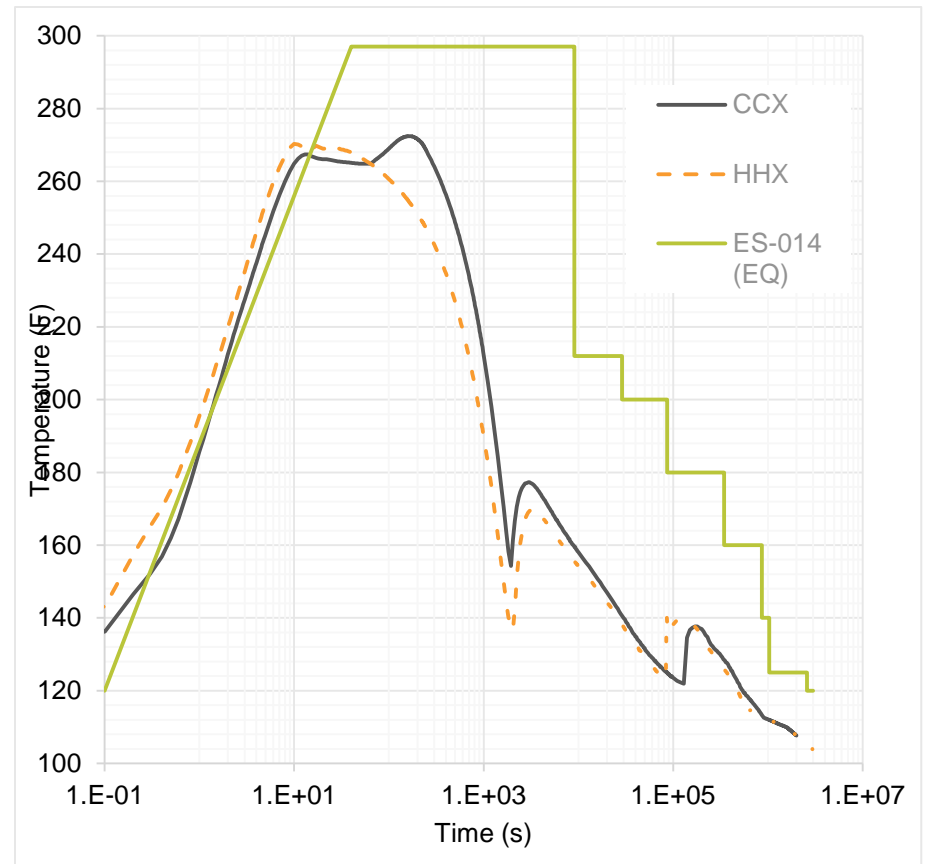
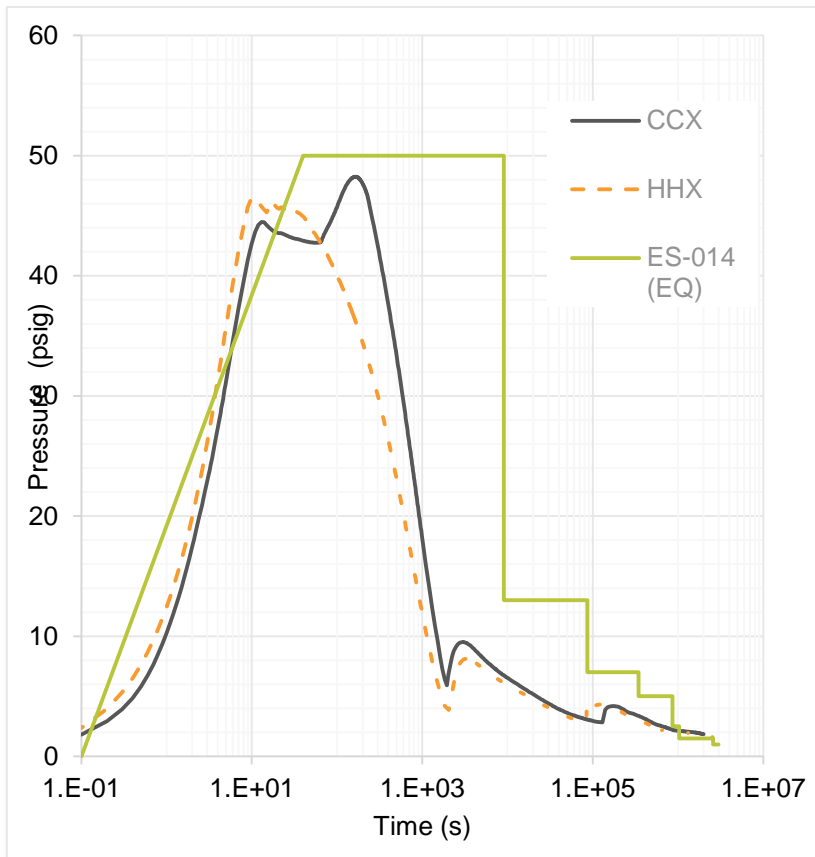
- Hot Leg Break

- Time to 140°F = 86.1 hours
- Time to 2.8 psig = 23.6 hours
- Time to secure pump = 62.5 hours
- Pressure @ 140°F = 1.95 psig

- Cold Leg Break

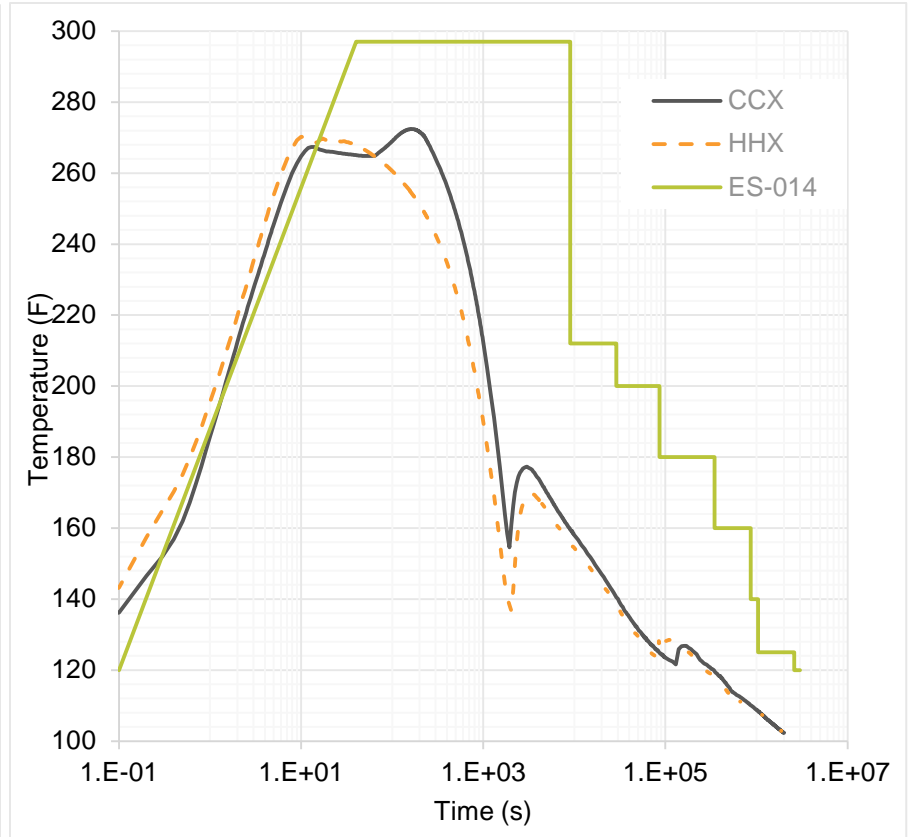
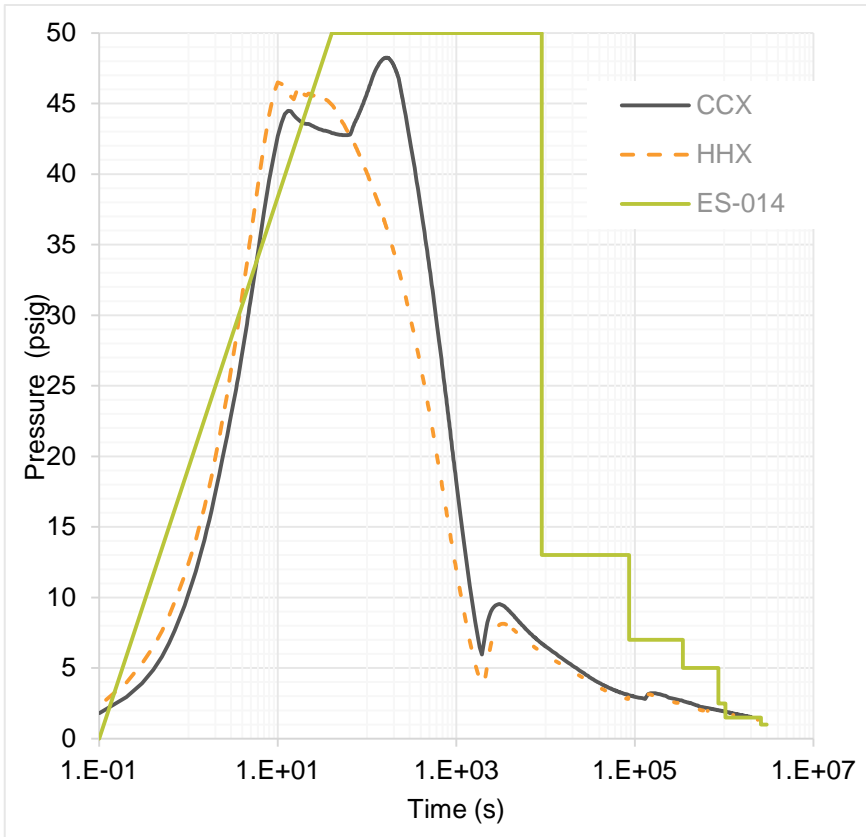
- Time to 140°F = 50.0 hours
- Time to 2.8 psig = 38.9 hours
- Time to secure pump = 11.1 hours
- Pressure @ 140°F = 2.63 psig

# Scenario C – Containment Pressure & Temperature





# Scenario D – Containment Pressure & Temperature



# Scenario E – Containment Pressure & Temperature

