Updated LOCA/LOFA Analyses for Blanket and Shield Only Regions

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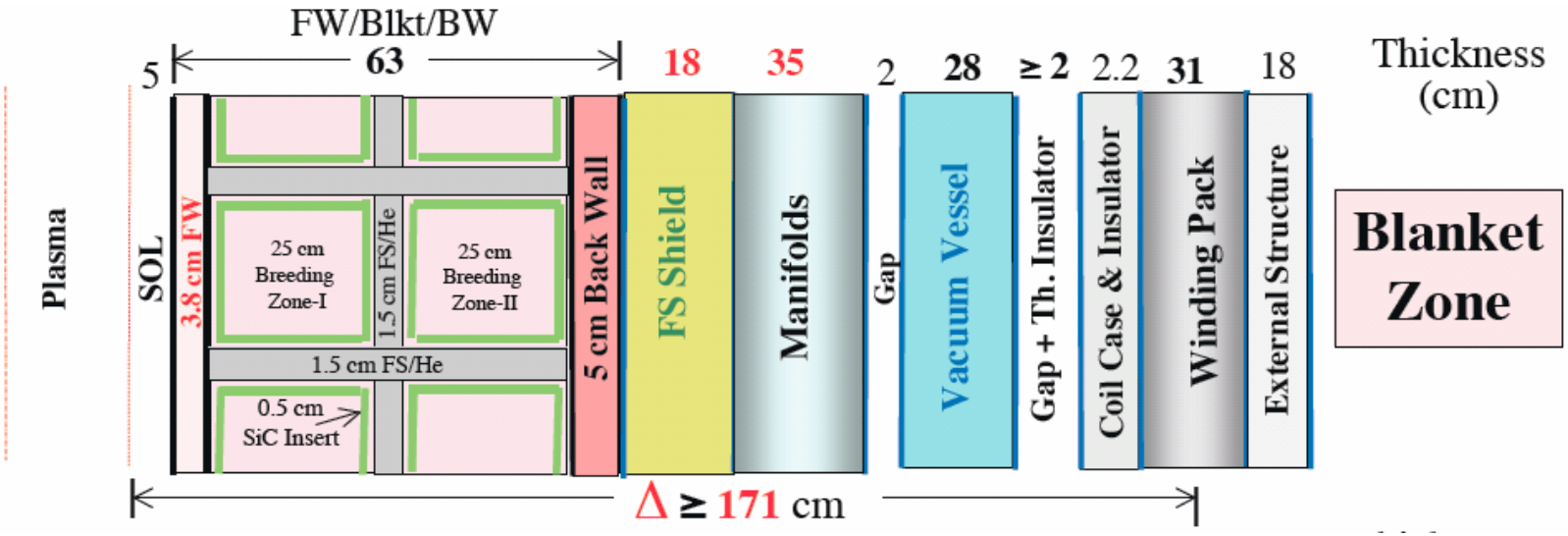
LOCA/LOFA Analysis Update

1. **Models for blanket and shield zones have been updated to reflected latest build configuration.**

2. **Shield-only model has been modified to include radiation from first wall across plasma.**

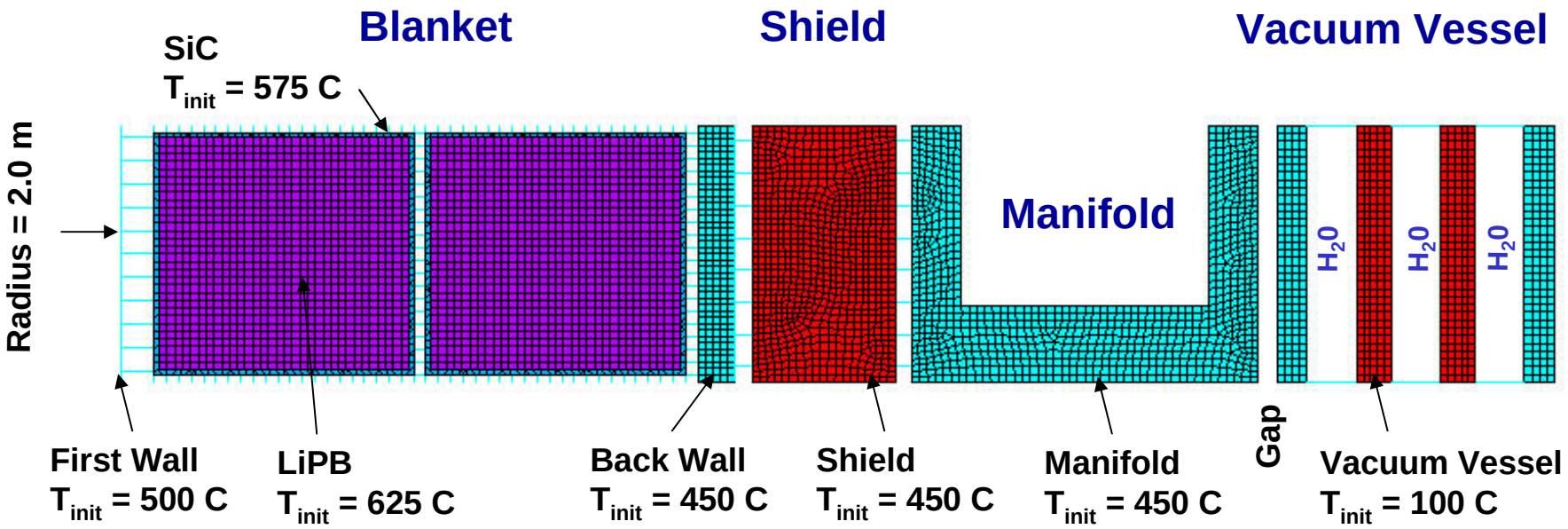
Latest Radial Build

- **Changes from previous model include two breeding zones in the blanket and the manifold region behind shield.**
- **Modeling and heat generation detail were also significantly improved from previous analyses.**



Updated Blanket and Shield FE Model

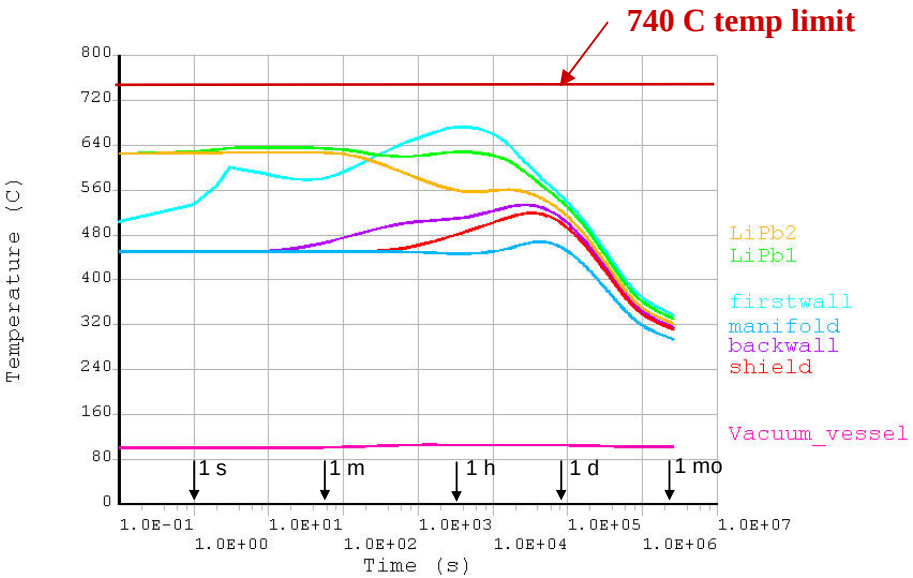
- Natural convection to water in vacuum vessel still assumed. Perfect contact modeled between blanket and shield.
- Manifold assumed to be empty (no LiPb or He) with radiation blockage to account for internal structure.



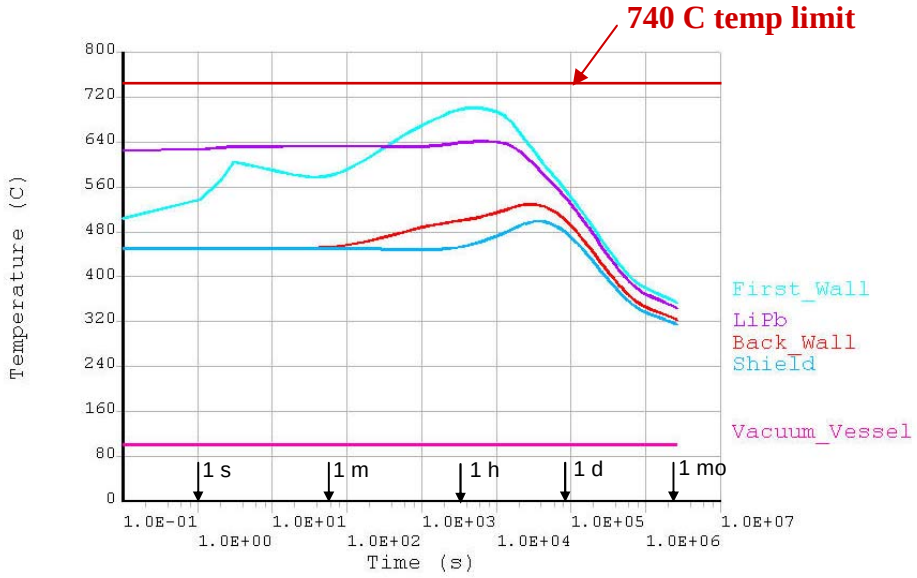
Thermal Results LOFA for LiPb and Water and LOCA for He

- **Maximum temperature is 28 C lower for new configuration.**
- **Difference can be attributed to the lower decay heating in LiPb.**

Updated Model
Maximum temperature – 673 C

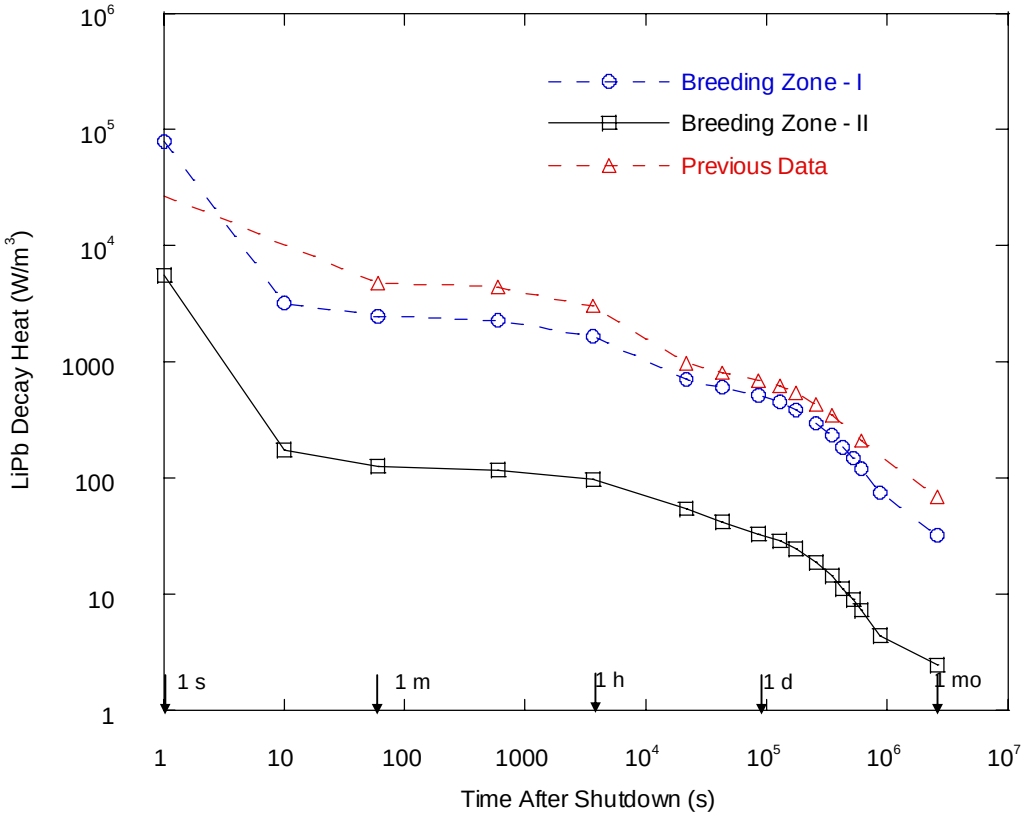


Previous Configuration
Maximum temperature – 701 C



Decay Heat for LiPb Compared to Previous Data

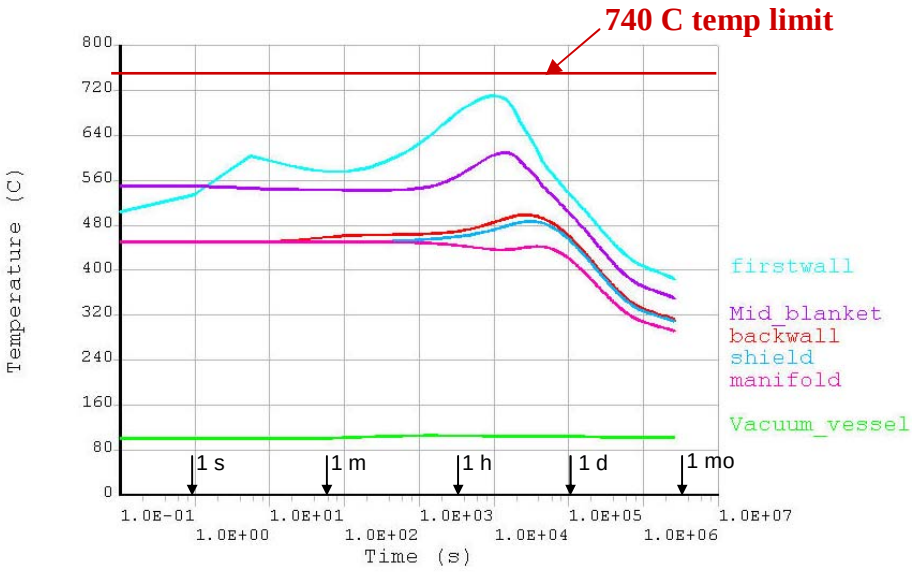
- New LiPb decay heats calculated by Laila El-Guebaly are significantly lower than estimates used previously – most notably in the outboard breeding zone.



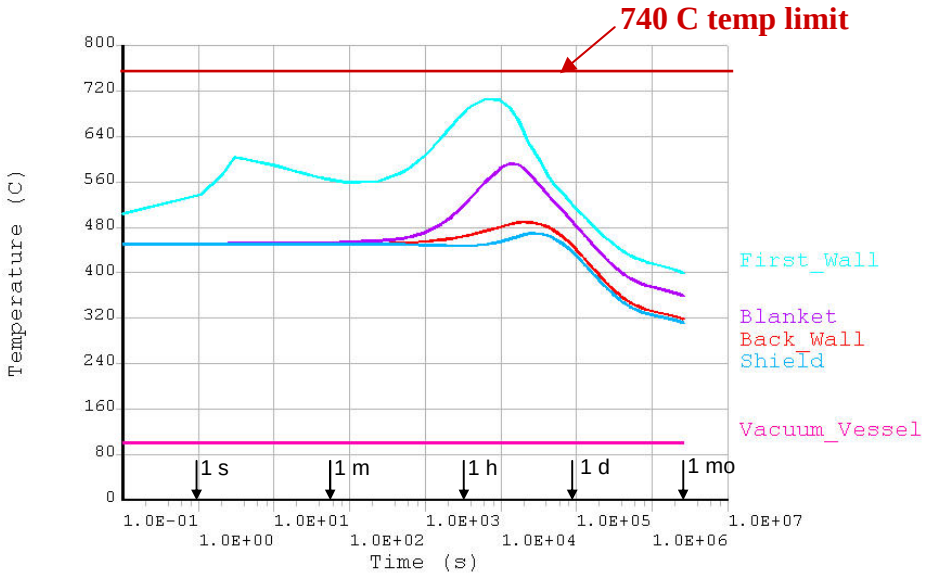
Thermal Response for LOCA in Blanket/Shield and LOFA in Vacuum Vessel

- Maximum FW temperature is 5 C higher for the new configuration.
- Higher Temperature attributable to reduced radiative heat transfer in blanket due to the intermediate wall and to addition of the manifold.
- Maximum temperature for LOCA (711 C) case 40 C higher than LOFA (673 C) for this build configuration.

Updated Model
Maximum temperature – 711 C



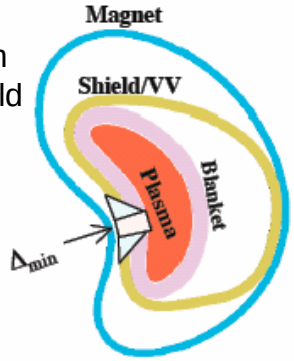
Previous Configuration
Maximum temperature – 706 C

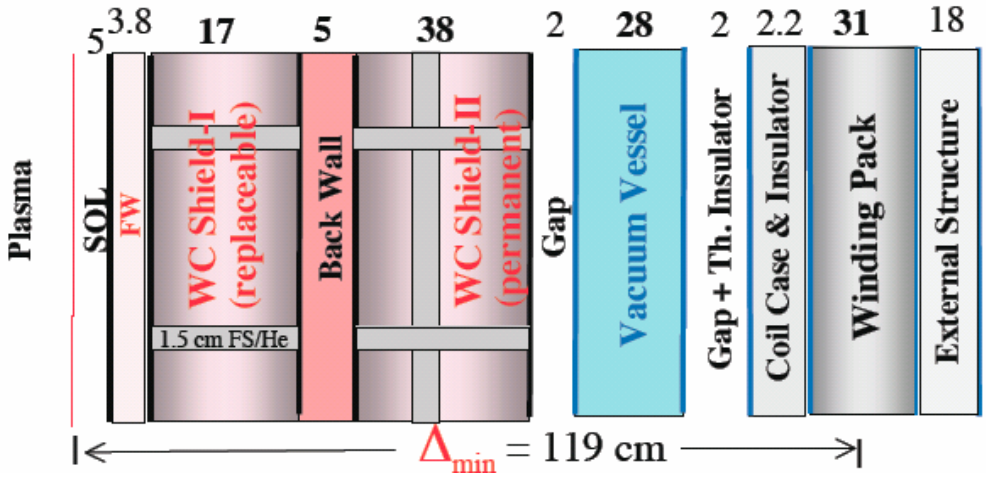


Updated Shield Only Zone Analysis

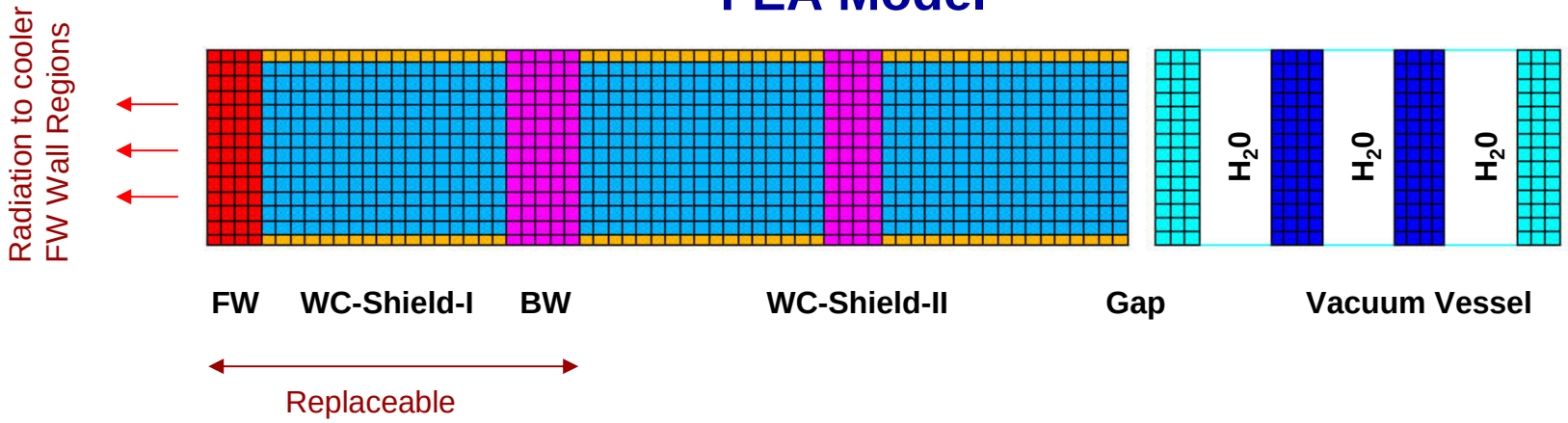
Model Modified to Include Radiation from FW

FW in shield only region sees mainly cooler shield & blanket zones





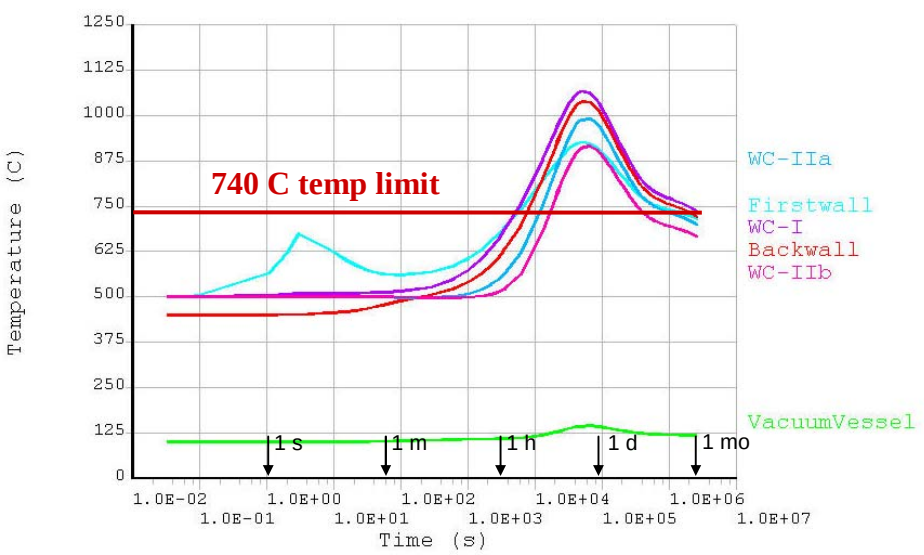
FEA Model



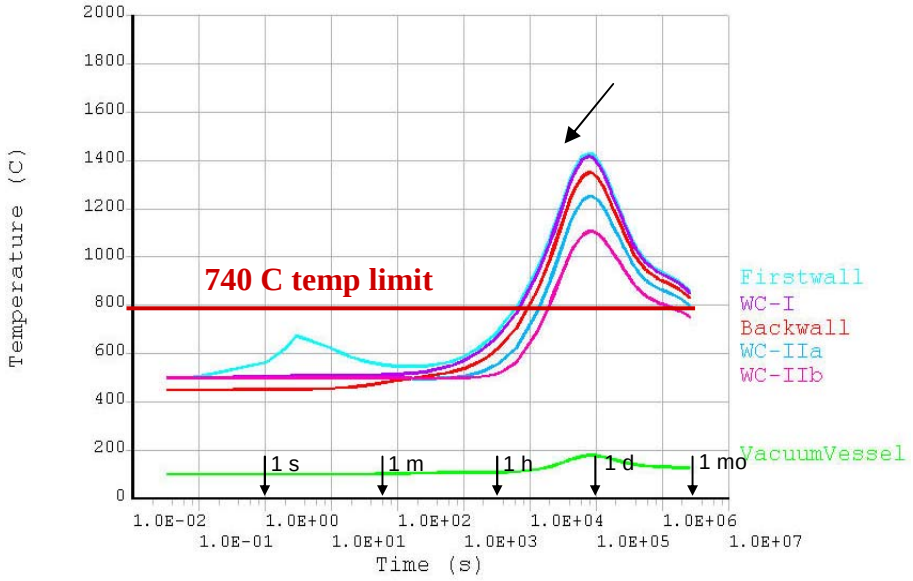
LOCA Thermal Results for Shield Only Region

- Maximum temperature is 368 C lower when first wall radiation is included, but still greatly exceeds 740 C FS temperature limit.
- Affect of thermal radiation on blanket and shield regions should be minimal since shield only region is a small fraction of total FW wall surface area.

Model with Surface Radiation
Maximum temperature – 1059 C



Original Model
Maximum temperature – 1427 C



Summary

1. **Model for blanket and shield zone has been updated to latest build configuration. Maximum FW temperature for LOFA in the LiPb is 28 C lower than previous analysis due to lower predicted LiPb afterheat.**

2. **Adding gap between blanket and shield raises maximum FW temperature by ~ 15 C.**

3. **Shield only model has been modified to include radiation from first wall across plasma. Maximum temperature is reduced 368 C,but still greatly exceeds 740 C FS temperature limit.**