



# Update of Selected SPAR Thermal Hydraulic Success Criteria

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## Outline

- Introductions
- Background
- Core damage definition
- Calculations completed to date
- Documentation and feedback
- SPAR model update
- Going forward

## Background

- Staff (including Senior Reactor Analysts) identified inconsistencies in similar-plant SPAR model success criteria (SC) in 2006
- Basis for SPAR model SC varies – DBA analysis, industry MAAP calcs., etc.
- Calculation matrix developed to address key discrepancies
- MELCOR analysis started in Fall 2008

## MELCOR applicability

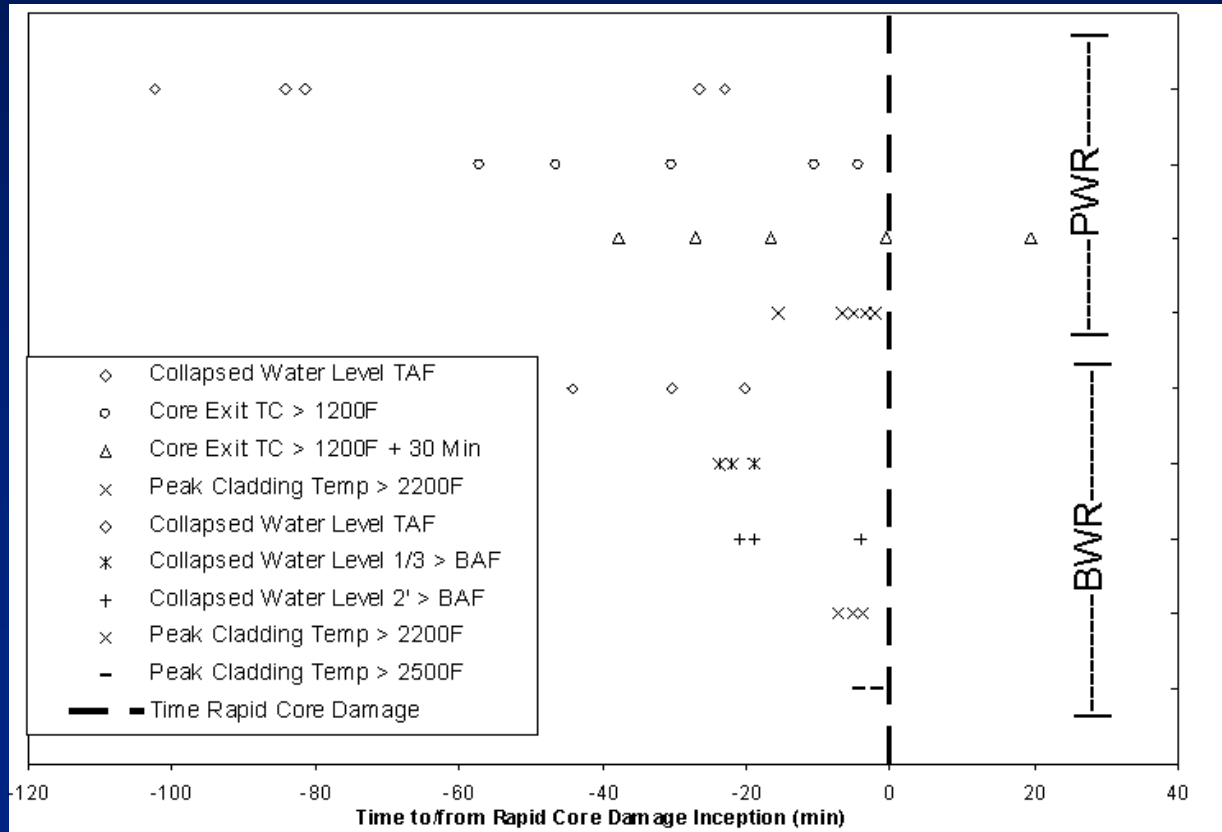
- RES staff made informed judgment that MELCOR is applicable
  - Designed to run best-estimate accident analysis
  - QA'd and assessed versus experiments and plant calculations
  - Has been used for Chapter 6, Chapter 15, and Chapter 19 audit calculations
  - Used extensively for reactor security assessments and the SOARCA project
  - Previously used to address SDP issue

## Plant representation

- This project is relying heavily on efforts performed under SOARCA to ensure that the as-built/as-operated plant is being faithfully modeled
- For system and operator details unique to this study, staff are reviewing plant documentation, EOPs, etc. and incorporating necessary modifications
- Models are updates from a previous assessment study which included additional interaction with the licensees

# Core damage definition

- MELCOR analyses performed to look at various core damage surrogates
  - 2200 F (1204 C) selected for use here



## Completed Calculations

- Calculations performed using the SOARCA MELCOR decks, with modifications as necessary
- Surry calculations completed for:
  - SBLOCA dependency on sump recirculation
  - Feed & Bleed PORV success criteria
  - SGTR event tree timing
  - SBO
  - Accumulator injection
- Peach Bottom calculations completed for:
  - Inadvertent open SRV
  - SBO

## **Surry SBLOCA dependency on sump recirculation**

**Operator action: Secures containment sprays**

- 1" break (with containment sprays)
  - Break is large enough to initiate sprays
  - System does not depressurize, thus necessitating high-head recirculation
  - RWST depletes at ~4.5 hours; in absence of HHSI recirc., core damage at ~10 hours



## Surry SBLOCA dependency on sump recirculation (cntd.) Operator action: Secures containment sprays

- 0.5" if PORV sticks open & 2" break
  - No core damage
  - System fully depressurizes
    - In 0.5" case, this is due to PORV sticking open after 247 lifts
  - Only low-pressure recirc. is needed
    - *Note that the PRA assumes high-pressure recirc. for all SBLCOAs*
- 0.5" break if PORV doesn't stick
  - Core damage at > 21 hours

## **Surry Feed & Bleed PORV success criteria**

**Operator action: Secures containment sprays**

- **1 SI + 1 PORV sufficient:**
  - At Surry, HHSI will lift PORV (no operator action required)
  - SI initiates on high containment pressure (~2 hrs),
  - In absence of HHSI recirc., core damage at ~ 13.5 hrs
    - ~4 hrs after RWST depletion
  - Confirms recent North Anna TRACE calcs and past industry calcs

## Surry Spontaneous SGTR Event Tree Timing

**Operator actions: Secures 1 HHSI pump (at 15 mins) and manually controls feedwater (standard practice)**

- 1-tube and 5-tubes
  - RWST depletes at ~10.5 hrs for 1 tube and ~5.5 hrs for 5 tubes
  - Core damage occurs at > 24 hours
  - Given secondary side cooling and HPI, time exists for RWST refill

## **Peach Bottom Inadvertently Open SRV**

### **No operator action except CRD injection**

- System will naturally depressurize to LPCI injection pressure prior to heatup for all cases:
  - HPCI only
  - RCIC only
  - CRD-1 at t=0 and CRD-2 at 10 minutes
  - CRD-1 at t=0 and CRD-2 at 20 minutes
  - No injection

## SPAR model updates

- Effects on Surry and Peach Bottom SPAR models are being assessed. Calculations suggest:
  - Revision of minimal equipment success criteria for ‘feed and bleed’ (Surry), medium/large LOCA (Surry), and inadvertently open SRV (Peach Bottom)
  - Updated timing considerations for spontaneous SGTR (Surry) and SBO (Surry and Peach Bottom)
- Actual updates to take place in 2010
- Additional work is needed to identify other affected SPAR models

## Going Forward

- Extrapolation of Surry/PB results based on applicability assessment
- Evaluate additional sequences and plant types
- MELCOR
  - SOARCA will provide an ice condenser deck
  - Tentative planning to develop other Level 1 input decks in 2010 and 2011
- TRACE
  - A separate project (LOCA IE frequency) may produce relevant results related to system response for a spectrum of LOCA sizes
- EPRI interactions
  - Desire on both sides to interact on this issue; logistics have not been worked out



**Questions?**