A Simplified Accident Scenario

Lars Hallstadius
Westinghouse Electric Company LLC
Objectives

- Propose a simplified but representative severe accident scenario
  - For the new fuel/cladding types to be measured against

- Simplified and generic
  - Applicable to many reactor designs
  - No event-specific operator actions
  - Should envelope all realistic LOCA accidents, e.g., Station Blackout

- After the core has been uncovered, no operator interaction
  - The system is let go until core integrity is lost
Proposal

- Zion Station Blackout scenario
  - Calculated using MAAP
    - 4-loop Westinghouse PWR

- Disabling creep rupture
  - No system depressurization
    - Conservative assumption

- Complete absence of active cooling
  - Temperature evolution envelopes other, less severe accidents

- Scenario probably applicable to PWR and BWR
  - Starting the clock when the core begins to uncover
Calculation is extended until the core has disintegrated

The "SiC" curve reflects an assumed perfectly inert cladding
  - Any significant cladding-steam reaction will lead to higher temperatures
    * Should be included in materials-specific application of the model
Suggested parameters to calculate

- Cladding-steam reaction rate
  - Enhances temperature and hydrogen generation
    - Feeds back on reaction rate
  - Coated cladding will have a two-tiered behavior

- Release of fuel and fission products
  - After first penetration of cladding

- Time to core disintegration
  - Melting of fuel
  - or
  - Gross failure of cladding