United States Nuclear Regulatory Commission

SELECTION OF TRANSITIONAL BREAK SIZE

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BACKGROUND

- Currently, 10 CFR 50.46 requires postulation of pipe breaks up to and including the double-ended rupture of the largest pipe in the reactor coolant system (also called double-ended guillotine break or DEGB) for evaluating emergency core cooling system performance.

- DEGB is highly unlikely and current regulatory treatment is inconsistent with risk insights.

- **A risk-informed approach to 50.46 will redefine the design-basis LOCA break size and establish a transitional break size (TBS).**

- **LOCA break sizes:**

  - **$\leq$ TBS (meet current 50.46 analysis/acceptance criteria)**

  - **> TBS (meet relaxed 50.46 analysis/acceptance criteria)**

ESTABLISHING THE TRANSITIONAL BREAK SIZE

- **TBS will be based on pipe break frequency estimates and other considerations.**

- **NRC conducted a number of studies on LOCA break frequencies in the past:**

  - **WASH-1400**
  - **NUREG-1150**
  - **NUREG/CR-5750**

- **These studies were based on limited amount of pipe break data.**

- **As a result, NRC convened an expert elicitation panel to develop current pipe break frequency estimates.**

EXPERT ELICITATION PROCESS

- **Expert elicitation process generated frequency estimates for pipe breaks caused by degradation mechanisms for BWRs and for PWRs. (Reference: SECY-04-0060)**

- **NRC used results of expert elicitation process as a starting point for selecting the TBS.**

- **The staff used a break frequency of one in 100,000 reactor years as a starting point for determining the TBS, since it is complemented by mitigation capability for LOCAs greater than the TBS. (Reference : SRM on SECY-04-0037)**

- NRC staff adjusted results of expert elicitation process to account for:
  - Uncertainties in elicitation process
  - LOCAs caused by inadvertent actuation of active components
  - LOCAs caused by large loads (such as seismic, waterhammer)
  - Other considerations (such as degradation in specific piping, specific pipe sizes)

PRELIMINARY TRANSITION BREAK SIZES

PWRs	BWRs
14"	20"

- NRC staff is finalizing contributions of seismically-induced LOCAs and other load-induced LOCAs on TBSs.
- The NRC plans to periodically update pipe break frequencies to ensure TBSs remain valid.

EXAMPLES OF POSTULATED LOCAs (PWRs)

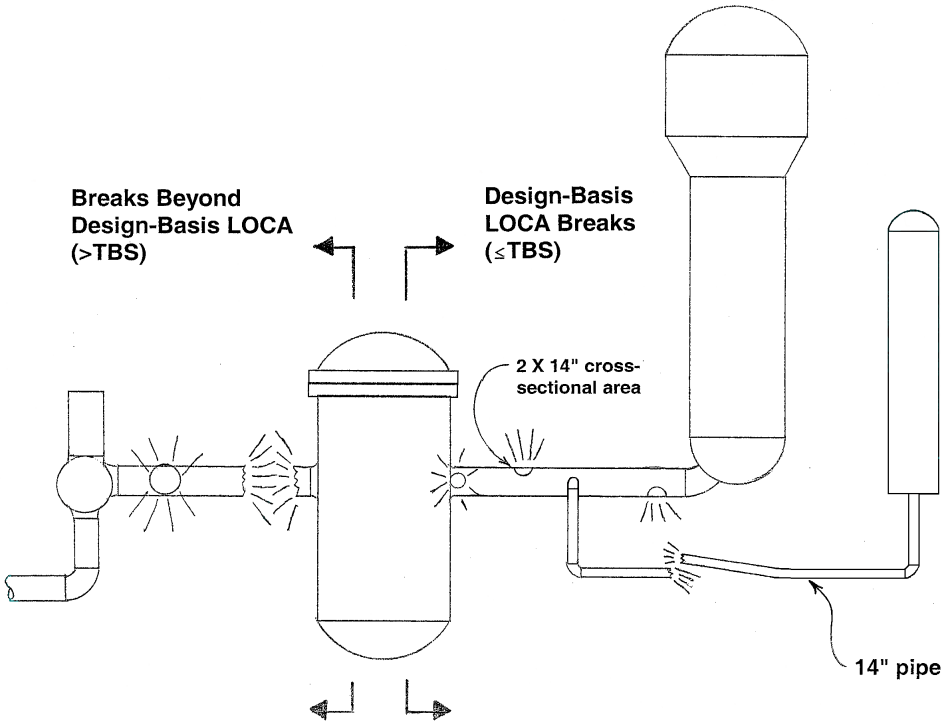
- **Design-Basis LOCAs (≤ TBS of 14")**

  <u>In RCS piping ≤ 14" nominal pipe size</u>
  - **Postulate full circumferential (double-ended guillotine) break.**

  <u>In RCS piping > 14" nominal pipe size</u>
  - **Postulate longtitudinal breaks with a discharge area equivalent to twice the cross-sectional flow area of a 14" pipe.**

- **Beyond Design-Basis Breaks (> TBS of 14")**

<u>In RCS piping > 14" nominal pipe size</u>

- **Postulate longitudinal and circumferential breaks from > 14" up to the DEGB.**

EXAMPLE BREAKS