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Modeling Experience on Disruption of Hotleg Counter-Current Flow by Thermally-Induced SGTRs

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The hotleg counter-current flow phenomenon in SBO severe accidents consists of hot flow in the hotleg upper part counter-current to cold flow in the hotleg lower part, and mixing of these flows in the SG inlet plenum. It is expected that if in this scenario the SG tube is thermally induced to rupture with a sufficiently large opening area, the suction effect of the rupture flow would reverse the cold flow in the hotleg, and therefore disrupt the counter-current flow as well as reduce the driving force for the SG inlet plenum mixing. This work presents modeling experience on MELCOR simulation of the flow pattern transition, and results on the transition criteria, as well as the heat transfer characteristics of the sonic jet issuing from the rupture. This work also introduces briefly the modeling efforts concerning jet impingement heat transfer which would affect the creep rupture behavior of the adjacent tube due to impingement by the high energy jet from the ruptured tube.