

November 28, 2001

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SUBJECT: SUMMARY OF OCTOBER 17, 2001, PUBLIC MEETING WITH  
NUCLEAR ENERGY INSTITUTE (NEI), BOILING WATER  
REACTOR OWNERS' GROUP (BWROG) AND OTHER  
INTERESTED STAKEHOLDERS REGARDING POTENTIAL  
CHANGES TO 10 CFR 50.46 (LOCA-LOOP REQUIREMENT)

The NRC staff hosted a public meeting on October 17, 2001, in order to discuss BWROG interest in the staff's recommended changes to 10 CFR 50.46, specifically changes to the current requirement to postulate a loss of offsite power (LOOP) when performing thermal-hydraulic calculations to demonstrate meeting the emergency core cooling system (ECCS) acceptance criteria stipulated in 10 CFR 50.46. This meeting was a follow-on to the public teleconference held on August 30, 2001. Industry, which included representatives from NEI, the BWROG and the Electric Power Research Institute (EPRI), led the discussions for the meeting, which addressed the following agenda items:

1. Industry expectations
2. Implications for boiling water reactors (BWRs)
3. LOOP data
4. Loss-of-coolant accident (LOCA) data
5. Delayed LOOP
6. Single failure criterion (NRC-proposed changes)
7. Schedule and future industry support activities

A summary of the discussions on each of these areas is provided below. The viewgraphs for the industry presentations are available under ADAMS accession number ML013310312. Attachment 1 contains the list of attendees.

## Industry Expectations

A representative from NEI made a brief presentation which defined the industry's expectations with respect to the staff's effort to risk-inform the LOCA-LOOP requirement (i.e., the requirement in General Design Criterion [GDC] 35 which stipulates that licensees should consider a coincident LOOP as part of their ECCS performance calculations), as described in SECY-01-0133. The industry's expectations are that GDC 35 would be amended to eliminate the LOCA-LOOP requirement for larger, more unlikely design basis LOCAs.

## Implications for BWRs

A representative from the BWROG provided information related to the potential safety benefits and potential unnecessary burden reduction that would be associated with relaxation of the LOCA-LOOP requirement. Industry indicated that potential safety benefits of this change include better industry and NRC focus on risk-significant structures, systems and components (SSCs), improved diesel generator (DG) reliability (due to slower DG start times, more risk-informed DG load sequencing, and less challenging DG load sequencing and testing), and improved ECCS equipment reliability and performance (slower valve stroke times, optimized pump flows, etc.). Potential areas of unnecessary burden reduction identified by industry include increased analytical margin leading to greater operational control with respect to peaking factors; power uprates; engineered safety feature (ESF) equipment assumptions (e.g., valve stroke times and pump flow rates); and technical specification allowed outage times, surveillances, and DG start times.

It was pointed out by industry that while the LOCA-LOOP requirement would probably still remain for small-break LOCAs (SBLOCAs), BWRs typically rely on steam-driven or diesel-driven pumps in the early response to these initiators, thereby allowing a delay in DG start time. It was acknowledged by industry that the potential impacts of a delayed LOOP would need to be assessed for those LOCAs still subject to the LOCA-LOOP requirement.

## LOOP Data

The definition of LOOP was discussed. In principle, EPRI and the NRC staff and its contractor (Brookhaven National Laboratory [BNL]) agreed that a LOOP occurs when there is a power supply transfer from the offsite sources to the onsite emergency power supplies, usually the DGs, due to an undervoltage at the emergency buses. EPRI believes their upper bound value for probability of a LOOP given a LOCA ( $2.2 \times 10^{-3}$ ) should apply for LBLOCAs (or any other sequence requiring power within a few minutes), which is more than an order of magnitude lower than the value listed in NUREG/CR-6538. The difference between the estimates of the probability of a LOOP given a LOCA provided by EPRI and NUREG/CR-6538 is due to the following factors: (1) inclusion of partial LOOPS in NUREG/CR-6538, (2) inclusion of a River Bend 1 event (LER 458/88-018) in NUREG/CR-6538, and (3) the way the data are aggregated in NUREG/CR-6538. NRC/BNL are in the process of updating the assessment of the probability of a LOOP given a LOCA with the most current data. The three issues identified above will be taken into account in the updated assessment. NRC/BNL stated (and industry concurred) that in the update conditional LOOP data will be combined for pressurized water reactors (PWRs) and BWRs, since no factors have been identified that justify segregating the data by reactor type.

With respect to plant operation with degraded grid voltage, the staff noted that there is a need to consider both real power problems and reactive power problems. The NRC is already working with industry on the degraded voltage issue, which is particularly of concern since it is not a self-revealing event. The staff acknowledged that the situation in the industry is better now due to the widespread licensee response to Institute for Nuclear Power Operations (INPO) SOER 99-1, which deals with loss of grid (during a May 2001 INPO workshop, nearly all licensees indicated that they had taken some actions in response to SOER 99-1).

## **LOCA Data**

Industry provided the preliminary results of a review of the LOCA frequency methodology used in NUREG/CR-5750. The review was performed by General Electric (GE) for the BWROG. GE claimed that the intergranular stress corrosion cracking (IGSCC) factor of improvement (FOI) should be at least 33 (as opposed to the FOI of 20 used in NUREG/CR-5750), and that the mean probability of rupture given a through-wall crack, for medium and large pipes, should be less than or equal to  $10^{-3}$  (as opposed to the value of  $10^{-2}$  used in NUREG/CR-5750). Industry concluded that the GE estimates of LOCA frequency combined with the EPRI estimate for conditional LOOP probability result in LOCA-LOOP frequencies well below  $10^{-6}/\text{yr}$ , even for medium LOCAs (i.e., break sizes of 1-5 inches). Note, the GE LOCA calculations are only for liquid pipe-break LOCAs, and consideration has not yet been given to other LOCA sources or steam LOCAs.

## **Delayed LOOP**

Industry presented its position that BWRs do not need to consider delayed LOOP because: (1) for breaks  $>0.1 \text{ ft}^2$ , the frequency of LOCA and LOOP is very low, and (2) for breaks  $<0.1 \text{ ft}^2$ , about 5 minutes are available before DG power is required, and delayed LOOPS are expected to occur in the first few seconds to 1 minute. NRC/BNL raised issues related to the response of electrical systems to a delayed LOOP, such as double sequencing; the impact of quick starting and stopping of motors, possibly under degraded voltage conditions, which could fail equipment and make it unrecoverable; or possible water hammer concerns. Industry agreed that there is a need to assess the issues associated with a delayed LOOP from an electrical analysis point of view (i.e., the potential for equipment lockout or failure).

## **Single Failure Criterion**

The staff provided a brief overview of its current efforts to risk-inform the ECCS reliability requirements, specifically the LOCA-LOOP and additional single failure requirements contained in GDC 35, as described in SECY-01-0133. In lieu of the current simultaneous LOOP requirement and single failure criterion, the staff envisions that two performance-based options would be offered to ensure ECCS reliability. The first option entails a generic approach that defines, by plant group, a set of minimal equipment required to meet an established ECCS reliability, such that licensees would not have to perform any technical analysis. The second option entails a plant-specific approach where licensees establish an ECCS functional reliability requirement that is commensurate with the LOCA frequency. The staff is continuing the technical analyses necessary to support both of these options.

## Schedule and Future Activities

The staff and industry agreed to schedule a follow-up meeting for November 29, 2001. In the interim, it was agreed that the industry (EPRI) would make itself available to assist the staff in evaluating licensee event reports that are candidates to be classified as consequential LOOPS. The industry also indicated that they would investigate the possibility of obtaining data on the fraction of time that plants operate in a vulnerable degraded grid voltage condition.

The meeting concluded with the general agreement that the meeting was very productive and had provided for a good exchange of information.

Attachments:

### 1. List of Attendees

Project No. 689

cc: See next page

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OCTOBER 17, 2001  
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