



UNITED STATES  
NUCLEAR REGULATORY COMMISSION  
WASHINGTON, D.C. 20555-0001

August 7, 2020

MEMORANDUM TO: Raj M. Iyengar, Chief  
Component Integrity Branch  
Division of Engineering  
Office of Nuclear Regulatory Research

FROM: Matthew J. Homiack, Materials Engineer */RA/*  
Component Integrity Branch  
Division of Engineering  
Office of Nuclear Regulatory Research

SUBJECT: SUMMARY OF THE JULY 29, 2020, RES CATEGORY 3 PUBLIC MEETING WITH EPRI AND STAKEHOLDERS TO DISCUSS RUNNING SIMULATIONS AND RETRIEVING RESULTS IN THE XLPR PROBABILISTIC FRACTURE MECHANICS CODE

The U.S. Nuclear Regulatory Commission (NRC) staff from the Office of Nuclear Regulatory Research (RES) held a meeting on July 29, 2020, with representatives of the Electric Power Research Institute (EPRI) to provide information and guidance to new users on running simulations and retrieving results in the Extremely Low Probability of Rupture (xLPR) probabilistic fracture mechanics code.

The agenda for the meeting is available in the NRC's Agencywide Documents Access and Management System under Accession Number ML20181A203. Enclosed is a list of the meeting participants and the slide presentation. Additionally, a video recording of the meeting will be posted on [www.youtube.com](http://www.youtube.com). A summary of the meeting discussions follows by agenda topic.

1. Introduction and Opening Remarks

The NRC staff welcomed participants and covered administrative items for the meeting. It explained that the meeting was the third in a four-part technical seminar series on xLPR Version 2.1 (V2.1). Participants were reminded of the schedule for the final seminar. The NRC staff also indicated that summaries and video recordings of all the seminars were being made available as completed.

2. File Structure Review

An NRC contractor began the presentations by reviewing the file structure and file naming requirements. Suggestions were provided for managing these files when running xLPR V2.1 simulations.

CONTACT: Matthew J. Homiack, RES/DE  
301-415-2427

### 3. Running the Preprocessor

Next, the NRC contractor described the six basic steps involved in running xLPR V2.1. The first step is to set up the inputs set file, which was covered in the previous technical seminar. The second step is to run the preprocessor. The NRC contractor explained that the preprocessor shortens xLPR V2.1 runtimes because it creates lookup tables that can be quickly interpolated from when the simulation is run. The preprocessor produces two sets of look-up tables. The first set contains values used in the fatigue calculations generated by the thermal stress intensity factors module. The second set contains values used in the leak rate calculations generated by the leak rate module. Operation of the preprocessor was demonstrated, and it was explained when it is necessary to run the preprocessor.

### 4. Setting Sampling Options and Controlling a Run

The NRC contractor explained that the third step in running xLPR V2.1 is to set up the simulation parameters in GoldSim. These settings are used to configure the desired sampling strategy for the simulation, for example: (a) whether to use a single sampling loop or two loops for separation of aleatory and epistemic uncertainties, (b) the sample sizes and random seeds used for each loop, (c) whether to use Latin hypercube sampling for each loop, and (d) whether to apply importance sampling on selected input distributions for each loop. It was shown how to locate these settings through the Global Settings Dashboard.

The fourth step is to run the simulation using GoldSim. Running the simulation involves the GoldSim Run Controller, which has three primary modes: Edit, Running, and Results. The NRC contractor covered the various options that are available in each mode. It was then shown how the Run Controller could be used to start, pause, stop, and monitor the progress of an xLPR V2.1 simulation. The fifth step is to save the results after a simulation completes, and the NRC contractor also demonstrated how to do this using the Run Controller.

### 5. Viewing Results

The sixth and final step in running xLPR V2.1 is to view and extract the results. The NRC contractor described the standard result options and showed how to view them through the Results Dashboards. They can be categorized as general results, orientation-specific results, and crack-specific results. The general results consider both axial and circumferential cracks. The orientation-specific results consider either axial or circumferential cracks. The crack-specific results provide information for the first five cracks that occur, such as the crack position, dimensions, leak rate, and stress intensity factor solutions. The NRC contractor then explained how each of these results can be viewed as either a chart or in a tabular form. Finally, it was shown how to export a specific set of results from GoldSim into either a text or Excel file.

## 6. Errors Display

The NRC contractor continued by explaining how to check for simulation errors and warnings using the Error Dashboards. Using an out-of-range input as an example, it was also shown how to investigate and resolve a run-time error. In addition, users were cautioned to monitor the amount of data generated by a simulation because large results file sizes can cause GoldSim to crash.

## 7. Navigating through the Framework

The NRC contractor concluded the presentation by showing how to use the features in GoldSim to navigate through the xLPR V2.1 computational framework. He explained that the various calculational elements are organized into containers. The important containers were highlighted, which include one for circumferential crack calculations and another for axial crack calculations. The NRC contractor also showed how to display the upstream and downstream elements for a selected element.

## 8. Questions and Answers

As an NRC Category 3 public meeting, stakeholders had the opportunity to participate by providing comments and asking questions throughout the meeting. This participation was facilitated through the electronic submission of questions and comments using the question and answer feature of the virtual platform used to host the meeting. Clarifications were provided in response to a few attendee questions about xLPR V2.1 sample size settings. All questions were answered over the course of the meeting.

## 9. Closing Remarks

The NRC staff concluded the meeting by providing a recap of the presentations. Participants were thanked for their time and encouraged to submit any future questions or comments to the NRC staff at [xlpr@nrc.gov](mailto:xlpr@nrc.gov) and to EPRI at [xlpr@epri.com](mailto:xlpr@epri.com).

The NRC staff provided EPRI with an opportunity to review a draft of this meeting summary. EPRI comments were incorporated as appropriate.

Enclosures:  
As stated

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