

# PUBLIC SUBMISSION

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**Docket:** NRC-2022-0037  
Design-Basis Floods for Nuclear Power Plants

**Comment On:** NRC-2022-0037-0001  
Design-Basis Floods for Nuclear Power Plants

**Document:** NRC-2022-0037-DRAFT-0006  
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## Submitter Information

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## General Comment

See attached file(s) for Kairos Power LLC comments on DG-1290

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## Attachments

KP-NRC-2204-006 Kairos Power Comments on DG-1290

April 11, 2022

Regulations.gov Docket ID: NRC-2022-0037

Office of Administration  
Mail Stop: TWFN-7-A60M  
U.S. Nuclear Regulatory Commission  
Washington, DC 20555-0001  
ATTN: Program Management, Announcements and Editing Staff  
Submitted via *Regulations.gov*

Subject: Kairos Power LLC  
Comments on USNRC Draft Regulatory Guide DG-1290, "Design Basis Floods for Nuclear Power Plants"  
Docket ID: NRC-2022-0037

Reference: Nuclear Energy Institute to Office of Administration, *NEI Comments on Draft Regulatory Guide DG-1290, "Design-Basis Floods for Nuclear Power Plants," Docket ID NRC-2022-0037*

The Nuclear Energy Institute (NEI) provided comments on the subject draft Regulatory Guide in the referenced letter. Kairos Power hereby endorses the NEI comments, and offers the attached supplemental comments in expansion of the NEI comments regarding annual probability of exceedance for the reasonableness of combined event flooding scenarios. This issue is of particular significance in establishing the applicability of the draft guidance to risk-informed, performance-based licensing of advanced reactors.

Kairos Power sincerely appreciates the opportunity to provide input for the staff's consideration. If you have any questions or need any additional information, please contact Darrell Gardner at [gardner@kairospower.com](mailto:gardner@kairospower.com) or (704) 769-1226, or myself at [hastings@kairospower.com](mailto:hastings@kairospower.com) or (704) 336-9596.

Sincerely,



Peter Hastings, PE  
Vice President, Regulatory Affairs and Quality

Enclosure: Kairos Power Supplemental Comments on DG-1290

xc (w/enclosure):

William Kennedy, Acting Chief, NRR, Advanced Reactor Licensing Branch  
Benjamin Beasley, Project Manager, NRR, Advanced Reactor Licensing Branch

**Kairos Power LLC**

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Enclosure

Kairos Power Supplemental Comments on  
DG-1290, "Design Basis Floods for Nuclear Power Plants"

Using an annual exceedance probability of  $1 \times 10^{-6}$  is inconsistent with other established NRC guidance and precedent. Design basis external hazards are described in NEI 18-04 (Reference 1) which is endorsed by Regulatory Guide 1.233 (Reference 2). RG 1.233 states:

"NEI 18-04 describes a set of DBEHLs that will determine the design-basis seismic events and other external events that the SR SSCs will be required to withstand. When the DBEHLs are determined using NRC-approved methodologies, this approach is generally consistent with current practices and provides acceptable protection of SR SSCs. When supported by available methods, the PRA model is expected to address the full spectrum of internal events and external hazards that pose challenges to the capabilities of the plant, including external hazard levels exceeding the DBEHLs. The inclusion of external events within the BDBE category supports the overall risk-informed approach in NEI 18-04 and the DID assessments described in subsequent sections. The PRA results, including consideration of external hazards, will also validate a designer's initial selections of DBAs and SR SSCs protected against DBEHLs, and ensure no new DBAs are introduced by external hazards."

Consistent with RG 1.233's endorsement of NEI 18-04, design basis external hazards, like floods, are evaluated using the frequency-consequence target shown in Figure 3-1 of NEI 18-04. The figure shows that events to be included in the design basis occur at a frequency of  $1 \times 10^{-4}$  and greater, while defense in depth is accounted for by evaluating beyond design basis events at frequencies below  $1 \times 10^{-4}$ .

Kairos Power also submitted a topical report, KP-TR-009 (Reference 3) which the NRC approved in a safety evaluation (Reference 4). The topical report and NRC's endorsement discussed treatment of external hazards, including floods, consistent with the approach outlined in RG 1.233.

The draft guidance in DG-1290 would require flooding events to be included in the design basis that would be considered beyond the design basis under RG 1.233. No discussion is provided in DG-1290 to justify why external floods would require different treatment than other external hazards or other design basis events at a nuclear power plant.

Furthermore, the NRC's quantitative safety goals, whose basis is provided in References 5 and 6, set fleetwide targets for the average core damage frequency at  $1 \times 10^{-4}$ /yr. Establishing an annual exceedance probability of a Design Basis flood at  $1 \times 10^{-6}$ /yr, which becomes the initiating event flooding magnitude for a conservative and stylized plant response, as opposed to a realistic assessment of the plant response, is excessively conservative as in comparison to the stated reactor safety goal.

Recommendation

Remove content in DG-1290 that would require the design basis of a nuclear power plant to include events beyond a  $1 \times 10^{-4}$  per year frequency.

## References

1. Nuclear Energy Institute (NEI) 18-04, "Risk-Informed Performance-Based Technology-Inclusive Guidance for Non-Light Water Reactor Licensing Basis Development," Revision 1, August 2019 (ADAMS Accession No. ML19241A472)
2. Regulatory Guide 1.233, Revision 0, "Guidance for A Technology-Inclusive, Risk-Informed, and Performance-Based Methodology to Inform the Licensing Basis and Content of Applications for Licenses, Certifications, and Approvals for Non-Light-Water Reactors"
3. KP-TR-009, "KP-FHR Risk-Informed Performance-Based Licensing Basis Development Methodology Topical Report," April 2020, ML20101P623
4. Nuclear Regulatory Commission, Letter, "Final Safety Evaluation for Kairos Power LLC Topical Report "KP-FHR Risk-Informed Performance-Based Licensing Basis Development Methodology" (Revision 1), November 10, 2020, ML20294A337
5. Nuclear Regulatory Commission, "QHO Margins Progress and Path Forward," November 28, 2018, ML18331A363
6. Nuclear Regulatory Commission, "Feasibility Study for a Risk-Informed and Performance-Based Regulatory Structure for Future Plant Licensing," NUREG-1860, Vol 2, December 2007, ML080440215

KP-NRC-2204-006

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