Response to Public Comments on Draft Regulatory Guide (DG)-4026
"Volcanic Hazards Assessment for Nuclear Power Reactor Sites"
Proposed Regulatory Guide (RG) 4.26

On March 19, 2020 the NRC published a notice in the *Federal Register* (85 FR 16147) that Draft Regulatory Guide, DG-4026, a proposed new Regulatory Guide was available for public comment. The Public Comment period ended on May 19, 2020. The NRC received comments from the individuals or organizations listed below. The NRC has combined the comments and NRC staff responses in the following table.

Comments were received from the following:

Kevin Coppersmith Coppersmith Consulting, Inc. 2121 N. California Blvd, #290 Walnut Creek, CA, 94596 kevin@coppersmithconsulting.com ADAMS Accession No. ML20106F061	Anonymous ADAMS Accession No. ML20086H877
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Commenter	Section of DG-4028	Specific Comments	NRC Resolution
Kevin Coppersmith	Section B, Senior Seismic Hazard Analysis Committee Study Guidelines	In the discussion of the selection of the SSHAC Level, it is stated on page 9 that there is a distinction between the attributes that would require a Level 3 study versus a Level 4 study. In particular, the criteria for a Level 4 study are more challenging than those for a Level 3 study. This position implies that a Level 4 study would provide a higher level of regulatory assurance than a Level 3 study because it can handle additional challenges. However, this position is in direct contrast to the position in NUREG-2213 and NUREG-2117.	The NRC agrees that NUREG-2213 is clear about the equivalency of regulatory assurance between Levels 3 and 4 (NUREG 2213 Section 2.5 and others), and clarified the language in the RG for consistency. The staff clarified on page 12 that higher regulatory assurance occurs "at the higher levels (i.e., Levels 3 and 4)" and added a reference to the discussion in NUREG-2213 about study level selection (Section 2.5). RG 4.26 also includes a citation on page 12 to include that NUREG-2213 Section 3.2.1 provides discussion of the factors for choosing a SSHAC study. RG 4.26 also replaces the final two bullets as suggested in the comment (i.e.; Applicable for a facility with potentially large sourceterms or design

		As stated at multiple locations in NUREG-2213, the NRC makes no distinction in terms of regulatory assurance between SSHAC Levels 3 and 4. For example, on page 3-14: *"As noted in NUREG-2117, the NRC makes no distinction between SSHAC Level 3 and 4 studies in terms of the regulatory assurance afforded by either level. As a result, in order to achieve the high levels of regulatory assurance needed for nuclear facilities (see Section 2.5) and to avoid some of the additional burdens associated with Level 4 studies (see Section 3.1), "* Because of this lack of a distinction on the part of the NRC, the Level 3 approach has gained significant favor for nuclear facilities in the US and worldwide because it involves fewer people, costs less, and takes less time. To artificially create a distinction in this Reg Guide will lead to confusion not only in the application to future volcanic hazard analyses, but also to decisions made previously by nuclear utilities regarding SSHAC Levels based on their understanding of regulatory guidance documents, including NUREG-2213. As discussed in detail in NUREG-2213, the distinction in regulatory assurance between Level 2 and Level 3 studies is much larger than the distinction between Levels 3 and 4. I therefore suggest that the third bullet on page 9 be deleted and the fourth bullet be reworded slightly to the following: "*Level 3 or 4: facility with potentially large source terms or design fragilities; significant number of alternative or potentially contradictory hazard models available; low confidence in the completeness and accuracy of the geologic record; and numerous complex, multi-hazard scenarios considered."*	fragilities,a significant number of available alternative or potentially contradictory hazard models,low confidence in the completeness and accuracy of the geologic record,and/ornumerous complex, multi-hazard scenarios that can be considered. .." The staff also updated the final bullet on Page 12 with the following additional text: "A Level 3 or Level 4 study may be chosen depending on the organization of the study (i.e., whether a single or multiple logic trees will need to be developed, the complexity of the study, the methods for characterizing uncertainty, and other factors). The NRC staff should be consulted for determination of which study level is appropriate (NUREG-2213 Section 2.6.16).."

		This revised wording and concept is consistent with other regulatory guidance issued by the NRC.	
Anonymous	General Comment	I recommend we not build any more nuclear plants until we figure out how to use fusion instead of fission and we can safely store or reuse spent nuclear waste.	The comment is beyond the scope of the proposed guide.
NEI #1	General Comment	The regulatory guide is not sufficiently risk-informed because it does not consider the potential radiological consequences. It is noted that the NRC is exploring development of an enhanced technology-inclusive (TI) and risk-informed and performance based (RIPB) conceptual seismic design approach to achieve desired seismic safety for advanced non-light-water reactors that would align with the NEI 18-04, "Risk-Informed Performance-Based Technology Inclusive Guidance for Non-Light Water Reactor Licensing Basis Development," approach endorsed in RG 1.233. NEI Recommendation: The regulatory guide should provide a more clearly risk-informed process that considers potentialradiological consequences and the ability to design for, or mitigate, those potential radiological consequences due to volcanic hazards. The example that follows this table illustrates the need to address options for both design and mitigation against volcanic hazards in order to provide guidance for various application scenarios. Additionally, as the NRC approach to apply RG-1.233 to seismic safety moves forward, the NRC should consider how it could also be applied to other external events, like volcanic hazards.	RG 4.26 allows the use of appropriate risk-insight information throughout the volcanic hazards assessment process. Although radiological consequences are not explicitly used as risk-significance metrics, the applicant may use such consequences, as well as other risk-insight information, to evaluate the significance of potential volcanic hazards. To enhance the clarity of potential risk-significance determinations, the staff revised RG 4.26 to include guidance based on NEI 18-04 and RG 1.233 for the identification of volcanic hazards as a contribution to potential initiating events for design basis event (DBE), and beyond design basis event (BDBE) sequences. This approach would align more closely with the approach used to evaluate other natural hazards at a site. For sites with potential volcanic hazards based on the evaluation of site characterization information, the guidance now allows potential mitigating actions, which prevent the occurrence of potential DBE and BDBE sequences, early in the volcanic hazards assessment process. This flexibility of the process is shown in Figure 1.
NEI #2	General Comment	As cited by the Staff's October 21, 2019 presentation, applicants must assess, "Geological, seismological, and engineering characteristics. The geological, seismological, and engineering characteristics of a site and its environs must be investigated in sufficient scope and detail to permit an	The NRC staff agrees that technical criteria can be developed to consider potential hazards from distant volcanoes early in the screening process. RG 4.26 has been revised to better leverage the information developed from the Part 100 site characterization program to determine if additional consideration is warranted for hazards from volcanoes >320 km (200 mi) of a proposed site. Figure 1 was

		adequate evaluation of the proposed site...permit adequate engineering solutions to actual or potential geologic and seismic effects at the proposed site. The size of the region to be investigated and the type of data pertinent to the investigations must be determined based on the nature of the region surrounding the proposed site. ...each applicant shall investigate all geologic and seismic factors (for example, volcanic activity) that may affect the design and operation of the proposed nuclear power plant...” [excerpted from 10 CFR 100.23(c)]. The US Geologic Survey (USGS) regularly updates their publication, “National Volcanic Threat Assessment,” including the most recent update in 2018 [https://pubs.er.usgs.gov/publication/sir20185140]. The USGS systematically evaluates the potential hazards posed by 165 individual volcanic features across the US, including territories. Of those 165 features, 48 are locatedin ten western states; ranging from 1 each in Colorado, Nevada, and Wyoming, to 14 in Oregon. Using the aviation planning tool Great Circle Mapper (gcmap.com) and the 2018 report Appendix longitude data of each feature, the eastern edge of a 400 mile (644 km) radius from the three easternmost features depicted in Figure 6 of the 2018 update was generated. This effort found that no sites in the continental US east of 98 degrees 30 minutes W longitude (roughly the longitude of Wichita Falls, TX) were included within the above parameters. This result corresponds with the academic literature regarding volcanism in the central and eastern US; the consensus being that volcanic activity ceased long before the 2.6 million years ago (2.6 Ma) interval discussed by the Staff. Even recent literature regarding the youngest volcanic features in the CEUS [Mazza, et. al. DOI: 10.1130/G35407.1] found that these features date to at least 47 Ma. The relevant Title 10 regulations apply uniformly to all sites within the jurisdiction of the NRC. As the proposed Regulatory Guide is an appropriate tool to provide guidance to	also updated to reflect the evaluation of the Part 100 geologic site characterization information as an initial screening criteria. The applicant typically conducts a geological characterization of the region extending 320 km (200 mi) from a proposed site. Quaternary volcanoes within this region indicate the need to consider potential hazards from future eruptions of these volcanoes or volcanic systems. Nevertheless, some large Quaternary volcanoes might be located >320 km from the proposed site, and might have the potential to produce hazards. To evaluate these hazards, RG 4.26 has been revised to rely on the more detailed geological information collected as part of site characterization within the 40 km vicinity of the site. A volcanic hazards assessment is warranted for a Quaternary volcano located >320 km from the propsed site if there are Quaternary deposits from the volcano located within 40 km (25 mi) of the proposed site. Thus, a volcanic hazards assessment is warranted if the site characterization determined that either i) a Quaternary volcano is located within 320 km of a proposed site, and/or ii) deposits from a Quaternary volcano more than 320 km away from the proposed site occur within 40 km of the proposed site.

		potential applicants on this topic, it would be in the interest of the public, NRC, and applicants to, with sound scientific basis, specifically delineate the region of the continental United States in which this particular hazard does not apply and thus, applicants are not expected to prepare, nor Staff review, any application content regarding volcanic hazards. NEI Recommendation: Use the USGS "National Volcanic Threat Assessment," as a technical basis to state in the Regulatory Guide that applications for sites located in the continental US east of 98 degrees 30 minutes W longitude do not have to prepare application content regarding volcanic hazards. Referencing the USGS "National Volcanic Threat Assessment," in defining the region of interest is in keeping with the NRC Principles of Good Regulation of regulatory clarity and efficiency. Applications for proposed sites west of 98 degrees 30 minutes W longitude and all US territories would be expected to use the USGS "National Volcanic Threat Assessment," to characterize the volcanic threat, if any, and then address volcanic hazards in their application with the contents of the proposed Regulatory Guide offering one acceptable process to prepare such application content.	
NEI #3	General	The DG states that the NRC staff relied heavily on detailed information in IAEA-TECDOC-1795 and SSG-21. While this may provide useful insights, there are a number of technical areas that are not aligned with the NRC approach to regulate other external events and/or are not consistent with a risk-informed approach. For example, the IAEA-TECDOC-1795 look at 10 million years to identify hazards does not align with NRC's use of 2.6 million years in DG-4028. Application of the IAEA guidance in its entirety would result in excessive conservatism and could preclude the ability to site advanced reactors in much of the western United States. NEI Recommendation: The NRC should avoid referencing IAEA-TECDOC-1795 and SSG-21, since there are portions of	Although DG-4028 relied, in part, on information in both IAEA SSG-21 and TECDOC-1795, use of selected technical information from these documents does not constitute endorsement by NRC of non-cited information. The NRC staff clarified the text in RG 4.26 on this point. Some text in RG 4.26 section on "Consideration of International Standards" has also been revised to further clarify important distinctions between the methods proposed in IAEA SSG-21 and RG 4.26.

		those guidance documents that are inconsistent with the NRC approach to regulating other external events. If the NRC references IAEA-TECDOC-1795 or SSG-21, it should be limited to areas where they are consistent with the NRC regulation of other external events.	
NEI #4	General	In several areas, the draft guide uses subjective criteria, for example: (1)Pg. 9, 2nd paragraph under Harmonization...: the stepwise approach uses available information to conduct a screening evaluation (2)Pg. 11, Figure 1, which simply ends if risk insights are developed and plant performance is acceptable. (3)Pg. 13, under Step 3: evaluated to determine whether the total system performance would be acceptable for volcanically induced failures. Similar statement on pg. 17, 2nd paragraph. (4)Pg. 14, 1st full sentence: shows that the potential volcanic hazards did not significantly affect safety, then additional analyses would not be warranted. While subjective criteria is not as straightforward for an applicant or reviewer, as we've learned with the defense in depth assessment for emergency planning zones (EPZ), a subjective approach may be the best option in some cases. NEI Recommendation: Provide some guidance for what would be acceptable to meet these criteria:(1) The use of available information could eliminate the need to develop a model (conceptual model of tectono-magmatic processes).(2) and (3) Should allow for complete SSC failure if response of other SSCs or plant is acceptable. (4) "Significantly affect safety" could be judged by comparison to meeting the safety goals.	1) The NRC staff did not make any changes based on this comment since this is a statement of what IAEA recommends, not what the NRC is proposing in its RG. 2) RG 4.26 includes revised text and a new Figure 1 that provide further clarification of what would be considered acceptable to complete the analysis at step 3, or proceed to step 4, 6 or 7. 3) As with the previous comment, there a significant revisions to Step 3 to provide additional clarification. 4) The NRC staff did not make changes to this particular sentence but the overall changes to the text provide additional clarification.
NEI #5	Section B, Overview of	Hydrothermal proximal hazards is only mentioned once in this document without any guidance on acceptable modeling of this volcanic phenomenon. The DG states that the NRC staff relied heavily on detailed information in IAEA-TECDOC-1795, but this	The NRC staff determined that some volcanic hazards, such as hydrothermal volcanic hazards, are expected to be restricted to within 40 km (25 mi) of a volcanic vent. Consequently, if a proposed site is greater than 40 km (25 mi) from a Quaternary volcano or potential volcanic vent, the volcanic hazards assessment

	Volcanic Hazards, Other Proximal Hazards, Page 6	document identifies hydrothermal activity as the one phenomenon without a practicable model (see Conclusion, page 189, 2ndparagraph). The DG needs to provide specific modeling guidance on hydrothermal hazard evaluation. NEI Recommendation: Specify one or more acceptable methodologies for an applicant to evaluate hydrothermal volcanic hazards.	would not need to consider hazards from avalanche/landslide/slope failure, missiles, gases and aerosols, atmospheric phenomena (e.g. lightning), ground deformation, hydrothermal systems and groundwater effects. If a proposed site is located less than 40 km (25 mi) from a Quaternary volcano, or potential volcanic vent, then pre-licensing interactions would be needed to determine the appropriate scope of the VHA for proximal hazards. The Section B, Discussion, of the revised guide includes a new subsection that addresses the consideration of proximal hazards.
NEI #6	Section B, Risk Informed Regulation, Page 8	The section titled “Risk Informed Regulation” ends with the following statement: “The significance of the volcanic hazards assessment could then be determined using the suite of information available to support risk-informed decision-making (i.e., items a–e in SECY-98-144).” The items in SECY-98-144 are denoted with numbers, so it is not clear which items are being referenced here. NEI Recommendation: Revise the reference for clarity. Also, given the discussion of risk significance supporting risk-informed performance-based licensing basis development in RG 1.233, there is an opportunity to include recognition of the potential use of this reference as well.	RG 4.26 clarifies that items a through e are from concept #5, “Risk Informed Approach” in SECY 98-144.
NEI #7	Section B, Senior Seismic Hazards Analysis Committee Study Guidelines, Page 9	NRC staff guidance for SSHAC study level uses qualitative adjectives “low-level,” “modest,” “high confidence,” “straightforward,” “intermediate,” “modest,” “moderate confidence,” “potentially large,” “potentially significant,” “moderate-to-low confidence,” etc. NEI Recommendation: To the extent that this guidance may be modelled on the SSHAC process, clarify by specific quantification and detailed definition the adjective descriptors used in staff guidance for SSHAC study level. For example, a low-level source term is one which would not exceed the 1 rem Total Effective Dose Equivalent (TEDE) Protective Action Guide (PAG) at the EPZ plume exposure distance.	The NRC staff note that the SSHAC guidance was purposefully written with qualitative adjectives to maximize flexibility for application to a variety of hazard assessments and types of facilities, and to be applied both domestically and internationally. The context referred to in the suggestion pertains to the choice of appropriate SSHAC study levels and, although mentioned as an example on RG Page 12, source term is not the only factor to be considered in selection of a study level (see NUREG-2213 Section 3.2.1 for discussion of the various factors for choosing a SSHAC study). Providing a specific quantification and detailed definition needlessly restricts the flexibility of SSHAC study level application and consideration of other determination factors. The staff provided brief clarifying text in the RG that i) explains the flexibility of the SSHAC guidelines and that they can be beneficially applied for various types and

			completeness of information available, tailored to a facility and location; ii) reminds that the SSHAC guidelines are a practical, approved method but are not legally binding or regulations; and iii) encourages pre-application interactions with NRC for choosing the level of study, if a SSHAC process is used (NUREG-2213 Section 2.6.16, "The regulator should have input into the choice of the SSHAC study level…"). Specifically, RG 4.26 refers to NUREG 2213 Sections 2.5, 3.1, and 3.2; note that the factors are meant to be subjective and are dependent on qualitative factors. Staff also added a brief explanation of the purpose and potential outcomes that can be expected of a SSHAC used to assess volcanic hazards.
NEI #8	Section B, Senior Seismic Hazards Analysis Committee Study Guidelines, Page 9	The Level 1 SSHAC is defined as having a "high confidence in the completeness and accuracy of the geologic record." It is not clear what "high confidence" is when the recommended volcanic assessment covers the Quaternary Period, defined as the geologic timeframe ranging from 2.6 million years ago. NEI Recommendation: Define per Comment No. 7,above, and consider changing to "moderate confidence."	The response to this comment is similar to the previous response to Comment #7. Qualifiers are used to allow flexibility; however, SSHAC Level 1 studies are to be used in situations where there is high confidence that the driving factors for hazard are well understood and uncertainty is low (i.e., there are not significantly conflicting models or interpretations, or sites may be "data rich.") In other words, the "center" of the center, body, and range of technically defensible interpretations is easily defined and well understood. Higher levels of SSHAC are required when uncertainties are larger in order to fully capture the body and range. In addition, NUREG-2213 specifies that higher levels of SSHAC are needed when additional stability of the hazard is needed (i.e., the numerical results of the hazard analysis should be expected to remain stable for a reasonable period of time after the completion of the hazard study; for example, to support a licensing basis). As with the resonse to Comment #7, the staff added clarifying text to refer to NUREG-2213 Sections 2.5, 3.1, and 3.2 and Figure 2-1 (center, body and range diagram) in RG 4.26. Additionally, the staff emphasizes the need for pre-application meetings with NRC if use of SSHAC is an option. The text in RG 4.26 was updated accordingly.
NEI #9	Section B, Harmonization with International Standard	This section does not endorse IAEA requirements for monitoring volcanoes in the U.S. for nuclear reactors, stating that "it does not appear applicable for nuclear reactors in the United States." It goes on to point to the USGS statutory authority and what actions would be taken if there is a perceived gap in monitoring at a proposed nuclear reactor site. These statements are contradictory and confusing. If the	The intent was that individual licensees do not need to monitor volcanoes themselves, as required by IAEA SSG-21, because volcano monitoring is the statutory authority of the USGS. NRC staff revised the text to clarify that prospective applicants should work with the USGS to fill any identified gap in volcano monitoring for a proposed site.

	s, item (3), Page 10	USGS has statutory volcanic activity monitoring authority and IAEA requirements are not applicable, how would there be a perceived gap in monitoring that would be filled in by the USGS? Perhaps the intent was that individual nuclear reactors are not required to monitor volcanoes themselves because the USGS performs this role nationally. The USGS fulfilling this role (including regular publication of their, "National Volcanic Threat Assessment") meets NRC requirements for volcano monitoring. NEI Recommendation: Revise the statements in item (3) on page 10 to explain the role, authority, requirements, and acceptability of USGS volcanic monitoring as applied to U.S. commercial nuclear reactor sites being proposed. Delete "If there is a perceived gap in monitoring activities at a proposed commercial nuclear reactor, the U.S. Geological Survey will fill that gap."	
NEI #10	Figure 1, Page 11	Step 1 should be consistent with Step 1 in the text. NEI Recommendation: Please refer to Step 1 in the Figure as "Perform Initial Characterization."	Step 1 has been revised in both the text and Figure 1 and is now titled, "Evaluate Site Characterization Information."
NEI #11	SectionC, Page 12, Step 1, Paragraph 2	The draft guidance states: "For the purpose of the initial evaluation of potential hazards from volcanic ash falls, the region of interest for the volcanic hazards assessment should extend a sufficient distance beyond 320 km (200 mi) to encompass those Quaternary volcanic systems that have the potential to affect the design or operation of the proposed reactor." This leaves a lot of ambiguity surrounding the sufficient distance to consider ash fall a potential hazard. NEI Recommendation: Suggest the guidance characterize volcanic hazard regions of effects to determine the areas where they need to be considered, e.g., using the USGS "National Volcanic Threat Assessment," rather than the current draft guidance to search for hazards based on distance from the site selected.	The response to this comment is incorporated in the response to NEI comment #2. Potential hazards from a Quaternary volcano >320 km (200 mi) from a proposed site only need to be considered if Quaternary volcanic deposits from this volcano occur within 40 km (25 mi) of the proposed site. This is also reflected in Figure 1.

NEI #12	Section C, Page 12, Step 1, Paragraph 3	In performing initial characterization, when there is evidence of Quaternary volcanism in the regions of interest, a conceptual model of tectono-magmatic processes is recommended to be developed to determine how past patterns of volcanism should be projected to estimate future activity. It is unclear whether a 2D or 3D model is required, or if applicants need to use LaMEM, FDSTAG, or other software to prepare the model. NEI Recommendation: Provide reference(s) of acceptable models and examples of use and applicability.	The text in RG 4.26 was enhanced to further explain that a conceptual model provides a series of technical rationale to determine if all Quaternary volcanoes in the site region warrant analysis in the volcanic hazards assessment. This model provides a framework to determine if the large-scale tectonic and magmatic processes that controlled volcanism during the Quaternary Period can be reasonably extrapolated to evaluate the likelihood of future volcanic activity. A numerical model is not required to develop this conceptual understanding. Examples of tectono-magmatic conceptual models are cited in RG 4.26.
NEI #13	Section C, Page 12, Step 1, Paragraph 4	The draft guidance states: “The hazard analysis can screen out volcanic systems that are not consistent with the tectono-magmatic model. This screening, however, is dependent on establishing sufficient confidence in the underlying technical basis showing that future volcanism is not a credible event.” This suggests that future reactors will need an increased burden of proof over the existing fleet (excluding Columbia) to screen volcanic hazards. Additionally, the term, “sufficient confidence,” though followed by one example, is ambiguous and subject to a wide range of interpretation by applicants and NRC reviewers. NEI Recommendation: The guidance should provide more flexibility to screen volcanic hazards without this model in places where: 1. nuclear facilities already exist, 2. entire regions (e.g. the eastern United States) where consideration of volcanic hazards is excluded based on the USGS, “National Volcanic Threat Assessment,” and 3. locations where there are no significant proximal volcanic hazards. Suggesting that a tectono-magmatic model is required for those areas is counter to a risk-informed performance-based approach. Clarify with a specific quantifiable definition what is meant by sufficient confidence.	The revised guidance clarifies that a geologic analysis, engineering analysis, and operational considerations may all contribute to the screening of volcanic hazards at the site. The flexibility of the approach to perform a volcanic hazards assessment, engineering analysis or consider site operations to screen volcanic hazards is also shown in revised Figure 1 and the accompanying text. The revised guide also clarifies that proximal hazards would only need to be considered for sites located in distributed volcanic fields with the expectation that proximal hazards from volcanoes would not need to be considered since the NRC does not anticipate proposed reactor sites within 40 km (25 mi) of the central vent of a Quaternary volcano. This is described in a new section on the consideration of proximal hazards.

NEI #14	Section C, Page 13, Step 2, Paragraph 1	"...volcanoes in the region of interest are consistent with the tectono-magmatic model..." lacks the same clarity addressed in Comment No. 12on Step 1. NEI Recommendation: Once the acceptable type(s) of models have been provided in Step 1, provide a reference here back to that section.	Response to this comment is the same as to NEI comment #12.
NEI #15	Section C, Page 13, Step 2, Paragraph 1	Quantify what "credible" means. "...credible distance...credible phenomena..." NEI Recommendation: Credible is defined as an annual frequency of occurrence of ≥1 x 10-5 per year in Section 6-2.3 of the ASME/ANS PRA Standard.	The term "credible" in DG-4028 is used in its common English context, that is: "offering reasonable grounds for being believed" (Oxford-Merriman Dictionary). Its usage does not imply any metric of frequency. Additional discussion of DBE and BDBE sequences for volcanic hazards were added to RG 4.26 to provide additional clarity on the credibility of a future volcanic event.
NEI #16	Section C, Page 13, Step 2, Paragraph 4	The draft guidance states: "...the screening analysis should evaluate..." NEI Recommendation: An example of a representative screening analysis should be provided as a "go-by" reference.	The revised guide includes numerous clarifications on what a suitable screening analysis would entail such that an example analysis is not necessary. Additionally, the NRC does not typically provide example analyses in regulatory guidance and so has not included one here.
NEI #17	Section C, Page 14, Step 3	The term "beyond-design-basis event" is used with no definition. NEI Recommendation: Recommend including a metric for beyond-design-basis event based on probability of occurrence; for example, RG 1.233 and NEI 18-04, define beyond-design-basis event as event sequences with mean frequencies of 5×10-7/plant-year to 1×10-4/plant-year.	As discussed in response to NEI Comment #1, the NRC staff revised the guide to better incorporate the concepts and definitions in RG 1.233. These revisions in the "Risk Insights" discussions in RG 4.26 make a clear distinction between DBE and BDBE for event sequences initiated by potential volcanic hazards.
NEI #18	Section C, Page 18, first sentence	Typo: "IAEA-TECCOC-1795" NEI Recommendation: Revise to "IAEA-TECDOC-1795"	Staff revised RG 4.26 to correct this typo.
NEI #19	Section C, Page 18, Step 7,	This section requires a robust technical basis for the amount of time available for mitigative actions, but in the same paragraph, acknowledges that considerable uncertainties exist in any such predictions based on historical data. There is no specification of how a reviewer or applicant can provide a robust technical	The staff replaces "robust" with "practicable" in the discussion of mitigative actions and expanded the discussion on potential mitigative actions to clarify the need for an applicant to demonstrate that the proposed mitigative actions are practicable. The text in RG 4.26 was enhanced to better explain the concept of "practicability," such as the development of action levels based on volcano monitoring

	Paragraph 2	basis. This section identifies “appropriate monitoring resources” to accommodate these uncertainties without defining what is “appropriate.” USGS monitoring is sufficient and no additional monitoring from the site is needed. NEI Recommendation: Considering the effort to be risk-informed, specify acceptable methodologies and appropriate monitoring resources for providing a robust technical basis to estimate the amount of time available for mitigative actions. NRC should work with stakeholders to determine an appropriate process for receiving timely information from the USGS on volcanic activity from sources that could impact a plant.	information, rationale for accomplishing mitigative actions in allotted time, and inclusion of actions in appropriate operation plans.
NEI #20	Section C, Page 18, Step 7, first bullet	The first bulleted item in Step 7 indicates monitoring resources are established to provide early indication of potential eruption, yet item (3) on page 10 states, “if there is a perceived gap in monitoring activities at a proposed commercial nuclear reactor, the U.S. Geological Survey will fill that gap.” See Comment No. 9. Here it is implied the plant is responsible, at least in part, for its own monitoring activities; however, USGS monitoring is sufficient and no additional monitoring from the site is needed. NEI Recommendation: NRC should work with stakeholders to determine an appropriate process for receiving timely information from the USGS on volcanic activity from sources that could impact a plant.	The general process for notifications of an impending volcanic event or hazard is that the local civil protection would be responsible for notifying the affected areas once the USGS issues a notification. The USGS Volcano Hazards Monitoring Program also has a notification system (https://volcanoes.usgs.gov/vhp/notifications.html) that can be used by applicants or licensees for additional information on volcanic events. The staff revised the guide to reflect this information.
NEI #21	Consideration of Alternative Sites, Page 20	This section states that if the outcome of the volcanic hazards assessment indicates that volcanic hazards are beyond the facility’s design basis and cannot be mitigated effectively, then alternative sites should be investigated. This does not appear to accurately reflect the general approach for addressing external events. We would expect that an applicant would use an assessment to understand hazards and ensure the design protects against those hazards. An applicant always has the option to select a more suitable site. This section is	The section on consideration of alternative sites has been deleted and Figure 1 revised accordingly.

		unnecessary; if the plant is unable to achieve acceptable results, then the applicant will not pursue a site that would not be approved in the NRC safety review. NEI Recommendation: Delete the section on Consideration of Alternative Sites. If the staff wish to retain this section, work with stakeholders to clarify that this is not related to the alternatives analysis required per §51.50(b) or (c). The focus of this guidance is volcanic hazards assessment as an input to the safety review.	