Response to Public Comments on Draft Regulatory Guide DG-4030, "Use of ARCON Methodology for Calculation of Accident-Related Offsite Atmospheric Dispersion Factors" Proposed New Regulatory Guide 1.249

On August 17, 2021, the U.S. Nuclear Regulatory Commission (NRC) published a notice in Volume 86 of the *Federal Register* (FR) (86 FR 46024) announcing the availability for public comment of Draft Regulatory Guide (DG)-4030, "Use of ARCON Methodology for Calculation of Accident-Related Offsite Atmospheric Dispersion Factors," for new Regulatory Guide (RG) 4.28. The public comment period ended on September 16, 2021. It should be noted that, after further consideration of the applicability of this RG, the staff decided that it is more suitable to be listed under the RGs of Division 1, "Power Reactors." As a result, the RG number was changed to RG 1.249, using the same RG title, instead of being listed under Division 4, "Environmental and Siting," as RG 4.28. The NRC received comments from the following organizations.

Commenter Name and Organization	**Agencywide Documents Access and Management System (ADAMS) Accession No.**
Marsha Kinley Duke Energy	ML21273A156
Delaney Simmons Kairos Power	ML21272A286
T.M. Cook Tennessee Valley Authority (TVA)	ML21272A285
Richard Gropp Exelon Generation Company, LLC	ML21272A287
Ray Schiele TVA	ML21272A350

The table below shows the public comments and the NRC staff's responses.

Commenter	**Section**	**Specific Comments**	**NRC Resolution**
T.M. Cook (TVA)	2.1.1 Page 9	In Section 2.1.1. Onsite Meteorological Data, recommendations for meteorological data collection is presented. Regarding wind direction data, there is no specification on whether the parameter should be collected as a scalar or vector average (or both). Further guidance is requested.	The NRC staff agrees with this comment and added a sentence to Section 2.1.1 stating that wind direction should be recorded as discussed in RG 1.23 and its supporting documentation (ANSI/ANS-3.11-2005).
Delaney Simmons (Kairos)	2.2.1 and 2.2.2 Page 11	Section 2.2.1 on page 11 and Section 2.2.2 (page 12) imply what PBA is, but a clear definition of PBA should be provided.	The NRC staff agrees that a clear definition should be provided. After consideration, the staff changed the term

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			"power block area (PBA)" to "nuclear island." This term is more consistent with those used in previously reviewed applications.
Delaney Simmons (Kairos)	C.2 Page 8	A performance metric should be developed for when site atmospheric transport and diffusion conditions are not suitable for application of the dispersion algorithms in ARCON, rather than deterministically excluding Alaska and Hawaii from the applicability of ARCON.	No change is needed. This RG does not exclude any areas from consideration but rather acknowledges that the existing models may not be applicable to certain sites.
Delaney Simmons (Kairos)	C.2 Page 8	This section is written for design certifications and may not apply to construction permits. This section should be graded in two dimensions: 1. Construction permit vs. design certification, and 2. Test reactors vs. power reactors.	The NRC staff agrees in part and has added a statement under Applicable Regulations to address advanced and test reactors.
Delaney Simmons (Kairos)	2.1.1 Page 9	There should be a graded approach for meteorological data expectations between power reactors and test reactors.	No change is needed, as this RG is consistent with both existing and draft guidance related to meteorological data sets for power, test, and advanced reactors. This RG provides a graded approach for meteorological data, as it provides guidance for the use of both onsite and alternative data, as described in Sections 2.1.1 and 2.1.2.
Delaney Simmons (Kairos)	2.1.2 Page 9	There should be a graded approach for technical detail expectations when using alternative meteorological data between power reactors and test reactors.	No change is needed. This RG provides a graded approach for meteorological data expectations for both onsite data and alternative data in Sections 2.1.1 and 2.1.2. The guidance provided is just one way to meet the NRC regulations and is applicable to any type of reactor that meets the applicability statement, which includes both power and test reactors.
Delaney Simmons (Kairos)	2.1.2 (last paragraph) Page 11	There should be a graded approach for meteorological data expectations between power reactors and test reactors.	No change is needed. This RG provides a graded approach that is consistent with both existing and draft guidance related to meteorological data sets for power, test, and advanced reactors. The guidance provided is just one way to meet the NRC regulations and is applicable to any type of reactor that meets the applicability statement, which includes both power and test reactors.
Delaney Simmons (Kairos)	2.1.2 (last paragraph) Page 11	Is 5 years of weather data necessary to have confidence in the representativeness of data to determine 95th percentile and 99.5th percentile X/Q per RG 1.145?	This regulatory position shows that the staff finds 5 years of offsite data acceptable because of the uncertainty in using meteorological data from a system that does not follow RG 1.23. RG 1.23 provides guidance to develop an onsite meteorological monitoring system that ensures high data quality. Five years of data provide confidence in

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			meteorological data collected from systems with different design specifications.
Delaney Simmons (Kairos)	2.1.2 (last paragraph) Page 11	The “relatively short time scale” of 5 years is long when compared to the number of hours to calculate 99.5th percentile X/Q. 5 years is also longer than the time scale requirements for onsite monitoring in RG 1.23. It is unclear why the staff considers 5 years to be a relatively short time scale.	The use of the phrase “relatively short time scale” is referring to the remainder of the sentence, which reads “...added attention should be given to the comparison between the offsite station(s) and the conditions at the site, as discussed above in Sections 2.1.2(f) and 2.1.2(g) of this RG.” The comparison between onsite data and offsite data usually involves long-term data justifying the representativeness of the onsite data (see NUREG-0800, Section 2.3.2, Subsection III(1), and RG 1.70, Section 2.3.3). Previously the staff and industry have interpreted “long term” to mean a climate normal period of 30 years or longer. Since, in the case of Section 2.1.2 of this RG, there is no comparison to onsite data, 5 years is both a relatively short time and will be considered representative of the conditions at the site.
Delaney Simmons (Kairos)	2.1.2 (last paragraph) Page 11	Should 2.1.2(6) and 2.1.2(7) be 2.1.2(f) and 2.1.2(g), respectively?	The NRC staff agrees and has made the edits as suggested.
Delaney Simmons (Kairos)	2.3.2 Page 15	An acceptable method using a single code (i.e., ARCON) should be provided.	The existing versions of ARCON are not able to model plume rise and do not appear to adequately estimate effluent concentrations at the bases of industrial stacks. The staff recognizes the shortcoming of modeling this rare, but plausible, scenario and has provided this method as an alternative. This mirrors the same control room intake configuration as in RG 1.194.
Delaney Simmons (Kairos)	Appendix A Page A-1	In Section 3.7 of NUREG/CR-6331, the larger of the 1-hr and 2-hr averaging interval is used for the 0-2 hr period.	The NRC staff agrees with this comment and updated the RG text to recommend that the 1-hr X/Q be used, as is consistent with RG 1.145 and will usually be the most conservative method. The staff also added that NUREG/CR-6331 recommends that the larger of the 1-hour or 2-hour averaging periods should be used but that this is likely to only apply under certain circumstances.

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Richard Gropp (Exelon)	Background Page 6	Under the Background section (Page 5), last paragraph, last sentence, Exelon recommends inserting a period "." at the end of the sentence.	The NRC staff agrees with this comment and made the editorial change.
Richard Gropp (Exelon)	2.1.1 Page 9	Section 2.1.1 (Page 8) states "…data should meet the 90-percent recovery criterion…." Exelon recommends inserting "RG 1.23" before "90-percent" for clarity purposes.	The NRC staff agrees with this recommendation and made the corresponding change to the RG text.
Richard Gropp (Exelon)	2.1.1 Page 9	Section 2.1.1 (Page 8) provides guidance related to the minimum amount of onsite meteorological data that is significantly different than the guidance in RG 1.194. Exelon believes that this change in guidance should also be applicable to RG 1.194. Therefore, does the NRC plan to revise RG 1.194 to incorporate the relevant changes made in DG-4030?	The NRC staff expects to update RG 1.194 as part of a larger review of atmospheric dispersion guidance documents.
Richard Gropp (Exelon)	2.1.2 Page 9	Section 2.1.2 (Page 8) provides guidance in developing meteorological data from alternative sources that is not found in RG 1.194. Therefore, does the NRC plan to revise RG 1.194 to incorporate the relevant changes made in DG-4030?	The NRC staff expects to update RG 1.194 as part of a larger review of atmospheric dispersion guidance documents.
Richard Gropp (Exelon)	2.2.1 Page 11	Section 2.2 implies that individual ARCON runs will be run for all 16 source-to-receptor sectors. Exelon believes that it would be helpful to include additional guidance related to this, including if this is the preferred approach or if there are alternatives to running all the combinations.	The NRC staff agrees with the comment; however, the current functionality of the ARCON96 and ARCON 2 graphical user interfaces (GUIs) allows only one source-receptor pair to be entered at a time.
Richard Gropp (Exelon)	Section 2.3.4 Page 16	Plants may have safety-related and seismically designed systems that process and release activity at a specific point from a building (e.g., a plant vent). Typical applications of RG 1.194 would include modelling this scenario as a point source at the vent release point, which could be on the roof. Exelon believes that Sections 2.2 and 2.3.4 do not seem to address this scenario and further clarification might be beneficial.	The NRC staff agrees with the comment and added clarifying text to Section 2.2.1 of the RG. If there is a known location within the bounds of a building, that would also be an acceptable method.

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Richard Gropp (Exelon)	2.3.4 Page 16	The use of point sources on the edge of a building closest to the exclusion area boundary (EAB) or low population zone (LPZ) in a given sector is considered conservative. However, the approach in Sections 2.2.1 and 2.2.2 do not provide any guidance related to robust structures that may be seismically qualified and safety-related. Exelon believes that a robust structure of this design that does not have an engineered release point on the surface should be modeled as a diffuse area source. Guidance for this situation is provided in RG 1.194, Section 3.2.4, and should also be applicable in this new RG as well.	The NRC staff agrees with the comment and added a discussion in RG Section 2.2.1 pointing to Section 2.3.5 and RG 1.194 for more details on diffuse area sources. The staff also added that, for some situations, it may be more appropriate to use a diffuse area source.
Richard Gropp (Exelon)	2.3.2 Page 14	The ARCON calculation process to address multiple sources, for all 16 sectors, including determining the 99.5th percentile X/Q values for the various time periods may be a challenge to implement.	The NRC staff agrees with the comment and recognizes the challenge of needing multiple ARCON runs for an analysis. However, the current functionality of the ARCON96 and ARCON 2 GUIs allows only one source-receptor pair to be entered at a time.
Richard Gropp (Exelon)	2.3.4 and 2.3.5 Page 16	Sections 2.3.4 and 2.3.5 (Page 15) describe modeling the source as a point or a point in the center of a diffuse area source. The guidance in Sections 2.2.1 and 2.2.2 describe modeling the source to receptor as distances from edges of buildings from which radioactive material could potentially be released. Section 2.2.2 provides a useful option for the analyst to explicitly evaluate the effects from individual release points. However, Figure 2-2 assumes that all buildings release radioactivity. Exelon believes that a better example of Figure 2-2 may be to include some buildings that do not release radioactivity.	The NRC staff does not agree with the comment that the figures should include buildings that do not release radioactivity. Sections 2.3.4 and 2.3.5 suggest that the closest point along the edge of the applicable building be used. The staff does not include nonradiological buildings in Figure 2.2 since those are not the buildings of concern. Adding in nonradiological buildings would clutter the image and might lead to confusion.
Richard Gropp (Exelon)	Appendix A Page A-3	Appendix A does not include examples on calculating the X/Q time intervals beyond 2 hours. ARCON methodology determines these by a weighted combination of the two applicable X/Q values. Exelon believes providing an example of calculating the 99.5th percentile for the time intervals beyond 2 hours, including equations and the procedure, is needed to ensure the analyst performs the calculation according to approved guidance.	The NRC staff agrees with this comment and revised the text to state that other averaging periods can be calculated using the .CFD example and ARCON output files.

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Ray Schiele (TVA)	Background Page 6	This Draft RG does not mention the short-term dispersion estimates for an environmental report. NUREG-1555 and RG 4.2 address the 50th percentile X/Qs for the design basis accident evaluation in an environmental report. This guidance should address ARCON as an acceptable methodology for calculation of 50th percentile atmospheric dispersion factors for an environmental report.	The NRC staff does not agree that this RG should also address the atmospheric dispersion factors for an environmental report. The focus of this RG is on design-basis accident dispersion factors, rather than the nominal meteorological conditions considered in NUREG-1555. However, the same data and assumptions used in Appendix A to this RG may be useful for estimating the 50-percent X/Q value.
Marsha Kinley (Duke)	Discussion Page 6	DG-4030 states that only the user interface was updated in ARCON 2.0, and not the algorithms. However, the ARCON 2.0 User Guide (Figure 2.8) and NRC RAMP response (11/12/2020, ATM_HelpResource@nrc.gov from Kerstun Norman) to inquiry from Duke Energy (Marsha Kinley) both indicate that ARCON 2.0 allows the user to select either ARCON96 or RASCAL diffusion coefficient adjustments. a. Recommend adding to DG-4030 the NRC's preference or guidance on use of either ARCON96 or RASCAL diffusion coefficients for setup of ARCON 2.0.	The NRC staff agrees with the comment and added a sentence to the background section to read, "Although the ARCON 2 model includes an option to use RASCAL diffusion coefficients (NUREG-1940), this guidance is applicable to only the ARCON96 diffusion coefficients provided in RG 1.194."
Marsha Kinley (Duke)	Discussion Page 6	b. Recommend explaining the differences of selecting either ARCON96 or RASCAL diffusion coefficients in the ARCON 2.0 User's Guide and/or in DG-4030. Only minimal information is available from NUREGs on RASCAL and related presentations:	The text includes references to both the RG 1.194 and NUREG-1940 dispersion coefficients. No change to this RG is needed, since this guidance is only to be used with ARCON96 dispersion coefficients.
Marsha Kinley (Duke)	Discussion Page 6	Where is the full content of ARCON 2.0 User's Guide available? The ARCON 2.0 documentation from the NRC's RAMP website only provides chapter 2 of the user's guide, but the reader is referred to chapter 3 for more information on diffusion coefficients. Are chapter 3 and the full content of the ARCON 2.0 User's Guide available to the public?	The NRC staff agrees with this comment that the previous version of the ARCON 2.0 User's Guide was organized in a manner that could be confusing. The User's Guide has been updated and is available through the RAMP Web site (ADAMS Accession No. ML22004A219).
Marsha Kinley (Duke)	2.2.1 Page 11	Will use of the conservatively shorter EAB and LPZ distances measured from closest powerblock building(s) as proposed in DG-4030, instead of actual release point(s), set a precedence to then require updating an existing facility's EAB and LPZ distances for licensing bases? Are revisions to station procedures, UFSAR, and ODCM (etc)) needed to agree with the shorter distances to EAB and LPZ	The NRC staff does not intend to use the guidance in this RG to support actions in a manner that would constitute backfitting. The staff added a sentence to Section 2.2.1 stating that it is also acceptable to use known release point locations rather than the closest edge of the building. Use of this method may further inform the location of offsite sampling locations for Radiological Environmental Monitoring

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		used per the DG-4030 method? Will this also impact selection of offsite sampling locations for REMP programs?	Programs (REMP) but in a way consistent with existing procedures.
Marsha Kinley (Duke)	2.4 Page 17	Clarify whether ARCON (CFD output) or PAVAN is preferred to determine the 99.5 percentile max sector X/Q. Suggest revising text in (2.4). • (2.4) states that ARCON does not calculate the 99.5 percentile max sector X/Q, but PAVAN does. • (2.4.2) states that ARCON CFD output file can be used to calculate the 99.5 percentile X/Q for any sector.	The NRC staff is not stating a preference for either PAVAN or ARCON to determine the 99.5th-percentile maximum sector X/Q. This RG only provides an additional acceptable method.
Marsha Kinley (Duke)	Appendix A Page A-3	The result in Appendix A example for the 99.5th percentile X/Q value of 1.97E-03 is not reproducible. Verify that values given in the example are correct and show the values for all input variables. a. What is the value for the total number of hours (Htotal) in this example? b. There is a typo either on page A-2 or A-3 for the lesser % exceedance value in the example. Two different values are stated for the lesser % exceedance. Verify the correct value and edit the text of Appendix A accordingly.	The NRC staff agrees with this comment and has made the following changes to the text: (a) H_{Total} is 8,750 for this example. (b) The text has been updated to now recommend that the 1-hr X/Q value be used for most cases. The staff has corrected and clarified the example numbers.
Marsha Kinley (Duke)	General Comment Page 1	Why is NRC proposing to create a new Regulatory Guide 4.28 in the “Environmental and Siting” division (DG-4030) rather than revising the existing Reg. Guide 1.145 in the “Power Reactors” division? It appears that the proposed alternative use of ARCON 2.0 for DBA offsite impacts is applicable to both existing and future nuclear power facilities, as long as EAB and LPZ distances are less than 1200m. Why was revision of RG 1.145 not considered as an option in the Regulatory Analysis for RG 4.28 (NRC-2021-0133-0003_content.pdf)? Recommend revising RG 1.145 to include the proposed alternative method presented in DG-4030 for calculating accident related offsite atmospheric dispersion factors (e.g. suggest adding an appendix to RG 1.145 for the proposed alternative method), instead of creating a new RG 4.28. Creating multiple guidance documents on the same topic for different methods will ultimately confuse the regulatory	The NRC staff agrees, in part, with this comment. The RG number was reassigned to the Power Reactor division and will be RG 1.249. Updating RG 1.145 was considered an alternative option, since it is also used to determine design-basis accident (DBA) offsite impacts. However, since this RG uses ARCON rather than PAVAN, and includes different dispersion assumptions, it may have been confusing to combine the two approaches into one guide.

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		guidance for the industry and increase NRC costs to maintain separate documents.	