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July 30, 2002
Contract No. NRC–02–97–009
Account No. 20.01402.461

U.S. Nuclear Regulatory Commission
ATTN: Dr. John S. Trapp
Office of Nuclear Material Safety and Safeguards
Two White Flint North, Mail Stop 7 D13
Washington, DC 20555

Subject: Completion of Administrative Item—Review of DOE Information Addressing Igneous Activity Key Technical Issue Agreement Item 2.16 (AI 01402.461.272)

Dear Dr. Trapp:

Attached is AI 01402.461.272, entitled "Review of DOE Information Addressing Igneous Activity Key Technical Issue Agreement Item 2.16." This review provides a basis for accepting the DOE response to staff concerns regarding the potential effects of climate change on biosphere dose conversion factors used in volcanic disruption scenarios. Staff conclude that neglecting climate-change effects will not underestimate risk in DOE performance calculations and represents a reasonable approach for the current volcanic disruption scenario. Nevertheless, available data indicate that this approach may not introduce significant conservatism into the risk calculations, as stated in the supporting DOE documentation. If you have any questions, please contact Dr. Brittain Hill at 210-522-6087 or me at 210-522-5183.

Sincerely,

H. Lawrence McKague
Element Manager, GLGP

HLM:rae

Attachment

cc:

J. Linehan	D. Riffle	J. Schlueter	C. McKenney	CNWRA Dirs/EMs (letter only)
W. Reamer	B. Meehan	S. Wastler	J. Anderson	B. Hill
B. Leslie	L. Campbell	T. Essig	W. Patrick	R. Benke
D. DeMarco	J. Greeves	K. Stablein	B. Sagar	T. Nagy (SwRI Contracts)

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NRC Review of DOE Documents Pertaining to Key Technical Issue Agreements

The U.S. Nuclear Regulatory Commission (NRC) goal of issue resolution during this interim pre-licensing period is to assure that the U.S. Department of Energy (DOE) has assembled enough information on a given issue for NRC to accept a license application for review. Resolution by the NRC staff during pre-licensing does not prevent anyone from raising any issue for NRC consideration during the licensing proceedings. Also, and just as importantly, resolution by the NRC staff during pre-licensing does not prejudge what the NRC staff evaluation of that issue will be after its licensing review. Issues are resolved by the NRC staff during pre-licensing when the staff has no further questions or comments about how DOE is addressing an issue. Pertinent new information could raise new questions or comments on a previously resolved issue.

This attachment addresses one agreement between the NRC and DOE made during the Igneous Activity (IA) Technical Exchange and Management Meeting (see letter,[1] which summarized the meeting). By letter,[2] DOE submitted information to address IA Agreement 2.16. The information submitted for this agreement is discussed below:

1) Igneous Activity Key Technical Issue Agreement Item 2.16

Summary: A Letter Report entitled "Climate Change Effects on Disruptive Events Biosphere Dose Conversion Factors," was submitted by the U.S. Department of Energy (DOE) to fulfill Igneous Activity Key Technical Issue Agreement item 2.16. This agreement is for the DOE to provide clarifying information on the basis for neglecting the effects of climate change on biosphere dose conversion factors used in DOE performance calculations of volcanic events. Based on staff review of the Letter Report and other available information, the information contained in this Letter Report appears adequate to satisfy Igneous Activity Key Technical Issue Agreement item 2.16. Staff conclude that the information provided in the Letter Report adequately documents that neglecting the effects of climate change on biosphere dose conversion factors used for volcanic disruption scenarios will not underestimate risk in the resulting performance calculations. Neglecting these effects, however, does not necessarily introduce a significant degree of conservatism in the DOE performance calculations.

Wording of the Agreement: "Document that neglecting the effects of climate change on disruptive event BDCFs (i.e., biosphere dose conversion factors) is conservative. DOE will document that neglecting the effects of climate change on disruptive event BDCFs is conservative in a subsequent revision to the AMRs Input Parameter Values for External and Inhalation Radiation Exposure Analysis (ANL-MGR-MD-000001) and Disruptive Event Biosphere Dose Conversion Factor Analysis (ANL-MGR-MD-000003) or equivalent document. This will be available to the NRC in FY02."

Review: Biosphere dose conversion factors (i.e., BDCFs) are used in performance calculations to convert a radionuclide concentration into units of annual radiological dose. In CRWMS M&O (2001a), biosphere dose conversion factors used for the DOE nominal scenario are affected by postulated

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[1]Reamer,C.W. "U.S. Nuclear Regulatory Commission/U.S. Department of Energy Technical Exchange and Management Meeting on Igneous Activity (June 21–22, 2001)." Letter (June 27) to S. Brocoum, DOE. Washington, DC: NRC. 2001.

[2]Ziegler, J.D. "Transmittal of Report Addressing Key Technical Issue (KTI) Agreement Item Igneous Activity (IA) 2.16." Letter (July 1) to J.R. Schlueter, NRC. Las Vegas, Nevada: DOE. 2002.

effects of climate change. In contrast, biosphere dose conversion factors used for the DOE volcanic disruptive scenario are not affected by postulated effects of climate change, as neglecting these effects is presumed to be conservative (CRWMS M&O, 2001b). Staff asked the DOE to provide documentation supporting the stated conservatism in neglecting the possible effects of climate change on volcanic scenario biosphere dose conversion factors.

Inhalation of contaminated airborne particles is the dominant dose pathway for the volcanic disruption scenario (CRWMS M&O, 2001b). Future climates used in DOE performance calculations are wetter than the present-day climate (e.g., CRWMS M&O, 2000a). As discussed in the Climate Change Effects on Disruptive Events Biosphere Dose Conversion Factors Letter Report, an increase in the frequency, intensity, or duration of precipitation will result in multiple processes that may reduce the concentration of airborne particles. The magnitude of this potential reduction in airborne particle concentration, however, is not specified in the subject Letter Report. Nevertheless, staff can find no credible basis to indicate that airborne particle concentrations will increase in periods of wetter climate, relative to drier climates. Staff agree that neglecting climate-change processes that may potentially reduce airborne particle concentrations is a reasonable approach for current volcanic disruption scenarios, and that implementing this approach will not underestimate risk in DOE performance calculations.

Neglecting the effects of climate change on volcanic biosphere dose conversion factors, however, may not be appreciably conservative, as indicated in CRWMS M&O (2001b). Staff note that basaltic tephra fall deposits at Cerro Negro volcano in Nicaragua received over 4 m [13 ft] of rainfall between 1995–1999 (Hill et al., 2001). Airborne particle concentrations measured over these deposits, ranged from approximately 10^{-4} g/m^3 for static deposits to approximately 10^{-2} g/m^3 for heavy surface disturbance(Hill et al., 2001). In comparison, the DOE used a range of approximately 10^{-4} g/m^3 to 10^{-3} g/m^3 in volcanism performance calculations (CRWMS M&O, 2000a, b). Average annual rainfall in the dose receptor location, however, was only approximately 0.1 m/yr (CRWMS M&O, 2000c). The Cerro Negro data show that airborne particle concentrations measured in climates ten times wetter than current Amargosa Valley conditions may not be appreciably lower than those used by DOE in volcanism performance calculations. Thus, neglecting the apparently minor effects of climate change does not necessarily create an appreciable degree of conservatism in DOE airborne particle concentrations.

References

CRWMS M&O. "Total System Performance Assessment–Site Recommendation." TDR–WIS–PA–000001. Revision 00 ICN1. North Las Vegas, Nevada: TRW Environmental Safety Systems, Inc. 2000a.

———. "Input Parameter Values for External and Inhalation Radiation Exposure Analyses." ANL–MGR–MD–000001. Rev. 01 ICN 00. North Las Vegas, Nevada: DOE, Yucca Mountain Site Characterization Office. 2000b.

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———. "Nominal Performance Biosphere Dose Conversion Factor Analysis." ANL–MGR–MD–000009. Rev. 01. North Las Vegas, Nevada: DOE, Yucca Mountain Site Characterization Office. 2001a.

———. "Disruptive Event Biosphere Dose Conversion Factor Analysis." ANL–MGR–MD–000003. Rev. 01. North Las Vegas, Nevada: DOE, Yucca Mountain Site Characterization Office. 2001b.

Hill, B.E., C.B. Connor, J. Weldy, and N. Franklin. "Methods for Quantifying Hazards from Basaltic Tephra-Fall Eruptions." C. Stewart, ed. *Proceedings of the Cities on Volcanoes 2 Conference, Auckland, New Zealand, 12–14 February 2001.* Institute of Geological and Nuclear Sciences Information Series 49. Lower Hutt, New Zealand: Institute of Geological and Nuclear Sciences Limited. p. 50. 2001.