Summary of the Resolution of the Key Technical Issue on Igneous Activity - Agreements Reached

Subissue #	Subissue Title	Status	NRC/DOE Agreements
1	Probability of future igneous activity	Closed-Pending	See agreements from August 29-31, 2000.
2	Consequences of future igneous activity	Open	IA.2.11 - Provide an analysis that shows the relationship between any static measurements used in the TSPA and expected types and durations of surface disturbing activities associated with the habits and lifestyles of the critical group. DOE will provide an analysis that shows the relationship between any static measurements used in the TSPA and expected types and durations of surface disturbing activities associated with the habits and lifestyles of the critical group in a subsequent revision to the AMR Input Parameter Values for External and Inhalation Radiation Exposure Analysis (ANL-MGR-MD-000001) or equivalent document. This will be available to the NRC in FY02. IA.2.12 - Provide clarifying information on how PM10 measurements have been extrapolated to TSP concentrations. This should include consideration of the difference in behavior between PM10 and TSP particulates under both static and disturbed conditions. DOE will provide clarifying information on how PM10 measurements have been extrapolated to TSP concentrations. This will include consideration of the difference in behavior between PM10 and TSP particulates under both static and disturbed conditions in a subsequent revision to the AMR Input Parameter Values for External and Inhalation Radiation Exposure Analysis (ANL-MGR-MD-000001) or equivalent document. This will be available to the NRC in FY02.

			IA.2.13 - Provide the justification that sampling of range of transition period BDCFs is necessarily conservative in evaluating long-term remobilization processes. DOE will provide the justification that sampling of range of transition period BDCFs is necessarily conservative in evaluating long-term remobilization processes in a subsequent revision to the AMR Input Parameter Values for External and Inhalation Radiation Exposure Analysis (ANL-MGR-MD-000001) or equivalent document. This will be available to the NRC in FY02. IA.2.14 - Provide information clarifying the method used in TSPA to calculate how deposit thickness effects the average mass load over the transition period. DOE will provide information clarifying the method used in TSPA to calculate how deposit thickness effects the average mass load over the transition period in a subsequent revision to the AMR Input Parameter Values for External and Inhalation Radiation Exposure Analysis (ANL-MGR-MD-000001) or equivalent document. This will be available to the NRC in FY02. IA.2.15 - Clarify that external exposure from HLW-contaminated ash, in addition to inhalation and ingestion, was considered in the TSPA. Include in this clarification the consideration of external exposure during indoor occupancy times, or provide basis for dwelling shielding from outdoor gamma emitters. DOE will clarify that external exposure from HLW-contaminated ash, in addition to inhalation and ingestion, was considered in the TSPA. DOE will include in this clarification the consideration of external exposure during indoor occupancy times, or provide basis for dwelling shielding from outdoor gamma emitters in a subsequent revision to the AMR Input Parameter Values for External and Inhalation Radiation Exposure Analysis (ANL-MGR-MD-000001) or equivalent document. This will be available to the NRC in FY02.

			IA.2.16 - Document that neglecting the effects of climate change on disruptive event BDCFs 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.

Summary of the Resolution of the Key Technical Issue on Igneous Activity - Agreements Not Reached

Subissue #	Subissue Title	Status	NRC/DOE Agreements
1	Probability of future igneous activity	Closed-Pending	N/A
2	Consequences of future igneous activity	Open	1) Evaluate the stress distribution and strain response on existing or new geologic structures resulting from thermal loading of HLW. The evaluation should include appropriate spatial variations in overlying topography and appropriate spatial and temporal variations in thermal load. DOE acknowledges the NRC proposed agreement and will address this agreement as part of the consolidated response to NRC's proposed agreement items for the consequence subissue. 2) Evaluate how the presence of engineered repository structures (e.g., drifts, waste packages, etc.) can affect magma flow processes for the duration of an igneous event. Include in this evaluation the potential effects on initial magma flow characteristics, diversion of ascending magma into repository structures, reestablishment of multiple flow-paths to the surface, two phase flow, reaction of the geologic and engineered system to over and under pressure, gas separation, heat transfer, magma recirculation, and range of steady and nonsteady flow conditions that could occur for the duration of an igneous event. DOE acknowledges the NRC proposed agreement and will address this agreement as part of the consolidated response to NRC's proposed agreement items for the consequence subissue.

			3) Evaluate how the presence of repository structures may affect magma ascent, conduit localization, and evolution of the conduit and flow system. Include in this evaluation the potential effects of topography and stress, in addition to a range of physical conditions appropriate for the duration of igneous events. DOE acknowledges the NRC proposed agreement and will address this agreement as part of the consolidated response to NRC's proposed agreement items for the consequence subissue. 4) Evaluate the mechanical strength of natural or engineered barriers that are proposed to restrict magma flow within intersected drifts. A range of physical conditions appropriate for the duration of igneous events should be used in the evaluation. DOE acknowledges the NRC proposed agreement and will address this agreement as part of the consolidated response to NRC's proposed agreement items for the consequence subissue. 5) If significant amounts of backfill or rockfall are thought to occur in repository drifts, evaluate the effects of these materials on magma flow processes throughout the duration of an igneous event. The analysis should include the potential effects of entrainment, meltback, and displacement of backfill. DOE acknowledges the NRC proposed agreement and will address this agreement as part of the consolidated response to NRC's proposed agreement items for the consequence subissue. 6) Evaluate how ascent and flow through repository structures may incorporate HLW located along all potential flow paths that may occur during an igneous event. The evaluation should include such processes as segregation, two phase flow, heat transfer, convective flow, gas circulation of the magma, and evolution of the conduit and flow system. DOE acknowledges the NRC proposed agreement and will address this agreement as part of the consolidated response to NRC's proposed agreement items for the consequence subissue.

			7) Evaluate waste package response to stresses from dynamic magmatic pressurization, internal pressurization, gravitational loading, and heating, using appropriate at-condition strength properties and magma flow paths, for duration of an igneous event. DOE acknowledges the NRC proposed agreement and will address this agreement as part of the consolidated response to NRC's proposed agreement items for the consequence subissue. 8) Evaluate aging effects on materials strength properties when exposed to basaltic magmatic conditions for the duration of an igneous event. Include in this evaluation the potential effects of subsequent seismically induced stresses on substantially intact waste packages. DOE acknowledges the NRC proposed agreement and will address this agreement as part of the consolidated response to NRC's proposed agreement items for the consequence subissue. 9) Evaluate the response of Zone 3 waste packages, or waste packages covered by backfill or rockfall, if exposed to magmatic gasses at conditions appropriate for an igneous event. DOE acknowledges the NRC proposed agreement and will address this agreement as part of the consolidated response to NRC's proposed agreement items for the consequence subissue. 10) Evaluate the physical and chemical response of HLW and cladding after heating and potential disruption of waste package and contents, for waste packages remaining in drifts. Particular attention should be given to effects that may result in increased solubility potential relative to undisturbed HLW forms. DOE acknowledges the NRC proposed agreement and will address this agreement as part of the consolidated response to NRC's proposed agreement items for the consequence subissue.

			11) Provide a technical basis to support conclusions that the risk effects (i.e., effective annual dose) of eolian and fluvial remobilization are bounded by conservative modeling assumptions in the TSPA-SR, Rev00, ICN1. Particular attention should be paid to: (i) rate of mobilization off slopes, (ii) rate of transport in Fortymile Wash drainages, (iii) rate of transport from eolian processes, (iv) deposition rate at proposed critical group location, (v) changes in particle-size distributions during fluvial transport. DOE acknowledges the NRC proposed agreement and will address this agreement as part of the consolidated response to NRC's proposed agreement items for the consequence subissue. 12) Provide an independent technical basis for the method of HLW incorporation used in DOE models, including consideration of particle aggregation and the effect on waste transport. DOE acknowledges the NRC proposed agreement and will address this agreement as part of the consolidated response to NRC's proposed agreement items for the consequence subissue. 13) Provide support that the inherent assumption in the mass loading model that the concentration of radionuclides on soil in the air is equivalent to the concentration of radionuclides on soil on the ground does not underestimate dose (i.e., radionuclides important to dose do not preferentially attach to smaller particles). DOE acknowledges the NRC proposed agreement and will address this agreement as part of the consolidated response to NRC's proposed agreement items for the consequence subissue.

CHANGES TO EXISTING IGNEOUS ACTIVITY NRC/DOE AGREEMENTS

IA.2.02 - Document results of sensitivity studies for particle size, consistent with (1) above. DOE agreed and will document the waste particle size sensitivity study in ~~TSPA-SR, Rev. 1~~ a calculation document. This will be available to the NRC in ~~June 2001~~ FY2002.

IA.2.03 - Document how the tephra volumes from analog volcanos represent the likely range of tephra volumes from Yucca Mountain Region (YMR) volcanos. DOE agreed and will document the basis for determining the range of tephra volumes that is likely from possible future volcanoes in the YMR in ~~TSPA-SR, Rev. 1 or demonstrate that TSPA-SR results are insensitive to uncertainties in the reasonably expected volumes of tephra in the YMR~~ the Eruptive Processes AMR (ANL-MGR-GS-000002). This will be available to the NRC in ~~June 2001~~ FY2002.

IA.2.04 - Document that the ASHPLUME model, as used in the DOE performance assessment, has been compared with an analog igneous system. DOE agreed and will complete calculation CAL-WIS-MD-000011 that will document a comparison of the ASHPLUME code results to observed data from the 1995 Cerro Negro eruption. This will be available to the NRC in January 2001. DOE will consider Cerro Negro as an analog and document that in ~~TSPA-SR Rev. 1~~ the Eruptive Processes AMR (ANL-MGR-GS-000002). This will be available to the NRC in ~~June 2001~~ FY2002.

IA.2.05 - Document how the current approach to calculating the number of waste packages intersected by conduits addresses potential effects of conduit elongation along a drift. DOE agreed and will document the way in which the change in geometry of the repository drifts affects the number of waste packages incorporated into the volcanic conduit. Possible consequences of conduit elongation parallel to drifts will be documented in TSPA-SR Rev. 1, available to the NRC in June 2001. This agreement has been superceded by the proposed NRC Agreements in Attachment 2.

IA.2.06 - Develop a linkage between soil removal rate used in TSPA and surface remobilization processes characteristics of the Yucca Mountain region (which includes additions and deletions to the system). DOE agreed and will document its approach to include uncertainty related to surface-redistribution processes in TSPA-SR, Rev. 0. DOE will revisit the approach in TSPA-SR, Rev. 1. This documentation will be available to the NRC in June 2001. This agreement has been superceded by the proposed NRC Agreement 11 in Attachment 2.

IA.2.07 - Document the basis for airborne particle concentrations used in TSPA in Rev. 1 to the Input Values for External and Inhalation Radiation Exposure AMR. DOE agreed and will provide documentation for the input values in the Input Parameter Values for External and Inhalation Radiation Exposure Analysis AMR [ANL-MGR-MD-000001] Rev. 1. This will be available to NRC in January 2001. This agreement has been superceded by the NRC/DOE Agreements IA.2.11 to 2.16 in Attachment 1.

IA.2.09 - Use the appropriate wind speeds for the various heights of eruption columns being modeled. DOE agreed and will evaluate the wind speed data appropriate for the height of the eruptive columns being modeled. This will be documented in ~~TSPA-SR, Rev. 1~~ a calculation document. This will be available to the NRC in ~~June 2001~~ FY2002.

IA.2.10 - Document the ICNs to the Igneous Consequences AMR and the Dike Propagation AMR regarding the calculation of the number of waste packages hit by the intrusion. Include in these or other documents (1) the intermediate results of the releases from Zone 1 and 2, separately, and (2) the evaluation of thermal and mechanical effects, as well as shock, in assessing the degree of waste package damage in Zone 1 and 2. DOE agreed and will provide ICN 1 of the following AMRs: Igneous Consequences Modeling for TSPA-SR AMR [ANL-WIS-MD-000017], the Dike Propagation Near Drifts AMR [ANL-WIS-MD-000015], the Characterize Framework for Igneous Activity at Yucca Mountain, Nevada AMR [ANL-MGR-GS-000001], and the Calculation Number of Waste Packages Hit by Igneous Intrusion [CAL-WIS-PA-000001]. This will be available to the NRC in January 2001. DOE will provide the results showing the relative contributions of releases from Zones 1 and 2 in ~~TSPA-SR, Rev. 1~~ a calculation document. This will be available to the NRC in ~~June 2001~~ FY2002. DOE will provide the evaluation of thermal mechanical effects on waste package damage in Zones 1 and 2 in ICN 1 of the Dike Propagation Near Drifts AMR [ANL-WIS-MD-000015]. This will be available to the NRC in January 2001.