International Isotopes Inc.

September 12, 2011

ATTN: Document-Control Desk
U.S. Nuclear Regulatory Commission
Washington, DC 20555-0001

NRC Docket No. 40-9086

Subject: Submittal of Responses to Requests for Additional Information (RAI) TAC L32739.

To Whom it May Concern,

The following enclosures are provided as a response to the US Nuclear Regulatory Commission RAIs pertaining to the International Isotopes Fluorine Products Inc. December 30, 2009 application to license a depleted uranium hexafluoride de-conversion and fluorine extraction process facility.

1.	Official Responses to Seismic and Structural RAIs, Rev. C – Public Version
2.	Official Responses to Seismic and Structural RAIs Rev. C – Security Related Information

Please contact me by phone at 208 524-5300 or email at jjmiller@intisoid.com if you have any questions regarding this letter or require additional information.

Sincerely,

John J. Miller, CHP
Radiation Safety Officer

JJM-2011-49

Enclosure as Stated

cc: Dr. Matthew Bartlett
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FSME21

Official Responses to Seismic and Structural RAIs

SS-1. *Background:*
The LA and ISA Summary include several typographical errors.

Issue:
Minor typographical errors were found in various sections of the LA and ISA Summary. These errors need to be corrected.

Request:
1. *Correct the ground acceleration from 0.03g to 0.05g in the sentence that states, "The Peak Horizontal Ground Acceleration for a 1,000 and 2,500 year return is 0.03g and 0.12g respectively (USGS, 2002)" on Page 1-43 of the LA.*
2. *Correct the temperatures listed in LA Table 1-6 on Page 1-39.*
3. *Correct the section reference in LA Section 3.2.1 (Page 3-4) which states, "A description of the IIFP Site is contained in ISA Summary, Section 2 and a summary description is in LA Chapter 1." Section 2 should be Section 1 instead.*
4. *Correct the section reference in LA Section 3.2.2 which states, "the ISA Summary (Section 3) provides a description of the IIFP Facility." Section 3 should be Section 2.*
5. *Correct the column labels on the total snowfall in ISA Summary Table 1-1 (Page 1-6) and verify that the values listed in the table are correct.*
6. *Correct the temperatures listed in ISA Summary Table 1-2 (Page 1-7).*
7. *Items 1-6 are some examples. Please review the application to remove such errors.*

RESPONSE TO REQUEST #SS-1-1: The Peak Horizontal Ground Acceleration for a 1,000 return is 0.05g instead of the 0.03g as incorrectly stated in LA Section 1.6.4.2.

License Documentation Impact: The fourth paragraph of LA former Section 1.6.4.2 - now Section 1.7.4.2 (RAI-RP 13) and former Table 1-7 (now Table 1-8, see RAI GI-9D) will read:

Probabilistic ground motion for the sites is also shown in Table 1-~~7~~8. Seismic activity is well documented as the result of ~~the NEF LA~~licensing activities of an enrichment facility located near Eunice, New Mexico and the extensive network of seismometers established for a Waste Isolation Pilot Plant (WIPP) facility near Carlsbad, New Mexico. The Peak Horizontal Ground Acceleration (pga) for a 1,000 and 2,500 year return is ~~0.03~~0.05g and 0.12g respectively (USGS, 2002).

Table 1-~~7~~8 Seismic Criteria for New Mexico Site

$P=1/T$ $EP=1-(1-P)^n$ n=50 years

T	500 yrs	1000 yrs	2500 yrs
P	0.002 (.2%)	0.001 (.1%)	0.0004 (.04%)
EP	0.1 (10%)	0.05 (5%)	0.02 (2%)
N	50 yrs	50 yrs	50 yrs
pga	0.03g [(1)]	0.05g [(2)]	0.12 [(2)]

[(1)] Weber, 2008; [(2)] USGS, 2002

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RESPONSE TO REQUEST #SS-1-2: The negative sign for the Celsius temperatures listed in LA Table 1-6 on Page 1-39 was inadvertently omitted.

License Documentation Impact: Temperatures in former Table 1-6 - now Table 1-7(see RAI GI-9D) of Revision A of the IIFP License Application and the temperatures in Table 3-17 of Revision A of the IIFP Environmental Report (see also RAI GI-10A) will be revised as follows:
21.7 °C (-7 °F) will be revised to -21.7 °C (-7.1 °F) for January 11, 1962.
23.9 °C (-11 °F) will be revised to -23.9 °C (-11 °F) for February 1, 1951.
16.1 °C (3 °F) will be revised to -16.1 °C (3 °F) for December 8, 2005.

RESPONSE TO REQUEST #SS-1-3: The ISA Summary Section 1 provides a site description which focuses on those factors that could impact safety (geography, meteorology, seismology, etc.) of the site and surrounding area.

License Documentation Impact: The second sentence of the IIFP License Application Section 3.2.1 will be revised to read as follows:

The ISA Summary (IIFP, 2009) provides a description of the IIFP Facility and the surrounding Owner Controlled Area (herein referred to as the IIFP site). A description of the IIFP site focusing on those factors that could impact safety is contained in ISA Summary, Section ~~2~~1 and a summary description of those factors is in LA ~~Chapter 1~~ Section 1.6.

RESPONSE TO REQUEST #SS-1-4: The ISA Summary Section 2.1, "Overview of Facility Site," provides a layout of the facilities on the site with a summary description of the facilities and the location of those facilities.

License Documentation Impact: License Application Section 3.2.2 will be revised as follows:

The ISA Summary (Section ~~3~~2.1) provides a description of the IIFP Facility. A summary description of the IIFP Facility is provided in LA ~~Chapter 1~~ Section 1.1.

RESPONSE TO REQUEST #SS-1-5: The ISA Summary Table 1-1 was inadvertently corrupted when copying and editing Table 3-18 of the Environmental Report to the LA.

License Documentation Impact: Table 1-1 of Revision A of the IIFP Integrated Safety Analysis Summary will be deleted and replaced with revised (see RAI GI-10A) ER Table 3-18 above and be numbered as Table 1-1 in the LA. The renumbered Table 1-1 will incorporate changes to ER Table 3-18 (in response to RAI GI-10A) listing the mean snowfall for 1976 as 0.25 cm instead of 0.025 cm and the annual mean snowfall will be corrected from 12.95 cm (5.1 in) to 11.93 cm (4.7 in).

RESPONSE TO REQUEST #SS-1-6: ISA Summary Table 1-2 will be revised as stated below and as in the response to RAI GI-10 A.

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License Documentation Impact: The low extreme temperatures in Table 1-2 of Revision A of the IIFP Integrated Safety Analysis Summary and Table 3-17 of Revision A of the IIFP Environmental Report will be revised as follows:

21.7 °C will be revised to -21.7 °C for January 11, 1962.
23.9 °C will be revised to -23.9 °C for February 1, 1951.
16.1 °C will be revised to -16.1 °C for December 8, 2005.

RESPONSE TO REQUEST #SS-1-7: The LA is currently under review in response to the RAIs as well as a general review for typos or corrections need to be made.

License Documentation Impact: Once agreement has been attained on IIFP's response to the LA RAIs, the LA will be revised and submitted to the NRC as Revision B.

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SS-2. *Background:*

The regulations in 10 CFR 70.64(a) (2) require the applicant to include adequate protection against natural phenomena in its design of the facility, and 10 CFR 70.62(c)(iv) requires the applicant to conduct and maintain an ISA that identifies potential accident sequences caused by credible external events. In addition,

10 CFR 70.61(b) and 70.61(c) require the applicant to demonstrate that an accident event can be excluded from further consideration based on either its likelihood or its consequences.

Issue:

The applicant discussed the historical data of tornado, straight wind, snow, rain, and flood at the facility site in LA Sections 1.6.3.3, Severe Weather, and 3.2.5.2, Hazard Identification; ISA Summary Sections 1.3.2, Severe Weather, 4.4.2, Natural Phenomena Hazards, and 5.2.1 Hazard Identification Method, and Tables 3-6, FEP/DUP Facility Hazards Identification and 5-3, FEP/DUP Facility Hazard Identification Checklist. The applicant concluded in the ISA Summary Table 5-3 (Items 18.4, 18.5, and 18.6) that the rain, snow, and straight wind are low-risk hazards for the IIFP Fluorine Extraction Process & Depleted Uranium De-Conversion Plant (FEP/DUP). The justification the applicant provided for this determination at the end of ISA Summary Section 5.2.1 is not sufficient for the NRC staff to determine whether the justification is acceptable because the applicant did not provide justification on its low-risk determination. Nor, did the applicant characterize these hazards at an annual probability level consistent with their risk level. The applicant did include tornado-generated missiles as a hazard for consideration of the process equipment located outside the buildings. However, the applicant did not indicate the type of missiles it considered in its ISA.

Request:

1. *Characterize tornado and tornado-generated missile, straight wind, snow, rain, and flood hazards at an annual probability level (i.e., not unlikely, unlikely, or highly unlikely) consistent with their risk (i.e., low, intermediate, or high chemical or radiological consequence).*

2. *Provide technical basis to justify the perceived risk level for each of the hazards identified in Item 1.*

RESPONSE TO REQUEST # SS-2-1: Characterizations of tornadoes/winds, snow, rain and flood hazards have been performed. The following includes a discussion of those characterizations and changes to be made to Revision A of the IIFP Integrated Safety Analysis Summary.

Floods/Rain

It was determined that the information provided regarding "Floods" in former section 1.3.2.8 (now Section 1.3.2.6, in response to RAI GI-10D) of Revision A of the IIFP Integrated Safety Analysis Summary was insufficient in its scope. This section is now expanded to explain design

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basis flooding considerations. A preliminary flood hazard assessment for the IIFP Facility was performed using Department of Energy (DOE) documents DOE-STD-1020-2002, DOE-STD-1022-94 and DOE-STD-1023-95. For the IIFP Facility, a Performance Category-3 (PC-3) facility classification, as defined by the referenced DOE documents, was used. From that assessment, IIFP determined that a comprehensive flood hazard assessment is not required. Preliminary screening indicates that flooding is not a design basis event other than in consideration of storm water runoff. Following is a discussion of the preliminary flood hazard assessment.
DOE 1020-2002 Chapter 4 "Flood Design and Evaluation Criteria" cites criteria that must be considered to ensure that Structures, Systems and Components (SSCs) satisfy performance goals for PC-3 facilities. Evaluation of flood design includes:

1. Determination of the Design Basis Flood Level (DBFL) for each flood hazard as defined by the hazard annual probability of exceeding and the applicable combinations of flood hazards.
2. Development of a flood design strategy for the DBFL that satisfies the criteria performance goals.
3. Evaluation of the site storm water management system including site runoff and drainage, and roof drainage.
4. Design of civil engineering systems to the applicable DBFL and design requirements. (e.g., buildings, buried structures, site drainage, retaining walls, dike slopes, etc.). This criterion includes the design to withstand hydrostatic and/or hydrodynamic forces and debris loads.

In accordance with Table 4-2 "Design Basis Flood Events" in DOE-1020-2002, the following hazards must be considered:

A. River Flooding including peak flood elevation, wind-waves, ice forces, potential for erosion, debris, etc.
B. Dam failure including wind-waves and potential for erosion, debris, etc.
C. Storm surge, seiche (due to hurricane, squall lines, etc.) including tide effects and wave action.
D. Tsunami including tide effects.
E. Local Precipitation including flooding based upon the site runoff analysis, roof "ponding" and rain and snow loading.

1. Determination of the Design Basis Flood Level (DBFL)

A preliminary screening analysis was performed in accordance with the above DOE-1020-2002 criteria. Below are the results of that screening:

In accordance with DOE-1020-2002 Table 4-1 "Flood Criteria Summary", the Mean Hazard Annual Probability (MHAP) for Performance Category PC-3 is 1×10^{-4}. The preliminary screening analysis was performed with a MHAP of 1×10^{-4} as a minimum.

A. A preliminary screening for the potential of river flooding of the IIFP Facility site reveals that the nearest river (Pecos River) is approximately 50 miles south and southwest from and 700 feet in elevation below the IIFP Facility site at its nearest point. Based upon this information, the potential for river flooding is screened out as a potential source of flooding of the IIFP Facility site.

B. A preliminary screening for the potential of flooding of the IIFP Facility site from a dam failure reveals that the nearest dam is Brantley Dam forming Brantley Lake and Lake McMillan. Brantley Dam is located on the Pecos River approximately 61 miles northeast and approximately 550 ft below the elevation of the IIFP Facility site. Avalon Dam forming a smaller Lake Avalon is located on the Pecos River approximately 66 miles east of and 630 feet in elevation below the IIFP Facility site. No other dams or significant bodies of water are located within approximately 300 miles of the IIFP Facility site. Therefore, flooding from lakes (storm surge, wave action seiche) or from the breaching of dams is screened out as a potential source of flooding of the IIFP Facility site.

C. The IIFP Facility site is approximately 500 miles north of and 3800 feet in elevation above the Gulf of Mexico; therefore, storm surges, wave action, seiche or tide effects from hurricanes or squall lines from ocean waters is screened out as a source of flooding of the IIFP Facility site.

D. The IIFP Facility site, being approximately 500 miles north of and 3,800 feet in elevation above the Gulf of Mexico, is not subject to Tsunami or tide effects.

E. As a result of the preliminary screening analysis detailed above, it is determined that the only flooding hazard applicable to the IIFP Facility site is storm water runoff from a design basis rain event.

2. Development of a flood design strategy for the DBFL

All-season precipitation estimates for the IIFP site are provided by the National Weather Service (NWS) and the National Oceanic and Atmospheric Administration (NOAA) in the "Point Precipitation Frequency Atlas of the United States, NOAA Atlas 14 (Bonin, et.al., Revised 2011) and its associated database. Using a linear least-squares regression procedure to extrapolate NOAA's precipitation estimates to an average recurrence interval of 100,000 years, it was determined that the 1-hour, 24-hour, and 48-hour all-season precipitation estimates for 1.0×10^{-5} annual probability are 7.2 inches, 14.4 inches, and 17.0 inches respectively. Although DOE-1020-2002 specifies a MHAP of 1.0×10^{-4} for Performance Category PC-3, the conservative precipitation estimates for an annual probability of 1.0×10^{-5} are used in the evaluation of the IIFP Facility.

Since the only credible flooding event affecting the IIFP Facility site is a design basis rain event, the flood design strategy is developed from this basis. This includes:

A. Evaluation of the local site topography and contours to determine the effect of natural drainage on the site.

B. Means of managing storm water to ensure a design basis rain event does not present a flooding hazard in the process buildings containing IROFS SSC's.

C. Evaluation of process building roof design to ensure that structural failure does not occur during a design basis rain event.

D. Design of process buildings to withstand hydrostatic and/or hydrodynamic forces and debris loads caused by a design basis rain event.

3. Evaluation of local site topography

The IIFP Facility site is located in the northwestern portion and upper end of the Landreth-Monument Draw drainage basin designated as basin 13070007 by the USGS with an area of approximately 4,270 square miles (USGS, 2011), (US EPA, 2011).

The 40-acre IIFP Facility site is within a 640-acre section of land adjacent to and just east of NM Highway 483 and north of U.S. Highway 62/180. The general slope of the terrain in this area is from northwest to southeast. The natural lie of the terrain allows only limited rainwater from the northwest (approximately 16.1 acres) to flow over the site. Most rainwater is naturally diverted via low areas to the southwest and to the northeast around the site.

The slope of run-on to the site from the northwest is approximately 0.21%. The slope of the run-off to the northeast is approximately 0.46%, to the southeast is approximately 0.35% and to the southwest is approximately 0.38%. Thus the site is naturally self-draining thereby preventing "ponding" or accumulation of water except in two small playas (depressions) located near the west boundary.

According to drainage evaluations made by GL Environmental, a New Mexico based environmental consultant, ("Existing Groundwater Conditions in Section 27, Township 18 South, Range 36 East", 12/8/2010), once drainage is diverted around the IIFP Facility site, the terrain tends to drain toward the southeast to a collection playa approximately 8 miles away at an elevation approximately 225 feet lower than the IIFP Facility site.

Included, as a separate document, with this "Official Response to Seismic and Structural" document package is a drawing (Sketch F-1, Rev A, "640 Acre Plan, Site Drainage") showing the general contours of the land surrounding the IIFP Facility site. The contour drawing is based on the IIFP Facility concept. Detail civil engineering design and surveys have not yet been performed. The drawing was prepared from satellite imagery and is being included to show that the natural drainage in the area promotes constant flow across the site with a highly unlikely potential for accumulated flooding.

Due to the natural drainage of the area and the site grading and drainage system, it is reasonable to predict that rainwater from a design basis rain event will not flood the IIFP Facility site but that any rainwater entering the site that does not percolate into the soil will flow over and off the site.

4. Evaluation of site stormwater management system and development of DBFL

Using the conceptual contour drawing, Sketch F1, and assuming no credit for grading or storm water sewer system design or installation, a maximum DBFL affecting the process buildings is determined to be 4.8 inches from a 7.2 inch/hour 1.0 x 10^{-5} precipitation event [Natural Resources

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Conservation Service (NCRS) Method]. This evaluation considered the 1-hour, 24-hour, and 48-hour all-season precipitation estimates for 1.0 x 10^{-5} annual probability (7.2 inches, 14.4 inches, and 17.0 inches, respectively) using the probable maximum area of 16.1 acres of rainfall that might affect the process buildings and a slope of run-on (.00207 ft/ft) to the site from the 16.1 acres.

The site will be graded to divert rainwater away from process areas of the facility. Floor elevations of process buildings will be constructed a minimum of 6 inches above surrounding grade to promote drainage away from the buildings. Process buildings and structures will be provided with curbing a minimum of 12 inches in height in order to prevent internal spills (in such an event) from leaving the structure. This curbing although not credited in the DBFL also serves as flood barriers for those structures.

Roofs of all process buildings will be constructed of metal with a minimum pitch of 5/12 and with gutters and down-spouts however this design is not credited in the DBFL.

The site storm water system consisting of area inlets and storm sewers connected to the Stormwater Retention Basin in the southeast area of the IIFP Facility site will be designed and constructed for a 4 inch, 1 hour rain event slightly above the 3.2 inch, 1 hour rain event with a 1.0 x 10^{-2} annual probability as published in NOAA Atlas 14. This storm water system will <u>not</u> be relied upon for protection in case of a <u>design basis 7.2 inch, 1 hour rain event</u> with a 1.0 x 10^{-5} annual probability.

Berms and dams will not be relied upon or credited for protection in case of a <u>design basis 7.2 inch, 1 hour rain event</u> with a 1.0 x 10^{-5} annual probability.

All IROFS SSC's and related instrumentation, controls, electrical equipment and supports will be located well above the grade level of the first floor of process buildings.

5. Design of civil engineering systems to the applicable DBFL

Using the maximum calculated run-on velocity of 0.734 ft/sec, and a flow depth of 4.8 inches, preliminary calculations show that the maximum horizontal hydrodynamic pressure exerted on a process building by a design basis flood is 1.05 lb/square foot which equates to a force of 37.6 lb on the largest building, the DUF_6 Autoclave Building with maximum dimension of 90 ft. This force is negligible compared with the seismic force or straight wind force imposed upon the building, but will be considered in the design of building structures and foundations.

It is apparent that any impact of water-borne debris buoyant enough to be carried by 4.8 inches of water traveling at a velocity of 0.734 ft/sec would not damage the wall of a process building containing IROFS SSC's.

<u>Tornado/Wind</u>

The evaluation of tornadoes and straight winds was made based on NUREG/CR-4461, Revision 2 (February, 2007) including data in Appendices A, B and C of the NUREG. This NUREG guide

provides calculations based upon 46,800 tornado segments occurring from January 1, 1950 through August, 2003 of which more than 39,600 had sufficient information on location, intensity, length, and width to be used in the analysis included in this report. NUREG/CR-4461, Revision 1 had been published in April 2005. The National Weather Service changed from using the Fujita Scale to the Enhanced Fujita Scale in February 2007. Revision 2 incorporates the Enhanced Fujita Scale in its methodology and calculations. Specifically, Chapter 5 of the NUREG has been revised to show $1x10^{-5}$, $1x10^{-6}$, and $1x10^{-7}$ probability design wind speeds (i.e., probability of exceeding that wind speed in one year) for the contiguous United States estimated using the above database and the Enhanced Fujita Scale. (NCDC, 2010b)
The two-degree box where the IIFP site is located is in Region 2. While the two-degree and four-degree boxes are considered to be more reliable since they contain data for more events, the document does allow the use of the one-degree data if the number of events is large enough to provide accurate calculations. Instructions for using the NUREG Appendix C, Results for one-degree boxes state that the data set should contain a minimum of 10 events with 20 or more events being desirable. There were 76 events reported for the one degree box whose SE corner is the $32^0/103^0$ gridline. Of these, 56 were used in the calculations. The four-degree box uses data from 364 events of the 435 events observed.

The data from the above NUREG appendices for the one-degree, two-degree, and four-degree boxes are used. The maximum tornado wind speeds versus return period for each box are plotted on the same chart with the straight gust wind speed data (DOE-1020-2002, Table 3-2) versus return period for sites with basic gust wind speed of 90 mph (per USGS maps as adopted by the model building codes). All three tornado wind speed curves intersect the straight gust wind speed curve at approximately a 1×10^7 year return period or a probability of exceeding of 1×10^{-7}. DOE-STD-1022-2002, Appendix D, Paragraph D.2 states that, generally, straight and hurricane winds control the criteria for probabilities down to about 10^{-4}. Therefore, straight gust wind speeds will be used as the wind design basis for building design at the IIFP Facility.

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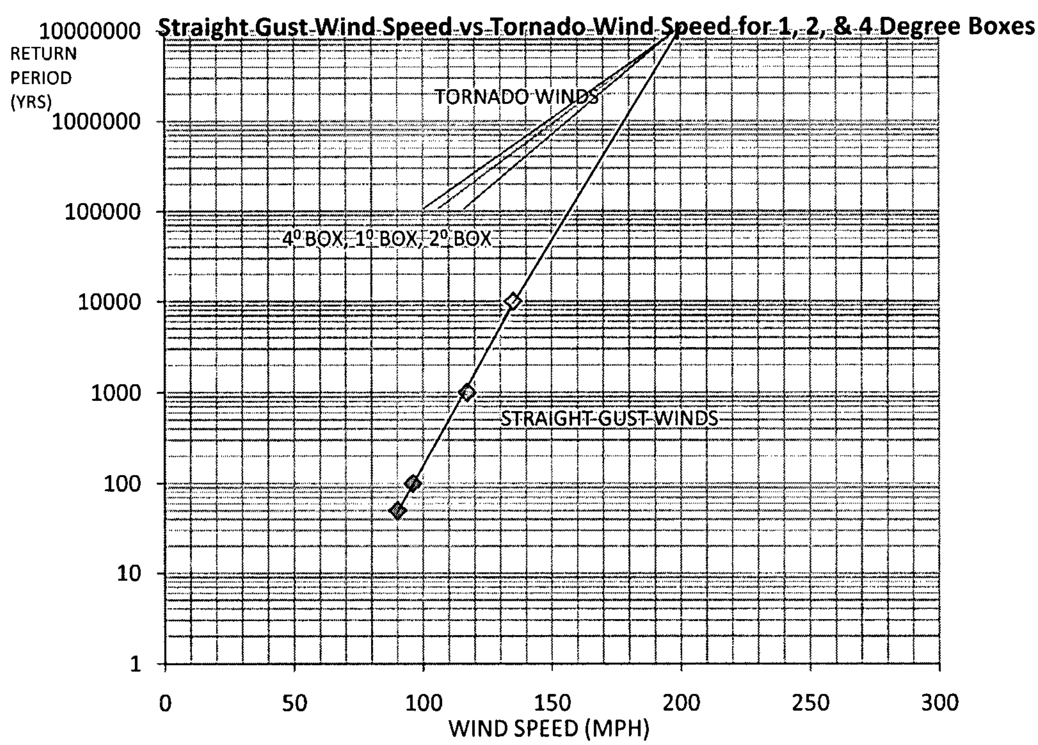

Legend: 4° Box - Red; 1° Box - Green; 2° Box - Blue

Note: See the discussion of straight winds below for the derivation of basic gust wind speeds versus probability used in the plots discussed above.

Design wind speeds for all buildings and structures that do not contain licensed material or for buildings and structures containing chemicals or processes that do not affect licensed material will be determined in accordance with the applicable model building codes (New Mexico Commercial Building Code (NMCBC, 2006) and American Society of Civil Engineers (ASCE 7-05) or latest editions adopted by the State of New Mexico at time of design). Specifically, these buildings and structures will be designed for a minimum straight gust wind speed of 90 mph.

Design wind speeds for all buildings and structures containing licensed material or buildings and structures containing chemicals or processes affecting licensed material are determined in accordance with NUREG-1520, Revision 1 (Appendix D and Annex to Appendix D) by reference to DOE-STD-1020-2002.

DOE-STD-1020-2002 Table 3-2 lists recommended peak gust wind speeds for Category C exposure and for tornadoes at 10m (33 ft) above the ground versus "Performance Category and Annual Probability of Exceedance" for 23 DOE sites across the United States.

By definition, DOE Performance Category 3 (PC-3) buildings and other structures are buildings and other common structures not classified as PC-4 structures which contain sufficient quantities of toxic or explosive substances to be dangerous to the public if released. PC-4 SSCs are designated as "reactor like" in that the quantity of hazardous material and energy is similar to a large Category A reactor (>200MW$_t$). For the purposes of evaluating risks and determining design basis criteria relative to natural phenomena events, the IIFP conservatively used the equivalent PC-3 category for the IIFP process buildings and other structures containing licensed material or process buildings containing processes or materials potentially affecting licensed materials. This designation is consistent with Occupancy Category III buildings and structures as defined in ASCE 7-05 Table 1-1(DOE G 420.1-2, 3/28/00).

DOE-STD-1020-2002, Table 3-2 lists design wind speeds and probabilities of exceeding the speeds for straight winds and for tornadoes for several DOE sites for Performance Categories PC-1 thru PC-4 structures. DOE Performance Categories are used below for illustrative purposes in determining the design wind speed and probability of exceeding the speed for the IIFP Facility site. The design wind speeds listed in DOE-STD-1020-2002, Table 3-2 for PC-1 structures (2 x 10^{-2} probability of exceeding the speed) are consistent with the USGS wind speed maps adopted by the International Building Code (IBC-2006) and ASCE 7-05. For all cases cited, where the design wind speed for PC-1 structures per the USGS wind speed maps is 90 mph (2 x10^{-2}), the design wind speed per DOE-STD-1020-2002, Table 3-2 for PC-2 structures is 96 mph (1 x 10^{-2}), for PC-3 structures is 117 mph (1 x 10^{-3}) and for PC-4 structures is 135 mph (1 x 10^{-4}).

Per Table D-2 in DOE-STD-1020-2002, Appendix D, the performance goal for a PC-3 facility is to design for the facility to withstand a straight-line wind load that occurs at a frequency of 1 x 10^{-4}. This criteria can be met in two ways: 1) design the facility to survive the force of winds with an occurrence probability of 1x10^{-4} (135 mph), or 2) design the facility to withstand a straight-line wind load of 1x10^{-3} (117 mph), but incorporate factors of safety such that the Ratio of Hazard to Performance Probability is equal to or greater than 10 using the methodology in Appendix D of DOE-STD-1020-2002. IIFP decided to use the first approach for meeting the performance criteria by designing PC-3 structures to withstand a 135 mph straight-line wind. At this design wind speed and probability of exceeding the speed, no credit is taken for the Ratio of Hazard to Performance Probability allowed in DOE-STD-1020-2002, Appendix D, Table D-2, even though conservatism will be achieved in the design due to factors of safety inherent in the design process and in material allowable stress specifications. From the evaluation that was performed, it was determined that the likelihood of a tornado generating winds at 135 mph was much lower for this area with a probability of less than 10^{-5}. Also, according to Appendix A of NUREG/CR-4461, Rev.2, the two-degree box which contains the IIFP site has a tornado strike probability of 8.444 x 10^{-5} yr^{-1}. Strike probabilities for the one-degree and four-degree boxes are 5.235 x $10^{-5}yr^{-1}$ and 3.975 x 10^{-5} yr^{-1} respectively. Therefore, facility design of PC-3 structures to a 135 mph wind speed at the 10^{-4} probability level represents a conservative approach with respect to wind speed.

The IIFP Facility building and structures that contain hazardous radiological and chemical (if applicable) materials that must be controlled or mitigated to meet the performance criteria given in 10 CFR part 70.61, "Performance Requirements," are defined as PC-3 structures per the Natural Phenomena Hazard Evaluation methods prescribed in DOE-STD-1020-2002. As mentioned above, those structures will meet the performance category of 1 x 10^{-4}, which is designed to withstand a 1 x 10^{-4} probability per year occurrence straight-line wind event. Hence, based on the order of magnitude scale for determining event likelihood using the ISA methodology in NUREG-1520, Revision 1, the collapse or loss of the building integrity is considered to be highly unlikely and meets the qualitative frequency scale of 1 x 10^{-5} per year or less. Events that occur at a highly unlikely frequency meet the performance criteria for acceptable risk without the need to further reduce the likelihood of hazardous release or mitigate its consequences. Therefore, designing the PC-3 facilities to withstand straight-line wind events with an occurrence frequency of 1×10^{-4} per year meets ISA risk acceptance levels regardless of the hazardous material inventories within the facilities and without consideration to mitigation of any hazardous release.

Snow

Snow was not addressed in the IIFP Integrated Safety Analysis Summary. A section that discusses the "snow hazard" analysis will be added to the IIFP Integrated Safety Analysis Summary Section 1.3.2.7 and the new text is shown in the License Documentation Impacts below.

License Documentation Impacts Related to Response SS-2-1:

License Documentation Impact: Former Section 1.3.2.8 – new Section 1.3.2.6 (in response to RAI GI-10D) of Revision A of the IIFP Integrated Safety Analysis Summary will be deleted and replaced with the following:

1.3.2.~~8~~6 Floods

~~The IIFP site does not fall within 100-year or 500-year floodplains (IIFP, 2009). The site is located in a semi-arid location with limited bodies of water.~~The site is located in an area which does not fall within a mapped 100 year or 500 year flood plain and has a semi-arid climate with an average rainfall of 12 to slightly less than 16 inches per year as recorded for Hobbs city (15.93 in/yr), Hobbs airport (12.35 in/yr), Pearl, NM (13.91 in/yr), and Roswell, NM (14.66 in/yr). This information was obtained from the Western Regional Climate Center website.

Since there is no significant body of water or river within several miles of the site, it is expected that any flooding would be due to extreme short-term precipitation which could result in flash flooding (See assessment discussion below). According to information obtained from NOAA National Climate Data Center (NCDC) Storm Events, there have been 68 flood events in Lea County, New Mexico between 1/1/1950 and 2/28/2010, an average of approximately one per year. Of these 68 events, there were no deaths reported, and property damage was reported for only 14 of the events, all of which occurred in the cities and towns of Lea County. Twenty-nine of the 68 events were reported for Hobbs which is located at an elevation from 125 to 170 feet lower than the site and approximately 11.4 miles to the east. The Hobbs airport is at an elevation of about 125 feet lower and some 6.9 miles southeast of the site, and it is also in FEMA Zone D and unmapped.

The IIFP property would likely receive some drainage from New Mexico Highway 483 on the west and possibly from the north as parts of these areas are at slightly higher elevations than the proposed facility location. However, site topography indicates that water would naturally drain away from the property toward the east and south as gradual but significant elevation declines occur in those directions for several miles.

A preliminary flood hazard assessment for the IIFP Facility was performed using Department of Energy (DOE) documents DOE-STD-1020-2002, DOE-STD-1022-94 and DOE-STD-1023-95. For the IIFP Facility, a Performance Category-3 (PC-3) facility classification, as defined by the

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referenced DOE documents, was used. From that assessment, IIFP determined that a comprehensive flood hazard assessment is not required. Preliminary screening indicates that flooding is not a design basis event other than in consideration of storm water runoff. A summary of the preliminary flood hazard assessment is discussed below.

In accordance with DOE-1020-2002 Table 4-1 "Flood Criteria Summary", the Mean Hazard Annual Probability (MHAP) for Performance Category PC-3 is 1×10^{-4}. The preliminary screening analysis was performed with a MHAP of 1×10^{-4} as a minimum.

A. A preliminary screening for the potential of river flooding of the IIFP Facility site reveals that the nearest river (Pecos River) is approximately 50 miles south and southwest from and 700 feet in elevation below the IIFP Facility site at its nearest point. Based upon this information, the potential for river flooding is screened out as a potential source of flooding of the IIFP Facility site.

B. A preliminary screening for the potential of flooding of the IIFP Facility site from a dam failure reveals that the nearest dam is Brantley Dam forming Brantley Lake and Lake McMillan. Brantley Dam is located on the Pecos River approximately 61 miles northeast and approximately 550 ft below the elevation of the IIFP Facility site. Avalon Dam forming a smaller Lake Avalon is located on the Pecos River approximately 66 miles east of and 630 feet in elevation below the IIFP Facility site. No other dams or significant bodies of water are located within approximately 300 miles of the IIFP Facility site. Therefore, flooding from lakes (storm surge, wave action seiche) or from the breaching of dams is screened out as a potential source of flooding of the IIFP Facility site.

C. The IIFP Facility site is approximately 500 miles north of and 3800 feet in elevation above the Gulf of Mexico; therefore, storm surges, wave action, seiche or tide effects from hurricanes or squall lines from ocean waters is screened out as a source of flooding of the IIFP Facility site.

D. The IIFP Facility site, being approximately 500 miles north of and 3,800 feet in elevation above the Gulf of Mexico, is not subject to Tsunami or tide effects.

E. As a result of the preliminary screening analysis detailed above, it is determined that the only flooding hazard applicable to the IIFP Facility site is storm water runoff from a design basis rain event.

All-season precipitation estimates for the IIFP site are provided by the National Weather Service (NWS) and the National Oceanic and Atmospheric Administration (NOAA) in the "Point Precipitation Frequency Atlas of the United States, NOAA Atlas 14 (Bonin, et.al., Revised 2011) and its associated database. Using a linear least-squares regression procedure to extrapolate NOAA's precipitation estimates to an average recurrence interval of 100,000 years, it was determined that the 1-hour, 24-hour, and 48-hour all-season precipitation estimates for 1.0×10^{-5} annual probability are 7.2 inches, 14.4 inches, and 17.0 inches respectively.

The 40-acre IIFP Facility site is within a 640-acre section of land adjacent to and just east of NM Highway 483 and north of U.S. Highway 62/180. The general slope of the terrain in this area is from northwest to southeast. The natural lie of the terrain allows only limited rainwater from the northwest (approximately 16.1 acres) to flow over the site in the vicinity of the process buildings. Most rainwater is naturally diverted via low areas to the southwest and to the northeast around the 40-acre site.

The slope of run-on to the 40-acre site from the northwest is approximately 0.21%. The slope of the run-off to the northeast is approximately 0.46%, to the southeast is approximately 0.35% and to the southwest is approximately 0.38%. Thus the site is naturally self-draining thereby preventing "ponding" or accumulation of water except in two small playas (depressions) located near the west boundary.

According to drainage evaluations (GL, 2010), once drainage is diverted around the IIFP Facility site, the terrain tends to drain toward the southeast to a collection playa approximately 8 miles away at an elevation approximately 225 feet lower than the site of the IIFP Facility.

Detail civil engineering design and surveys have not yet been performed. However, the drainage for the area surrounding the 40-acre conceptual design IIFP Facility was evaluated using general contours of the area. The contours show that the natural drainage in the area promotes constant flow across the site with highly unlikely potential for accumulated flooding. Using the general contours evaluation for the conceptual design facility land area and assuming no credit for site grading or storm water sewer installation, a maximum design basis flood level (DBFL) affecting the process buildings is estimated to be 4.8 inches from a 7.2 inch/hour 1.0×10^{-5} precipitation event [Natural Resources Conservation Service (NCRS) Method]. This evaluation considered the 1-hour, 24-hour, and 48-hour all-season precipitation estimates for 1.0×10^{-5} annual probability (7.2 inches, 14.4 inches, and 17.0 inches, respectively) using the probable maximum area of 16.1 acres of rainfall that might affect the process buildings and a slope of run-on (.00207 ft/ft) to the site from the 16.1 acres. The DBFL will be verified after the IIFP Facility site detail civil engineering survey is completed and prior to determination of site drainage grade requirements and design of building, roads and infrastructure.

Due to the natural drainage of the area and the planned site grading and drainage system, it is reasonable to predict that rainwater from a design basis rain event will not flood the IIFP Facility site but that any rainwater entering the site and that does not percolate into the soil will flow over and off the site.

Based upon the above precipitation estimates for the site and preliminary calculations performed as part of the prescreening flood hazard assessment, the effect of extreme precipitation of short duration on process buildings and IROFS SSCs at the IIFP Facility is minimal. In the area north and northwest of the developed site, the terrain will be contoured to divert run-on around the site so that only the precipitation that falls on the developed portion of the site will affect facility design. The site storm sewer system will be designed for a 4-inch, 1 hour maximum rain event slightly above the 3.2 inch, 1 hour rain event with a 1.0×10^{-2} annual probability as published in NOAA Atlas 14, however the storm sewer system will not be relied on or credited for protection against a design basis flood event. Buildings and structures containing IROFS SSCs will be constructed a minimum of six inches above grade level and above the level of plant roadways in order to physically remove (elevate) them from potential floodwater. Process buildings and structures will be provided with curbing a minimum of 12 inches in height in order to prevent internal spills (in such an event) from leaving the structure, and this curbing although not credited in the DBFL analysis also serves as flood barriers for those structures.

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License Documentation Impact: Section 1.4.5 of Revision A of the IIFP Integrated Safety Analysis Summary will be revised as follows:

1.4.5 Design-Basis Flood Events Used for Accident Analysis

The IIFP ~~FEP/DUP S~~site ~~is located outside~~ has not been mapped but does not lie within areas that are mapped in the 100-year or 500-year flood-plain~~.~~; in and around Hobbs, New Mexico according to information provided in the FEMA Mapping Information Platform. A detail discussion of the IIFP flood hazard assessment is provided in Section 1.3.2.6 of the ISA. The likelihood of any major flood at the facility ~~plant~~ site is determined to be ~~was~~ low and the consequences are ~~were~~ limited (due to no fissile material existing at the site). Thus, flood type accidents are not a significant risk for facility ~~plant~~ operations.

License Documentation Impact: Section 1.3.2.3 of Revision A of the IIFP Integrated Safety Analysis Summary will be deleted and replaced with the following:

1.3.2.3 Extreme Winds

~~Wind speeds over the State of New Mexico are usually moderate, although relatively strong winds often accompany occasional frontal activity during late winter and spring months and sometimes occur just in advance of thunderstorms. Frontal winds may exceed 30 mile/hr for several hours and reach peak speeds of more than 50 mile/hr.~~

This section describes the basis for evaluation of wind loading on the structures at the IIFP Facility in Lea County, New Mexico. Three sources of wind loading are evaluated; wind loading from a hurricane, straight wind loading and wind loading from a tornado.

Hurricanes

The IIFP Facility site is located in the extreme southeastern portion of New Mexico and over 500 miles inland from the Gulf of Mexico. Hurricane winds dissipate over Louisiana and Texas enough to prevent a wind damage threat to the IIFP Facility site as evidenced by the following information provided by NOAA, National Climatic Data Center (NCDC).

According to NOAA/ NCDC, of the 155 thunderstorm events recorded between 01/01/59 and 02/28/10, the maximum thunderstorm wind speed recorded for Lea County was 80 knots (92.1 mph) on 07/14/89. Some of these thunderstorm events likely would have been the result of dissipated hurricanes. (NCDC, 2010a)

Tornadoes and Straight Winds

NOAA NCDC Storm Events includes information for 527 tornado events reported for the state of New Mexico for the period 1950-2010 for an average of 8.78 events per year. Lea County reported 92 tornadoes for the same period for an average of 1.53 tornadoes per year. Of these 92 tornado events for Lea County between 01/01/50 and 01/31/10, 63 - F0, 20 - F1, 8 - F2, and one-F3 tornadoes were reported. During this same sixty-year period, no F4 or F5 tornadoes were reported. (NCDC, 2010a)

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The evaluation of tornadoes and straight winds was made based on NUREG/CR-4461, Revision 2 (February, 2007) including data in Appendices A, B and C of the NUREG, DOE-1020-2002 and DOE-STD-1022-2002 including Appendix D. It was determined from this evaluation that straight gust wind speeds will be used as the design basis for buildings and structures at the IIFP Facility. Design wind speeds for all buildings and structures that do not contain licensed material or for buildings and structures containing chemicals or processes that do not affect licensed material will be determined in accordance with the applicable model building codes (New Mexico Commercial Building Code (NMCBC, 2006) and American Society of Civil Engineers (ASCE 7-05) or latest editions adopted by the State of New Mexico at time of design). Specifically, these buildings and structures will be designed for a minimum straight gust wind speed of 90 mph.

Design wind speeds for all buildings and structures containing licensed material or buildings and structures containing chemicals or processes affecting licensed material are determined in accordance with NUREG-1520, Revision 1 and by reference to DOE-STD-1020-2002 which, in Table 3-2, lists recommended peak gust wind speeds for Category C exposure and for tornadoes at 10m (33 ft) above the ground versus "Performance Category and Annual Probability of Exceedance" for 23 DOE sites across the United States.

By definition, DOE Performance Category 3 (PC-3) buildings and other structures are buildings and other common structures not classified as PC-4 structures which contain sufficient quantities of toxic or explosive substances to be dangerous to the public if released. PC-4 SSCs are designated as "reactor like" in that the quantity of hazardous material and energies similar to a large Category A reactor (>200MW_t). For the purposes of evaluating risks and determining design basis criteria relative to natural phenomena events, the IIFP conservatively used the equivalent PC-3 category for the IIFP process buildings and other structures containing licensed material or process buildings containing processes or materials potentially affecting licensed materials. This designation is consistent with Occupancy Category III buildings and structures as defined in ASCE 7-05 Table 1-1(DOE G 420.1-2, 3/28/00).

DOE-STD-1020-2002, Table 3-2 lists design wind speeds and probabilities of "exceeding" for straight winds and for tornadoes for several DOE sites for Performance Categories PC-1 thru PC-4 structures. The design wind speeds listed in Table 3-2 for PC-1 structures (2×10^{-2} probability of "exceeding" in one year) are consistent with the USGS wind speed maps adopted by the International Building Code (IBC-2006) and ASCE 7-05. For all cases cited, where the design wind speed for PC-1 structures per the USGS wind speed maps is 90 mph (2×10^{-2}), the design wind speed per Table 3-2 for PC-2 structures is 96 mph (1×10^{-2}), for PC-3 structures is 117 mph (1×10^{-3}) and for PC-4 structures is 135 mph (1×10^{-4}).

Per Table D-2 in DOE-STD-1020-2002, Appendix D, the performance goal for a PC-3 facility is to design for the facility to withstand a straight-line wind load that occurs at a 1×10^{-4}. This 1×10^{-4} performance goal is met at the IIFP Facility by designing applicable structures (as defined above) using a 135 mph straight wind gust at the 1×10^{-4} probability level where no credit is taken for the Ratio of Hazard to Performance Probability allowed per Table D-2. Therefore, the IIFP design basis wind speed is one order of magnitude more conservative than the design basis required by DOE for PC-3 structures where a hazard probability of 1×10^{-3} with a Ratio of Hazard to Performance Probability of 10 may be used to meet the performance goal of 1×10^{-4}.

From the evaluation that was performed, it was determined that the likelihood of a tornado generating winds at 135 mph is at a probability level of less than 1×10^{-5}. Also, according to

Appendix A of NUREG/CR-4461, Revision 2, strike probabilities for the one-degree, the two-degree and the four-degree boxes containing the IIFP site are $5.235 \times 10^{-5} yr^{-1}$, $8.444 \times 10^{-5} yr^{-1}$ and $3.975 \times 10^{-5} yr^{-1}$ respectively. Therefore, selection of a design basis wind speed for IIFP PC-3 structures of 135 mph at the 1×10^{-4} probability level represents a conservative approach. The IIFP Facility building and structures that contain hazardous radiological and chemical (if applicable) materials that must be controlled or mitigated to meet the performance criteria given in 10 CFR part 70.61, "Performance Requirements," are defined as PC-3 structures per the Natural Phenomena Hazard Evaluation methods prescribed in DOE-STD-1020-2002. As mentioned above, those structures will meet the performance category of 1×10^{-4}, and be designed to withstand a 1×10^{-4} probability per year occurrence straight-line wind event. Hence, based on the order of magnitude scale for determining event likelihood using the ISA methodology in NUREG-1520, Rev. 1, the collapse or loss of the building integrity is considered to be highly unlikely and meets the qualitative frequency scale of 1×10^{-5} per year or less. Events that occur at a highly unlikely frequency meet the performance criteria for acceptable risk without the need to further reduce the likelihood of hazardous release or mitigate its consequences. Therefore, designing the IIFP applicable facilities to withstand straight-line wind events with an occurrence frequency of 1×10^{-4} per year meets ISA risk acceptance levels regardless of the hazardous material inventories within the facilities and without consideration to mitigation of any hazardous release.

License Documentation Impact: Additional references will be included in Section 1.7 (new Section 1.8) of the IIFP License Application (LA) for (ASCE, 2006) and (DOE, 2002). The following subheading and text for Snow will be inserted in former LA Section 1.6.3.3 – new LA Section 1.7.3.3 (renumbered in response to RAI RP-13) after subheading Floods and text of the IIFP License Application.

Snow

The mean annual snowfall is 5.1 inches as recorded at the Hobbs weather station with a high annual total of 27.1 inches. The historical maximum snow depth for Hobbs, NM is 12.2 inches and it occurred during the month of November. The 2-day 100-year snowfall is 12.1 inches which also occurred in November.

The design basis extreme environmental roof load for the process buildings (involving or affecting licensed material) at the IIFP site is 81.2 lb/ft^2 or 396.8 kg/m^2. This design load is based on the sum of the 100-year return period snowpack and the load corresponding to the 48-hour all-season precipitation and an annual probability of 1.0×10^{-5} for the facility site area. (Refer to the IIFP Integrated Safety Analysis Summary Section 1.3.2.7 for an additional description of determining the design basis snow load).

1.~~7~~8 References

ASCE, 2006. American Society of Civil Engineers, ASCE 7-05, "Minimum Design Loads for Buildings and Other Structures: SEI/ASCE 7-05 (ASCE Standard)." 2006.

DOE, 2002. U.S. Department of Energy, DOE STD-1020-2002, "Natural Phenomena Hazards Design and Evaluation Criteria for Department of Energy Facilities." Washington, D.C., January 2002.

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License Documentation Impact: Add references to Section 1.6 of the IIFP ISA Summary for (ASCE, 2006), (DOE, 2002), (NRC, 2010) and (GL, 2010). A new Section 1.3.2.7 "Snow" (below new Section 1.3.2.6 "Floods", numbering change in response to RAI 10 GI-10D) will be added to the IIFP ISA Summary, Revision A to read as follows:

1.3.2.7 Snow

The mean annual snowfall is 5.1 inches as recorded at the Hobbs weather station with a high annual total of 27.1 inches. The historical maximum snow depth for Hobbs, NM is 12.2 inches, and it occurred during the month of November. The 2-day 100-year snowfall is 12.1 inches which also occurred in November.

The design basis extreme environmental "ground" snow load for the IIFP Facility site is 96.7 lb/ft^2 or 472.5 kg/m^2. This design basis ground snow load is calculated as the sum of the 100-year return period snowpack and the load corresponding to the 48-hour all-season precipitation and an annual probability of 1.0 x 10^{-5} for the facility site. The method of determination follows acceptable methodology discussed in NRC NUREG-1951(NRC, 2010). The roofs of all process buildings (involving or affecting licensed materials) at the IIFP Facility site will be sloped at a minimum of 5/12 or 22.6 degrees. Using the method described in American Society of Civil Engineers Standard 7-05 "Minimum Design Loads for Buildings and Other Structures" (ASCE 7-05) to convert the ground snow load into a "roof" snow load, the design basis extreme environmental "roof" snow load for the buildings on the IIFP Facility site is 81.2 lb/ft^2 (396.8 kg/m^2). This calculation assumes no runoff of snow or rain notwithstanding that roofs of IIFP process buildings (involving or affecting licensed materials) are sloped. This load represents the extreme roof snow load for the purpose of process building design.

IIFP used the data collected by the Western Regional Climate Center (WRCC) for the Hobbs, New Mexico area to determine that the 100-year snowpack was 12.2 inches resulting in a normal (severe) design basis ground snow load of 8.4 lb/ft^2 (41.0 kg/m^2) (NRC, 2010). Since essentially 100 years of snowpack data was available for the area, no calculation or extrapolation of the data was necessary.

All-season precipitation estimates for the IIFP Facility site are provided by the National Weather Service (NWS) and the National Oceanic and Atmospheric Administration (NOAA) in the "Point Precipitation Frequency Atlas of the United States, NOAA Atlas 14 (Bonin, et. al., Revised 2011 and supersedes the "Two-to-Ten Day Precipitation for Return Periods of 2 to 100 Years in the Contiguous United States", 1964) and its associated data base. Using a least-square regression procedure to extrapolate NOAA's precipitation estimates it was determined that the 48-hour all-season precipitation frequency estimate for 1.0 x 10^{-5} annual probability is 17.0 inches. This 17.0 inches of precipitation (as water) corresponds to a ground snow load of 88.3 lb/ft^2 or 431.5 kg/m^2. The sum of the ground snow load from precipitation and from snowpack is 96.7 lb/ft^2 or 472.5 kg/m^2 from which the roof snow design load (81.2 lb/ft^2 or 396.8 kg/m^2) is determined as described above.

1.6 References

ASCE, 2006. American Society of Civil Engineers, ASCE 7-05, "Minimum Design Loads for Buildings and Other Structures: SEI/ASCE 7-05 (ASCE Standard)." 2006 DOE, 2002. U.S.

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Department of Energy, DOE STD-1020-2002, "Natural Phenomena Hazards Design and Evaluation Criteria for Department of Energy Facilities." Washington, D.C., January 2002.

NRC, 2010. Nuclear Regulatory Commission, NUREG-1951 "Safety Evaluation Report for the Eagle Rock Enrichment Facility in Bonneville County, Idaho, AREVA Enrichment Services LLC", Pages 1-23 to 1-25.

GL, 2010. GL Enviromental, "Existing Groundwater Conditions in Section 27, Township 18 South, Range 36 East", December 8, 2010.

RESPONSE TO REQUEST #SS-2-2: The ISA Summary Section 5.2.1 is intended to discuss PHA methodology and not the characterization and justifications for the hazards assessment. The three paragraphs immediately following Table 5-3 in the Section 5.2.1 of the ISA Summary Revision A are being removed because the information in those paragraphs is not part of the description of the PHA methodology. Instead, the natural phenomena hazard characterization and the technical basis for justification of the perceived risk levels are provided in the above discussions and further clarified in the ISA Revision A changes shown below.

License Documentation Impact: Paragraphs two, three and four in Section 5.2.1(immediately following Table 5-3) are removed.

5.2.1 Hazard Identification Method

The initial activity of the ISA was a review of the preliminary hazards, specific engineering design files, PFDs, and P&IDs. The information obtained from this review enabled the analysts to identify hazards associated with specific process areas. The hazards were subsequently categorized and documented in a checklist (Table 5-3), including those hazards identified as standard industrial hazards (SIH) covered by OSHA requirements and not considered separate initiating events. The hazards identification information was then used to develop a more detailed PHA.

~~There are a number of vehicle in motion hazards that are not considered in the PHA. An aircraft crash typically consists of an initial impact of the aircraft with the ground and a slide into the facility (direct impact is possible but much less likely). This event is extremely unlikely even for very large structures. For FEP/DUP process buildings and all other facilities on the site, a large aircraft crash is judged to be beyond extremely unlikely and is not considered further.~~

~~Impacts from general aviation planes or helicopters are credible but extremely unlikely. Although the damage potential to FEP/DUP facilities has not been quantified, it is reasonable to assume that the building structures that are designed and built to seismic criteria are sufficient to protect the hazardous materials within the buildings. Therefore, radiological and/or hazardous material releases are minimal. Since small aircraft and/or helicopter crashes are considered low risk and are not considered further in the PHA.~~

~~High wind, snow loading, flooding, and other NPH events are not considered separately. Due to the seismic design capacity of the process buildings, the FEP/DUP Plant is expected to withstand these hazards with minimal damage. Although toppling of equipment or lightning-induced fires may be possible, radiological and/or hazardous material releases are minimal. Therefore, these NPH events are considered low risk and are not considered further.~~

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SS-3. *<u>Background</u>:*
The regulations in 10 CFR 70.64(a)(4) require the applicant to include adequate protection against environmental conditions and dynamic effects in facility design, and 10 CFR 70.62(c)(iv) requires the applicant to conduct and maintain an ISA that identifies potential accident sequences caused by credible external events. In addition, 10 CFR 70.61(b) and 70.61(c) require the applicant to demonstrate that an accident event can be excluded from further consideration based on either its likelihood or its consequences.

<u>Issue</u>:
In LA Sections 1.1.1, Facility Location, Site Layout and Surrounding Characteristics, 3.2.4.3, New Facilities or New Processes at Existing Facilities, and 3.2.5.2, Hazard Identification; and ISA Summary Section 4.4.4, Environmental and Dynamic Effects and Table 3-6, FEP/DUP Facility Hazards Identification, the applicant indicated that several gas pipelines run across the proposed site, and pipelines were included as an external human-induced hazard. However, neither the LA nor the ISA Summary included discussion of gas pipeline characteristics. These characteristics may include the number of gas pipelines that pass through the proposed site and their relative distance from the site or facility, nature of the gas these pipelines carry, probability of gas pipeline explosion, and potential effects (e.g., explosion overpressure) if the probability of pipeline explosion exceeds an annual probability of 10^{-5} (the applicant's highly unlikely definition).

The LA indicated that nearby industrial and military facilities were included as an external human-induced hazard. However, neither the LA nor the ISA Summary included discussion of nearby industrial and military facilities. The applicant did not discuss potential hazards associated with transportation routes.

<u>Request</u>:
Describe the potential hazards to the FEP/DUP because of (i) industrial and military facilities, (ii) gas pipelines, and (iii) transportation routes per Regulatory Guide 1.91.

RESPONSE TO REQUEST #SS-3-i: There are four industrial facilities nearby the IIFP site. Descriptions of those facilities will be provided in the revisions to the ISA Summary as shown in the License Documentation Impact below.

There is no military installation within 20 miles of the IIFP site. There are, however, military operations out of the nearby regional/international airports, including the Lea County Regional Airport. Additionally, there is a Special Use Airspace for two Military Operations Areas (MOAs) north of the IIFP Facility. These include the Bronco 3 and Bronco 4 MOAs. Four (4) IFR Military Training Routes are within a 30 nautical mile radius of the IIFP Facility site. The ISA Summary will be revised to address military operations.

Hazard Energy Sources as listed in Table 5-3, "FEP/DUP Facility Hazard Identification Checklist," include the following as "applicable to the PHA"(1) non-facility events as explosions, fires, and power outages and (2) vehicles in motion, e.g. airplanes, cranes/hoists, forklifts, helicopters, or trucks/cars. The ISA Summary will also be revised to discuss the potential hazards from nearby industrial and military facilities.

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License Documentation Impact #SS3-i: Two additional references will be added to Section 1.6. One will be added for the explosion analysis for Cunningham Station (IIFP, 2011a). The other reference will be added for the Underground Natural Gas and LPG Pipeline Hazard Evaluation (IIFP, 2011b). Section 1.2.4, "Nearby Industrial Facilities." of the ISA Summary Rev A will be revised to discuss the potential hazards as non-facility hazards and vehicles in motion and to describe the nearby military facilities as follows:

Section 1.2.4 Nearby Industrial Facilities

Land around the proposed site has been mostly developed by the oil and gas industry. Three gas-fueled electric-generating~~power~~ plants and a gas-processing facility are located nearby including the ~~industrial~~ Xcel Energy Cunningham Station, 1.6 km (1.0 mi) ~~on~~ from the site on the west boundary (New Mexico Highway 483);~~, of the IIFP proposed property line,~~ Xcel Energy Maddox Station located 3.5 km (2.2 mi) ~~on the~~ east-southeast of the ~~side,~~site; and the Colorado Energy Hobbs Generating Station 3.1 km (1.9 mi) ~~on the~~ east-northeast of the site. The DCP Midstream Linam Ranch Plant is a natural gas processing facility and is located 5.8 km (3.~~1~~6 mi) southeast of the IIFP site. ~~Land use within a Five-Mile Radius.~~

Hazard Energy Sources as listed in Table 5-3, "FEP/DUP Facility Hazard Identification Checklist," include (1) non-facility events such as explosions, fires, and power outages and (2) vehicles in motion, e.g. airplanes, cranes/hoists, forklifts, helicopters, trains, or trucks/cars.

See ISA Summary Section 1.2.4.3, "Nearby Air Transportation" for the impact to the IIFP Facility from vehicles in motion hazards (aircraft and helicopters) at these nearby facilities.

Other potential hazards to the FEP/DUP because of nearby industrial facilities include non-facility events such as explosions. Since all three proximity criteria from Section 3.5.1.6 of SRP NUREG 0800 were met, an aircraft crash into the IIFP Facility is an incredible event. Similarly, an aircraft crash into a nearby industrial facility would be a highly unlikely event. Should an aircraft indeed crash into a nearby facility, the consequences to the IIFP Facility would be similar to that of an explosion potentially caused by the aircraft accident. The structures of the IIFP Facility are to be designed to withstand a 6.9 kilopascals (kPa) (1 psi) overpressure as suggested by the Regulatory Guide 1.91.

An explosion analysis (IIFP, 2011a) determined that a natural gas explosion at the nearest industrial facility, Excel Energy Cunningham Power Station located 1.6 km from the nearest IIFP Process Building, will not impose a blast wave greater than (or equal to) 6.9 kPa (1 psi) on any of the IIFP Process Buildings. The structures of the IIFP Facility are to be designed to withstand a 6.9 kPa (1 psi) overpressure as suggested by the Regulatory Guide 1.91. Thus, a natural gas explosion from nearby industrial facilities poses no credible danger to the IIFP Process Buildings. The explosion analysis and results for nearby gas pipelines are discussed in subsection1.2.4.2 of the ISA Summary.

Other hazard energy sources from other industrial facilities to the IIFP Facility are fires and power outages. Chapter 7 of the IIFP License Application covers "Fire Safety." The fire safety program is intended to reduce the risk of fires and explosions at the IIFP Facility and documents how the facility administrates the fire safety program at the IIFP Facility. Fires at adjacent industrial facilities could lead to power outages or potential explosions at those facilities. Should a fire at an adjacent industrial facility not be contained and spreads toward the IIFP Facility, administrative controls are maintained for vegetation control and limitations on combustible loads. These administrative controls reduce the potential for a fire to be initiated or sustained at the IIFP Facility.

A non-facility event at a nearby industrial facility could result in a power outage at the IIFP Facility. In the event of a power outage the IIFP Facility has a diesel powered emergency generator located outside the Main Switchgear Building. The IIFP Facility also possesses an Uninterruptable Power Supply (UPS) system that provides power to all critical loads during the interim period between power failure and the generator coming up to full speed to supply the site. All buildings are provided with emergency lighting for the illumination of the primary exit paths and critical operation areas where personnel are required to operate valves, dampers, and other controls in an emergency. Thus, fires and power outages at nearby industrial facilities do not pose a credible risk to the safe operation of the IIFP Facility.

There are no military facilities within 20 miles of the proposed site. The closest military installation is Cannon Air Force Base (AFB) which is 129 miles from the IIFP Facility. Thus, there is no need to further assess effects of non-facility events such as explosions, fires, or power outages from military facilities directly on the IIFP site. See ISA Summary Section 1.2.4.3, "Nearby Air Transportation" for the impact to the IIFP Facility from vehicles in motion hazards from military operations.

1.6 References

IIFP, 2011a. International Isotopes Fluorine Products, Inc., "Maximum Blast Pressure Wave at IIFP Process Building due to Natural Gas Pipeline Explosion at the Cunningham Power Station," Parts 1 and 2; 2011.

IIFP, 2011b. International Isotopes Fluorine Products, Inc., "Underground Natural Gas and LPG Pipeline Hazard Evaluation." 2011.

RESPONSE TO REQUEST #SS-3-ii: Several underground fossil fuel pipelines are present in the vicinity of the 40 acre IIFP Facility site. These include natural gas (NG) and liquefied petroleum gas (LPG). An engineering drawing (100-C-0004, Revision A) of the location of the pipelines with respect to the IIFP Facility is being included as part of the Seismic and Structural RAI response documentation package.

The leak or rupture of an underground fossil fuel pipeline, followed by detonation, would generate a blast pressure wave. The source magnitude of the fossil fuel release would primarily depend on the fuel type, pipe size, and pipe pressure. Atmospheric conditions (atmospheric stability class and wind speed) would affect dispersion of the fuel which would strongly influence the source magnitude of the blast.

The magnitude of the blast pressure wave generated by the blast would rapidly diminish with distance. Forces imposed on an industrial structure from a blast pressure wave less than one psi are considered safe (NRC Regulatory Guide 1.91). IIFP conducted a project evaluation entitled, "Underground Natural Gas and LPG Pipeline Hazard Evaluation" which provides an estimate of the annual probability that the rupture of a nearby underground fossil fuel pipeline (followed by ignition) could generate an overpressure blast wave greater than one psi at an IIFP process building.

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The analytic methods applied to estimate the probability are described in the License Documentation Impact (new ISA Section 1.2.4.2). These methods are based on NRC guidance, site specific meteorology, empirical data from the Gas Research Institute, and operational pipeline safety data from the Pipeline Hazardous Material Safety Administration (PHMSA). Key pipeline data (fuel type, diameter, and pressure) are known for all but two of the nearby pipelines. Specifically, there is one NG pipeline for which diameter is unknown, and there is another NG pipeline for which the pressure is unknown. A 12 inch diameter and a 1500 psi pressure are conservatively assumed in the IIFP pipeline hazard evaluation.

Upon rupture, the pressure in a pipeline will initially decay rapidly. Beyond the first five minutes, pipeline pressure will continue to decay but at a slower rate. To simplify the blast calculations, an average release rate is needed. The average release rate for each pipeline is conservatively based on a five minute decay factor, even though the release generally persists for 60 minutes prior to detonation. No credit is taken for release attenuation by the soil matrix.

Site specific atmospheric data was obtained from the State of New Mexico. To facilitate the evaluation, the data was assembled into a canonical set of 43 wind-speed plus stability-class combinations. For each pipeline release rate, blast circle results from the Environmental Protection Agency (EPA) ALOHA computer code were applied to calculate the one psi blast radius for all 43 sets of atmospheric conditions, and the frequency weighted pipeline exposure distances were determined per the method specified in NRC Regulatory Guide 1.91. Wind is conservatively assumed to blow directly toward each process building for every case. PHMSA pipeline safety data were applied to develop explosion-per-pipeline-mile-per-year metrics for both natural gas and liquefied petroleum gas transmission and distribution pipelines. Based on these methods and assumptions, the annual probability that a nearby, fossil fuel pipeline could rupture, detonate, and cause a one psi (or larger) blast pressure wave at a process building is less than 3×10^{-6}. The probability of this event qualifies as highly unlikely per guidance in NUREG-1520, Revision 1; therefore, no further analysis of this event is required.

License Documentation Impact #SS3-ii: A new Section 1.2.4.2 will be added to the IIFP ISA Summary to address hazards from nearby gas pipelines. This response and impact was also explained in response to RAI FS-8 and ISA-08.

1.2.4.2 Nearby Gas Pipelines

A New Mexico licensed engineering company performed a survey of the proposed site to identify nearby underground fossil fuel pipelines. Based on easement records filed with Lea County, several underground fossil fuel pipelines are located within one mile of the proposed site (one etroleum gas pipeline and several natural gas pipelines). An engineering drawing (number 100-C-0004 Revision A) shows the gas pipeline locations in reference to the IIFP Facility site plan and is available as part of the IIFP License Application Engineering Drawing Package submitted to the NRC. As part of the land survey, each pipeline was assigned a designation (i.e., Pipeline 45a). The survey successfully identified the diameter and pressure for the liquefied petroleum gas (LPG) pipeline and all but two of the natural gas (NG) pipelines. The pressure is unknown for one NG pipeline, and the diameter is unknown for the other NG pipeline. Based on the available ~~pipeline~~ data for pipelines located near the IIFP site, the largest NG pipeline diameter is 12 inches and the largest NG pipeline pressure is 1500 psi. These values are conservatively selected to characterize the pipelines for which diameter and pressure are unknown.

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The leak or rupture of a nearby, underground, fossil fuel pipeline could form an explosive cloud of gaseous fuel in the atmosphere. Detonation of the explosive cloud would generate a blast pressure wave. The magnitude of the blast pressure wave would depend primarily on fuel type, pipe diameter, and pressure. Atmospheric conditions (stability class, wind speed, and wind direction) would influence the transport and dispersion of the gaseous fuel and therefore influence the size of the explosive cloud and the magnitude of the blast. The magnitude of a blast pressure wave attenuates rapidly with distance. A blast pressure wave less than one psi is considered conservatively safe for industrial structures (NRC Regulatory Guide 1.91, 1978).

An evaluation (IIFP, 2010b) was performed to determine the annual probability that the rupture of a nearby fossil fuel pipeline (followed by detonation) could generate a blast pressure wave greater than one psi at a process building. Major calculation steps and key analytic assumptions for the pipeline explosion probability evaluation are listed below.

[Step 01] Based on 24 years of fossil fuel gas pipeline safety data obtained from the Department of Transportation (DOT) Pipeline Hazardous Material Safety Administration (PHMSA) website, an explosion per year per pipeline mile rate is developed for NG pipelines (a separate rate is developed for LPG pipelines).

[Step 02] Guillotine pipeline rupture is assumed to occur; a steady gas release ensues; and detonation of the gas plume occurs as much as one hour after the pipeline rupture.

[Step 03] Blast radii are determined by the Environmental Protection Agency (EPA) approved ALOHA computer code for every set of wind speed and stability class that occurs in the Lea County region (there are 43 sets of atmospheric conditions identified). Site specific meteorological data was provided by the State of New Mexico. Blast radii are determined for a range of average pipeline release rates and a power series curve fit is developed for each set of atmospheric conditions (k = 1 to 43):

$$BlastRadius_k = W_k T^{Z_k}$$

Where Blast $Radius_k$ is the blast radius (meters); W_k is the mantissa of the power series curve fit; T is the average release rate from the pipeline (kg/sec); and Z_k is the exponent of the power series curve fit. The subscript "k" represents each of the 43 sets of atmospheric conditions. Power series curve fits provide an excellent fit to all of the results generated by ALOHA.

[Step 04] For each pipeline, the initial release rate $Q_{initial}$ is calculated based on choked flow conditions from the end for the broken pipe. Equal flow from both ends of the ruptured pipeline is conservatively assumed. Based on empirical data from a year 2000 report published by the Gas Research Institute (GRI-00/0189, *A Model for Sizing High Consequence Areas Associated with Natural Gas Pipelines*), a release rate decay factor (λ) is calculated based on the first five minutes of the release (λ=0.16). An average pipeline release rate, $\lambda \times Q_{initial}$, is conservatively assumed to persist for as much as one hour before detonation occurs. Although the soil cover would likely attenuate the release rate via diffusion and absorption, the analysis assumes no credit for the presence of the soil cover.

[Step 05] Based on the curve fits in Step 04, for each pipeline, a blast radius is calculated for each set of atmospheric conditions (k = 1 to 43). Then, consistent with the method illustrated in Figure

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2 of NRC Regulatory Guide 1.91 (NRC, 1978), for each blast radius, calculations are performed to determine the pipeline exposure distance. Pipeline exposure distance is the span of nearby pipeline with potential to produce a blast pressure wave greater than one psi at a process building. It is conservatively assumed that the wind always travels directly toward the nearest process building.

[Step 06] Each pipeline exposure distance calculated in Step 05 is weighted based on the annual frequency of the atmospheric conditions.

$$WeightedExposureDistance_k = ExposureDistance_k \times Freq_k$$

For example, if the calculations reveal that a nearby pipeline has a 287 foot exposure distance based on D stability and 4 m/s wind conditions (D04), and the annual frequency of D04 conditions is 2.3 percent, then the weighted exposure distance is 2.3% x 287 feet = 6.6 feet.

[Step 07] Based on the equation below, a total, annual, weighted average exposure distance (S_{TOT}) is calculated for each pipeline. The use of a weighted average ensures that redundant exposure distances are not double-counted.

$$S_{TOT} = \frac{1}{43}\sum_{k=1}^{43} ExposureDistance_k \times Freq_k$$

[Step 08] Steps 04 through 07 are performed for each nearby fossil fuel pipeline. The combined exposure distance for all the NG pipelines is determined separately from the exposure distance for the LPG pipeline. The weighted exposure distance results for the NG pipelines are summed.

$$NGExposureDistance = \sum S_{TOT,NG}$$

$$PG\text{ Exposure Distance} = S_{TOT,LPG}$$

[Step 09] Each result from Step 08 (one result to represent the LPG pipeline and one result to represent the NG pipelines) is then multiplied by the appropriate annual pipeline explosion rate developed in Step 01. The sum of these products represents the total annual probability that a nearby, fossil fuel pipeline could rupture, detonate, and cause a one psi (or larger) blast pressure wave at a process building.

Based on the methods and assumptions described above, the annual probability that a nearby, fossil fuel pipeline could rupture, detonate, and cause a one psi (or larger) blast pressure wave at a process building is less than 3 x 10^{-6}. The probability of this event qualifies as "highly unlikely" per guidance in NUREG-1520, Revision 1; therefore, no further analysis of this event is required and IROFS are not necessary to prevent or mitigate this scenario.

RESPONSE TO REQUEST #SS-3-iii: The ISA Summary will be revised to address any potential transportation explosion hazards.

License Documentation Impact #SS3-iii: A new Section 1.2.4.1 will be added to the ISA Summary Revision A to describe the potential hazards to the FEP/DUP of transportation routes per Regulatory Guide 1.91.

1.2.4.1 Nearby Highways

The Proposed IIFP site is situated within Lea County, on the north side of U.S. 62/180 and on the east side of NM Highway 483. U.S Highways 62/180 is of four-lane construction and is a well-established radioactive waste transportation corridor established by the Department of Energy (DOE) for shipping transuranic and mixed waste. U.S 62/180 runs southwest toward Carlsbad, NM, approximately 56 miles (90.1 km) from the proposed site. NM 483 runs from intersection of U.S. 62/180 (Arkansas Junction) to Lovington, NM, approximately 15.4 miles (24.1km) from the IIFP site.

Regulatory Guide 1.91 provides guidance to address transportation explosion hazards near nuclear power plants. The potential hazard has been reviewed and evaluated in reference to the Regulatory Guide 1.91 and the NRC Safety Evaluation Report for the National Enrichment Facility in Lea County, New Mexico, Louisiana Energy Services (NUREG-1827) (USNRC, 2005).

In NUREG-1827, the potential hazard of a highway propane explosion was evaluated for likelihood of occurrence because the postulated accident was in the approximate safe-separation distance from a proposed safety-significant structure. In the case of the IIFP Facility, the structures of the proposed conceptual facility are to be designed to withstand a 6.9 kPa (1 psi) overpressure as suggested by the Regulatory Guide 1.91.

The IIFP initial calculation for the IIFP Facility was based on the NUREG-1827 postulated accident and considered a 10,000 pound propane truck completely crashing with a resulting explosion. When calculating TNT equivalents, a 100% TNT mass is used for solid energetic materials and 240 % TNT equivalence for substances subject to vapor effective explosions (Regulatory Guide 1.91, page 3 "C. Regulatory Position").

Using the postulated accident and 10,000 pounds of propane, the TNT explosion equivalence was determined using a 240% TNT mass equivalence for substances subject to vapor phase explosions. The value used in the original RAI response calculation was 24,000 pounds of TNT equivalence. Based on Regulatory Guide 1.91 conservative safe distance calculations (and the 1 psi incident overpressure for safety significant structure, systems and components (SSCs) that will be used in the IIFP design basis), the R= kWE-03 for the postulated accident is equal to (45) x $(24{,}000)^{1/3}$ or approximately 0.24 miles (0.39 km).

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SS-4. *Background:*
The regulations in 10 CFR 70.64(a)(4) require the applicant to include adequate protection against environmental conditions and dynamic effects in its design of the facility, and 10 CFR 70.62(c)(iv) requires the applicant to conduct and maintain an ISA that identifies potential accident sequences caused by credible external events. In addition, 10 CFR 70.61(b) and 70.61(c) require the applicant to demonstrate that an accident event can be excluded from further consideration based on either its likelihood or its consequences.

Issue:
In LA Section 3.2.5.2, Hazard Identification and ISA Section 5.2.1, Hazard Identification Method and Table 3-6, FEP/DUP Facility Hazards Identification, the applicant excluded aircraft crash as a potential external hazard from further consideration for facility design and in the ISA for the proposed FEP/DUP. IIFP justified this exclusion by stating that "An aircraft crash typically consists of an initial impact of the aircraft with the ground and a slide into the facility (direct impact is possible but much less likely). This event is extremely unlikely even for very large structures. For FEP/DUP process buildings and all other facilities on the site, a large aircraft crash is judged to be beyond extremely unlikely and is not considered further (Underline added)." However, IIFP did not provide quantitative assessment of the probability of aircraft crash hazard to the FEP/DUP to justify the exclusion.

Request:
Provide an aircraft crash hazard analysis to demonstrate that aircraft crash hazard is highly unlikely for the IIFP FEP/DUP site.

RESPONSE: A new section will be added to the ISA Summary to address nearby air transportation (Section 1.2.4.3) assessing the risks from aircraft hazards. This new section also addresses military operations.

License Documentation Impact: In addition, a new Section 1.2.4.3, "Nearby Air Transportation," will be added to the ISA Summary. This section also addresses military operations hazards [See RAI SS-3 (i).] Section 1.2.4.3 will read as follows:

1.2.4.3 Nearby Air Transportation

An aircraft hazard risk determination (IIFP, 2011) has been conducted. This analysis follows the methodology as described in Standard Review Plan (SRP) NUREG 0800 Section 3.5.1.6 for aircraft hazards evaluation (NRC, 2010). SRP 3.5.1.6 methodology is accepted by the U.S. Nuclear Regulatory Commission (USNRC) to assess the probability of hazards due to airport operations and aircraft transits near nuclear facilities.

SRP 3.5.6.1 proximity acceptance criterion 1A states that the probability of aircraft accidents with potential radiological consequences is considered to be less than about 1×10^{-7} per year if the site-to-airport distance, D, is between 5 and 10 statute miles and the projected annual number of operations is less than 500 D^2, or D is greater than 10 statute miles and the projected annual number of operations is less than 1000 D^2. Seventeen airports within 100 miles of the IIFP Facility were evaluated for the number of annual operations. The distance from the site to all the surrounding airports is greater than 5 statute miles and the acceptable number of operations

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permitted by this acceptance criterion is greater than the number of operations conducted at each airport multiplied by the distance factor. Based on the published number of operations and distances to the proposed IIFP site, this criterion has been met.

SRP 3.5.6.1 proximity acceptance criterion 1B states that the probability of aircraft accidents with potential radiological consequences is considered to be less than about 1 x 10^{-7} per year if the site is at least 5 statute miles from the edge of military training routes, including low-level training routes, except for routes used by more than 1000 flights per year or where activities (such as practice bombing) may create an unusual stress situation. There are four military routes within a 30 nautical mile radius of the proposed site. The closest approach is approximately 15 nautical (17 statute) miles southwest of the facility. The number of military operations at the Lea County Regional Airport is 561 annually. Additionally, there is a Special Use Airspace for two Military Operations Areas (MOAs) north of the IIFP site. The closest edge of the MOA is approximately 5 nautical (5.8 statute) miles from the facility. Thus, military operations, military training routes, or proximity to MOAs are not expected to pose any hazard to the proposed facility since these proximity criteria are met.

SRP 3.5.6.1 proximity acceptance criterion 1C states that the probability of aircraft accidents with potential radiological consequences is considered to be less than about 1 x 10^{-7} per year if the site is at least 2 statute miles beyond the nearest edge of a Federal airway, holding pattern, or approach pattern. Holding and approach patterns were evaluated for three airports within 20 miles of the IIFP site. These airports include:

- Lea County Regional Airport – 8 statute miles east southeast of the proposed facility site;
- Hobbs Industrial Airpark – 8.5 statute miles east northeast of the proposed facility site; and
- Lea County Zip Franklin Memorial Airport – 17 statute miles north northwest of the proposed facility.

For the Lea County Regional Airport, seven Instrument Flight Rule (IFR) procedures were evaluated for holding and approach patterns. There are no runways at the regional airport where the IFR landing/takeoff procedures would take aircraft within 2 statute miles of the IIFP site. During descent into the airport, the closest approach would be 6.5 nautical (7.5 statute) miles east southeast of the IIFP site. The Visual Flight Rule (VFR) landings/takeoffs from two runways would take aircraft no closer than 6.5 nautical (7.5 statute) miles from the site. The closest hold pattern is 6.5 nautical (7.5 statute) miles from the IIFP Facility. Thus for all seven IFR procedures for this regional airport, the IIFP site is at least 2 statute miles beyond the nearest edge of an approach or hold pattern. Holding and approach patterns for the Lea County Regional Airport meet SRP proximity criterion 1C.

The Hobbs Industrial Airpark has no instrument procedures or specific holding patterns. Assuming at least a 10 nautical mile visual landing approach of one runway, an aircraft could come within 3.5 nautical (4 statute) miles from the IIFP site. Using the other runway, aircraft could come within 5.5 nautical miles during the approach landing. This airpark has no air carrier, general aviation, or military operations, only operations from 32 airpark-based aircraft. The threshold limit provided in NUREG-0800 for air carrier, general aviation, and military operations is 37.400. Since no holding patterns exist for this airpark and the airpark poses no concern per SRP guidelines, the issue of holding patterns is not relevant for this airpark. No landing approach patterns are within 2 statute miles of the site. Holding and approach patterns for the Hobbs Industrial Airpark meet SRP proximity criterion 1C.

For the Lea County Zip Franklin Memorial Airport (E06), two IFR procedures were evaluated for holding and approach patterns. For the closest runway, the landing distance is 11.3 nautical miles with a 6 nautical mile holding pattern. At the southern-most point of the holding pattern, this would place an aircraft no closer than 16 nautical miles from the IIFP site. For VFR flights using the runway that would take aircraft the closest to the site, this would still put aircraft no closer than 16 nautical miles from the site assuming a 10 mile final approach. Thus, no holding or approach patterns are within 2 statute miles of the site. Holding and approach patterns for the E06 Airport meet SRP proximity criterion 1C.

There are four en-route high-level airways within 35 statute miles of the IIFP Facility. The closest airway is Q20 which passes 10.4 statute miles southwest of the IIFP site. This Q20 airway meets the SRP proximity criterion 1C. There are three en-route low-level airways passing through the navigational aid HOB VORTAC. The closest airway (V68) passes 3.2 statute miles of the proposed site. Another airway (V291) is 4.7 statute miles from the site. The closest point to the V102 airway is 6.5 nautical miles from IIFP site. All three airways meet the SRP proximity criterion 1C. Even though no additional analysis is required to meet criterion 1C, calculations were performed as a further check that the annual probability of an aircraft crash into the target area from CFR Part 121 and Part 135 operations using the airway closest to the site (V68) is less than 10^{-7} per year for the SRP 3.5.1.6 acceptance criterion 1C.

Using the method provided in Section 3.5.1.6 of NUREG 0800, the probability of an aircraft on the V68 airway crashing onto the proposed facility was estimated to be 2.7×10^{-8} for CFR 121 operations. This probability makes the aircraft crash an incredible event and thus requires no further consideration in either design or integrated safety analysis.

Department of Energy (DOE) Standard 3014-2006 (DOE, 2006) offers an alternative analytic method to evaluate external risk from aircraft operations. To establish additional confirmation of the results obtained by the NRC method, the DOE method was also applied. Since the DOE method applies a different analytic approach, the results obtained via the DOE method are only relevant in comparison to the DOE threshold risk metric, which is not the same as the NRC risk metric. Based on the results from the DOE evaluation, the calculated probability of 3.3×10^{-7} crashes per year at the site is less than the DOE evaluation guideline of 1.0×10^{-6}.Therefore, the DOE method also demonstrates that the crash of an aircraft into the target areas is an incredible event and thus requires no further consideration in the integrated safety analysis.

All three proximity criteria of Section 3.5.1.6 have been met. Additional calculations estimate that the probability per year of an aircraft crashing into the plant from the closest Federal airway (V68) is less than the NRC acceptance criteria. Calculations also estimate the annual probability of an aircraft crashing into the plant from the same airway is less than the DOE acceptance criteria. This probability is well below the NRC threshold metric of 1×10^{-7} which means an aircraft crash into the target area is an incredible event and thus requires no further consideration in the integrated safety analysis.

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The aircraft hazards determination following the methodology in SRP Section 3.5.1.6 addressed military operations. There are military operations out of the nearby regional/international airports, including the Lea County Regional Airport and the Winkler County (WINK), Texas airport. The number of total operations from both airports, including the military operations, is far below the SRP Section 3.5.1.6 Acceptance Limit 1A. Additionally, there is a Special Use Airspace for two Military Operations Areas (MOAs) north of the IIFP Facility. The closest edge of the MOA is approximately 5 nautical (5.8 statute) miles from the facility. This is not expected to pose any hazard to the proposed facility, since the MOAs are more than 5 statute miles from the site (SRP Section 3.5.1.6 Acceptance Limit 1B). Four (4) IFR Military Training Routes are within a 30 nautical mile radius of the proposed site. The closest approach is about 17 nautical miles west from the IIFP site. This is not expected to pose any hazard to the proposed facility, since the routes are more than 5 statute miles from the site, per SRP Acceptance Criterion 1B. Per SRP 3.6.1.5 Acceptance Criterion 1B, the probability of aircraft accidents is less than an order of magnitude of 1×10^{-7} per year if the plant is at least 5 statute miles from the nearest edge of military training routes, except for those associated with usage greater than 1000 flights per year. The Hobbs Regional Airport has the greatest number of military operations at 561 annually. Hence, no further analysis is required with regard to the impact of military training routes or military operations.

License Documentation Impact: Insert a new reference for an "Aircraft Hazard Risk Determination in Section 1.6.

1.6 References

IIFP, 2011. International Isotopes Fluorine Products, Inc., "Aircraft Hazard Risk Determination," 2011.

License Documentation Impact: The IIFP ISA Table 5-3 will be revised as follows for Item 17.1 (Airplanes) to identify "as applicable" to PHA because a hazard analysis has now been performed.

Item	Hazard Energy Source or Material	Applicable to PHA?		Rationale*
		Yes	No	
17.1	Airplane	X	~~X~~	Considered ~~beyond extremely unlikely.~~ external initiating event.

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SS-5. *Background:*
The regulations in 10 CFR 70.64(a)(4) require the applicant to include adequate protection against environmental conditions and dynamic effects in its design of the facility, and 10 CFR 70.62(c)(iv) requires the applicant to conduct and maintain an ISA that identifies potential accident sequences caused by credible external events.

Issue:
LA Section 1.6.4, Geology and Seismology; and ISA Summary Section 1.5, Geology and Seismology, did not include the information needed to assess the potential effects of site soil seismic amplification, soil settlement, allowable bearing capacity, and liquefaction potential.

Request:
1. *Provide the geotechnical and geophysical investigation plan that will be used to collect the geotechnical properties of the site soils that will be needed for assessing seismic site response, determining soil settlement and allowable bearing capacity for design, and assessing liquefaction potential for the site.*

2. *Provide assessment of site soil seismic amplification, soil settlement, allowable bearing capacity, and liquefaction potential.*

RESPONSE TO REQUEST #SS-5-1: At this time IIFP is providing information in the License Documentation Impact below regarding the planned procedure, guidance and standards that it will used to conduct geotechnical and geophysical investigations to characterize the site soil and to make an assessment.

License Documentation Impact #SS-5-1: A new Section 1.5.4 will be added to the IIFP ISA Summary Section 1.5, "Geology and Seismology" to describe the plan for geotechnical and geophysical investigation and analysis to read as follows:

1.5.4 Geotechnical and Geophysical Investigation and Analysis

A preliminary geotechnical and geophysical investigation and analysis plan has been developed to determine the site class, seismic site response, liquefaction potential, soil settlement potential, and allowable bearing capacity of the soil for the IIFP Facility site. Details of the analysis plan and the codes and standards to be followed are detailed below.

The proposed scope of the IIFP Facility geotechnical investigation, including the planned tests and their use for determining soil parameters, is as follows:

- Perform pathfinder surveys for determination of essential settlement parameters with dilatometer soundings to 150 feet of depth or blade thrust refusal load of 25 tons;
- Perform pathfinder surveys for determination of approximate small strain seismic data and large strain shear strength data with Seismic Cone Penetration Test soundings to 150 feet of depth or cone thrust refusal load of 25 tons;
- Perform critical determination of small strain seismic shear modulus and Poisson Ratio data with Cross-hole Seismic Tests to depths of 150 feet or so depending on the

requirements as defined by the Engineering use of the individual buildings and geology determined by the dilatometer and seismic cone penetration test soundings;

- Perform drilling and borings in select locations, based on data from dilatometer and Seismic Cone Penetration Test soundings, including Standard Penetration Test borings, to 150 feet of depth;
- Perform soil sampling in Standard Penetration boreholes to obtain disturbed and undisturbed soil samples; and
- Perform auger borings to 15 feet of depth and obtain bulk disturbed soil samples.

The proposed drilling and boring location guidelines are as follows:

- Structures: 1 boring for every 2500 square feet,
- Pier foundations: 1 boring for every pier, and
- Roads: 1 boring for every 500 feet.

Geotechnical Standards under which activities and tests will be performed in accordance with American Society for Testing and Materials (ASTM) standards. See Section 2.3.3 "Geotechnical and Geophysical Codes and Standards" for applicable ASTM Standards.

License Documentation Impact #SS-5-1: Revised Section 1.7.4.1 (formerly 1.6.4.1) of the IIFP License Application will be amended to refer to the geotechnical and geophysical investigation plan provided in the IIFP ISA Summary new Section 1.5.4. Wording will be added as a last paragraph to Section 1.7.4.1 to read as follows:

IIFP will conduct geotechnical and geophysical investigations and analyses to determine the site class, seismic site response, liquefaction potential, soil settlement potential, and allowable bearing capacity of the soil for the IIFP Facility site. Details of the analysis plan and the codes and standards to be followed are provided in the IIFP ISA Summary Section 1.5.4 and Section 2.3.3, respectively.

RESPONSE TO REQUEST #SS-5-2: The following is the preliminary determination of the field-free ground motion response spectra for the IIFP Facility site based on the input 2,500 year return ground motions and a reasonable assumption of the site's soil conditions of either Site Soil Class B or Site Soil Class C. The Site Soil Class will be verified as part of the geotechnical investigation.

1.0 Determination of Mapped Acceleration Parameters and Seismic Design Category

1.1 Following the procedure outlined in ASCE 7-05, Section 11 the spectral accelerations for the geographic location of the IIFP Facility may be determined from the historically-based maps shown in ASCE 7-05, Section 22 with isolines defining regions subject to varying levels of seismic accelerations. These maps are reprinted from those constructed in the USGS National Seismic Mapping Project. These maps show both Short Period (.2-sec) and Long Period (1-sec) spectral accelerations for the conterminous United States. They are based upon a grid spacing of approximately .05° and a Soil Site Class B. As an alternative to these maps, the spectral accelerations may more accurately be obtained from the "JAVA Ground Motion Parameter Calculator" application located on the USGS website: (http://earthquake.usgs.gov/research/hazmaps/design).

1.2 From preliminary site visits to the IIFP Facility site and from conversations with Pettigrew Associates (a licensed engineering firm) located in Hobbs, New Mexico, it is expected that soil conditions in the area will consist of a layer approximately two feet in depth of soft caliche over hard caliche rock. For this reason, the conceptual design Site Soil Class is assumed to be either Site Soil Class B or Site Soil Class C. Below is an analysis of the determination of the mapped acceleration parameters for the IIFP Facility site for both Site Soil Class B and Site Soil Class C. If, after geotechnical analysis, the Site Soil Class is determined to be other than Site Soil Class B or Site Soil Class C, the mapped acceleration parameters will be determined using the same procedure as detailed below and using the Site Soil Class as determined from geotechnical analysis.

1.3 Determination of Mapped Acceleration Parameters and Seismic Design Category (Site Soil Class B).

The Horizontal Spectral Response Accelerations Ss and S1 from the JAVA Application, assuming a Soil Site Class B (Default), 5% critical damping and site location coordinates of N32.71°, W-103.34° are as follows:

Period (Sec)	Sa (g)	
0.2	0.216	(Ss, Site Soil Class B)
1.0	0.041	(S1, Site Soil Class B)

1.3.1 The Horizontal Spectral Response Accelerations SMs and SM1 (adjusted for MCE and local Site Soil Class B) are calculated from ACCE 7-05 equations 11.4-1 and 11.4-2 as follows:

$$SMs = Fa \times Ss \quad SM1 = Fv \times S1$$

For Site Soil Class B, Site Soil Coefficients from ASCE 7-05 Table 11.4-1 and Table 11.4-2 are as follows:

Fa = 1.0 and Fv = 1.0

Period (Sec)	Sa (g)	
0.2	0.216	(SMs, Site Soil Class B)
1.0	0.041	(SM1, Site Soil Class B)

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1.3.2 The Horizontal Design Spectral Response Accelerations SDs and SD1 are *calculated using ASCE 7-05 equations 11.4-3 and 11.4-4 as follows:*

SDs = 2/3 x SMs SD1 = 2/3 x SM1.

Period (Sec)	Sa (g)	
0.2	0.144	(SDs, Site Class B)
1.0	0.027	(SD1, Site Class B)

1.3.3 In accordance with ASCE 7-05 11.6, the Seismic Design Category shall be determined from the most severe category of Table 11.6-1 relating Short Period Horizontal Design Spectral Response Acceleration versus Occupancy Category or Table 11.6-2 relating Long Period Horizontal Design Spectral Response Acceleration versus Occupancy Category.

1.3.4 Based upon the SDs of 0.144 and an Occupancy Category III, Seismic Design Category A is selected from Table 11.6-1. Based upon the SD1 of 0.027 and an Occupancy Category III, Seismic Design Category A is selected from Table 11.6-2. Seismic Design Category A is selected as the Seismic Design Category for the IIFP Facility assuming a Site Soil Class B.

1.4 Determination of Mapped Acceleration Parameters and Seismic Design Category (Site Soil Class C).

1.4.1 The Horizontal Spectral Response Accelerations Ss and S1 from the JAVA Application, assuming a Soil Site Class B (Default), 5% critical damping and site location coordinates of N32.71°, W-103.34° are as follows:

Period (Sec)	Sa (g)	
0.2	0.216	(Ss, Site Soil Class B)
1.0	0.041	(S1, Site Soil Class B)

1.4.2 The Horizontal Spectral Response Accelerations SMs and SM1 (adjusted for MCE and local Site Soil Class C) are calculated from ASCE 7-05 equations 11.4-1 and 11.4-2 as follows:

SMs = Fa x Ss SM1 = Fv x S1

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For Site Soil Class B, Site Soil Coefficients from ASCE 7-05 Table 11.4-1 and Table 11.4-2 are as follows:

Fa = 1.2 and Fv = 1.7

Period (Sec)	Sa (g)	
0.2	0.259	(SMs, Site Soil Class C)
1.0	0.070	(SM1, Site Soil Class C)

1.4.3 The Horizontal Design Spectral Response Accelerations SDs and SD1 are calculated using ASCE 7-05 equations 11.4-3 and 11.4-4 as follows:

SDs = 2/3 x SMs SD1 = 2/3 x SM1.

Period (Sec)	Sa (g)	
0.2	0.173	(SDs, Site Class C)
1.0	0.047	(SD1, Site Class C)

2.0 Determination of Seismic Design Category

2.1 In accordance with ASCE 7-05 11.6, the Seismic Design Category shall be determined from the most severe category of Table 11.6-1 relating Short Period Horizontal Design Spectral Response Acceleration versus Occupancy Category or Table 11.6-2 relating Long Period Horizontal Design Spectral Response Acceleration versus Occupancy Category.

2.2 Based upon the SDs of 0.173 and an Occupancy Category III, Seismic Design Category B is selected from Table 11.6-1. Based upon the SD1 of 0.047 and an Occupancy Category III, Seismic Design Category A is selected from Table 11.6-2. The more severe Seismic Design Category B is selected as the Seismic Design Category for the IIFP Facility assuming a Site Soil Class C.

License Documentation Impact #SS-5-2: None at this time.

Official Responses to Seismic and Structural RAIs

SS-6. *Background:*
The regulations in 10 CFR 70.64(a)(4) require the applicant to include environmental conditions and dynamic effects associated with normal operations, maintenance, testing, and postulated accidents that could lead to loss of safety functions. 10 CFR 70.62(c)(iv) requires the applicant to conduct and maintain an ISA that identifies potential accident sequences caused by credible external events. In addition, 10 CFR 70.61(b) and 70.61(c) require the applicant to demonstrate that an accident event can be excluded from further consideration based on either its likelihood or its consequences.

Issue:
In ISA Summary Section 5.2.1, Hazard Identification Method, the applicant stated that "Impacts from general aviation planes or helicopters are credible but extremely unlikely. Although the damage potential to FEP/DUP facilities has not been quantified, it is reasonable to assume that the building structures that are designed and built to seismic criteria are sufficient to protect the hazardous materials within the buildings. Therefore, radiological and/or hazardous material releases are minimal (Underline added)." The technical basis supporting this assumption is needed to determine whether buildings are designed sufficiently to protect hazardous materials from aircraft crash hazards.

Request:
Provide a technical basis for the assumption that building structures that are designed and built to seismic criteria are sufficient to protect the hazardous materials within the buildings from impacts of general aviation planes or helicopters.

RESPONSE: The Aircraft Hazard Risk Determination referenced in the response to RAI SS-4 was performed. All three proximity criteria of Standard Review Plan (SRP) NUREG 0800 Section 3.5.1.6 were met. Even though not required, calculations were performed as a further check to calculate the annual probability of an aircraft crash into the target area of the IIFP Facility from CFR Part 121 and Part 135 operations using the airway closest to the site. These calculations estimate that the probability per year of an aircraft crashing into the plant from the closest Federal airway is well below the NRC threshold metric of 1×10^{-7} which means an aircraft crash into the target area is an incredible event and thus requires no further consideration in the integrated safety analysis.

License Documentation Impact: The 2nd paragraph of ISA Summary Section 5.2.1 will be deleted in response to RAI SS-2. The aircraft crash hazard determination has been conducted and an explanation is provided in the IIFP ISA Summary Section 1.2.4.3 "Nearby Air Transportation" in response to RAI SS-4.

Official Responses to Seismic and Structural RAIs

SS-7. *Background:*
The regulations in 10 CFR 70.64(a)(2) and 70.64(a)(4) require the applicant to include adequate protection against natural phenomena, environmental conditions, and dynamic effects in its design of the facility. In addition, 10 CFR 70.61(b) and 70.61(c) require the applicant to demonstrate that an accident event can be excluded from further consideration based on either its likelihood or its consequences.

Issue:
In LA Section 1.1.2.1, Process Buildings and Process Areas and ISA Summary Sections 2.4, Process Buildings and 5.2.1, Hazard Identification Method, the applicant did not provide any load combination information for the structural design of Process Buildings. The applicant also indicated in its ISA Summary Section 5.2.1, that due to the seismic design capacity of the process buildings, the FEP/DUP Plant is expected to withstand hazards such as high wind, snow loading, flooding, and other natural phenomena-related hazards with minimal damage. However, a technical basis is not provided to support this assumption. Furthermore, the applicant did not include civil structural design information in either LA or ISA Summary to permit assessment of reasonableness of the IIFP proposed design.

Request:
1. *Provide a facility site plan, layout of the buildings, and multiple horizontal and vertical cross-sectional drawings of the conceptual structural design of all the Process Buildings.*

2. *Provide information about the structural and foundation design of Process Buildings with emphasis on seismic design, including design bases, design criteria, design methodology, and design codes used for reinforced concrete and steel structures.*

3. *Provide a description of the methods used to conduct structural analyses of Process Buildings with an emphasis on seismic analysis, including major assumptions made such as fixed supported structures or soil-structure interaction structures, modeling methodology used, type of seismic analyses conducted, and computer codes used.*

4. *Provide a description of the methods used to conduct seismic analysis of equipment, piping, silos, and other mechanical systems.*

5. *Provide load combinations to be used for structural design of Process Buildings and demonstrate, using these load combinations, that the load combinations with seismic hazard bound all other hazards, including the hazards in RAI 2 at the site for the design of these Process Buildings.*

6. *Either determine the effects of building damage, including collapse resulting from a ground motion corresponding to an annual probability of 10^{-5} on radiological and chemical consequences on workers and the public; or demonstrate that the proposed seismic design of buildings justify excluding seismically-induced building damage from the ISA.*

Official Responses to Seismic and Structural RAIs

RESPONSE: (Requests #SS-7-1 through #SS-7-5):

RESPONSE TO REQUEST #SS-7-1: An updated conceptual facility site plan drawing is being included with this Seismic and Structural RAI response package. Conceptual structural floor plan drawings of all process buildings showing horizontal cross sections at each floor level are being provided. Conceptual structural elevation drawings of all the process buildings are also being furnished.

RESPONSE TO REQUEST #SS-7-2: The following provides the structural design criteria for the design of concrete and steel structures including their foundations for the Fluorine Extraction Process and Depleted Uranium De-conversion (FEP/DUP) Plant (IIFP Facility) to be built by International Isotopes Fluorine Products in Lea County, New Mexico. This section also provides the methodology that will be used for the structural design of this facility.

Governing Codes and Standards

For the design of structures not housing equipment designated as IROFS, the following codes and standards will be used:

NMCBC 2009, New Mexico Commercial Building Code

IBC 2009, International Building Code

ASCE 7-05, Minimum Design Loads for Buildings and Other Structures

ACI 318-08, Building Code Requirements for Structural Concrete

ACI 530-08/ASCE 5-08/TMS 402-08, Building Code Requirements for Masonry Structures

ANSI/AISC 360-05, Specification for Structural Steel Buildings

AISC Steel Construction Manual 13th Edition

ANSI/AISC 341-05, Seismic Provisions for Structural Steel Buildings

AWS D1.1-2004, Structural Welding Code - Steel, American Welding Society

For the design of those structures housing equipment designated as IROFS, the following codes and standards will be used:

NMCBC 2009, New Mexico Commercial Building Code

IBC 2009, International Building Code

ASCE 7-05, Minimum Design Loads for Buildings and Other Structures

ANSI/AISC N690-06, Specification for Safety-Related Steel Structures for Nuclear Facilities

ANSI/AISC 360-05, Specification for Structural Steel Buildings

Official Responses to Seismic and Structural RAIs

AISC Steel Construction Manual 13th Edition

AWS D1.1-2004, Structural Welding Code - Steel, American Welding Society

ACI-349-06, Code Requirements for Nuclear Safety Related Concrete Structures

ASCE 4-98, Seismic Analysis of Safety-Related Nuclear Structures

Materials

All structural materials will conform to the specifications listed below, as a minimum. The latest version of these standards will be used at the time of procurement of these materials.

a) Structural Steel:

Wide Flange and WT Shapes:	ASTM A992 or ASTM A572 Gr. 50
Structural channels, angles:	ASTM A36 (unless otherwise noted on drawings)
Plate less than 3/8-inch thick:	ASTM A36
Plate 3/8-inch thick to 4-inch thick:	ASTM A572, Gr. 50
b) Cold formed steel tubing:	ASTM A500, Gr. B; Fy = 46 ksi
c) Hot formed steel tubing:	ASTM A501
d) Steel Pipe:	ASTM A53, Gr. B

e) Structural Steel Connections:

Primary structural connections will consist of high strength bolting materials as follows:

Bolts:	ASTM A325 Type 1 or ASTM A490 Type 1
Nuts:	ASTM A563, (Heavy Hex) Grade C or Grade DH
Washers:	ASTM F436, Type 1 or ASTM F959 (Direct Tension Indicator)

Secondary field connections limited to stair stringers, ladders, and handrail may consist of the following materials:

Bolts:	ASTM A307, Grade A
Nuts:	ASTM A563, Grade A Hex
Washers:	ASTM F436, Type 1

Official Responses to Seismic and Structural RAIs

Galvanized parts will be connected with galvanized bolts. Galvanizing will be in accordance with ASTM A123.

f) Structural steel welding filler standard will be: E70XX Electrodes per AWS D1.1

g) Concrete:

Cement per ASTM C150, Type II, Low alkali

Concrete will have the following 28 day compressive strengths as a minimum:

F'c = 4000 psi for structural concrete

F'c = 2000 psi for encasements, thrust blocks, electrical ducts, lean concrete backfill

h) Reinforcing Steel:

Reinforcing bars:	ASTM A615, Grade 60 or ASTM A706, Grade 60
Welded wire fabric:	ASTM A185

i) Masonry:

Masonry will conform to the NMCBC and the following properties:

Block: ASTM C90 (Type I) Normal Weight; Minimum Compressive Strength of Concrete Masonry Units (CMU) = 1900 psi

Mortar: ASTM C270, Type S; Minimum Compressive Strength of Masonry and f'_m=1500psi

j) Cast-in-Place Anchor Bolts:

Standard and High Strength Bolting Components:

Bolts:	ASTM F1554, Grade 36, 55 or 105
Nuts:	ASTM A563, Gr. A or DH (Heavy Hex)
Washers:	ASTM F436, Type 1

k) Drilled-in Anchors and Reinforcing Bars:

Expansion Type Anchor:	Hilti Kwik Bolt TZ or approved equal
Sleeve Type Anchor:	Hilti HSL or approved equal
Undercut Anchor:	Hilti HDA Undercut anchor, or approved equal

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l) Handrail:

ASTM A53 Grade B 1-1/2-inch Dia. I.P.S., Sch 40 Handrail, and 2-inch Dia. I.P.S., Schedule 40 or Schedule 80 posts

m) Floor Grating and Stair Treads: ASTM A1011/A1011M steel, galvanized

n) Checkered Plate: ASTM A786 /A786M

Bolts and nuts connecting grating, stair treads, or checked plate will conform to ASTM A307 Grade A or approved equal. Grating will be hot-dipped, galvanized after fabrication in accordance with ASTM A123.

o) Metal Decking: ASTM A1008 or ASTM A653-94

F_y = 33.0 ksi or higher

Unit design stress < 0.60 F_y, where F_y = 36 ksi maximum

p) Welded Studs:

Type S3L Shear Connectors or Type H4L Headed Concrete Anchors as provided by Nelson, or approved equal.

Mild Steel F_y = 51 ksi F_u = 65 ksi

RESPONSE TO REQUEST #SS-7-3: IIFP Process Buildings will be of braced frame structural steel construction with spread footings, reinforced concrete floor slabs and metal roofs.

A 3D mathematical finite element model of each process building will be constructed, and a linear dynamic modal analysis will be performed on each process building, using computer software SAP 2000, developed by Computer and Structures, Inc. Dynamic analysis will be based on response spectra method.

Response spectra used for the building analysis will be based on a Soil-Structural Interaction (SSI) analysis which will be performed for each process building. Foundation/soil/upper structure will be coupled using a 3D finite element program SASSI. Strain dependent soil properties will be used based on upper bound, lower bound, best estimate and enveloped soil parameters. Soil has no potential for the liquefaction under the seismic event.

The methodology for the seismic analysis of the process buildings will be based on the guidelines provided in ASCE 4-98. Design Basis Earthquake (DBE) for process buildings, peak ground acceleration (PGA) at the free-field ground surface will be selected for the site that has an extremely low probability of occurrence based on the site geology and seismology study. Seismic input ground motions will be smoothed response spectra, conservatively estimated to account for uncertainties in future earthquake.

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The methodology used to determine the seismic loads, ground acceleration and design parameters to be used in the design of the non-process buildings and structures will be in accordance with the requirements of International Building Code and ASCE 7.

RESPONSE TO REQUEST #SS-7-4: Seismic qualification of equipment for active seismic IROFS will be performed in accordance with the requirements of IEEE Standard 344, 'Seismic Qualification of Class 1E Equipment' and Regulatory Guide 1.100, 'Seismic Qualification of Electrical and Mechanical Equipment for Nuclear Power Plants'.

In-structure seismic response spectra for various damping values will be developed at the IROFS locations from the seismic soil-structure interaction analysis.

Seismic design of the supports and anchorages for IROFS equipment will be based on an equivalent static approach in accordance with the guidelines provided in ASCE 4-98, Seismic Analysis of Safety-Related Nuclear Structures. The peak horizontal and vertical acceleration values will be chosen from appropriate in-structure response spectra. These values will be increased by a factor 1.5 to account for multi-mode effects.

Equipment such as outdoor elevated tanks, silos, tall scrubbers and stacks will be modeled based on the finite element method or as a lumped mass stick model. Linear dynamic modal analysis will be performed. Effect of sloshing will be considered for the fluid containing tanks.

Piping, conduit and other miscellaneous supports and hangers will be evaluated using an equivalent static approach. The peak horizontal and vertical acceleration values will be chosen from appropriate in-structure response spectra. These values will be increased by a factor 1.5 to account for multi-mode effects.

The seismic response from each orthogonal direction of earthquake will be combined using the SRSS method. Alternatively, the combined seismic response for all three seismic components may be obtained by using the 100-40-40 rule, as permitted by ASCE 4-98.

Seismic design/qualification of components and support structures mounted at the building grade elevation, DBE ground motion response spectra will be used.

RESPONSE TO REQUEST #SS-7-5:

1. **<u>Design Loads:</u>**

a) Dead Loads (D):

Dead loads will be the total weight of materials forming the permanent part of a building or structure, empty vessels, piping, conduit, cable tray, ductwork, and equipment, air handling units and other equipment, supports for same, built-in partitions, insulation, fire protection covering, other permanent fixtures and long term stored materials.

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b) Live Loads (L) and Roof Live Loads (Lr):

Live loads and roof live loads will be defined as the weight of all movable loads such as personnel, tools, miscellaneous equipment, movable partitions, hoists, parts of dismantled equipment and in-process material.

c) Pressure Differential Loads (Pa):

Maximum differential pressure loads generated by a postulated design basis accident or pipe break.

d) Snow Loads (S):

The design-basis ground snow load for IIFP structures will be 10 lb/ft^2 as specified in ASCE 7-05. There is also a rain-on-snow surcharge of 5 lb/ft^2 recommended by this standard which will be considered. Since IIFP is using DOE Performance Category 3 criteria for its risk assessment of process buildings, an importance factor of 1.2 will be used to calculate the final design-basis snow load (DOE-1020-2002).

e) Rainfall Loading (R):

For all buildings, rainwater will be carried away from roof surfaces using rain gutters connected to the storm drains and intermittent downspouts along the building perimeter. Provisions for minimizing the potential for ponds occurring on roofs will be achieved by using metal sloped roofs.

f) Flood Loading (F):

The IIFP site does not fall within mapped 100-yr or 500-yr floodplains. The site is located in a semi-arid location with limited bodies of water.

Since the grade level of the Facility is set substantially above the maximum flood level for rivers, dams, lakes and other large bodies of water, the only potential flooding of the Facility results from local intense rainfall. Protection against local intense rainfall flooding is provided by natural contour or site grading to provide positive flows away from the buildings and by installing the floor levels of process buildings above the design basis flood level from a local intense rainfall. Flood Loading (F) has been determined to be negligible compared with other loads, but will be converted to an equivalent hydrostatic load in accordance with ASCE 7-05, Paragraph 5.4-3 "Hydrodynamic Loads" and will be included in the calculations. See official response to SS RAI-2 for analysis of Flood Loading.

g) Lateral Earth Pressure (H) as Applicable to Foundation Design:

The lateral earth pressure coefficients, soil density and ground water table will be obtained by geotechnical study.

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h) Thermal Loads (To and Ta):

Thermal loads are defined as self-straining forces arising from contraction or expansion resulting from temperature change or differential temperature between the opposite exposed surfaces of a structural element. Thermal loads may result from either operating (To) or accidental environmental (Ta) conditions and will be determined accordingly.

i) Straight Wind Loads (W):

Per IBC 2006, straight wind loads for structures containing no IROFS will be calculated in accordance with the provisions of ASCE 7-05. Wind design will be based on the following:

Exposure C- Open terrain with scattered obstructions

V = 90 mph

Iw = 1.00 - Based on buildings classified as Category II occupancy

Kzt = 1.0

Wind loads for structures containing IROFS will be calculated in accordance with the provisions of DOE-1020-2002, for a 10,000-year period of recurrence.

Exposure C- Open terrain with scattered obstructions

V = 135 mph

Iw = 1.15 - Based on buildings classified as Category III occupancy

Kzt = 1.0

j) Extreme Tornado Winds (Wt):

Process buildings and structures housing IROFS equipment will not be designed to withstand extreme tornado wind loadings, which include tornado missiles and extreme straight wind. An analysis of wind and tornado loading determined that straight wind loads bound tornado wind loads for the IIFP Facility site. See official response to SS RAI-2 for details of this analysis.

k) Seismic Loads:

International Building Code Earthquake (E):

All facility structures containing no IROFs will be designed to withstand the earthquake loads defined in Sections 1614 to 1623 of the International Building Code. Every structure is designed to resist the total horizontal and vertical seismic forces acting non-concurrently in the direction of each of the main axes of the structure. Seismic Use Group = II and Seismic Importance Factor IE = 1.25 based on buildings classified as Category III occupancy.

Design Basis Earthquake (Es):

Process buildings and structures housing IROFs equipment will be designed to the Design Basis Earthquake (Es). The peak ground acceleration and Ground Response Spectra will be developed based on DOE-1020-2002 performance criteria for a PC-3 equivalent structure and corrected for site soil class as determined in the geotechnical investigation.

2. Load Combinations for Non-Process Buildings:

For structural design of all facility structures and buildings that do not contain IROFs, the following load combinations will be considered in accordance with ASCE 7-05:

a) Concrete Load Combinations:

1. 1.4(D+ F)
2. 1.2(D + F + To or Ta) + 1.6(L + H) + 0.5(Lr or S or R)
3. 1.2(D) + 1.6(Lr or S or R) + (L or 0.8W)
4. 1.2(D) + 1.6W + L + 0.5(Lr or S or R)
5. 1.2(D) + 1.0E + L + 0.2S
6. 0.9(D) + 1.6W + 1.6H
7. 0.9(D) + 1.0E + 1.6H

Notes:

1. The load factor on L in combinations (3), (4) and (5) is permitted to equal 0.5 for all occupancies in which live load is less than or equal to 100 pounds per square foot (psf), with the exception of garages or areas occupied as places of public assembly.
2. The load factor on H will be zero in combinations (6) and (7) if H counteracts W or E. Where lateral earth pressure provides resistance to other forces, it will not be included in H but will be included in the design resistance.
3. In combinations (2), (4) and (5), the companion load S will be either the flat roof snow load (pf) or the sloped roof snow load (ps).

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b) Steel Load Combinations:

For steel, either the Load and Resistance Factor Design (LRFD) load combinations listed above or the Allowable Strength Design (ASD) load combinations listed below can be used:

1. D+F
2. D + H + F + L + (To or Ta)
3. D + H + F + (Lr or S or R)
4. D + H + F + 0.75(L + To or Ta) + 0.75(Lr or S or R)
5. D + H + F + (W or 0.7E)
6. D + H + F + 0.75(W or 0.7E) + 0.75L+ 0.75(Lr or S or R)
7. 0.6(D) + W + H
8. 0.6(D) + 0.7E + H

Note:
In combinations (4) and (6), the companion load S will be either the flat roof snow load (pf) or the sloped roof snow load (ps).

3. Load Combinations for Process Buildings:

For process buildings and structures which house IROFS equipment, the following load combinations will be considered:

a) Concrete Load Combinations per ACI 349-06:

Normal Load Combinations

1. 1.4 (D + F + Ro) + To
2. 1.2 (D + F + To + Ro) + 1.6 (L + H) + 1.4 C + 0.5 (Lr or S or R)
3. 1.2 (D + F + To + Ro) + 0.8 (L + H) + 1.4 C + 1.6 (Lr or S or R)

Severe Environmental Load Combinations

4. Not used, since operating basis earthquake load (earthquake load for which plant's power production equipment is designed to remain functional without undue risk to public health and safety) is not applicable. The emergency generator and UPS system are designed to remain functional during any postulated natural phenomena hazard event.

5. 1.2 (D + F + Ro) + 1.6 (L + H + W)

Extreme Environmental and Abnormal Load Combinations

6. 1.0 (D + F + C + H + Ta + Ra + Es) + 0.8L
7. Not used since straight wind (W) governs over tornado wind (Wt) for the Facility site due to probability of occurrence.
8. 1.0 (D + F + C + H + Ta + Ra) + 1.2 Pa + 0.8L
9. Not used since no postulated high energy pipe reaction (Yr), jet impingement (Yj) or pipe missile impact (Ym) are expected during a design basis natural phenomena hazard.

Preliminary analysis has shown that flood load (F) is negligible for the design of the IIFP process buildings.

Ra, Ro and To and Ta are expected to be negligible.

Rain load (L) on process building roofs is negligible, since all process building roofs are sloped metal (5/12) pitch minimum with no parapets or other appurtenances that might inhibit roof drainage.

Crane load (C) is only applicable in Autoclave Building.

b) Steel Load Combinations Per AISC N690-06 if Load and Resistance Factor Design (LRFD) is used:

Normal Load Combinations

1. 1.4 (D + Ro) + To +C
2. 1.2 (D + Ro + To) + 1.6L + 1.4C + 0.5 (Lr or S or R)
3. 1.2 (D + Ro + To) + 1.6 (Lr or S or R) + 0.8L + 1.4C

Severe Environmental Load Combinations

4. 1.2 (D + Ro) + 1.6W + 0.8L + C + 0.5 (Lr or S or R) + To
5. Not used, since operating basis earthquake load (Eo) (earthquake load for which plant's power production equipment is designed to remain functional without undue risk to public health and safety) is not applicable. The emergency generator and UPS system are designed to remain functional during any postulated natural phenomena hazard event.

Extreme Environmental and Abnormal Load Combinations

6. D + 0.8L +C + To + Ro + Es
7. Not used since straight wind (W) governs over tornado wind (Wt) for the Facility site due to probability of occurrence.

8. D + 0.8L + C + 1.2 Pa + Ra + Ta

9. Not used since no postulated high energy pipe reaction (Yr), jet impingement (Yj) or pipe missile impact (Ym) are expected during a design basis natural phenomena hazard.

c) Steel Load Combinations Per AISC N690-06 if Allowable Strength Design (ASD) is used:

Normal Load Combinations

1. D + L + Ro + To + C

2. D + (Lr or S or R) + Ro + To +C

3. D + 0.75L + 0.75(Lr or S or R) + To +C

Severe Environmental Load Combinations

4. D + Ro + W + .75L + C + 0.75(Lr or S or R) + To

5. Not used, since operating basis earthquake load (Eo) (earthquake load for which plant's power production equipment is designed to remain functional without undue risk to public health and safety) is not applicable. The emergency generator and UPS system are designed to remain functional during any postulated natural phenomena hazard event.

Extreme Environmental and Abnormal Load Combinations

6. D + L + C + Ro + To + Es

7. Not used since straight wind (W) governs over tornado wind (Wt) for the Facility site due to probability of occurrence.

8. D + L + C + Pa + Ra + Ta

9. Not used since no postulated high energy pipe reaction (Yr), jet impingement (Yj) or pipe missile impact (Ym) are expected during a design basis natural phenomena hazard.

4. <u>Foundations:</u>

Based on the preliminary soil condition, shallow foundations are proposed for the structures. All major equipment and structure foundations will be designed for a minimum frost penetration of 12 inches. The final foundation type will be determined after the geotechnical study is completed.

Foundations for structures will be designed to provide a factor of safety against bearing failure of 3 for static loads and 1.1 for static loads + dynamic loads. These analyses will be based on un-factored loads, including Extreme Environmental Load Es. Settlement will be calculated and checked against the allowable settlement.

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All foundations will be checked against sliding and overturning due to building code earthquake (E for buildings and structures containing no IROFs), design basis earthquake (Es for process buildings and structures containing IROFs), and design basis wind (W) (90 mi/hr for buildings and structures containing no IROFs) (135 mi/hr for process buildings and structures containing IROFs) in accordance with the following:

Minimum Factors of Safety:

Load Combination	Overturning	Sliding
D + H + E	1.5	1.1
D + H +W	1.5	1.1
D + H + Es	1.1	1.1

Soil bearing capacity, soil sub-grade modulus, coefficient of friction against sliding, lateral earth pressure coefficients and other critical parameters will be determined by geotechnical study.

5. Structural Design Methodology:

Detailed 3-D Finite element models of the structures will be developed using SAP2000. Static and linear dynamic analysis will be performed on the finite element models.

For IBC earthquake load (E), static analysis will be used. Every structure is designed to resist the total horizontal and vertical seismic forces acting non-concurrently in the direction of each of the main axes of the structure. Seismic Use Group = II and Seismic Importance Factor IE = 1.25 based on buildings classified as Category III occupancy.

For Design Basis Earthquake (Es), linear dynamic response spectra analysis will be performed. Three orthogonal components of earthquake ground motions (two horizontal and one vertical) will be considered. Responses from the various direction components shall be combined in accordance with ASCE 4. Wind pressure on the buildings based on the design wind speed will be distributed in accordance with ASCE 7.

For all the load combinations, the structural strength and deformations will be evaluated and checked against the relevant code requirements.

Good design detailing practice and consistency in accordance with the relevant codes will be followed to ensure adequate ductility of the structures.

License Documentation Impact: (Request # SS-7-1): Add the following drawings to the "Fluorine Extraction Process & Depleted Uranium De-conversion Plant (FEP/DUP) License Application Engineering Drawings" package that was furnished with the IIFP License Application:

1. Replace conceptual facility site plan drawing 100-C-0001 Rev D with updated drawing 100-C-0001 Rev E.

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2. Add conceptual structural floor plans, conceptual equipment layout plans and conceptual elevation drawings of process buildings. (Drawings: 400-M-1201-D, 400-M-1202-C, 400-M-1203-A, 500-M-1201-C, 500-M-1202-D and 500-M-1203-A).

License Documentation Impact (Request #SS-7-2): The codes and standards will be added to IIFP ISA Summary Section 2.3.2 in response to RAI SS-8 for structural and foundation design of IIFP Facility buildings with emphasis on seismic design.

License Documentation Impact (Requests #SS-7-3 through #SS-7-5): None at this time.

RESPONSE TO REQUEST #SS-7-6: Based upon guidance provided in NUREG-1520, an assessment of building damage and the resulting radiological and chemical consequences from a seismic event that has a 1×10^{-5} annual probability is not required. The consequences of a 1×10^{-5} annual probability (100,000 year return period) seismic event does not need to be evaluation as the frequency is such that risk acceptability is met based on likelihood alone.

Table 5-8 of the ISA Summary (provided below) shows the scoring of initiating events based on frequency. A 100,000 year return period results in a 10^{-5} annual probability and is scored a -5. Using this value we can then determine the likelihood category for this event. (Note: prevention/protection IROFS are typically included in the likelihood determination, but none are assumed present for this scenario). Table 5-9 of the ISA Summary is provided below. Based on the -5 scoring from Table 5-8, the 100,000 year return seismic event is categorized as a highly unlikely event. Also the comments column of Table 5-8 was originally added to illustrate examples for the failure frequency indices, but is now being deleted to avoid apparent confusion between the "comment" and "frequency evidence" statements.

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Table 5-8. Initiating Event Failure Frequency Index Values

Failure Frequency Index*	Based on Evidence	~~Comments~~
-6	External Event with frequency of $<10^{-6}$/yr	~~If initiating event, no IROFS needed.~~
-5	External Event with frequency of $>10^{-6}$/yr and $<10^{-5}$/yr	~~If initiating event, no IROFS needed.~~
-4	No occurrences in 30 years for hundreds of similar systems in industry	~~Rarely can be justified by evidence.~~
-3	No occurrences in 30 years for tens of similar systems in industry	~~Requires multiple failures or failure of a robust passive system to result in adverse consequences.~~
-2	No occurrences of this type in this facility in 30 years	~~Applicable for passive system failures.~~
-1	A few occurrences during facility lifetime	~~Applicable for routine mechanical failures.~~
0	Occurs every 1 to 3 years	~~Applicable for operator errors, loss of power, or other routine system failures.~~
1	Several occurrences per year	
2	Occurs every week or more often	

*Based on the example provided in NUREG-1520. Indices less than (more negative than) -1 should not be assigned unless the configuration management, auditing, and other management measures are high quality.

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Table 5-9. Likelihood Categories

Event Likelihood	Likelihood Category	Probability of Occurrence	Qualitative Description
Not Unlikely	3	Greater than 10^{-4} per event per year	
Unlikely	2	Between 10^{-4} and 10^{-5} per event per year	Consequence Category 2 accidents must be "unlikely."
Highly Unlikely	1	10^{-5} or less per event per year	Consequence Category 3 accidents must be "highly unlikely."

The consequences and likelihood categories are displayed below in Table 5-10 (from the ISA Summary) in a 3 x 3 risk index matrix. The overall risk number of an accident is determined by the product of the likelihood category number and the consequence category number.

Unacceptable risk levels are highlighted with shaded areas. IROFS are needed for accidents that fall in the shaded regions so that an acceptable risk level is achieved.

Table 5-10. Risk Matrix and Risk Index Values

Severity of Consequences	Likelihood of Occurrence		
	Likelihood Category 1 Highly Unlikely (1)	Likelihood Category 2 Unlikely (2)	Likelihood Category 3 Not Unlikely (3)
Category 3 High Consequence (3)	Acceptable Risk 3	Unacceptable Risk 6	Unacceptable Risk 9
Category 2 Intermediate Consequence (2)	Acceptable Risk 2	Acceptable Risk 4	Unacceptable Risk 6
Category 1 Low Consequence (3)	Acceptable Risk 1	Acceptable Risk 2	Acceptable Risk 3

A 100,000 year return period seismic event results in a risk number of 3 and meets criteria for acceptable risk. But as shown in Table 5-10 from the ISA Summary, events that fall into Likelihood Category 1 meet risk acceptability regardless of the consequences. Even assuming facility collapse and high radiological and chemical consequences occur during a 100,000 year earthquake, we still meet the criteria for acceptable risk.

License Documentation Impact #SS-7-6: The "Comments" column of Table 5-8 of the IIFP ISA Summary will be deleted as shown in the Request #6 Response shown above.

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SS-8. *Background:*
The regulations in 10 CFR 70.64(a)(2) and 70.64(a)(4) require the applicant to include adequate protection against natural phenomena, environmental conditions, and dynamic effects in its design of the facility.

Issue:
In LA Section 2.2.7, DB contractor, the applicant stated that it will rely on the DB contractor to ensure that design meets all applicable Federal, State, and local codes and standards required for the startup stage of the project. However, the applicant did not provide this list.

Request:
Provide a list of applicable Federal, State, and local codes and standards that the DB contractor will use for the startup stage of the project.

RESPONSE: The following is a list of applicable Federal, State, and local codes and standards that the DB contractor will use during the detailed design, construction and startup stage of the project to ensure adequate protection against natural phenomena, environmental conditions, and dynamic effects. The DB contractor will also ensure, as part of the written contract, that design meets these applicable federal, state and local codes and standards.

License Documentation Impact: Revise Section 2.3 "Building Codes and Standards" of the IIFP ISA to replace existing building codes with an updated and expanded list of building codes. After Table 2-2 following the second paragraph of 2.3, insert new Sections 2.3.1, 2.3.2, 2.3.3, 2.3.4, and 2.3.5 to read as follows:

2.3 Building Codes and Standards

The design and construction of the on-site IIFP Facility buildings conform to applicable building codes and standards. The ~~basic~~ construction codes applied include:

- ~~International Building Code (IBC) as amended by the NMCBC,~~
- ~~Uniform Mechanical Code (UMC) as amended by the New Mexico Mechanical Code (NMMC),~~
- ~~Uniform Plumbing Code (UPC) as amended by the New Mexico Plumbing Code (NMPC),~~
- ~~International Energy Conservation Code (IECC) as amended by the New Mexico Energy Conservation Code (NMECC),~~
- ~~International Fire Code (IFC),~~
- ~~NFPA 101 (Life Safety Code), and~~
- ~~National Electrical Code as amended by the New Mexico Electrical Code (NMEC).~~

~~Codes followed for construction are the latest editions as adopted by the State of New Mexico.~~ Table 2-2 below is a listing of code conformance for buildings located on site based on New Mexico Commercial Building Code (NMCBC, ~~2006~~2009), NFPA 13 (NFPA, ~~2007a~~2010), and NFPA 101 (NFPA, ~~2007b~~2009).

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2.3.1 General Building Codes and Standards

2009	New Mexico Commercial Building Code (adopts by reference the 2009 International Building Code (IBC) with amendments),
2009	New Mexico Energy Conservation Code (adopts by reference the 2009 International Energy Conservation Code (IECC) with amendments),
2009	New Mexico Plumbing Code (adopts by reference the 2009 Uniform Plumbing Code (UPC) with amendments),
2009	New Mexico Mechanical Code (adopts by reference the 2009 Uniform Mechanical Code (UMC) with amendments),
2008	New Mexico Electrical Code (adopts by reference the 2008 national Electrical Code (NEC) with amendments),
2007	New Mexico Electrical Safety Code (adopts by reference the 2007 National Electrical Safety ~~e~~Code (NESC) with amendments),
2009	International Fire Code,
2010	American Society for Mechanical Engineering (ASME) Section VIII, Division 1 Design and Fabrication of Pressure Vessels,
2010	ASME B31.1 "Power Piping",
2009	ASME B31.3 "Process Piping",
2010	ASME B31.5 "Refrigeration Piping and Heat Transfer Components,"and
2008	ASME B31.9 "Building Services Piping".

2.3.2 Structural and Foundation Codes and Standards

ASCE 7-05	Minimum Design Loads for Buildings and Other Structures,
ACI 318-08	Building Code Requirements for Structural Concrete,
ACI 530-08/	Building Code Requirements for Masonry Structures,
ASCE 5-08/	Building Code Requirements for Masonry Structures,
TMS 402-08	Building Code Requirements for Masonry Structures,
ANSI/ AISC 360-05	Specification for Structural Steel Buildings,
AISC	Steel Construction Manual 13th Edition,
ANSI/ AISC 341-05	Seismic Provisions for Structural Steel Buildings,
AWS D1.1-2004	Structural Welding Code - Steel, American Welding Society,
ANSI/AISC N690-06	Specification for Safety-Related Steel Structures for Nuclear Facilities
ACI-349-06	Code Requirements for Nuclear Safety Related Concrete Structures, and
ASCE 4-98	Seismic Analysis of Safety-Related Nuclear Structures.

2.3.3 Geotechnical and Geophysical Codes and Standards

Editions listed are shown exactly as designated by ASTM organization as being active editions. If the standard identifier number does not have a date in parenthesis, the active date is designated by the last two digits in the standard identifier number.

ASTM D420-98 (2003)	Standard Guide to Site Characterization for Engineering, Design, and Construction Purposes,

ASTM D421-85 (2007)	Standard Practice for Dry Preparation of Soil Samples for Particle Size Analysis and Determination of Soil Constants,
ASTM D422-63 (2007)	Standard Test Method for Particle Size Analysis of Soils,
ASTM D854-10	Standard Test Method for Specific Gravity of Soils,
ASTM D1140-00 (2006)	Standard Test Method for Amount of Material in Soils Finer than the No. 200 Sieves,
ASTM D1452-09	Standard Practice for Soil Investigation and Sampling by Auger Borings,
ASTM D1557-09	Test Method for Laboratory Compaction Characteristics of Soil Using Modified Effort (56,000 ft-lb/ft^3 (2,700 KN – m/m^3)),
ASTM D1586-08a	Standard Method for Penetration Test and Split-Barrel Sampling of Soils,
ASTM D1883-07e2	Test Method for California Bearing Ratio (CBR) of Laboratory-Compacted Soils,
ASTM D2216-10	Standard Test Method for Laboratory Determination of Water (Moisture) Content of Soil and Rock,
ASTM D2487-10	Standard Classification of Soils for Engineering Purposes (Unified Soil Classification System),
ASTM D2488-09a	Standard Practice for Description and Identification of Soils (Visual Manual Procedure),
ASTM D2850-03a (2007)	Test Method for Unconsolidated, Un-drained Strength of Cohesive Soils in Triaxial Compression,
ASTM D4220-95 (2007)	Standard Practices for Preserving and Transporting Soil Samples,
ASTM D4318-10	Standard Test Method for Liquid Limit, Plastic Limit, and Plasticity Index of Soils,
ASTM D4428-07	Standard Test Method for Cross-hole Seismic Testing,
ASTM D4633-10	Standard Test Method for Energy Measurement for Dynamic Penetrometers,
ASTM D4767-11	Standard Test Method for Consolidated-Un-drained Triaxial Compression Test on Cohesive Soils,
ASTM D5434-09	Guide for Field Logging of Subsurface Explorations of Soil and Rock,
ASTM D5778-07	Standard Test Method for Performing Electronic Friction Cone and Piezocone Penetration Testing of Soils,
ASTM D6635-01 (2007)	Standard Test Method for Performing the Flat Dilatometer (SUPPLIER shall implement method exceptions cited in Subpart 3.2.6 of this Specification because of obsolescence of major elements in ASTM D6429), and
ASTM D6429-99 (2006)	Standard Guide for Selecting Surface Geophysical Methods.

2.3.4 NFPA Codes and Standards

NFPA 10-2010	Portable Fire Extinguishers,
NFPA 13-2010	Installation of Sprinkler Systems,
NFPA 14-2010	Standard for the Installation of Standpipe and Hose Systems,
NFPA 15-2007	Standard for Water Spray Fixed Systems for Fire Protection,
NFPA 20-2010	Installation of Stationary Pumps for Fire Protection,
NFPA 22-2008	Water Tanks for Private Fire Protection,

NFPA 24-2010	Installation of Private Fire Service Mains and Their Appurtenances,
NFPA 30-2008	Flammable and Combustible Liquids Code,
NFPA 45-2011	Fire Protection for Laboratories Using Chemicals,
NFPA 54-2011	National Fuel Gas Code,
NFPA 55-2010	Storage, Use and Handling of Compressed Gases and Cryogenic Fluids in portable and Stationary Containers, Cylinders and Tanks,
NFPA 70-2011	National Electric Code,
NFPA 70E-2009	Standard for Electrical Safety in the Workplace®,
NFPA 72-2010	National Fire Alarm Code,
NFPA 80-2010	Standard for Fire Doors and Other Opening Protectives,
NFPA 80A-2007	Recommended Practice for Protection of Buildings from Exterior Fire Exposures,
NFPA 85-2011	Boiler and Combustion Systems Hazards Codes,
NFPA 90A-2009	Installation of Air-conditioning and Ventilating Systems,
NFPA 90B-2009	Installation of Warm Air Heating and Air-conditioning Systems,
NFPA 91-2010	Standard for Exhaust Systems for Air Conveying of Vapors, Gases, Mists, and Noncombustible Particulate Solids,
NFPA 101-2009	Life Safety Code,
NFPA 110-2010	Emergency and Standby Power Systems,
NFPA 220-2009	Standard on Types of Building Construction
NFPA 221-2009	Standard for High Challenge Fire Walls, Fire Walls, and Fire Barrier Walls,
NFPA 251-2006	Standard Methods of Tests of Fire Resistance of Building Construction and Materials,
NFPA 430-2004	Storage of Liquid and Solid Oxidizers,
NFPA 600-2010	Standard on Industrial Fire Brigades,
NFPA 780-2011	Standard for the Installation of Lightning Protection Systems,
NFPA 801-2008	Standard for Fire Protection for Facilities Handling Radioactive Materials, and
NFPA 1410-2010	Standard on Training for Initial Emergency Scene Operations

2.3.5 Instrumentation and Controls Codes and Standards

The criteria in the following regulatory guides and standards will be used to ensure that the instrumentation and control IROFS will be designed to monitor and control their behavior:

NRC Regulatory Guide 1.100-2009	"Seismic Qualification of Electric and Mechanical Equipment for Nuclear Power Plants,"
NRC Regulatory Guide 1.105-1999	"Setpoints for Safety-Related Instrumentation
NRC Regulatory Guide 1.118-1995	"Periodic Testing of Electric Power and Protection Systems."
NRC Regulatory Guide 1.152-2006	Criteria for Digital Computers in Safety Systems of Nuclear Power Plants" (Endorses IEEE Std. 603-2009),
NRC Regulatory Guide 1.153-1996	"Criteria for Safety Systems" (Endorses IEEE Std. 603-2009),

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NRC Regulatory Guide 1.168-2004	"Verification, Validation, Reviews and Audits for Digital Computer Software Used in Safety Systems of Nuclear Power Plants " (Endorses IEEE Std. 1012-1998),
NRC Regulatory Guide 1.169-1997	"Configuration Management Plans for Digital Computer Software Used in Safety Systems of Nuclear Power Plants" (Endorses IEEE Std. 828-1990),
NRC Regulatory Guide 1.170-1997	"Software Test Documentation for Digital Computer Software Used in Safety Systems of Nuclear Power Plants" (Endorses IEEE Std. 829-1983),
NRC Regulatory Guide 1.171-1997	"Software Unit Testing for Digital Computer Software Used in Safety Systems of Nuclear Power Plants" (Endorses IEEE Std. 1008-1987),
NRC Regulatory Guide 1.172-1997	"Software Requirements Specifications for Digital Computer Software Used in Safety Systems of Nuclear Power Plants" (Endorses IEEE Std. 830-1993),
NRC Regulatory Guide 1.173-1997	"Developing Software Life Cycle Processes for Digital Computer Software Used in Safety Systems of Nuclear Power Plants" (Endorses IEEE Std. 1074-1995),
NRC Regulatory Guide 1.180-2003	"Guidelines for Evaluating Electromagnetic and Radio-Frequency Interference in Safety-Related Instrumentation and Control Systems," " (Endorses IEEE Std. 1050-1996, IEC Std. 61000-2005, IEEE Std. C62.41-1991, and Mil Std. 461F-2007),
NRC Regulatory Guide 1.209-2007	"Guidelines for Environmental Qualification of Safety-Related Computer-Based Instrumentation and Control Systems in Nuclear Power Plants,"
NRC Regulatory Guide 1.53-2003	"Application of the Single-Failure Criterion to Safety Systems" (Endorses IEEE Std. 603-2009),
ANSI/ISA-67.04.01-2006	"Setpoints for Nuclear Safety-Related Instrumentation,"
IEEE Std. 323-2003	"IEEE Standard for Qualifying Class 1E Equipment for Nuclear Power Generating Stations"
IEEE Std. 336-2010	"IEEE Standard Installation, Inspection, and Testing Requirements for Power Instrumentation, and Control Equipment at Nuclear Facilities,"
IEEE Std. 338-2006	"IEEE Standard Criteria for Periodic Surveillance Testing of Nuclear Power Generating Station Safety Systems,"
IEEE Std. 344-2004	"IEEE Recommended Practices for Seismic Qualification of Class 1E Equipment for Nuclear Generating Stations,"
IEEE Std. 384-2008	"IEEE Standard Criteria for Independence of Class 1E Equipment and Circuits,"
IEEE Std. 603-2009	"IEEE Standard Criteria for Safety Systems for

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	Nuclear Power Generating Stations."
IEEE 7-4.3.2-2010	"IEEE Standard Criteria for Digital Computers in Safety Systems of Nuclear Power Generating Stations."
IEEE 730-2002	"IEEE Standard for Software Quality Assurance Plans."
NUREG-0800-2011	"Standard Review Plan for the Review of Safety Analysis Reports for Nuclear Power Plants."
NUREG/CR-6090-1993	"The Programmable Logic Controller and its Application in Nuclear Reactor Systems,
Branch Technical Position HICB-11-1997	"Guidance on the Application and Qualification of Isolation Devices," and
Branch Technical Position HICB-17-1997	"Guidance on Self-Test and Surveillance Test Provisions."

The most recent versions of the regulatory guides and Branch Technical Positions adopted by the NRC will be used at the time of the Instrumentation and Controls systems detail design.

License Documentation Impact: A new Section 3.1.4, "Codes and Standards" will be added to the IIFP License Application Chapter 3 to include the above referenced codes and standards that are provided in the IIFP ISA Section 2.3.

License Documentation Impact: The former 6th paragraph of Section 1.1.2 of the IIFP License Application, Revision A, will be revised to read as follows:

1.1.2 Facility Description

See ISA Summary Section 2.3 for a list of applicable Federal, State, and local codes and standards that the Design and Build (DB) contractor will use during the detailed design, construction and startup stage of the project to ensure adequate protection against natural phenomena, environmental conditions, and dynamic effects. The DB contractor will also ensure, as part of the written contract, that design meets these applicable federal, state and local codes and standards. Buildings, lighting, fire protection, and building support systems are designed in accordance with latest revisions, of building and construction codes including where applicable the National Fire Protection Association (NFPA) standards, local and State codes, and related codes and standards. A list of NFPA Standards is repeated in Chapter 7 of the LA, Table 7-1.

A listing of the major buildings and estimated sizes is provided in Table 1-2.

License Documentation Impact: The last paragraph of Section 1.1.2.1 of the IIFP License Application, Revision A, will be revised this RAI will supersede RAI GI-6B to read as follows:

1.1.2.1 Process Buildings and Process Areas

The process buildings are classified per NFPA 13 as Ordinary Group 2 and are protected with 100 percent coverage, wet-type fire protection sprinkler systems with Class 1 standpipes between floors in all exit stairways of multi-story buildings~~. (NFPA, 2007)~~. Further information is

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provided for code construction conformance requirements in the IIFP Integrated Safety Analysis Summary, Section 2.3. IIFP will contract and use a Design and Build (DB) contractor for detail design, engineering and construction of the IIFP Facility.

License Documentation Impact: The last paragraph of Section 4.4.2 of the IIFP ISA Summary will to read as follows:

4.4.2 Natural Phenomena Hazards

Engineering design requirements for all active and passive IROFS will include adequate protection from natural phenomena events. Seismic, wind, and lightning hazards will be specifically addressed through implementation of building code design requirements as listed in Section 2.3. ~~such as: IBC (International Building Code, as amended by the 2006 New Mexico Commercial Building Code) (IBC, 2006), ASCE 7-05 (Minimum Design Loads for Buildings and Other Structures) (ASCE, 2006), and NFPA 780 (Standard for the Installation of Lightning Protection Systems) (NFPA, 2008a).~~Table 4-~~9~~10 and Table 4-~~10~~11 document examples of how the design incorporated natural phenomena hazards for engineered IROFS.

License Documentation Impact: Revise references in Section 2.6 to reflect the updated versions of building codes to read as follows:

2.6 References

IIFP, 2009. International Isotopes Fluorine Products, Inc., "License Application for FEP/DUP Facility." ~~International Isotopes Fluorine Products,~~ 2009.

NFPA, ~~2007a~~2010. National Fire Protection Association "NFPA 13, Installation of Sprinkler Systems." Quincy, MA, ~~MA : National Fire Protection Association,~~ ~~2007~~2010~~a~~.

NFPA, ~~2007b~~2009. National Fire Protection Association."NFPA 101, Life Safety. *Life Safety Code.*" Quincy, MA, ~~MA : National Fire Protection Association, 2007~~2009~~b~~.

NMCBC, ~~2006~~2009. New Mexico Commerical Building Code, Title 14, "Housing and Construction," Chapter 7, Building Codes General Part 2. s.l. : http://www.nmcpr.state.nm.us/nmac/parts/title14/14.007.0002.htm, ~~2006~~2009.