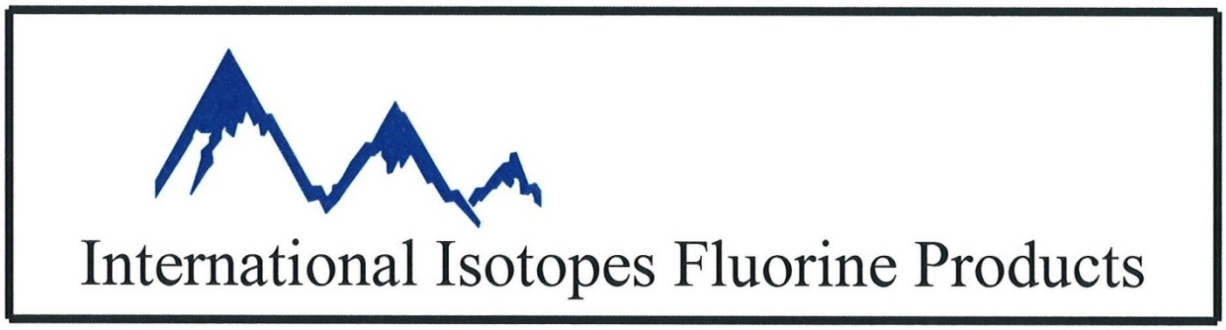


International Isotopes Fluorine Products, Inc.
(IIFP)
A Wholly Owned Subsidiary of
International Isotopes, Inc.

Fluorine Extraction Process & Depleted Uranium De-conversion (FEP/DUP) Plant

License Application

Revision A

December 23, 2009

TABLE OF CONTENTS

LIST OF FIGURES

LIST OF TABLES

1 General Information

International Isotopes Fluorine Products (IIFP), Inc., a wholly owned subsidiary of International Isotopes Inc., intends to build and operate a new uranium processing facility (plant) near Hobbs in Lea County, New Mexico (referred to as the Hobbs site). IIFP will provide services to the uranium enrichment industry for converting (de-conversion) depleted uranium hexafluoride (DUF_6) into uranium oxide for long-term stable disposal. The company will also include a commercial plant to produce specialty fluoride gas products for sale. High-purity silicon tetrafluoride (SiF_4) and boron trifluoride (BF_3) will be manufactured in the IIFP facility by utilizing the fluorine derived from the de-conversion of DUF_6. The fluoride gas products are highly valuable for applications in the electronic, solar, and semi-conductor markets. In addition, anhydrous hydrogen fluoride (AHF) is a product of the de-conversion and is sold as a chemical in high demand for various industrial applications.

Depleted uranium hexafluoride referred to as "tails" is the by-product of uranium enrichment. Enrichment is required as a vital step in the nuclear fuel cycle to produce fuel for nuclear reactors. All of the existing and planned commercial uranium enrichment processes use uranium hexafluoride (UF_6) as the process gas to produce isotopic enriched UF_6. Upon further processing, the enriched uranium material results in the desired nuclear fuel product. The depleted tails may have some residual value but will ultimately require disposal. A commercial service is needed in the U.S. to convert the DUF_6 into the more stable uranium oxide for long term disposal. This process is generally referred to as "de-conversion". IIFP is proposing to design, engineer and license the nation's first privately-owned commercial facility for de-conversion of DUF_6.

This Chapter provides an overview of the Fluorine Extraction Process/Depleted Uranium De-Conversion Plant (FEP/DUP) commercial facility along with a description of the facility and various processes and a description of the FEP/DUP site. Institutional information is provided to identify the applicant, describe the applicant's financial qualifications, and describe the proposed license activities.

The facility will be built and operated beginning at a time when new U.S. uranium enrichment facilities are coming on-line and the need for de-conversion services increasing. The IIFP plant has an annual capacity of approximately 7.3 million pounds per year (lb/yr) DUF_6 (270-300 UF_6 48-Y type cylinders per year). From that de-converted DUF_6, the plant will produce approximately 1.5 million pounds SiF_4, 0.5 million pounds BF_3, and 1 million pounds AHF. The facility is scheduled to start operation in late 2012. These annual design capacities are provided only for general information. The facility actual production volumes of depleted uranium and fluoride products will be the quantities necessary to support routine operations and sales demand.

This facility will be licensed under Title 10 of the Code of Federal Regulations (CFR) Part 40, Domestic Licensing of Source Material (CFR, 2008a). The format and content, however, of this License Application (LA) follows the criteria specified in 10 CFR 70, Domestic Licensing of Special Nuclear Material (CFR, 2008d), and particularly the methodology set forth in NUREG-1520, Standard Review Plan for the Review of a License Application for a Fuel Cycle Facility (USNRC, 2002). This was done in the IIFP LA in anticipation that NRC will through rulemaking establish ISA requirements for conversion and de-conversion facilities that will be similar to those in 10 CFR 70 Subpart H.

IIFP is requesting a license authorizing up to 750,000 kilograms of depleted uranium (kgU) to be maintained at any one time in the facility inventory. IIFP plans to operate the facility indefinitely and continue to renew the licenses as needed. IIFP also has a written agreement with the State of New Mexico on the maximum inventories of major chemicals that can be maintained on site.

Table 1-1 provides the estimated average inventories and the maximum limit on the major chemical inventories as per the IIFP agreement with the State.

Table 1-1 IIFP Facility Inventories

Material	Maximum Limit Agreement with New Mexico[1]	Projected Average
Total Depleted Uranium (DUF_6, DUO_2 and DUF_4)[2]	4,851,000 lbs (2,200,000 Kg)	See Note [2]
DUF_6	Not Applicable	15-20 full cylinders
DUF_6 in Process	Not Applicable	43,000-66,000 lbs (19,500-30,000 Kg)
DUF_4	Not Applicable	140,000-300,000 lbs (63,600-136,400 Kg)
Uranium Oxides as DUO_2	2,205,000 lbs (1,000,000 Kg)	340,000-470,000 lbs (154,500-213,600 Kg)
HF (aqueous)	Not Applicable	10,000-15,000 lbs (4,500-6,800 Kg)
AHF	Not Applicable	31,000-35,000 lbs (14,000-15,900 Kg)
SiF_4 (Packaged + in process)	Not Applicable	48,000-70,000 lbs (21,800-31,800 Kg)
BF_3 (Packaged + in process)	Not Applicable	17,000-33,000 lbs (7,800-15,000 Kg)
KOH	Not Applicable	15,000-17,000 lbs (6,800-7,700 Kg)
CaF_2	Not Applicable	45,000-50,000 lbs (20,400-22,700 Kg)

[1] Memorandum of Agreement Between International Isotopes, Inc. and the New Mexico Environment Department, October 22, 2009.
[2] Projected Averages: see individual breakdowns for DUF_6 in cylinders and in process; DUF_4 and DUO_2. Maximum limits of Total Depleted Uranium include limits for DUF_6 in cylinders and in process; DUF_4 and DUO_2.

1.1 Facility and Process Description

The facility consists mainly of two processes and the supporting infrastructure. The processes are:

- DUF_6 de-conversion to depleted uranium tetrafluoride (DUF_4), i.e. the DUF_6 to DUF_4 plant.
- The Fluorine Extraction Process for producing SiF_4 and BF_3 by reacting the DUF_4 produced in the de-conversion step with the oxides of silicon (SiO_2) and boron (B_2O_3), respectively

The overall process design throughput capacity is depicted in Figure 1-1.

FEP and Depleted UF6 De-conversion Plant

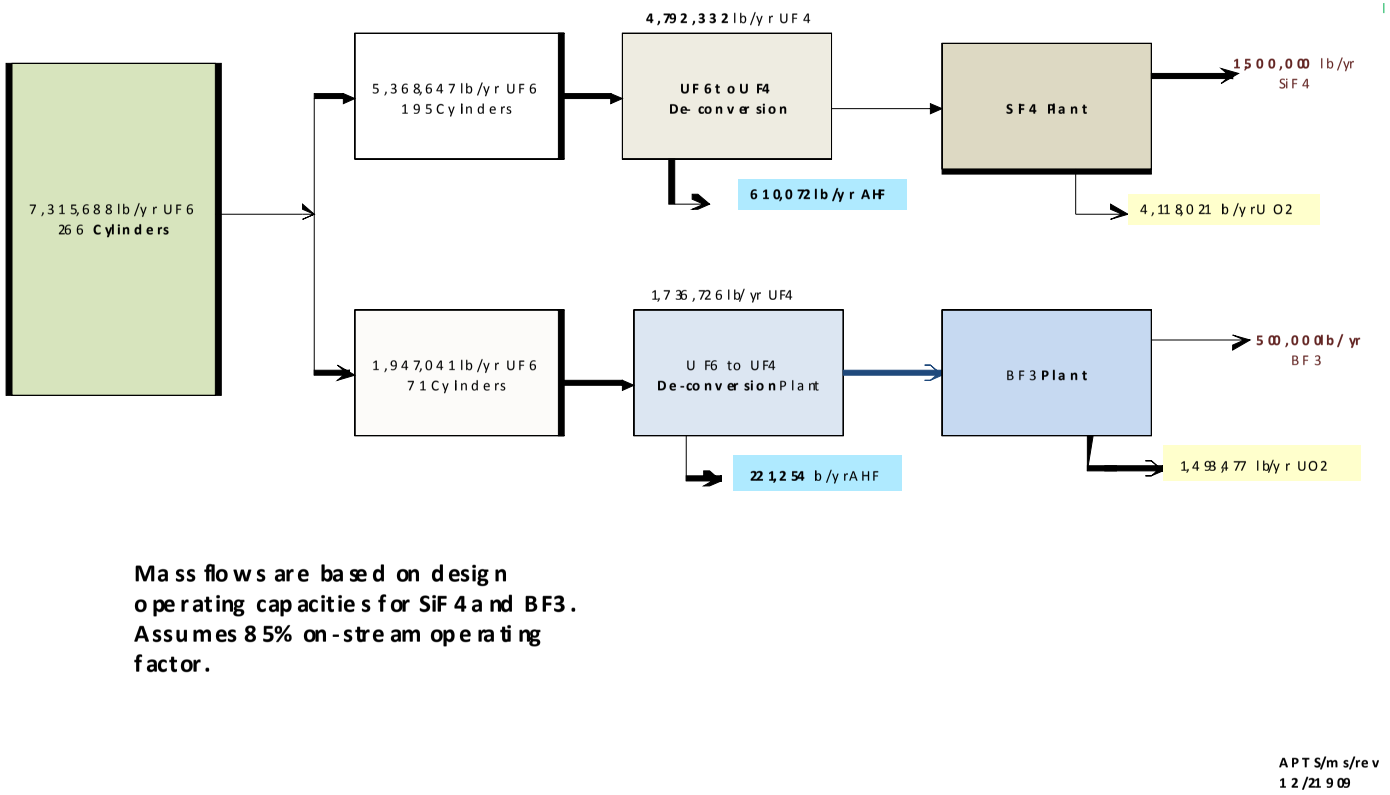


Figure 1-1 DUF_6 De-Conversion and FEP Plant Throughput

1.1.1 Facility Location, Site Layout and Surrounding Characteristics

The proposed IIFP site is located in Southeast New Mexico, approximately 23 kilometers (km) or 14 miles (mi) west of Hobbs, New Mexico (population 28,657). The site is located in Lea County, approximately 27 km (17 mi) west of the Texas state border, 85 km (53 mi) northwest of Andrews, Texas (population 10,182) and 308 km (242 mi) southeast of Albuquerque, New Mexico (population 712,728).

The nearest large population center (>100,000 population) and commercial airport is the Midland-Odessa, Texas area which is approximately 134 km (83 mi) to the southeast. The IIFP site consists of a 259 ha (640-ac) Section, of which approximately 16.2 ha (40-ac) is the facility site proper. The site is located on U.S. Highways 62/180 (U.S. 62/180) near the New Mexico/Texas State line in Lea County, New Mexico. See Figure 1-2, Location of Proposed IIFP Site. The site 640-acre Section lies along the north side of U.S. 62/180 and along the east side of New Mexico Highway 483 (NM 483).

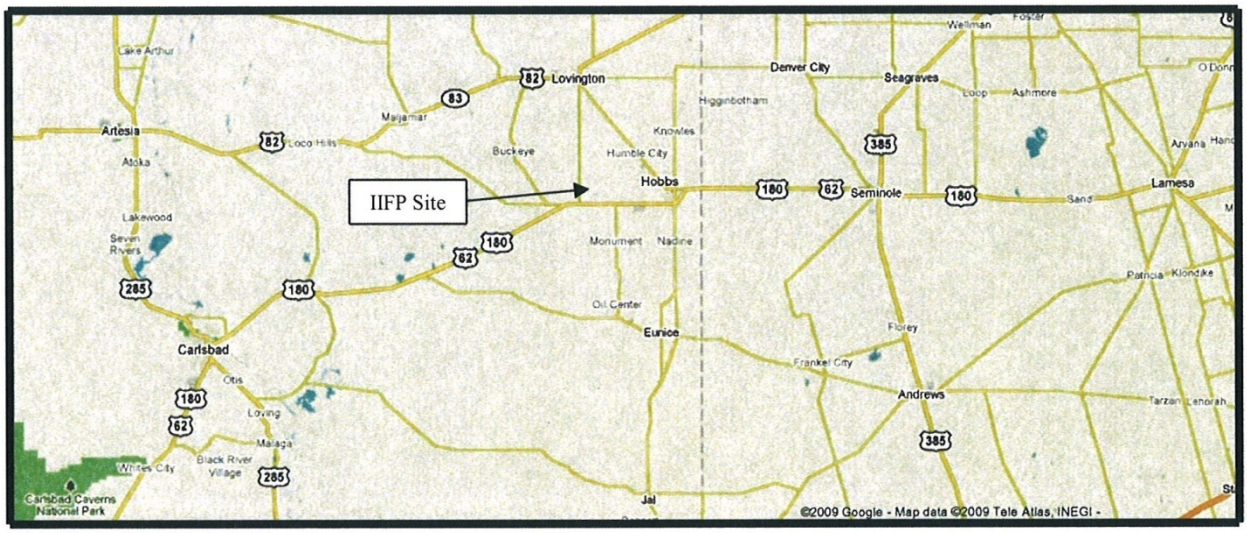


Figure 1-2 Location of Proposed IIFP Site

The area surrounding the site consists of vacant land and industrial properties. The general area consisting of four (4) approximate 640-acre Sections is delineated in Figure 1-3, IIFP Site Map with Surrounding Industrial Properties.

The Proposed IIFP Facility will be built on 16.2 ha (40 ac) of one of the 259-ha (640-ac) Sections (Section 27). The approximate 40-acre plot is shown in Figure 1-4.

The proposed site is located within Township 18S, Range 37E and Sections 26, 27, 34, and 35. The site is relatively flat with slight undulations in elevation. Surrounding properties consist of vacant land and the industrial Xcel Energy Cunningham Generating Station on the west boundary; Xcel Energy Maddox Generating Station 3 km (2 mi) east of the site; and Colorado Energy Generating Station located 5 km (3 mi) southeast from the center of the site along U.S. 62/180.

Figure 1-3 IIFP Site Map with Surrounding Industrial Properties.

Several power lines and underground power lines generally run across the proposed site generally east to west, and several gas pipelines run north and south as well as east to west. The proposed IIFP Site as well as land around the proposed site has been mostly developed by the oil and gas industries.

Refer to the IIFP FEP/DUP Environmental Report (ER) (IIFP, 2009a) for a more detailed description of the proposed site. Section 1.6 below also provides additional detail about the site location and significant features.

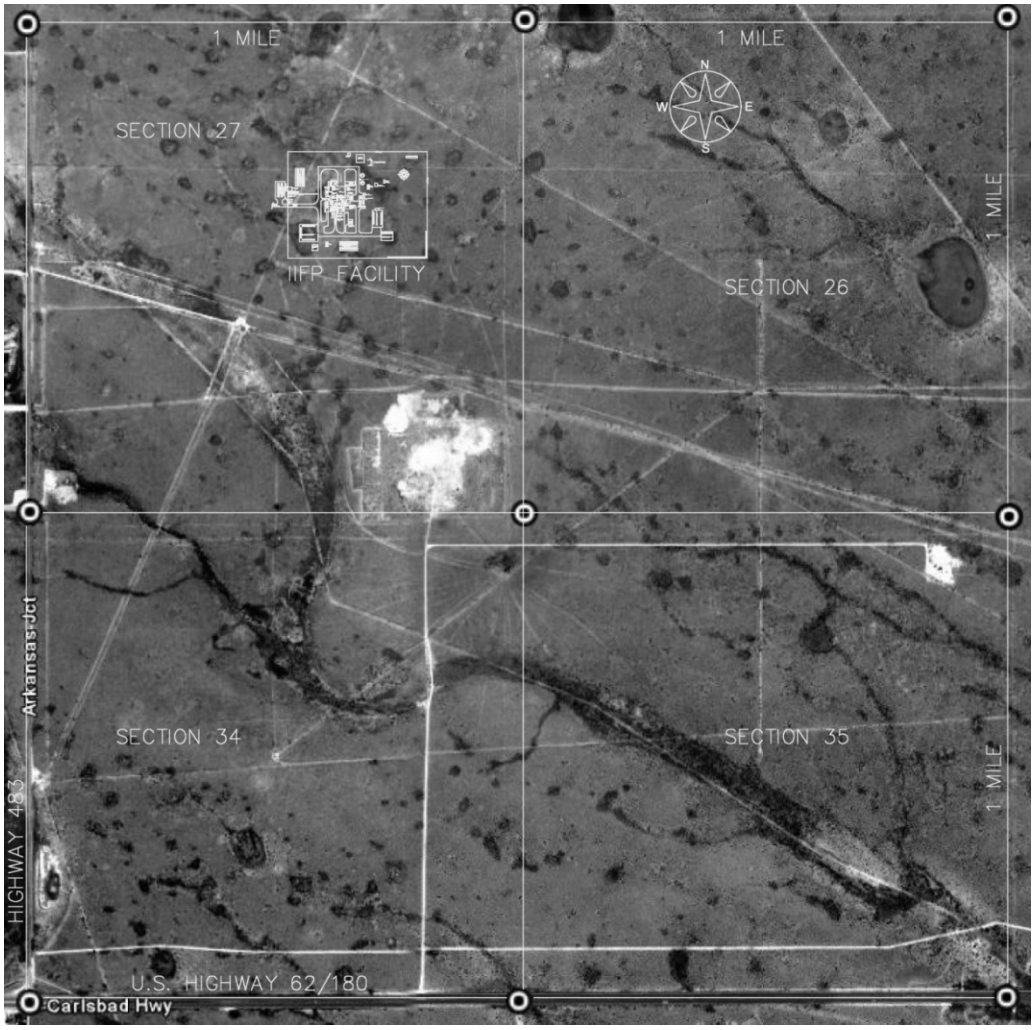


Figure 1-4 Location of the IIFP Facility within Section 27 of the Proposed Site

1.1.2 Facility Description

The facility and infrastructure are typical of specialty chemical and industrial facilities. Buildings, in addition to the process buildings, are included for administration, laboratory, maintenance shop, stores inventories, security checkpoints, utilities and powerhouse, and warehousing. Figure 1-5 shows the facility site plan and layout of the buildings, roads and major infrastructure.

The 40-acre facility site is surrounded by security fence with a surveillance road just inside the fence. Pole mounted security lighting is installed around the perimeter of the security fence.

The entrance to the facility is from the west via a paved road (approximately 3/4 mile) that intersects with NM 483. The road connects with the plant road system at the main gate and guard station.

Figure 1-5 ~~IIFP Facility Site Plan~~ – Redacted Security Related Information

The process equipment is located within building structures, where feasible. Process buildings that function as product and waste material storage have separate areas for each purpose. Those areas have loading/unloading docks to facilitate shipping.

Process buildings have aprons, curbing and dikes and external pads have curbing and dikes where chemicals are stored or handled. Pumps are provided on pads and in building selected areas to transfer chemicals to containers or to the EPP in event of a spill or leak.

Auxiliary buildings generally house:

- Materials;
- Maintenance shop;
- Laboratory equipment;
- Steam boilers and supporting utilities;
- Electrical utility equipment;
- Sanitary water treatment, certain equipment for process water treatment and recycle, and
- Accommodation for personnel work, break-rooms, change-rooms, and toilets.

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

1.1.2.1 Process Buildings and Process Areas

The DUF_6 Autoclave Building, DUF_4 Process Building, DUF_4 Container Storage Building, DUF_4 Container Staging Building, Decontamination (Decon) Building, FEP Process Building (SiF_4 and BF_3), FEP Oxide Staging Building, FEP Product Storage & Packaging Building and the EPP Building are of structural steel beam and column construction with metal wall panels and with Class 1 metal roofs. The first floor of each building is constructed of reinforced concrete with curbing to function as a containment barrier. Located in the northeast corner of the access pad and adjacent to the DUF_4 Process Building, is the DUF_4 Container Staging Building. This building is used for removing DUF_4 from DUF_4 shipping containers that may be received from suppliers and for transferring into the DUF_4 hoppers located in the DUF_4 Process Building.

The AHF Staging Containment Building and the Fluoride Products Trailer Loading Building are constructed of reinforced concrete floor slabs with a containment barrier design around the inside perimeter. The upper sections of these buildings are of concrete or concrete block construction with Class 1 metal roofs.

Radiological boundary control hand-foot monitors are strategically located at building walkway exits of areas where determined to be needed. Fluoride and radiological detection systems, local alarms and alarm notification to Controls Rooms are also strategically located in those building areas, where applicable.

The process buildings are multi-story buildings where necessary to provide requirements for equipment space and to provide elevations for permitting gravity flow of particulate solids.

Table 1-2 IIFP FEP/DUP Plant Building Sizes

BUILDING (Areas where uranium is processed or stored are marked in "bold" print")	DIMENSIONS (feet)			APPROXIMATE AREA (square feet)	APPROXIMATE VOLUME (cubic feet)
	LENGTH	WIDTH	EAVE HEIGHT		
DUF_6 Autoclave Building	90	60	40	5,400	216,000
DUF_4 Process Building	50	50	70	2,500	175,000
DUF_4 Container Storage Building	40	40	18	1,600	28,800
DUF4 Container Staging Building	25	25	18	625	11,250
Decontamination (Decon) Building	50	30	30	1500	45,000
FEP Process Building (SiF_4 and BF_3)	60	40	60	2400	144,000
FEP Oxide Staging Building	40	20	30	800	24,000
FEP Product Storage & Packaging Building	50	35	18	1750	31,500
AHF Staging Containment Building	40	30	30	1,200	36,000
Fluoride Products Trailer Loading Building	90	20	20	1,800	36,000
Maintenance & Stores Building	60	50	15	3,000	45,000
EPP Building	40	30	18	1,200	21,600
Lime Silo Storage Shed	20	20	8	400	3,200
Utilities Building	50	50	18	2,500	45,000
Material Warehouse	100	50	18	5,000	90,000
Main Switchgear Building	50	40	18	2,000	36,000
Fire Pump House	10	10	15	100	1,500
Water Treatment Building	30	15	15	450	6750
Process Offices	50	30	15	1,500	22,500
Laboratory (**Small uranium samples handled)**	30	30	15	900	13,500
Administrative Building	80	50	15	4,000	60,000
Guard House	25	20	10	500	5,000

The upper floors are configured such as to provide adequate room for equipment function and maintenance. The upper floor areas below equipment and piping containing powdered materials are constructed of reinforced concrete with curbing and seal coatings on floor and wall surfaces. Other upper floor areas of the buildings are constructed of metal grating or metal flooring.

Process Control Rooms are provided in the major processes, including appropriate monitoring, recording, alarm notification and control instrumentation. A Control Room is located in the DUF_4 Process Building. The Autoclave Building is controlled from the DUF_4 Process Building. The FEP plant has its own process Control Room for the SiF_4 and BF_3 processes. The AHF Staging Containment Building and Fluoride Products Trailer Loading Facility share a Control Room. Likewise, one control area is located in the Utilities Building for monitoring and controlling the steam boiler system, air compressors and other utility supply equipment. Control room areas and electrical and instrument rooms are typically of concrete block construction with concrete or metal roofs. Ceiling assemblies and fire walls separate these areas from

production areas of the facilities. Process area Control Rooms, where routinely occupied by workers, have environments maintained for comfort and safety. Control Rooms located in process areas, where uranium or hazardous chemicals are processed, stored or handled, have separate heating, ventilation and air conditioning (HVAC) systems. The Control Rooms in these areas are designed to maintain a positive pressure environment with high-efficiency filtration of intake air and are provided with low pressure alarms to notify occupants should a loss of pressure inside a Control Room occur.

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)

1.1.2.2 Other Major Buildings

Decontamination Building

The Decontamination Building is located adjacent to, and on the north side of the DUF_4 Process Building. The construction provides for a fire barrier between the Decontamination Building and the DUF_4 Process Building. This building is used for decontamination of equipment for maintenance and removal of uranium from decontamination wash waters or from small volumes of contaminated liquors. The Decontamination Building contains an equipment cleaning booth and hood system, primary and secondary dust collector system in series, contaminated-water holding tanks, primary and polishing filters, associated pumps, piping, field equipment instrumentation panels, ion exchange columns and associated controls and backwash systems.

DUF_4 Container Storage Building

Just east of, and adjacent to, the FEP Oxide Staging Building is the DUF_4 Container Storage Building. This building is used to store shipping containers of DUF_4 that may be received from suppliers. This source of DUF_4 can be used in production of FEP products and/or de-converted to depleted uranium oxide.

Fire Pump House

The Fire Pump House is located on the east side of the access road loop and between the two fire water storage tanks. This building houses the fire water pumps, interconnecting piping and controls for the facility fire water system. A fire wall separates the main fire water pump from the diesel powered emergency fire water pump.

Administrative Building (Offices)

The Administrative Building houses the offices of personnel not directly involved in the production and maintenance functions of the facility. This building is accessed directly through the front from the parking lot. The rear portion of this building is the Change/Locker Area with toilet facilities, showers and lockers. The main employee entrance and boundary control area are located at the side of the Change/Locker Area. A turn-style and access controls are located at the security fence permitting employee entrance into the controlled area.

Process Offices/Laboratory

The Process Office Building is located adjacent to, and north of the DUF_4 equipment access pad. This building contains the offices for the engineering, technical, ESH and plant production supervisory staff. The north side of this building contains the Laboratory that is furnished with work benches, equipment, analytical instrumentation, fume hoods, containment devices and exhaust systems with vent streams exiting to an outdoor scrubber on a containment pad just east of the Laboratory area. The Laboratory area provides areas that receive, prepare, and store various samples as follows:

- Health Physics Lab for calibrating instrumentation and counting samples,
- Chemical Laboratory for the analyses of process and product samples, and
- Environmental Monitoring Lab for the process of environmental/regulatory analysis.

Maintenance and Stores Building

The Maintenance and Stores Building is located southeast of the Fluoride Products Trailer Loading Building. This building contains small tools, machines, repair equipment, and maintenance supplies such as pipe and fittings, hardware, electrical parts and other small items required for maintenance of the facility. No raw, licensed, or in process materials or finished products are stored in this building. An office area is provided for maintenance supervision and stores personnel.

Material Warehouse

The Material Warehouse is located just northeast of the Process Offices/Laboratory Building. This warehouse is used to receive and store such items as piping components, electrical conduit, wiring, equipment for capital construction projects and spare parts. Small quantities of chemicals such as paints, oils, and cleaning agents are stored in the warehouse, but the quantities are limited to meet NMCBC and NFPA requirements. No licensed, raw, or in-process materials or finished products are stored in this building.

Water Treatment Building

The Water Treatment Building is located east of the electrical utility substation and adjacent to the facility water wells. This building contains the domestic water storage tank, pumps, treatment system, and controls required to furnish potable water for use throughout the facility.

Main Switchgear Building

The Main Switchgear Building is located just east of the Utilities Building. This building houses the incoming main switchgear distribution and metering equipment for the facility. The main switchgear is fed from the electrical utility substation located just inside the north fence line.

Guard House

The Guard House is located at the entrance to the plant. It functions as a security checkpoint for all incoming and outgoing traffic. Employees, visitors and trucks that have access approval are screened at the Guard House. Vehicle traffic entering the secured area including common carriers, such as mail delivery trucks, are checked and authorized for access to the facility at this location.

1.1.3 Process Description

This section provides a description of the process chemistry, process flows, general descriptions of the unit operations and type of equipment used in the process. Section 3 of the IIFP ISA Summary describes in more detail the process, its equipment systems and estimated ranges for the operating parameters (IIFP, 2009b).The following flow diagrams in this section are for illustration only in helping understand the process flow description larger and more legible process flow sheets are provided in a separate engineering drawing package as part as part of the overall LA submittal to the NRC.

1.1.3.1 Process Chemistry

The IIFP commercial plant involves the following major chemical stoichiometry reactions:

DUF_6 to DUF_4 Process

$UF_6 + H_2 \rightarrow UF_4 + 2HF$

SiF_4 Process

$SiO_2 + UF_4 \rightarrow SiF_4 + UO_2$ (or U_3O_8)

BF_3 Process

$2B_2O_3 + 3UF_4 \rightarrow 4BF_3 + 3UO_2$ (or U_3O_8)

Air and Water Treatment Systems

$HF + H_2O \rightarrow HF$ (aqueous)

$HF + KOH \rightarrow KF + H_2O$

$3SiF_4 + 4KOH \rightarrow 2K_2SiF_6 + 2H_2O + SiO_2$

$SiO_2 + 2KOH \rightarrow K_2SiO_3 + H_2O$

$4BF_3 + 3KOH \rightarrow 3KBF_4 + B(OH)_3$

$2HF + Ca(OH)_2 \rightarrow CaF_2 + 2H_2O$

$2KF + Ca(OH)_2 \rightarrow CaF_2 + 2KOH$

1.1.3.2 De-conversion of DUF_6 to DUF_4 Process

DUF_6 can be converted to DUF_4 by a high temperature reaction with hydrogen. The basic chemical equation is:

UF_6 (gaseous) + H_2 (gas) $\rightarrow$ UF_4 (solids) + 2HF (anhydrous)

The DUF_4 is used as a feed material to produce high-purity fluoride products of SiF_4 and BF_3

The IIFP facility in Hobbs, New Mexico receives DUF_6 material in a solid physical state typically contained in 14-ton type 48-Y cylinders owned by the supplier (the IIFP de-conversion customer). These cylinders are built to American National Standards Institute (ANSI) standards (ANSI, 2001) and are transported by truck trailers that are Department of Transportation (DOT) approved. The 48-Y cylinder is

approved for multi-shipments, provided the ANSI standards; which include a 5 year hydrostatic test requirement are met. Empty cylinders are returned to the customer following de-conversion.

The type 48-G cylinder is typically used by the uranium enrichment facilities for their on-site storage of DUF_6 but has been utilized for transport by the Department of Energy. Shipment of the type 48-G cylinders to the IIFP facility may require the supplier/customer to obtain a DOT Special Permit. The type 48-G is a one-time use cylinder. Disposition of the empty cylinder would require the complete removal of DUF_6. One option under consideration would be to qualify the empty 48-Y cylinder as an Industrial Package (IP) and utilize it as a DU oxide transport and disposal container.

Upon receipt, full cylinders of DUF_6 are visually inspected for damage and surveyed for radiation and removable contamination. Documents that contain information regarding cylinder ID, weight and uranium assay that accompany the shipment are reviewed and verified for accuracy. Uranium assay is qualitatively verified by performing a non-destructive gamma survey measurement. Once accepted for receipt, the cylinder is unloaded using the facility cylinder hauler vehicle and placed in the Full DUF_6 Storage Pad area until it is scheduled for feed to the de-conversion process.

The DUF_6 cylinder is placed in a containment-type autoclave; where the contents are vaporized. The DUF_6 vapor is fed to a reaction vessel where it undergoes exothermic reaction to produce DUF_4 and AHF. The DUF_4 solid powder is continuously withdrawn from the reaction vessel bottom through a cooling screw mechanism and transferred to storage hoppers. A 2-stage dust collector system is provided to control and recycle DUF_4 dusts that are internal to the solids handling equipment and generated by air or gas flows associated with the handling equipment. The DUF_4 in the storage hoppers is transferred to the FEP plant for use as raw material feed in producing SiF_4 and BF_3.

Off-gases from the reaction vessel leave the cooling screw equipment and pass through a series of filters and carbon-bed traps to remove entrained particulates and residual traces of un-reacted DUF_6, respectively. The off-gas flow exiting the carbon-bed trap system passes through heat exchangers where the by-product AHF is condensed. Residual off-gases exit the condenser equipment to a hydrogen burner system to combust any un-reacted hydrogen gas. The off-gas flows into a 3-stage scrubbing system designed for removing trace quantities of fluorides. Off-gas flow through the Plant potassium hydroxide (KOH) Scrubbing System is described in Section 1.1.3.5.

The AHF that liquefies in the condenser equipment is drained to storage tanks that are located in a containment-type building (AHF Staging Containment Building). The AHF product has been chemically separated from licensed material. It is physically stored in a building separate from licensed material. The AHF is temporarily stored and then loaded into tank-truck trailers inside the containment-type building for shipment to customers. The trailers are DOT approved for shipment.

Major flows for the DUF_6 to DUF_4 de-conversion process are shown in Figure 1-6.

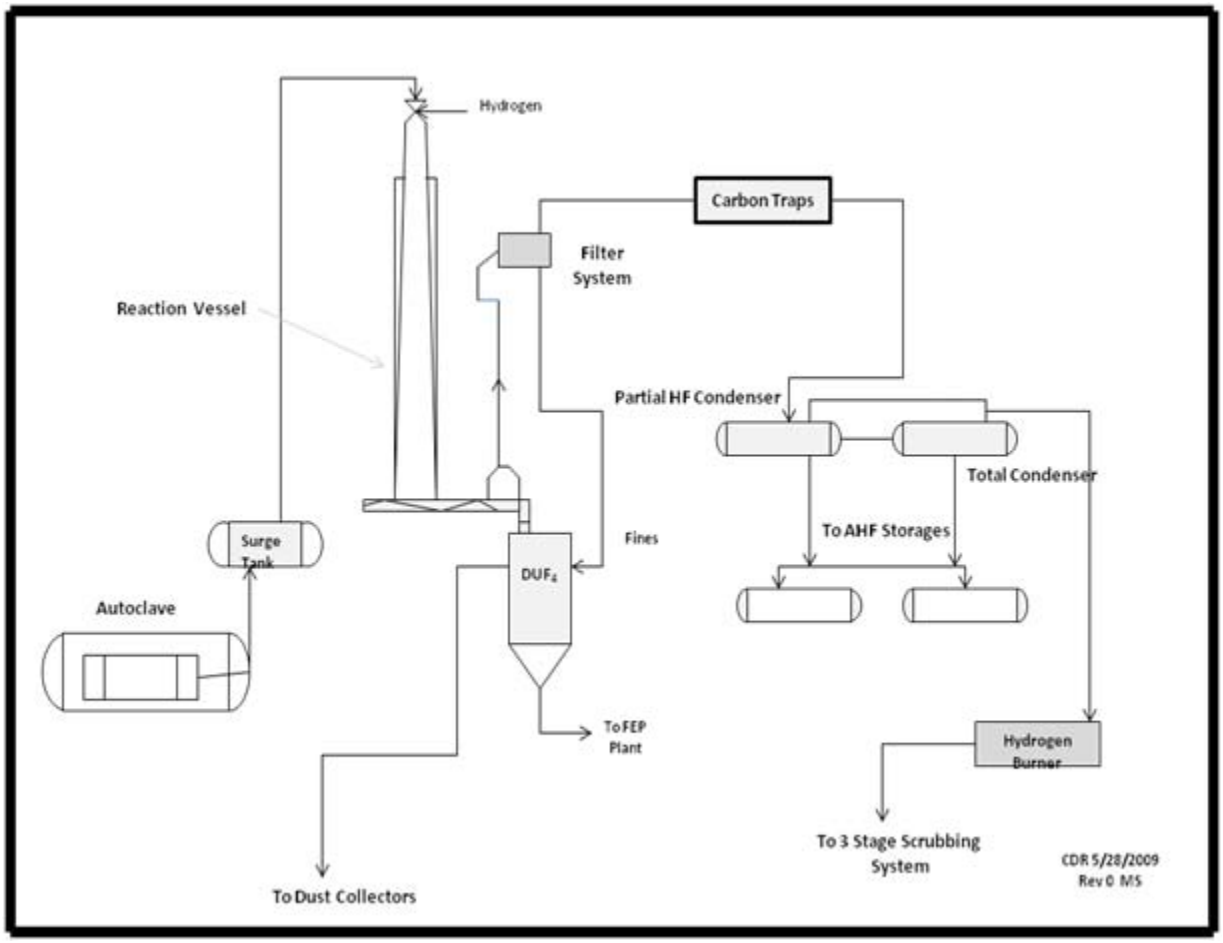


Figure 1-6 DUF_6 to DUF_4 Plant Major Flows

1.1.3.3 SiF_4 Production Process

The IIFP method of SiF_4 production in the FEP/DUP plant involves the reaction of solid particulate uranium tetrafluoride (UF_4) with solid particulate silicon dioxide (SiO_2) as follows:

$$SiO_2\,(\text{solids}) + UF_4\,(\text{solids}) = SiF_4\,(\text{gas}) + UO_2\,(\text{solids})\ (\text{or } U_3O_8\ \text{solids})$$

Silicon dioxide powder is mixed with DUF_4 and continuously fed to a rotary calciner where the mixture is heated and reacted to form SiF_4 and uranium oxide. The mass flow of the feed mixture is controlled through the rotary calciner to ensure the desired reaction residence time. The resulting SiF_4 gas product and trace impurities exit the rotary calciner as an off-gas while the uranium oxide powder discharges at the end of the rotary calciner through a cooling screw mechanism and transfers to storage hoppers. A two-stage dust collector system is provided to control and recycle uranium oxide dusts that are internal to the solids handling equipment and generated by air or gas flows associated with the handling equipment. The

uranium oxide in the storage hoppers is packaged into DOT approved shipping containers and transported to an off-site licensed disposal facility.

Off-gas leaves the rotary calciner and flows through two-stages of filters to capture entrained particulates. Particles captured by the filter system are recycled back as feed to the rotary calciner. After exiting the filter system, the off-gas flow passes through a pre-condenser system to remove hydrogen fluoride (HF) and other trace gas contaminants; followed by a two-stage cold trap system that collects the SiF_4 product.

The SiF_4 product is collected by solidifying the gas in the cold trap system. More than one cold trap is utilized for operating in a loading and unloading cycle. When a trap is loaded, the coolant temperature is set to allow the product to warm and transfer to a SiF_4 product storage tube via the evaporator.

The SiF_4 product has been chemically separated from licensed material. It is physically stored in a building (FEP Product Storage and Packaging Building) separate from licensed material. The product is packaged as a gas from the storage tube, using a compressor, into customer cylinders or tube trailers that are a type design approved by the DOT.

The final residual off-gas, which is not collected in the cold trap and passes through the cold trap system, flows to the 3-stage Plant KOH Scrubbing System for treatment to remove trace amounts of fluorides before venting to the atmosphere.

Off-gas flow through the scrubbing system is described in Section 1.1.3.5. Figure 1-7 depicts the SiF_4 process major flows.

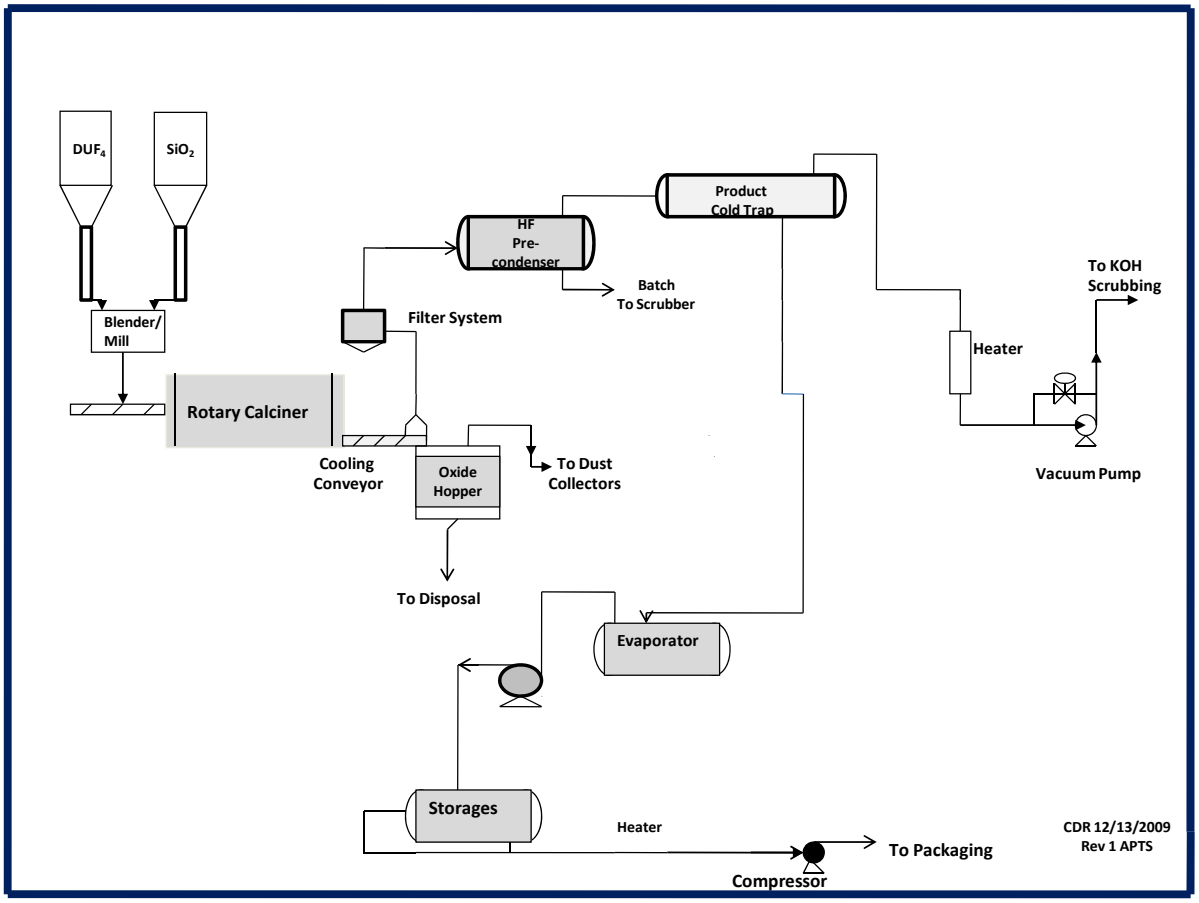


Figure 1-7 SiF_4 Plant Major Flows

1.1.3.4 BF_3 Production Process

The BF_3 production process follows essentially the same IIFP patented FEP technology as in the SiF_4 process, but involves the reaction of solid particle boric oxide (B_2O_3) with the DUF_4 as follows:

$$2B_20_3\,(\text{solids}) + 3UF_4\,(\text{solids}) \rightarrow 4BF_3\,(\text{gas}) + 3U0_2\,(\text{solids})\ (\text{or } U_30_8\ \text{solids})$$

The BF_3 process does include preheating of the feed mixture prior to feeding it to the rotary calciner to remove moisture and minimize the amount of HF impurities in the product gas stream.

In the production of BF_3, B_2O_3 is mixed with DUF_4 powder and continuously fed to a pre-heater, where the temperature is controlled to cause reaction of small amounts of the DUF_4 with the moisture that may be contained in the mixture. The resulting HF leaves the pre-heater as a vapor and passes through filters and then on to the Plant KOH Scrubbing System for treatment and conversion to potassium fluoride.

The mixed powder leaves the discharge end of the pre-heater then enters a rotary calciner where it is heated and forms BF_3 gas and uranium oxide powder. The BF_3 product, traces of AHF, and gas contaminants leave the rotary calciner as off-gases.

The uranium oxide powder exits the discharge end of the rotary calciner through a cooling screw mechanism and is transferred to storage hoppers. A two-stage dust collector system is provided to control and recycle uranium oxide dusts that are internal to the solids handling equipment and generated by air or gas flows associated with the handling equipment.

The uranium oxide in the storage hoppers is packaged into DOT approved shipping containers and transported to an off-site licensed disposal facility.

Off-gas from the rotary calciner flows through two-stages of filters to capture entrained particulates. The particles captured by the filter systems are recycled back as feed to the rotary calciner. After exiting the filter system, the off-gas flow passes through a pre-condenser system to remove AHF and other trace gas contaminants; followed by a two-stage cold trap system that collects the BF_3 product.

The BF_3 product is collected by solidifying in the cold trap system. More than one cold trap is utilized for operating in a loading (collecting) and unloading cycle. When a cold trap is ready to unload, the coolant temperature is set to allow the product to warm and transfer to a BF_3 product storage tube via the evaporator.

The BF_3 product has been chemically separated from licensed material. It is physically stored in a building (FEP Product Storage and Packaging Building) separate from the licensed material. The product is packaged as a gas from the storage tube, using a compressor, into customer cylinders or tube trailers that are a type/design approved by the DOT.

The final residual off-gas exits the cold-trap system and passes to the three-stage plant KOH scrubbing system for treatment to remove trace amounts of fluorides before being vented to the atmosphere. Off-gas flows through the plant scrubbing system as described in Section 1.1.3.5.

The BF_3 plant major flows are shown in Figure 1-8.

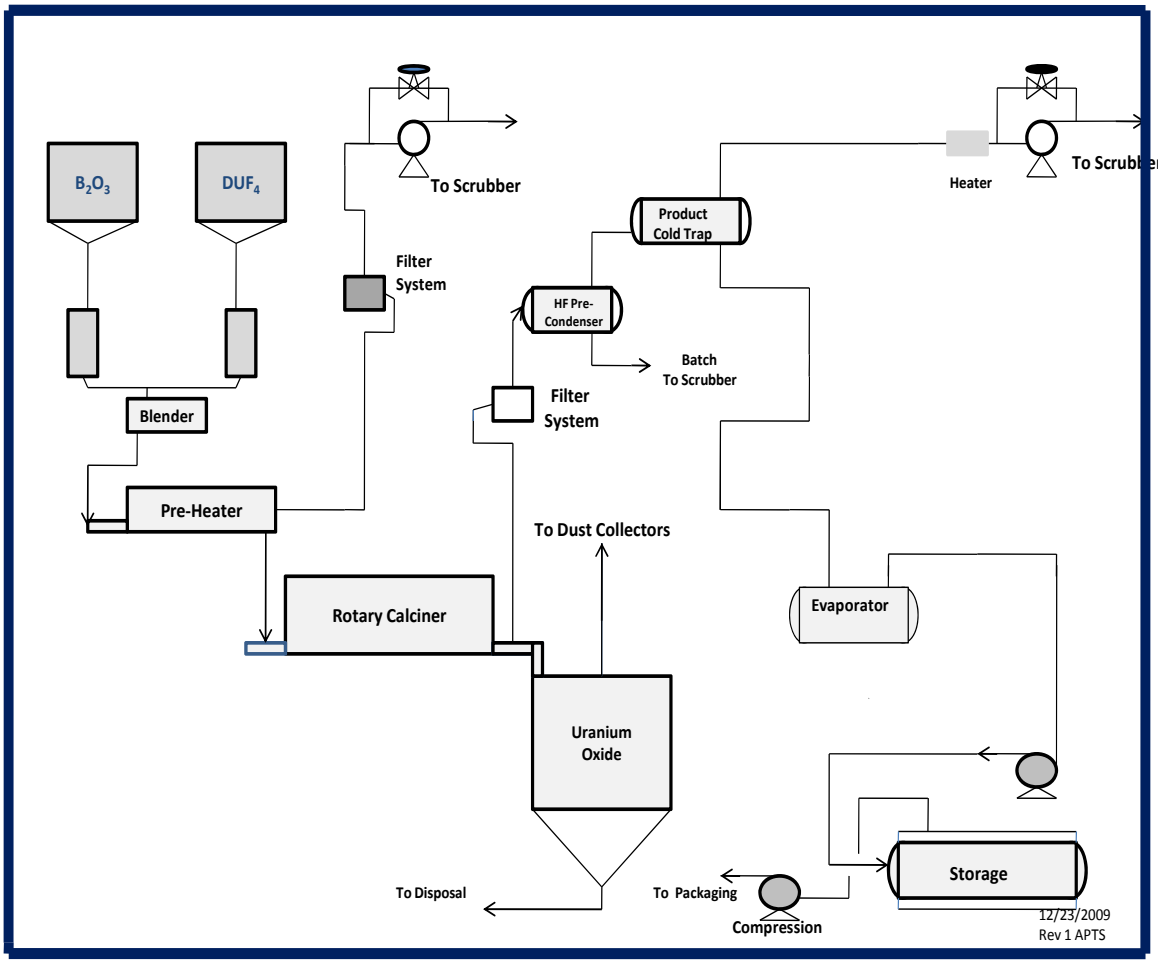


Figure 1-8 BF_3 Plant Major Flows

1.1.3.5 Process Off-gas Emissions Treatment (Plant KOH Scrubbing System)

Final off-gas streams from the DUF_6 to DUF_4, SiF_4 and BF_3 processes (comprised mostly of nitrogen, air and trace fluorides) enter the Plant KOH Scrubbing System. The off-gases flow through this three -stage scrubber system for treatment prior to be vented to the atmosphere.

There are two parallel line systems that are basically alike to provide operating flexibility. Each scrubber line consists of a primary wet venturi scrubber, followed by a secondary countercurrent-flow gas-liquid packed tower. The third-stage tertiary scrubber is designed to treat gas flow exiting the secondary packed tower scrubber though a bed of sized coke. The coke is wetted by an aqueous KOH solution that serves as the scrubber liquor. An aqueous KOH solution is used and recycled within each of the scrubbers until the concentration of KOH (spent) needs replenishment. The KOH solution concentration in the scrubber equipment is maintained at a safe margin to ensure it effectively reacts (scrubs) with fluoride components in the gas stream.

When there is a need to replenish the KOH scrubbing liquor concentration, some of the spent scrubbing solution, containing potassium fluoride (KF), water and some excess KOH, is pumped from the scrubber recycle tanks to the Environmental Protection Process (EPP). The EPP is described in Section 1.1.3.6.

The system equipment basically consists of a KOH storage tank, KOH pump tank, regenerated KOH tank, two or three (installed spare) venturi scrubbers, two packed towers, and two coke boxes as shown in Figure 1-9. There are redundant pumps for each scrubber, pump tank, and storage tank.

Hydrogen fluoride, from the discharge of the DUF_6 to DUF_4 process, and from the SiF_4 and BF_3 pre-condensers, is routed to one venturi. Final off-gas streams exiting the SiF_4 and BF_3 processes, containing some of the uncollected SiF_4 and BF_3 and trace quantities of other fluorides, are routed to another venturi scrubber.

The plant KOH scrubbing system vents treated gases through a single stack. The three-stage KOH scrubbing system is designed for removing fluoride bearing components in the gas streams at approximate efficiencies of greater than 80%, 95%, and 99% for the first, second, and third stages, respectively. The overall system removal efficiency is designed at greater than about 99.9 %. The plant KOH scrubbing system stack is continuously sampled and routinely analyzed to measure for traces of fluorides or uranium in the vent gas.

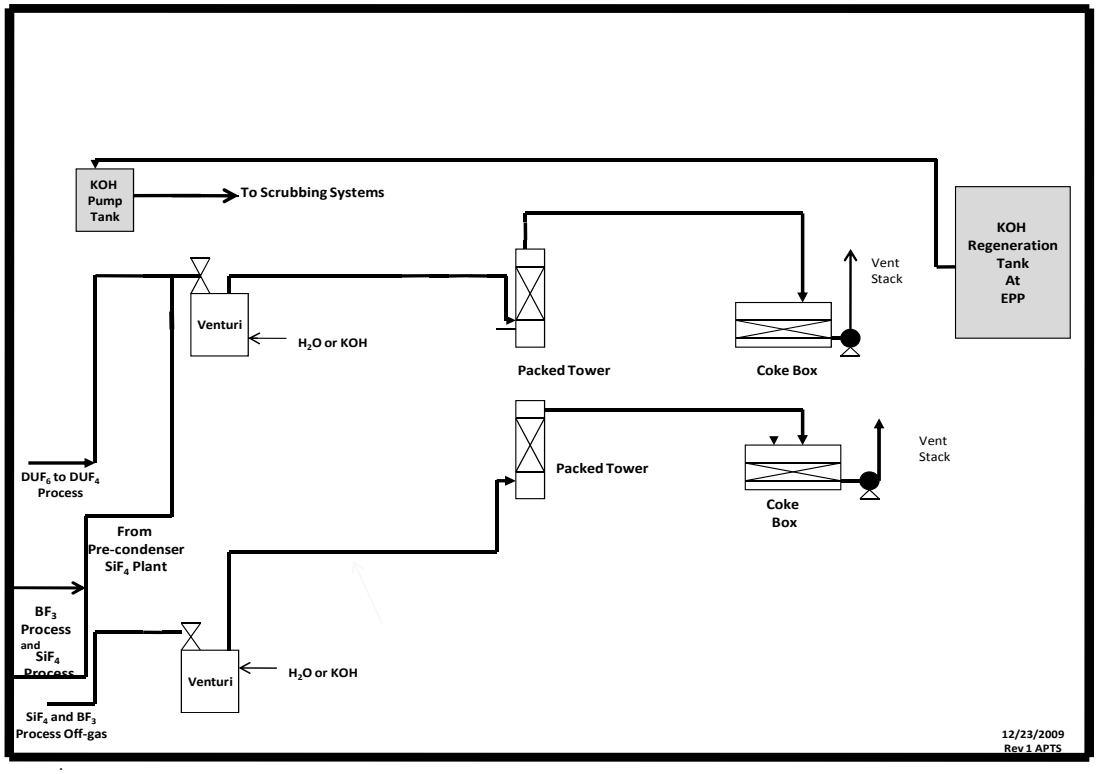


Figure 1-9 Plant KOH Process Scrubber System Major Flows

1.1.3.6 Environmental Protection Process (EPP)

The EPP is primarily a means of treating two types of liquids (solutions) that result from the production processes; potassium fluoride solutions (KOH regeneration process) and weak aqueous HF (HF neutralization process). Each of these materials originates from scrubbing systems designed to prevent air emissions. The potassium fluoride solution is a by-product of using KOH as a scrubbing medium.

In the KOH regeneration process of the EPP, the potassium fluoride, water, and excess KOH spent solution from the plant KOH scrubbing system are reacted with a lime-slurry. Calcium fluoride and regenerated potassium hydroxide solution are produced. The regenerated KOH is recycled and reused in the plant scrubbing process. The calcium fluoride is filtered, dried, and packaged for shipment to an approved commercial waste burial site, to an HF producer, or other potential users.

The other stream treated in the EPP is weak aqueous HF solution, water or KOH solution that may contain a low concentration of fluorides. Also, small spills that potentially occur and require clean up from spill control containment areas may contain weak fluoride concentrations. In this case, the fluoride-bearing liquids may have too much water to send to the KOH regeneration and recycle system. The HF neutralization process uses lime slurry to react with weak HF to produce calcium fluoride (CaF_2) and water. Figure 1-10 depicts the main flows of the EPP Neutralization and KOH Regeneration and Recycle processes. These processes are discussed below.

HF Neutralization

The HF Neutralization process is designed to operate intermittently, as needed. A lime silo is provided, including an installed dust collector. The silo holds an inventory of hydrated lime. Lime is fed to a mix tank where it is mixed with harvested water. The slurry generated is ~30% solids. Dilute HF solution is transferred from the weak HF solution tank to an agitated acid reaction vessel. The lime slurry from the mix tank is also transferred to the acid reaction vessel. The materials in the acid reaction vessel require a retention time of about one hour or greater for reaction completion. With the reaction complete, materials from the acid reaction vessel are transferred to a thickener tank for settling. After thickening, calcium fluoride and excess lime are transferred by a slurry type pump from the bottom of the thickener to a rotary drum vacuum filter. Solids are discharged from the filter to a dryer capable of removing excess water. Liquors from the rotary vacuum filter are recycled to the weak HF solution tank for recycling. Calcium fluoride, after drying, is packaged suitable for sale or disposal an appropriate off-site licensed Resource and Conservation Recovery Act (RCRA) disposal facility. The primary chemical reaction is:

$$2HF + Ca(OH)_2 \rightarrow CaF_2 + 2H_2O$$

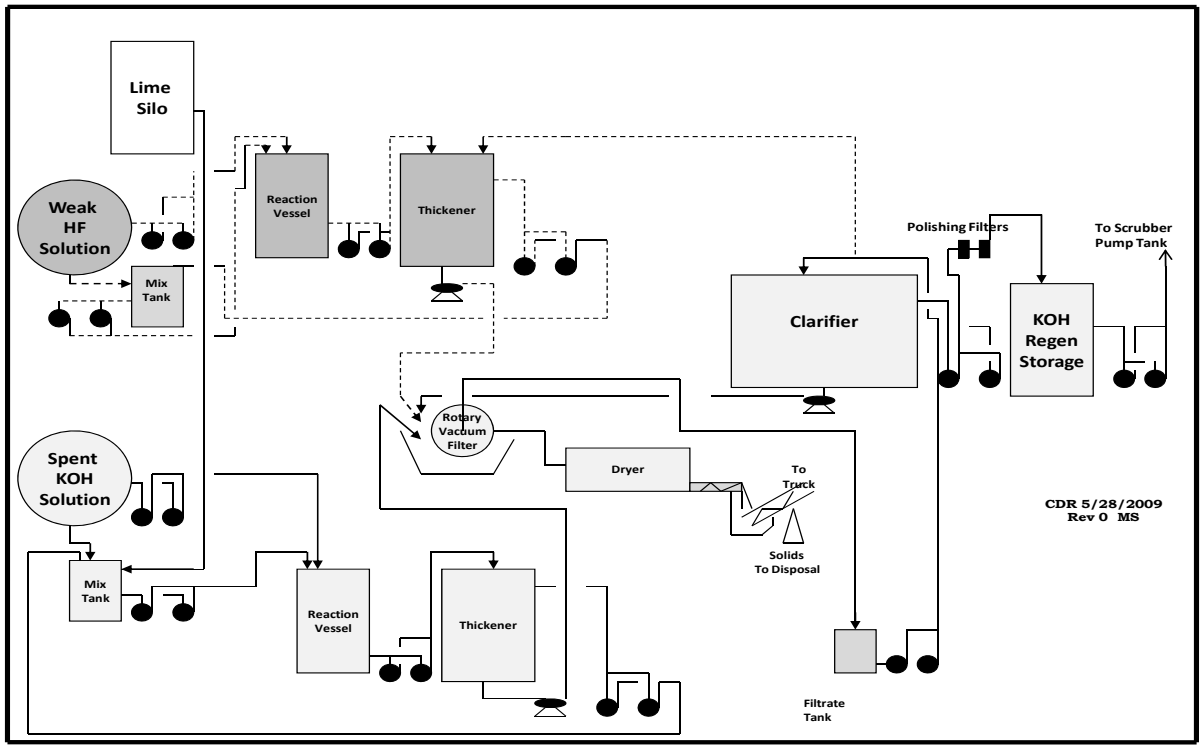


Figure 1-10 Environmental Protection Process Major Flows

KOH Regeneration

Lime is fed to an agitated mix tank where it mixes with harvested water. The slurry generated contains ~30% solids. Spent KOH solution (KF solution containing a weak concentration of KOH) is transferred from a spent KOH storage tank to an agitated reaction vessel. The lime slurry from the mix tank is also transferred to the reaction vessel. The materials in the reaction vessel tank are given a retention time of about one hour or greater for reaction completion. With the reaction complete, materials from the reaction vessel are transferred to a thickening tank for settling. Calcium fluoride and excess lime are transferred by a slurry pump from the bottom of the thickener to a rotary drum vacuum filter. Solids are discharged from the filter to a dryer capable of processing excess water. Liquors are transferred to a clarifier where trace solids are settled. Regenerated KOH is removed from the top of the clarifier and passed through a set of filters to the regenerated KOH storage tank. The regenerated KOH solution is pumped to the Plant KOH Scrubbing System as needed for reuse by the scrubbers. Solids are transferred via a slurry pump from the bottom of the clarifier to the rotary drum vacuum filter and subsequently transferred to the dryer. The dried material is packaged and stored for sale or sent to an approved off-site licensed RCRA disposal facility.

The primary chemical reaction is:

$$2KF + Ca(OH)_2 \rightarrow CaF_2 + 2KOH$$

1.1.3.7 AHF Staging Containment Building and Fluoride Products Trailer Loading Building

The AHF product is stored temporarily in the AHF Staging Containment Building until it is loaded into customer or-transporter owned DOT approved tank trailers (typically type DOT-412 trailer, loaded to about 30,000-40,000 lb product) and shipped to customers.

The purpose of the AHF Staging Containment Building and equipment is to provide temporary storage of AHF that is received from the DUF_6 to DUF_4 process AHF condensers. AHF transferred from the DUF_4 Process Building partial and total condensers is temporarily stored in ~8,000-lb (3,630-kg) tanks of materials of construction compatible with AHF. Dikes are provided around each storage tank. Each dike is sized to hold the contents of a single storage tank with an additional margin of safety to minimize the surface area (and evaporation rate of liquid) in the unlikely event the tank breaches and spills liquid AHF.

When AHF inventories reach a level for shipment, the AHF is loaded into an approved tank trailer staged in the Fluoride Products Trailer Loading Building. The tank trailer is the type approved by the DOT and of the design/type routinely used for shipping AHF nationwide. A transfer line from the storage tanks enters the tank trailer side of the building. The Fluoride Products Trailer Loading Building has a truck entrance door on one side that remains sealed, closed and controlled, except for short periods when the trailer is moved in and out. Safety precautions, controls and barriers are used to prevent the trailer from inadvertently being moved and from contacting the fill line.

The SiF_4 and BF_3 products awaiting shipment to customers are stored in the FEP Product Storage and Packaging Building until packaged using the respective enclosed packaging station within that building into customer DOT approved shipping cylinders (typically type 3A or 3AA). The SiF_4 or BF_3 product may be packaged into DOT approved shipping tube trailers, and in this case the product is transferred from the storage tubes to the tube trailer in the Fluoride Products Trailer Loading Building.

The Fluoride Products Trailer Loading Building is connected to the AHF Staging Containment Building and serves the purposes of: 1) loading tank trailers with AHF from storage, 2) loading gas-tube trailers with BF_3 or SiF_4 transferred from the FEP Product Storage and Packaging Building.

The AHF Staging Containment Building and the Fluorine Products Trailer Loading Building are totally enclosed, separated by a containment-type wall and are provided with a leak detection and water spray system that are described below.

The SiF_4, BF_3 and AHF products in the FEP Product Storage and Packaging Building, AHF Staging Containment Building and the Fluoride Products Trailer Loading Building have been chemically separated from licensed material through several process stages. These chemical products are physically stored, transferred and controlled such as not to affect on-site licensed material in the event of a release of these chemicals.

Products (AHF, SiF_4 and BF_3) that are shipped in the approved DOT tube or tank trailers are transferred through independent and safe-pressure designed piping and connections from their respective storage vessels to the product designated trailer in the Fluoride Products Trailer Loading Building. Process hazard analysis is conducted for the storage, handling, and transferring of these chemicals. Safeguards and operational controls are designed and provided for standard industrial chemical safety, and where applicable to meet requirements of OSHA 1910.119, *Process Safety Management*, or federal and State of New Mexico environmental permit requirements.

The AHF Staging Containment Building and the Fluoride Products Trailer Loading Building are not totally leak-tight, but are sufficiently enclosed and sealed to suppress or inhibit releases to the outside environment or into other adjacent buildings in the event of a leak or spill of the chemicals being stored or transfer loaded. A fluoride leak detection and water-spray deluge system provides for additional suppression and mitigation of potential AHF or fluoride product chemical releases.

The fluoride detection and water spray system is a safeguard to suppress (knock down) fluoride vapors within the building in the event of a leak or vessel breach and to minimize the potential of abnormal fluoride emissions to the environment. The system also provides the operational means to facilitate treatment and disposal of fluorides in event of a leak from a container or during transfer operation.

The AHF Staging Containment Building and the Fluoride Products Trailer Loading Building are equipped with an array of water-fog nozzles that are activated automatically if a leak of AHF or fluoride product chemicals should occur. Fluoride detectors are effectively configured throughout the two containment areas. The detection and control system are designed for automatically closing isolation valves at the storage tanks and at the tank trailer fill lines. The detection system also provides automatic and manual controls for initiating the water deluge system in event of chemical leakage in either building area. In the event one detector activates, an alarm sounds in the area Control Room and any chemical material transfer is stopped by automatic closure of the transfer isolation valves. The condition is investigated and corrected as necessary before starting or resuming transfer operations. If any two or more fluoride detectors activate in a building, the chemical material transfer valves automatically close and the water deluge system is automatically activated for that area. The detection and control system design in the storage tank area is based conservatively on the leakage of the entire contents of one full 8,000 lb (3,630 kg) storage tank of AHF. Once activated, the water flow continues unless investigated and determined to be a false alarm or under control. The system design in the truck loading area assumes that transfer of materials through hose connections and transfer lines is shut off by the automatic detection and control system, controllers and valves, before more than 8,000 lb (3,630 kg) of full-truck contents is released.

There are two positive-air-lock doors in each of the two containment-type buildings. One air-lock in each building is an emergency exit to the outside. The other air-lock in each building is an exit and entrance to a separate Control Room, under positive pressure, where control and remote surveillance of the buildings and equipment are managed. Parts of the containment-type building structures, trenches and sumps have a protective coating compatible with aqueous HF to minimize corrosion in the event of a leak or spill.

If the deluge system activates, the water is gravity drained to sump pumps where it is transferred to a large lined carbon steel emergency reservoir tank (HF Recycle Tank) that is vented to the plant KOH scrubbing system. In the event the water deluge is activated and fluoride bearing water from the buildings spill drainage system is received into the holding tank, the aqueous fluoride (HF) solution is sent to the EPP treatment plant. At the EPP, it is neutralized with lime, forming solid calcium fluoride particles that are separated from the treated water by settling and filtration. The treated filtrate is either recycled for plant process use or evaporated, and the solid particle filter cake is dried. The treated water contained in the solids is evaporated through the calcium fluoride dryer unit. The calcium fluoride is sent to customers or a licensed disposal facility.

1.1.4 Utilities Requirements

Utility resource requirements include electrical power, steam, natural gas, dry air, water and liquid and gaseous nitrogen. The Utilities Building contains a package steam boiler, a spare steam boiler for backup supply; associated boiler feed water softening and treating equipment; and compressors for generating

plant air and air driers, as needed. A separate electrical substation and switchgear building are provided to supply and distribute electrical power requirements.

1.1.4.1 Electrical

The electrical power load demand in the facility is mostly for operating four reaction vessels (calciners) in the FEP Process Building and the refrigeration system and reaction vessel in the DUF_4 Process Building. The substation and major line-distribution system are designed for the plant at an estimated 4.9 VA. As detailed design and engineering proceeds, the electrical take-off calculations for specific equipment will better define load demands by area. The Main Switchgear Building houses the electrical gear, breakers and electrical systems for control and distribution of the main electrical power.

1.1.4.2 Steam

Steam is the primary heat source for vaporizing DUF_6 in the autoclave, heating some process and warehouse buildings, and tracing pipes, in some cases, to prevent solidification of temperature sensitive substances.

Steam requirement is estimated at about 2,500-3,500 lb/hr based on routine operations at design capacities. The steam is produced on-site using a packaged boiler system. The steam boiler package includes a softener system for the feed water, standard blow-down capabilities, and associated steam and fuel controls. The boiler operates on natural gas and is located in the Utilities building. A spare package redundant boiler is planned for maintaining reliable heat source capabilities.

Condensate from autoclaves, line traps, heating units and process equipment is collected in local condensate tanks for temporary holding and flow control. Condensate is either treated and returned as feed to the steam boiler or used as makeup water in the process. Boiler blow-down is sent to the EPP for treatment, if needed, and evaporated at that point.

1.1.4.3 Compressed Air

Compressed air is needed for operation of some instrumentation, control valves, dust collector blow-back, hopper vibrators and some miscellaneous uses. Air is compressed and dried using vendor standard selected compressors to deliver approximately 100 psig. Air regulators and controls are specified as part of the detailed engineering and procurement package.

1.1.4.4 Nitrogen

Nitrogen is required for purge gas systems and in the process mainly for cooling of pre-condensers and product cold traps in the FEP process building. Liquid nitrogen is used for the cold traps. The cold nitrogen vapor exiting the product cold traps will be re-used for the pre-condenser cooling. Gaseous nitrogen leaving the condensers is collected and compressed to supply gaseous nitrogen in other parts of the facility where a dry inert gas is needed. The main application is for purge and seal systems, such as the rotary calciner inlet and discharge seals. A cost-benefit analysis will be conducted during detailed design to determine whether to make or buy the liquid nitrogen or to utilize another type cryogenic system, such as gaseous helium. It is assumed for the LA that liquid nitrogen is procured from a vendor.

1.1.4.5 Water Supply

The plant requires relatively low volumes of incoming water because of designs for recycling process water and re-circulating the cooling water. A preliminary estimate of water supply requirement is less than 10,000 gallons per day. Sanitary water usage for showers, lavatories, drinking, toilets and the laboratory comprise 3,000-4,500 gal/day of the total.

There is currently no municipal water line within a reasonably close distance to the plant site. Some other plants in the local area use ground wells as water supply. Ground wells are used for the IIFP plant coupled with a packaged treatment plant to render the groundwater acceptable for sanitary and drinking water use.

1.1.4.6 Heat, Ventilation and Air Conditioning

Steam is used as the main heat source for process building environment. Process control room areas are served by electrical or gas supplied heat pump units for heating and air conditioning. Process equipment areas are open and of large volumes, so steam heating is practical. Cooling of the large process and storage areas of low occupancy is by fresh air ventilation either by roof-fan or side-wall vents. Smaller process areas that are routinely occupied by personnel, such as the product packaging areas, are cooled by local HVAC refrigerant type units. Final decisions on types, locations, number of units and thermal loading is pending the architecture and engineering details with respect to building design and layout.

1.1.4.7 Ground-Thermal System

Administrative, stores, process offices, laboratory, guard station and other personnel high occupancy areas are heated and cooled by ground-thermal systems. The current concept is to design, select and install two systems close to consumers.

A total 60-ton capacity (720,000 British Thermal Units, BTUs per hour) is estimated for the buildings identified and currently sized in the plant concept. Actual sizing, selection and engineering of the system will be decided in later detailed engineering work.

1.1.4.8 Solar Power Supplement

Plans are to use a combination of solar electric supply ground mount and roof space panel systems to supplement some building lighting and light-duty auxiliaries, such as small fan motors and battery chargers.

1.1.5 Supporting Infrastructure

The following sections address the supporting infrastructure including equipment support pads and spill containment; water treatment; storm sewers and collection basins; and fire protection.

1.1.5.1 Equipment Support Pads and Spill Containment

Most of the process equipment is located inside the process buildings. There are some storage tanks, air scrubbing equipment and utilities equipment located outside. Process building concrete aprons and pads layout designs are arranged to be close to the inside process equipment for each building, respectively.

Process pads, where chemicals or hazardous materials are stored or handled, have dikes with sealed seams between the dike walls and concrete pad. The dike areas are designed to have an excess total capacity plus a design margin of safety for any one of the largest containers, vessels or tanks within the area.

Building aprons and pads that do not require dikes for spill control have curb designs to collect rainwater from building roofs and to prevent erosion. This arrangement helps prevent potential contamination of soil in the areas near process buildings in event of a leak or spill outside the normally controlled containment areas. In this design concept, runoff from building roofs and non-hazard areas is sent via the storm water sewer system to a double-lined retention basin designed to collect and evaporate storm water. It is unlikely that roof and non-hazard designated pads would contain radioactive or chemical contamination. The storm water runoff system design provides a means to collect and sample, if needed, this retained water. The collection and evaporation of rainwater from the process and plant areas proper provides reasonable assurance for operating the plant with minimal risks relative to storm water disposition.

1.1.5.2 Water Treatment

Cooling Water

Re-circulated cooling water is used in refrigeration systems, chillers, and process heat exchangers. Cooling water is treated for corrosion prevention and protection relative to fungi, mold and Legionnaire disease organisms. The closed-system avoids effluent treatment in general owing to little to no waste discharge.

In the event of a spill or leak around the chillers or cooling systems, the cooling water is collected in the spill containment areas, pumped to the EPP holding tanks where it could be lime-treated, neutralized and evaporated through the EPP dryer unit. Chemical residues are likely be very small amounts, if any, and will be disposed in an approved Resource Conservation and Recovery Act (RCRA) permitted disposal site. Small amounts of boiler blow-down water will also be sent to the EPP to be treated in the same manner.

Plant-Water Treatment

Plant water supply is from an on-site well(s). Civil engineering and surveys have not been performed, so characterization of the well water is not fully defined. The current water supply treatment concept is to employ packaged treatment that provides well water to meet specifications for plant boiler raw water feed and for cooling water make-up needs. The boiler raw feed is further treated in the Utilities building, for example through softeners, to meet the boiler feed specifications. Part of the raw water is pumped to separate storage and treated to meet drinking water standards for sanitary supply. About 3,000-4,500 gal/day of raw well water will need to be treated in a sanitary intake water packaged unit. The package unit treatment equipment and controls are housed in the Water Treatment Plant Building

1.1.5.3 Sewer Systems and Collection Basins

Storm Sewers

The facility storm sewer systems design assumes a 100-year return period storm of 8.9 to 10.2 cm (3.5 to 4-in) rain of 1-hour duration for the Hobbs, New Mexico area. Preliminary engineering of the drainage system size and layout was done to estimate costs and determine requirements and information for additional detailed design later. The early design encompasses an area of the facility that includes the process buildings, auxiliary buildings, pads, roads, parking lot and the water treatment and electrical substation areas in the back acreage of the facility. All the storm sewer systems are inside the inner fenced area and collect rainwater runoff from an estimated 20-25 acres including roadways, building roofs and pads.

Storm Water Retention and Evaporation Basins

Two collection basins are planned for use in handling surges of storm water drainage. One serves the Full DUF_6 Cylinder Storage Pad. The other is the main retention basin for collection of the site storm sewer drainage. Preliminary engineering calculations estimate the main basin needs to be approximately 100,000 cubic feet volume, assuming a 20% freeboard above the maximum design water level. The basin is double-lined with impervious synthetic materials typically used in these applications. Current plans are to use a sand base with a layer of geo-synthetic liner and a second layer of high density polyethylene, Detail engineering and specifications will be refined after civil data are obtained from the site surveys and further discussions with the State of New Mexico regarding permits.

Considerable detail design and engineering is required to meet state and local requirements relative to the retention/evaporation basins including bird netting and lining specifications and design. Given the plant basins are strictly for storm water collection and disposition, some of the issues normally encountered with holding basins are avoided.

Sanitary Sewer

Preliminary design of the currently planned sanitary system provides for capability to handle hydraulic loading of about 3,000-4,500 gal/day.

Treatment of sanitary sewer discharge uses a packaged system for primary and secondary digestion and activation. Tertiary treatment, most likely ultraviolet or other effective disinfection, follows. Biomass generated by the treatment is removed from the plant site by an approved and licensed haul and disposal contractor. The triple-treated water will be re-used in the plant for landscape or tree watering.

Process Sewer

Water and solutions used in process equipment and KOH liquors used in air emissions scrubbing units are pumped, when contaminant concentrations dictate, to the EPP via above ground piping. The design, in some cases, is double-walled pipes where significantly hazard solutions may require rigorous spill/leak prevention. This design is used where such piping could not practically be located within a contained spill control area.

Process water is not transported through underground sewers and the facility is designed such as not to require process sewers.

1.1.5.4 Fire Protection

Two redundant above ground fire water storage tanks of 100,000 gallons each are provided to supply immediate demand. Water supply is from the groundwater wells with booster and jockey pumps to maintain supply to and from the reservoir. An electrical fire water pump and an emergency diesel fire water pump are provided.

The plant fire protection system is based on NFPA standard NFPA 13 and the New Mexico Commercial Building Code (NMCBC).

Details of the fire safety program including further description of fire protection system are provided in the IIFP LA; Chapter 7, Fire Safety.

1.1.6 Waste Management

The following sections address generation and handling of wastes at the plant.

1.1.6.1 Solid Wastes

Solid waste generated at the IIFP plant will be grouped into industrial (nonhazardous), radioactive and mixed, and hazardous waste categories. In addition, solid radioactive and mixed waste will be further segregated according to the quantity of liquid that is not readily separable from the solid material. The solid waste management systems will be in designated areas, administrative procedures, and practices that provide for the collection, temporary storage, (no solid waste processing is planned), and preparing for off-site disposal of categorized solid waste in accordance with regulatory requirements. Solid radioactive wastes generated will be low-level wastes (LLW) as defined in 10 CFR 61 (CFR, 2009a). See Table 1-3, Estimated Annual Quantities of Waste Generated at the IIFP Facility.

Table 1-3 Estimated Annual Quantities of Waste Generated at the IIFP Facility

Material	Estimated Annual Amount (lb)
Depleted uranium oxide	2,800,000-6,000,000
Other process LLW	42,000-68,000
Misc, LLW	35,000-55,000
RCRA	32,300-361,500*
Industrial waste including sanitary waste	71,000-108,500

*Includes Calcium Fluoride which may not be RCRA Waste if sold.

The depleted uranium oxide waste from the de-conversion process is shipped to an off-site LLW disposal facility licensed for accepting depleted uranium oxide.

Industrial waste, including sanitary waste, miscellaneous trash, vehicle air filters, empty cutting oil cans, miscellaneous scrap metal, and paper will be shipped to off-site facilities for recycle or minimization, and, then sent, if required, to a licensed waste disposal facility.

Radioactive waste, including dust collector bags, ion exchange resin, crushed-contaminated drums, contaminated trash, contaminated coke-material and carbon-bed trap material will be collected in labeled containers in each Restricted Area and transferred to a temporary radioactive waste storage area for inspection. Suitable waste will be volume-reduced, if appropriate, and radioactive waste will be disposed at a licensed LLW disposal facility.

Hazardous wastes and some mixed wastes will be generated at the IIFP site. These wastes will also be collected at the point of generation, transferred to a temporary waste storage area, inspected, and classified. Any mixed waste that may be processed to meet land disposal requirements may be treated in its original collection container and shipped as LLW for disposal at a licensed facility.

Resource Conservation and Recovery Act (RCRA) hazardous wastes will be collected and packaged in approved containers and shipped by a licensed RCRA transporter and sent to licensed RCRA disposal facility. Under New Mexico regulations, a facility that generates more than 1,000 kg (2,200 lb) per month is a large quantity generator of RCRA wastes. In New Mexico, hazardous waste generators are classified by the actual monthly generation rate, not the annual average.

There is no on-site disposal of any solid or liquid waste at the IIFP facility. Waste management impacts for on-site disposal, therefore, are not evaluated.

1.1.6.2 Liquid Wastes

The facility does not directly discharge any process effluents to natural surface waters or grounds onsite, and there is no tie into a Publicly Owned-Treatment Works (POTW). No public impact is expected from routine liquid effluent discharge as no process liquids are discharged offsite (process wastes are recycled).

Worker exposure to liquid in-plant effluents is minimal. No exposures exceeding 29 CFR 1910, (CFR, 2009b) Subpart Z is anticipated. Additionally, handling of all chemicals and wastes is conducted in accordance with the site Environment, Health, and Safety Program, which conforms to 29 CFR 1910 and specifies the use of appropriate engineered controls, as well as personnel protective equipment, to minimize potential chemical exposures.

1.1.6.3 Liquid and Air Effluents

Process and Non-Process Wastewaters

Process effluents are treated and recycled or reused within the processes. Relatively small amounts of aqueous and non-aqueous liquid waste generation can be expected. These miscellaneous materials are collected in approved containers. Solutions containing uranium may be sent to the Decontamination Building for removal of the uranium followed by evaporation of the treated water. Aqueous laboratory samples and other miscellaneous liquids from maintenance activities that may contain uranium are sampled to determine their uranium or hazardous waste content, collected in approved containers and sent to an approved licensed disposal facility appropriate for that type hazardous material, if applicable. Where potentially contaminated areas have to be cleaned with solutions, the solution, if contaminated, is sent to

the De-contamination Building to remove uranium, evaporate the liquids, and packaging of any uranium residues for shipment to an off-site licensed disposal facility.

Non-process waste liquids that are determined to contain regulated or hazardous contaminants are collected and disposed at off-site licensed facility. Cooling water is recycled and steam condensate is either reused as process makeup water or treated and returned to the boiler.

A retention basin is used for the collection and monitoring of general site storm water runoff. Sanitary sewage effluent is discharged into a package treatment unit where it receives primary, secondary and tertiary treatment. The effluent from sanitary treatment is used in the plant for process make-up water or for landscape or site tree watering.

Air Effluents

The primary materials used or generated at the facility are UF_6, HF, SiF_4, BF_3, UF_4 and UO_2. UF_6 is hygroscopic (moisture absorbing) and, in contact with water, will chemically break down into uranyl fluoride (UO_2F_2) and hydrogen fluoride (HF). When released to the atmosphere, gaseous UF_6 combines with humidity to form particulate UO_2F_2 and HF fumes. Inhalation of UF_6 typically results in internal exposure to UO_2F_2 and HF. In addition to a potential radiation dose, a worker would be subjected to two other primary toxic effects:

- Uranium in the uranyl complex acts as a heavy metal that can affect the kidneys, and
- HF can cause severe irritation to the skin and lungs at high concentrations.

Because of low specific-activity values, the radio-toxicity of UF_6 and its products are smaller than the chemical toxicity.

Of primary importance to IIFP is the control of UF_6. The UF_6 readily reacts with air, moisture, and some other materials. The most significant reaction products in this plant are HF, SiF_4, BF_3, and small amounts of UF_4. Of these, HF is the most significant hazard, is toxic to humans, and is generated as a by-product

as well as being a product of hydrolysis of UF_6, BF_3 and SiF_4 if those are released to the atmosphere. Airborne uranium is removed through filtration prior to the discharge of gaseous effluent to the atmosphere. See IIFP ER for estimated emission data (IIFP, 2009a).

Worker exposure to in-plant gaseous effluents will not exceed chemical exposure limits defined in 29 CFR 1910, Subpart Z are anticipated (CFR, 2009a). Laboratory and maintenance operations activities involving hazardous gaseous or airborne effluents are conducted with ventilation control (i.e., fume hoods, local exhaust or similar) and/or with the use of respiratory protection as required. All regulated gaseous effluents are below regulatory limits as specified by the New Mexico Air Quality Bureau.

Hazardous chemicals that are contained within licensed material, or could affect licensed material activities are evaluated as part of the ISA (IIFP, 2009b).

1.1.7 Raw Materials, By-Products, Wastes, and Finished Products

The primary raw materials used FEP/DUP facility includes DUF_6, SiO_2, and B_2O_3 feeds. The by-product of the facility is a chemically stable uranium oxide suitable for permanent offsite burial. The wastes from the FEP/DUP facility include solid wastes, process wastewaters, and air effluents as described above. The finished products are fluoride products, namely SiF_4, AHF, and BF_3.

1.2 Institutional Information

This section describes the corporate identity, financial qualifications, type of license, and the requested special authorizations and exemptions.

1.2.1 Corporate Identity

The applicant name and address, corporate structure and ownership control, and physical location of the facility are provided below.

1.2.1.1 Applicant Name and Address

This application for a NRC source license is filed by IIFP. IIFP is a wholly owned subsidiary of International Isotopes Inc. (INIS) that is headquartered in Idaho Falls, Idaho.

The full address of the applicant is as follows:

Mailing Address:

4137 Commerce Circle

Idaho Falls, Id. 83401

Physical Address:

Same as Mailing Address

1.2.1.2 Organization and Management of Applicant

International Isotopes, Inc. was formed as a Texas corporation in 1995. Its wholly owned subsidiaries are International Isotopes Idaho Inc.; International Isotopes Fluorine Products Inc.; and International Isotopes Transportation Services Inc., all of which are Idaho corporations. Company headquarters and all operations are currently located within two facilities in Idaho Falls, Idaho.

Mr. Steve Laflin is President and Chief Executive Office and reports to the Board of Directors of INIS. An organization chart and description of the organizational structure for the IIFP facility is provided in Section 2.1.4 of the IIFP LA Chapter 2.

1.2.1.3 Address of Facility and Site Location Description

The proposed IIFP site is located in Southeast New Mexico, approximately 23 km (14 mi) west of Hobbs, New Mexico (population 28,657). The site lies along the north side of U.S. Highways 62/180 and the east side of New Mexico Highway 483. A mailing address has not yet been designated for the site. IIFP will provide the NRC a mailing address when it is determined and assigned by the U.S. Post Office. In the interim, the mailing address provided in the Applicant Name and Address section above may be used for all mail deliveries.

1.2.2 Financial Qualifications

IIFP estimates the total initial capital and startup cost of the FEP/DUP commercial facility to be approximately $75 -90 million dollars (estimated in 2009 dollars), excluding escalation, interest, waste disposition, decommissioning, and any replacement equipment required during the life of the facility.

Plans are to finance the facility mostly through capital funding investors.

IIFP presently intends to utilize a surety bond and Standby Trust Fund method to provide reasonable financial assurance of decommissioning funding will be available at the time of decommissioning the facility. At least six months prior to startup of the Phase 1 facility, IIFP will provide NRC the financial assurance instrument that IIFP intends to execute. Upon finalization of the specific funding instrument to be used and at least 21 days prior to the commencement of operations, IIFP will supplement its application to include the signed, executed documentation. The surety bond and fund will provide assurance that decommissioning costs will be paid in the unexpected event IIFP is unable to meet its decommissioning obligations at the time of decommissioning. In this case, funds drawn from the surety bond will be placed directly into a standby trust fund naming the U.S. Nuclear Regulatory Commission as the beneficiary.

A Decommission Funding Plan (DFP) for the facility is developed and provided as Chapter 10 of the IIFP NRC Licensing Application.

1.3 Type, Quantity, and Form of Licensed Material

IIFP proposes to acquire, deliver, receive, possess, produce, use, transfer, and/or store source material meeting the criteria of *Source Material* as described in 10 CFR 40.4, *Definitions* (CFR, 2008a). Details of the source material are provided in Table 1-4, *Type, Quantity, and Form of Licensed Source Material*. It is anticipated that license materials may be used for instrument calibrations. As those needs are identified during the detailed design phase, IIFP will prepare a license amendment as needed.

Table 1-4 Type, Quantity, and Form of Licensed Source Material

Source Material	Physical and Chemical Form	Maximum Amount by this License to be Possessed at any One Time
Uranium (depleted) and daughter products	Physical: solid, liquid, and gas Chemical: UF_6, UF_4, UO_2F_2, oxides, and other compounds	750,000 Kilograms as uranium
Any byproduct material	Sealed Source	Not to exceed 10.0 mCi per

with atomic numbers 1 through 83 and any source material		source, and 1.0 Ci total

1.4 Requested Licenses and Authorized Uses

IIFP will not store or process Special Nuclear Material (SNM) at the FEP/DUP facility. Therefore, no licenses and authorized uses for SNM are requested. SNM is defined in 10 CFR 70.4, *Definitions*, (2008d).

1.5 Security of Classified Information

All processes, materials and information at the FEP/DUP are unclassified. Therefore, the security of classified information is not applicable to the FEP/DUP facility.

1.6 Site Description

This section contains description of the New Mexico site and surrounding areas. The IIFP ER contains more detailed information regarding the site and its environs. The information provided in the Site Description sections below was extracted mainly from the development and preparation of the site information in the IIFP FEP/DUP ER (IIFP, 2009a). The references for the specific site data and information are provided in the ER.

1.6.1 Site Geography

This section contains information regarding the site location, including nearby highways, bodies of water, and other geographical features.

1.6.1.1 Site Location Specifics

The proposed IIFP site is located in Southeast New Mexico, approximately 23 km (14 mi) west of Hobbs, New Mexico (population 28,657). The site is located in Lea County, approximately 27 km (17 mi) west of the Texas state border, 85 km (53 mi) northwest of Andrews, Texas (population 10,182) and 308 km (242 mi) southeast of Albuquerque, New Mexico (population 712,728). The nearest large population center (>100,000 population) and commercial airport is the Midland-Odessa, Texas area which is approximately 134 km (83 mi) to the southeast. See Figure 1-2, IIFP Location Relative to Population Centers within 80 Km (50 Miles) in Section 1.1.1 for a depiction of the site location. The approximate center of the IIFP site is located at latitude 32 degrees, 43 min North and 103 degrees, 20 min West longitude.

Lea County is situated at an average elevation of 1,220 m (4,000 ft) above mean sea level (msl) and is characterized most often by its flat topography. Lea County covers 11,381 km^2 (4,393 mi^2) or approximately 1,138,114 ha (2,822,522 acres) which is three times the size of Rhode Island and only slightly smaller than Connecticut. From north to south, Lea County spans 173 km (108 mi); the county spans 70 km (44 mi) from east to west at its widest point

The proposed IIFP site location will be carved out of 958.7 ha (2369 ac) in Township 18S, Range 37E, Sections 26, 27, 34, and 35. The site is located approximately 23 km (14 mi) west of the nearest city, which is Hobbs, New Mexico (population 28,657). The site lies along the north side of U.S. Highways 62/180 and the east side of New Mexico Highway 483. U.S. Highway 62/180 intersects New Mexico Highway 209 providing access from the city of Hobbs south to Eunice and Jal. New Mexico Highway 132 runs north from Hobbs at the intersection with U.S Highways 62/180 to Knowles and Denver City. U.S. Highways 62/180 runs southwest to Carlsbad, New Mexico, approximately 50 miles from the proposed site. U.S. Highways 62/180 runs east through Seminole, Texas, 28 miles from Hobbs to Forth Worth, Texas, 340 miles from the site.

1.6.1.2 Features of Potential Impact to Accident Analysis

The landscape of the site and vicinity is typical of a semi-arid climate and consists of sandy soils with desert-like vegetation such as mesquite bushes, shinnery oak shrubs and native grasses. The IIFP site is open, vacant land. Except for man-made structures associated with the neighboring industrial properties and the local oil and gas industry, nearby landscapes are similar in appearance. The only agricultural activity in the site vicinity is domestic livestock ranching.

The proposed site is within the southern part of the Llano Estacado or Staked Plains, which is a remnant of the southern extension of the Southern High Plains. The Southern High Plains are remnants of a vast debris apron spread along the eastern front of the mountains of Central New Mexico by streams flowing eastward and southeastward during the Tertiary period. The site and surrounding area has a nearly flat surface. Natural drainage is south to southwest. Surface drainage is into numerous un-drained depressions as well as a small intermittent water tributary running from the southeastern boundary to the northwest.

The site area overlies prolific oil and gas geologic formations of the Pennsylvanian and Permian age. Other common features of the Southern High Plains are un-drained depressions called "buffalo wallows" which are believed to have formed by leaching of the caliche cap and the calcareous cement of the underlying sandstone and subsequent removal of the loosened material by wind.

There are no mountain ranges in the site vicinity. Several “produced water" lagoons are located on the property. "Produced water" is water that has been injected into oil wells to facilitate the extraction of oil. As oil wells mature, the ratio of water to oil in each well increases. This is because of the formation of “waters out” due to the water injection process. Water becomes a significant by-product of oil and gas production. There are two Playa lakes on the site, but no significant bodies of water such as rivers or lakes. There are no parks, wilderness areas or other recreational areas located within or immediately adjacent to the IIFP site. In addition, there are no architectural or aesthetic features that would attract tourists to the area.

1.6.2 Demographics

This section provides the current census results (calendar year [CY] 2000) for the area surrounding the IIFP New Mexico site, to include specific information about populations, public facilities, and industrial facilities. Land use and nearby bodies of water are also described.

1.6.2.1 Latest Census Results

According to the U. S. Census Bureau, the population of Andrews County was 13,004 in 2000 with a population density of 3.3 people per square kilometer (see IIFP ER). Its population experienced a similar

growth/decline pattern as that of Lea County. The population of Gaines County in 2000 was 14,467. Unlike in Andrews County, the population of Gaines County was relatively stable during the 1990's. The total population of the three principal counties in the region of influence was nearly 83,000 in 2000. The area did not experience the population increase that occurred in other areas of New Mexico and Texas.

1.6.2.2 Description, Distance, and Direction to Nearby Population Area

The proposed IIFP site is in Lea County, New Mexico. Figure 1-2 shows the city of Hobbs, New Mexico, the closest population center to the site, at a distance of about 14 miles. Other population centers are at distances from the site as follows:

- Eunice, Lea County, New Mexico: 34 km (21 mi) south
- Jal, Lea County, New Mexico: 69 km (43 mi) south
- Lovington, Lea County, New Mexico: 31 km (19 mi) north-northwest
- Seminole, Gaines County, Texas: 47 km (29 mi) east
- Denver City, Gaines County, Texas: 32 km (20 mi) north-northeast
- Andrews, Andrews County, Texas: 85 km (53 mi) southeast

Aside from these communities, the population density around the site region is extremely low. Other communities in Lea County include Buckeye, Caprock, Humble City, Knowles, McDonald, Maljamar, Monument, Oil Center, and Tatum.

Surrounding property consists of vacant land and the industrial New Mexico Power and Light Company on the west boundary (New Mexico Highway 483) of the IIFP proposed property line. Cattle grazing on nearby sites occur throughout the year. Land around the proposed site has been mostly developed by the oil and gas industry. The nearest residence is situated at the northeast of the site 8.5 km (5.3 mi) from the northern boundary. There are no known public recreational areas within 5 miles of the site.

1.6.2.3 Proximity to Public Facilities

Urban development is relatively sparse in the vicinity of the proposed IIFP site. The nearest city, Hobbs, New Mexico, is approximately 22.5 m (14 mi) to the east. Within Hobbs, New Mexico, several educational institutions are available for the education of personnel in the local community. There are three colleges including a community vocational junior college, a high school and an alternative high school, three junior high schools, and eleven elementary schools as well as two private schools.

As mentioned above, there are no state or federal parks are located within five (5) miles of the IIFP site.

1.6.2.4 Near-by Industrial Facilities

Land around the proposed site has been mostly developed by the oil and gas industry. The lone nearby industrial facility is the New Mexico Power and Light Company plant on the west boundary (New Mexico Highway 483) of the IIFP proposed property line.

1.6.2.5 Land Use within a Five Mile Radius

As mentioned above, the site is undeveloped and utilized for oil and gas wells. Several power lines and underground power lines run generally east to west and several gas pipelines run north and west as well as east to west.

Surrounding property consists of vacant land and the New Mexico Power and Light Company power plant on the west boundary of the IIFP proposed property line. Cattle grazing on nearby sites occur throughout the year. Land around the proposed site has been mostly developed by the oil and gas industry. The nearest residence is situated northeast of the site 8.5 km (5.3 mi) from the north boundary.

1.6.2.6 Land Use within One Mile of the Facility

As described above, very little land use occurs nearby the IIFP site. Land use within one mile of the facility is essentially the same as that within 5 miles of the facility.

1.6.2.7 Uses of Nearby Bodies of Water

Water resources at the site are minimal. There are two local playa lakes on the site with a small stream that runs from the southeast to the northwest across the property that is predominantly dry during the year. The site sits upon the Ogallala Aquifer where groundwater resources are at depths greater than approximately 36.58 m (120 ft). The site region has semi-arid climate, with low precipitation rates and minimal surface water occurrence. Thus, the potential for negative impacts on those water resources are very low due to lack of water presence and formidable natural barriers to any surface or subsurface water occurrences. Groundwater at the site would not likely be impacted by any potential releases.

1.6.3 Meteorology

The following sections address the site meteorologic conditions.

1.6.3.1 Primary Wind Directions and Average Wind Speeds

Spring is the windy season. Winds of 15 mph or more occur from February through May. Blowing dust and serious soil erosion of unprotected fields may be a problem during dry spells. Winds are generally stronger in the eastern plains than in other parts of the State. Winds generally predominate from the southeast in summer and from the west in winter, but local surface wind directions will vary greatly because of local topography and mountain and valley breezes. Average wind speed and direction from four regional locations are shown below in Figure 1-11, Wind Roses for Midland-Odessa, Roswell, Hobbs, and Eunice for 1993.

1.6.3.2 Annual Precipitation – Amounts and Forms

As described in the IIFP ER, the normal annual total rainfall as measured in Hobbs, New Mexico is 16 inches. Precipitation amounts range from an average 0.45 inch in January to 2.63 inches in September. Maximum and minimum monthly totals are 13.8 inches and zero. Table 1-5 presents a summary of precipitation in the Hobbs area for monthly and annual means from the Hobbs weather station with monitoring data from 1914 to 2006. Total snowfall is also shown in Table 1-5. The mean snowfall is 5.1 inches with a high of 27.1 inches at this monitoring location.

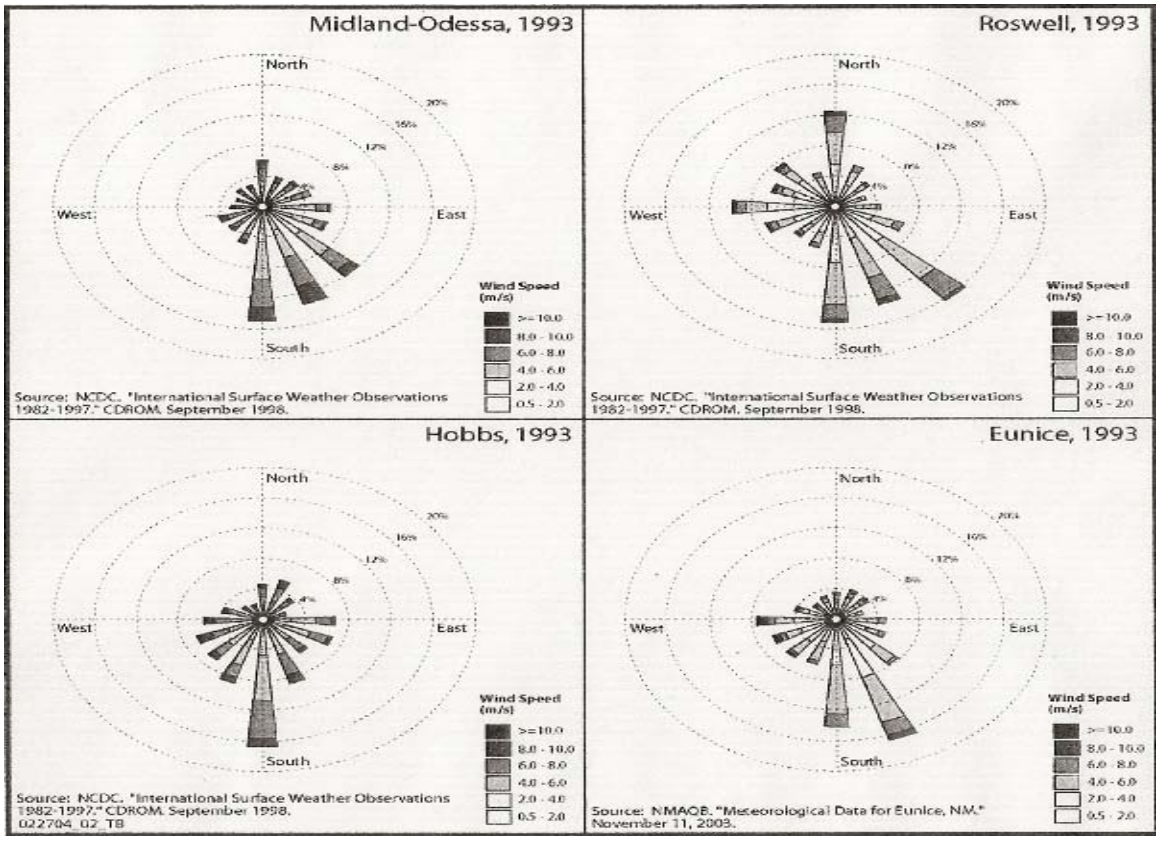


Figure 1-11 Wind Roses for Midland-Odessa, Roswell, Hobbs, and Eunice for 1993

.

Table 1-5 Summary of Monthly Precipitation at Hobbs, New Mexico, from 1914 to 2006

	Precipitation							Total Snowfall		
Month	**Mean**	**High**	**Month**	**Mean**	**High**	**Month**		**Mean**	**High**	**Month**
January	1.14 cm (0.45 in)	7.52 cm (2.96 in)	January	1.14 cm (0.45 in)	7.52 cm (2.96 in)	January	1.14 cm (0.45 in)	7.52 cm (2.96 in)	January	1.14 cm (0.45 in)
February	1.14 cm (0.45 in)	6.20 cm (2.44 in)	February	1.14 cm (0.45 in)	6.20 cm (2.44 in)	February	1.14 cm (0.45 in)	6.20 cm (2.44 in)	February	1.14 cm (0.45 in)
March	1.40 cm (0.55 in)	7.57 cm (2.98 in)	March	1.40 cm (0.55 in)	7.57 cm (2.98 in)	March	1.40 cm (0.55 in)	7.57 cm (2.98 in)	March	1.40 cm (0.55 in)
April	2.03 cm (0.80 in)	13.13 cm (5.17 in)	April	2.03 cm (0.80 in)	13.13 cm (5.17 in)	April	2.03 cm (0.80 in)	13.13 cm (5.17 in)	April	2.03 cm (0.80 in)
May	5.16 cm (2.03 in)	35.13 cm (13.83 in)	May	5.16 cm (2.03 in)	35.13 cm (13.83 in)	May	5.16 cm (2.03 in)	35.13 cm (13.83 in)	May	5.16 cm (2.03 in)
June	4.80 cm (1.87 in)	23.62 cm (9.30 in)	June	4.80 cm (1.87 in)	23.62 cm (9.30 in)	June	4.80 cm (1.87 in)	23.62 cm (9.30 in)	June	4.80 cm (1.87 in)
July	5.33 cm (2.10 in)	23.90 cm (9.41 in)	July	5.33 cm (2.10 in)	23.90 cm (9.41 in)	July	5.33 cm (2.10 in)	23.90 cm (9.41 in)	July	5.33 cm (2.10 in)
August	6.02 cm (2.37 in)	23.29 cm (9.17 in)	August	6.02 cm (2.37 in)	23.29 cm (9.17 in)	August	6.02 cm (2.37 in)	23.29 cm (9.17 in)	August	6.02 cm (2.37 in)
September	6.68 cm (2.60 in)	32.99 cm (12.99 in)	September	6.68 cm (2.60 in)	32.99 cm (12.99 in)	September	6.68 cm (2.60 in)	32.99 cm (12.99 in)	September	6.68 cm (2.60 in)
October	4.04cm (1.59 in)	20.70 cm (8.15 in)	October	4.04cm (1.59 in)	20.70 cm (8.15 in)	October	4.04cm (1.59 in)	20.70 cm (8.15 in)	October	4.04cm (1.59 in)
November	1.45 cm (0.57 in)	11.00 cm (4.33 in)	November	1.45 cm (0.57 in)	11.00 cm (4.33 in)	November	1.45 cm (0.57 in)	11.00 cm (4.33 in)	November	1.45 cm (0.57 in)
December	1.42 cm (0.56 in)	12.90 cm (5.08 in)	December	1.42 cm (0.56 in)	12.90 cm (5.08 in)	December	1.42 cm (0.56 in)	12.90 cm (5.08 in)	December	1.42 cm (0.56 in)
Annual	40.49 cm (15.94 in)	81.76 cm (32.19 in)	1941	13.41 cm (5.28 in)	1917	19.05 cm (7.50 in)	09/15/1995	12.95 cm (5.1 in)	68.83 cm (27.1 in)	1980

1.6.3.3 Severe Weather

Extreme Temperature

Table 1-6 below, Temperature Extremes at Hobbs, New Mexico, shows the highest and lowest recorded temperatures in the IIFP site area.

Table 1-6 Temperature Extremes at Hobbs, New Mexico

Station	Temperature Extremes [^{o}C (^{0}F)]			
	High	Date	Low	Date
Hobbs	45.6 (114)	June 27, 1998	21.7 (-7)	January 11, 1962
Hobbs FAA Airport	42.2 (108)	July 14, 1958	23.9 (-11)	February 1, 1951
Hobbs 13 W	41.7 (107)	June 25, 1998	16.1 (3)	December 8, 2005

Extreme Precipitation

Summer rains fall almost entirely during brief, but frequently intense thunderstorms. Frequent rain showers and thunderstorms from June through September account for over half the annual precipitation. The general southeasterly circulation from the Gulf of Mexico brings moisture from the storms into the State of New Mexico, and strong surface heating combined with orographic lifting as the air moves over higher terrain causes air currents and condensation. Orographic lifting occurs when air in intercepted by a mountain and is forcefully raised up over the mountain, cooling as it rises. If the air cools to its saturation point, the water vapor condenses and a cloud forms. August and September are the rainiest months with 30 to 40 percent of the year's total rainfall during those two months.

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.

Thunderstorms

Thunderstorms occur during every month but are most common in the spring and summer months. Thunderstorms occur on an average of 36.4 days/yr in Midland-Odessa. The seasonal average are: 11 days in the spring (March through May) and 17.4 days in the summer (June through August); 6.7 days in the fall (September through November); and 1.3 days in winter (December through February). Occasionally, thunderstorms are accompanied by hail.

Lightning

Only two lightning events having sufficient intensity to cause loss of life, injury, significant property damage, and/or disruption to commerce were reported in Lea County, New Mexico, between January 1,

1950 and April 30, 2004 (see IIFP ER). The closest lightning event occurred in Hobbs with minor property damage of $3,000 on August 12, 1997. The second occurred in Lovington on August 8, 1996, causing two deaths.

Tornados

Tornadoes are occasionally reported in New Mexico, most frequently during afternoon and early evening hours from May through August. There is an average of nine tornados a year in New Mexico. Tornadoes occur infrequently in the vicinity of IIFP. Only two tornadoes were reported in Lea County from 1880 to 1989. Only one tornado was reported in Andrews County, Texas in the same period.

Tropical Storms and Hurricanes

Hurricanes are low pressure weather systems that develop over the tropical oceans and as they move inward they lose their intensity quickly once they make landfall. The IIFP site is approximately 500 mile from the nearest coast, it is likely that any hurricane that moved in that direction would have downgraded to a tropical depression before it reached IIFP.

Floods

The IIFP site does not fall within 100-year or 500-year floodplains (see IIFP ER). The site is located in a semi-arid location with limited bodies of water.

Hydrology

This section describes the IIFP site's surface water and groundwater resources. Data are provided for the IIFP site and its general area, and the regional associations of those natural water systems are described. This information provides the basis for evaluation of any potential facility impacts on surface water, groundwater, aquifers, water use, and water quality. Subsections address surface hydrology, water quality, preexisting environmental conditions, water rights and resources, water use, contamination sources, and groundwater characteristics.

1.6.3.4 Characteristics of Nearby Rivers, Streams, and Other Bodies of Water

Surface drainage at the site is contained within two local playa lakes that have no external drainage. There is also a small stream that runs from the southeast to the northwest across the property that would be predominantly dry during the year. Essentially all the precipitation that occurs at the site is subject to infiltration and/or evapotranspiration. More information on the movement and fate of surface water and groundwater at the site is provided in ER Section 3.4. There are also several intermittent surface features in the vicinity of the IIFP site that may collect water for short periods of times following heavy rainfall events.

The climate in southeast New Mexico is semi-arid. Precipitation in the IIFP area averages only 33 to 38 cm/yr (13 to 15 in/yr). Evaporation and transpiration rates are high which results in minimal, if any, surface water occurrence or groundwater recharge.

Surface drainage at the site is contained within two local playa lakes that have no external drainage. Runoff does not drain to one of the state's major rivers. Surface water is lost through evaporation, resulting in high salinity conditions and the waters in soils associated with the playas. These conditions are not favorable for the development of viable aquatic or riparian habitats. There is no designated FEMA Zone "A" area that would be inundated during a 100-year flood event.

1.6.3.5 Depth to the Groundwater Table

The site sits upon the Ogallala Aquifer where groundwater resources are at depths greater than approximately 36.58 m (120 ft). The site region has semi-arid climate, with low precipitation rates and minimal surface water occurrence. Thus, the potential for negative impacts on those water resources are very low due to lack of water presence and formidable natural barriers to any surface or subsurface water occurrences. Groundwater at the site would not likely be impacted by any potential releases.

1.6.3.6 Groundwater Hydrology

The IIFP site is located west of the Llano Estacado caprock and east of the Pecos River in southeastern New Mexico. The Llano Estacado surface is underlain by the Ogallala Formation, which is composed of fluvial gravels exposed at the base with thicker eolian fine sand above. It is capped by the Caprock, a 3-m (9-ft) thick calcrete that is the resistant layer upon which the Llano Estacado if formed.

The surface geology is dominated by erosion that has exposed the upper weathered surface of the Caprock. Bioturbation of site sediments by rodents and insects may be severe. In some places, young deposits are present that include slope-wash sediments along the margins of playas and eolian sand deposits on the leeward (east) side of playas. Thin eolian deposits also occur along the northern edge of the southern lobe of the Llano, the sand derived from the Mescalero Plain. The draws across some areas of the Llano are old drainages filled with Holocene-age sediment.

Most precipitation is contained onsite due to infiltration and/or evapotranspiration. The vegetation on the site is primarily shrubs and native grasses. The surface soils are predominantly of an alluvial or eolian origin. The texture of the surface soils is generally silt to silty sands. Therefore, the surface soils are relatively low in permeability, and would tend to hold moisture in storage rather than allow rapid infiltration to depth. Water held in storage in the soil is subsequently subject to evapotranspiration. Evapotranspiration processes are significant enough to short-circuit any potential groundwater recharge.

1.6.3.7 Characteristics of the Uppermost Aquifer

The Hobbs site sits on the Ogallala Aquifer. The Ogallala Aquifer, also known as the High Plains Aquifer, is a huge underground reservoir created millions of years ago that supplies water to the region which includes the proposed IIFP site. The aquifer extends under the High Plains from west of the Mississippi River to the east of the Rocky Mountains. The aquifer system underlies 174 square miles in parts of eight States (Colorado, Kansas, Nebraska, New Mexico, Oklahoma, South Dakota, Texas, and Wyoming).

1.6.3.8 Design Basis Flood Events Used for Accident Analysis

The IIFP FEP/DUP site is located outside the 100-year (10^{-2}) flood-plain.; however, a flood of any magnitude was considered credible during the accident analysis performed in the ISA. The likelihood of any major flood at the plant site was low and the consequences were limited (due to no fissile material existing at the site). Thus, flood type accidents are not a significant risk for plant operations.

1.6.4 Geology and Seismology

This section describes the geology and seismology at the New Mexico, including soil characteristics, earthquake magnitudes and return periods, and other geologic hazards.

1.6.4.1 Characteristics of Soil Types and Bedrock

The IIFP site is located west of the Llano Estacado caprock and east of the Pecos River in southeastern New Mexico. The Llano Estacado surface is underlain by the Ogallala Formation, which is composed of fluvial gravels exposed at the base with thicker eolian fine sand above. It is capped by the Caprock, a 3-m (9-ft) thick calcrete that is the resistant layer upon which the Llano Estacado if formed.

The Pecos Plains section is characterized by its more irregular erosion topographic expression. The boundary between the two sections is locally referred to as Mescalero Ridge. In southern Lea County, Mescalero Ridge is an irregular erosion topographic feature with a relief of about 9.1 to 15.2 m (30 to 50 ft) compared with a nearly vertical cliff and relief of approximately 45.7 m (150 ft) in Northwestern Lea County. The lower relief of the ridge in the southeastern part of the county is due to partial cover by wind-deposited sand. The dominant geologic feature of this region is the Permian Basin. The Permian Basin is a massive subsurface bedrock structure that has a downward flexure of a large thickness of originally flat-lying, bedded, sedimentary rock. The Permian Basin extends to 4,880 m (16,000 ft) below msl. The proposed IIFP site is located within the Central Basin Platform area. The Central Basin Platform divides the Permian Basin into the Midland and Delaware sub-basins. The top of the Permian deposits are approximately 434 m (1425 ft) below ground surface at the proposed IIFP site. Overlying the Permian are the sedimentary rocks of the Triassic Age Dockum Group.

The upper formation of the Dockum Group is the Chinle Formation, a tight claystone and silty clay layer. The Chinle Formation is regionally extensive with outcrops as far away as the Grand Canyon region in Arizona. In the vicinity of the site, the Chinle Formation consists of red, purple, and greenish micaceous claystone and siltstone with interbedded fine-grained sandstone. The Chinle (also known as Red Bed) Formation is overlain by Tertiary Ogallala, Gatuna, or Antlers Formations (alluvial deposits). Caliche is a partly indurate zone of calcium carbonate deposits accumulation formed in the upper layer of surficial deposits. Soft caliche is interbedded with the alluvial deposits near the surface.

1.6.4.2 Earthquake Magnitudes and Return Periods

The Hobbs site is in a seismically quiet region, with earthquakes being of relatively small (< 2.0 Md) magnitude. No Quaternary faults or folds, thought to be associated with most earthquakes of moment magnitude 6 or greater over the last 1.6 million years, exist in the southeast New Mexico/west Texas region (Yarger, 2009).

The majority of earthquakes in the United States are located in the tectonically active western portion of the country. However, areas within New Mexico and the southwestern United States also experience earthquakes, although at a lower rate and at lower intensities. Earthquakes in the region around the IIFP site include isolated and small clusters of low to moderate size events toward the Rio Grande Valley of New Mexico and in Texas, southeast of the IIFP site.

Table 1-7 below summarizes IIFP site peak horizontal ground acceleration (pga) for various recurrence intervals of potential interest (1,000, and 2,500 years). As noted below, *T* is the earthquake return period, *P* is the annual probability of exceedance, *EP* is the probability of exceedance in *n* years when *n* is taken to be 50 years. The pga values of 0.05g and 0.12g for 1,000 year recurrence interval earthquakes, respectively are determined from the United States Geological Survey (ESGS) seismic hazard tables for the site latitude and longitude (USGS 2002). The pga of 0.03 for the 500 year recurrence interval earthquake was determined by Weber (Weber, 2008).

Probabilistic ground motion for the sites is also shown in Table 1-7. Seismic activity is well documented as the result of the NEF LA and the extensive network of seismometers established for the Waste Isolation Pilot Plant (WIPP) facility. The Peak Horizontal Ground Acceleration for a 1,000 and 2,500 year return is 0.03g and 0.12g respectively (USGS, 2002).

Table 1-7 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)]

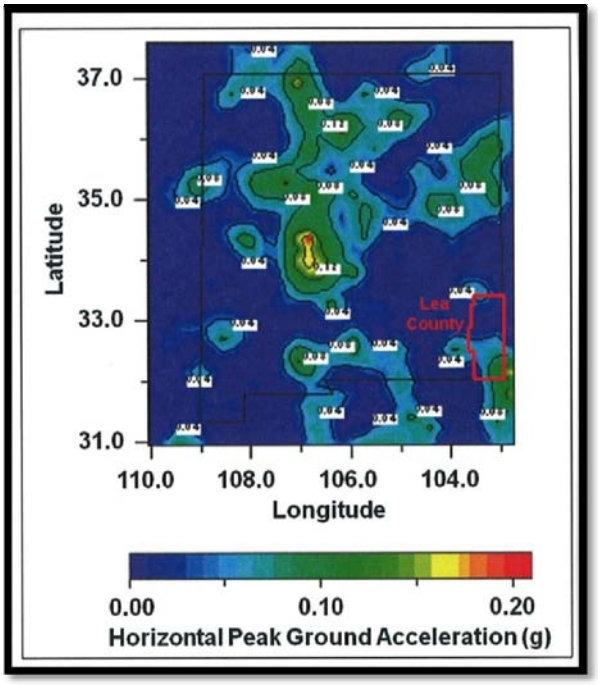
[(1)] Weber, 2008
[(2)] USGS, 2002

Seismic activity in southeastern New Mexico is typically of small magnitude and generally caused by oil field injection activities. However, one of the most recent major earthquakes (moment magnitude of > 4.5 on the Modified Mercalli-Revised 1931 scale) in New Mexico occurred south of Eunice in January 1992. The earthquake was 5.0 on the Modified Mercalli (Md) scale with its epicenter at 32.3 degrees North and 103.2 degrees West (Yarger, 2009).

The New Mexico Institute of Mining and Technology has generated probabilistic seismic hazard estimates for different magnitude of earthquakes. Figure 1-12 and Figure 1-13 show horizontal peak ground acceleration (g) for an earthquake Md of 6 in New Mexico (10% probability of exceedance in a 50-year period). For a horizontal ground acceleration of 0.2 g, the risk of structural damage is minimal for a modern well-designed building, but non-structural risk damage can be significant (Yarger, 2009).

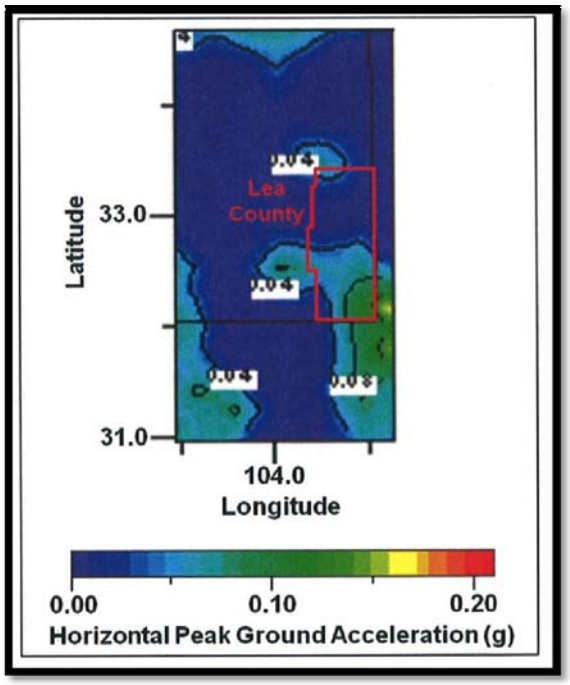
1.6.4.3 Other Geologic Hazards

No other known geological hazard exists at the IIFP New Mexico site During the New Mexico State permitting process IIFP will work with the State to ensure abandoned oil and gas wells, if any, are closed in accordance with the State of New Mexico requirements and regulations for abandoned wells.



Source: Yarger 2009. Adapted from Lin et.al. 1998

Figure 1-12 New Mexico Seismic Hazard for a Moment Magnitude (Md) 6 Earthquake



Source: Yarger, 2009. Adapted from Lin et.al, 1998

Figure 1-13 Detailed Map Showing Lea County Seismic Hazard for a Moment Magnitude (Md) 6 Earthquake

1.7 References

ANSI, 2001. American National Standards Institute Inc., "Uranium Hexafluoride—Packaging for Transport," ANSI N14.1-2001, February 1, 2001.

CFR, 2008a. Title 10, Code of Federal Regulations, Part 40, *Domestic Licensing of Source Material*, U.S. Nuclear Regulatory Commission, 2008.

CFR, 2008b. Title 10, Code of Federal Regulations, Part 40.36, *Financial Assurance and Recordkeeping for Decommissioning*, U.S. Nuclear Regulatory Commission, 2008.

CFR, 2008c. Title 10, Code of Federal Regulations, Part 40.4, *Definitions*, U.S. Nuclear Regulatory Commission, 2008.

CFR, 2008d. Title 10 Code of Federal Regulations, Part 70, *Domestic Licensing of Special Nuclear Material*, U.S. Nuclear Regulatory Commission, 2008.

CFR, 2009a. Title 40, Code of Federal Regulations, Part 61, *National Emission Standards for Hazardous Air Pollutants*, 2009.

CFR, 2009b. Title 29, Code of Federal Regulations, Part 1910, Subpart Z, *Toxic and Hazardous Substances,* 2009.

IIFP, 2009a. International Isotopes Fluorine Products, Inc, *IIFP FEP/DUP Environmental Report*, Revision 0, December, 2009.

IIFP, 2009b. International Isotopes Fluorine Products, Inc, *Integrated Safety Analysis (ISA) Summary for the FEP/DUP Facility*, December 2009.

NFPA, 2007a. National Fire Protection Association, "NFPA 13, "Installation of Sprinkler Systems" Quincy, MA, 2007,or latest edition.

USNRC, 2002. *NUREG-1520, Standard Review Plan for the Review of a License Application for a Fuel Cycle Facility*, U.S. Nuclear Regulatory Commission, March 2002.

USGS, 2002. U.S. Geological Survey, *National Seismic Hazard Mapping Project,* U.S. Department of the Interior, Washington, D.C., 2002.

Weber, 2008. Neil Weber & Associates, Regional Seismological Evaluation, Hobbs, New Mexico, December 17, 2008.

Yarger, 2009. F. Yarger, *Seismic Probability in Lea County, NM: A Brief Analysis*, New Mexico Institute of Mining and Technology, New Mexico Center for Energy Policy, Socorro, NM, 2009.

2 Organization and Administration

This chapter of the IIFP, Inc; FEP/DUP LA presents the organizations that are responsible for managing the design, construction, operation, and decommissioning of the facility. IIFP is a wholly owned subsidiary of International Isotopes (INIS), Inc. Key management and supervisory positions and functions are described, including personnel qualifications for each key position. This chapter also describes the management system and administrative procedures for effective implementation of Environmental, Safety, and Health, (ESH) functions at the IIFP New Mexico facility (plant).

Once the facility (plant) construction is completed, the IIFP Chief Operations Officer/Plant Manager (COO/PM) has overall responsibility for operation, safety and regulatory compliance of the New Mexico plant site. The IIFP policy is to ensure and maintain a safe work place for its employees, to protect the public relative to the operation of its plant, and to assure operational compliance with the terms and conditions of the NRC license and applicable federal, state and local regulations. The COO/PM reports directly to the President and Chief Executive Officer (CEO) of International Isotopes, Inc. (INIS). The President/ CEO reports to the Board of Directors of INIS, and ensures corporate policies are established, and that policy direction is communicated.

IIFP employs the principle of keeping radiation exposures to employees and the general public as low as reasonably achievable (ALARA). Additionally, the IIFP organization is structured to maintain appropriate independency between the safety and quality organizations and the operations organization to ensure that production does not take priority over safety.

INIS/IIFP is using ISO 9001 in their existing Quality Management System (QMS) and is planning to have the corporate office and Idaho production facility achieve ISO 9001 certification by mid-year 2010. Corporate quality processes and implementing procedures for the IIFP de-conversion facility will be incorporated into the IIFP Quality Assurance Program (QAP). IIFP is also incorporating a graded approach into the QAP that will ensure compliance with necessary regulatory requirements. A description of the QAP and graded approach is provided in the LA Appendix A, Quality Assurance Description.

The IIFP QAP and corporate QMS comprise the requirements and management system to ensure that IIFP operations, products and services are safe and reliable, and that those products and IIFP services meet or exceed customers' requirements. The IIFP QAP graded levels are applied based on an item’s importance to safety. This approach provides the level of rigor necessary to satisfy the requirements of assuring safety and reliability of items-relied-on-for-safety (IROFS) that have been identified the IIFP LA Integrated Safety Analysis (ISA) Summary.

The IIFP QAP is applicable for the detailed design, construction, operations and de-commissioning of the FEP/DUP Facility.

2.1 Organizational Structure

The following sections will address the organizational structure for the FEP/DUP Plant including corporate ownership, structure during design and construction and operations.

2.1.1 Corporate Background

International Isotopes, Inc. was formed as a Texas corporation in 1995. Its wholly owned subsidiaries are International Isotopes Idaho Inc.; International Isotopes Fluorine Products Inc.; and International Isotopes Transportation Services Inc., all of which are Idaho corporations. Company headquarters and all operations are currently located within two facilities in Idaho Falls, Idaho.

The Company currently operates under three separate US Nuclear Regulatory Commission possession and use licenses, maintains a specific license to import and export Category 1 and Category 2 quantities of radioactive material, maintains an NRC Approved QAP for the shipment of Type B quantities of radioactive materials, maintains two US Department of Transportation Special Form Certificates, and several Sealed Source and Device Registry Safety Evaluations.

2.1.2 IIFP Design and Construction Organizational Structure

As the owner and operator of the plant, IIFP management is responsible for the design, engineering, construction, startup, operation, maintenance, modification, testing and final facility decommissioning.

In the early stages of the project concept, INIS hired a contractor to help develop the IIFP FEP/DUP Project. The contractor has experience in uranium and fluorine technologies and related commercial operations including the environmental, safety and health (ESH) aspects. The contractor's scope of work included developing and managing early project activities and preparing a conceptual design of the plant. The contractor was also hired to prepare the NRC LA and the ER for INIS/IIFP approval and submittal.

The facility site evaluation and selection was conducted by INIS and its experienced contractors. The selected site at Hobbs, New Mexico is described in the IIFP LA, Chapter 1.

A design and build (DB) contractor is being contracted to perform detailed design and construction of the facility.

As the project moves from its development and licensing phase, IIFP will hire a Chief Operations Officer who will take responsibility as the Chief Operations Officer/Commercial Facility Project Director (COO/CFPD) during the DB phase of the Project. Plans are to have the COO/CFPD transition into the COO/Plant Manager role upon startup of the FEP/DUP Facility operations. Figure 2-1 presents the Project organization and lines of communications during the DB phase.

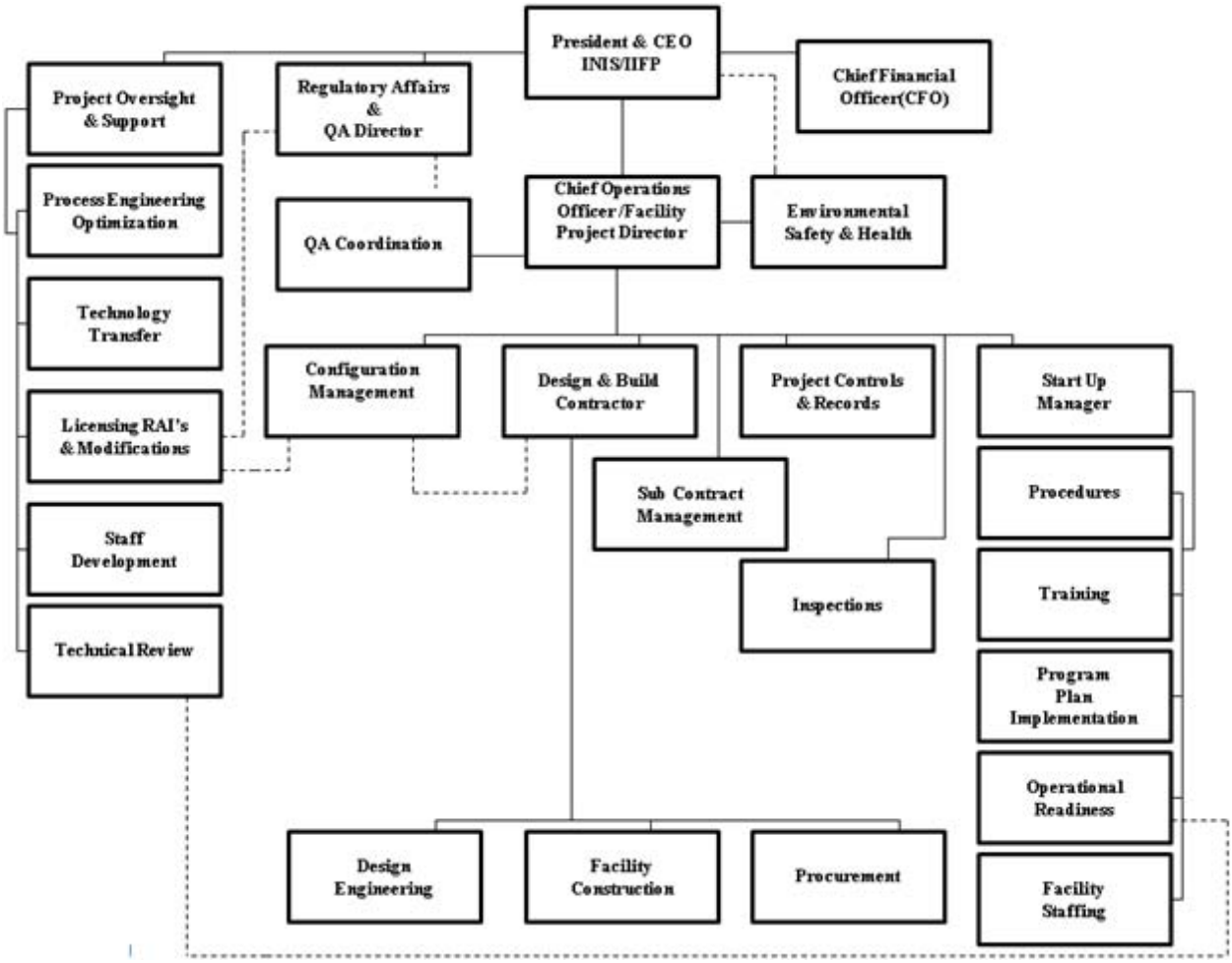


Figure 2-1 IIFP Project Design and Construction Organization

As shown in Figure 2-1, the COO/CFPD is responsible for managing the design, engineering, construction, initial startup, and procurement activities. The IIFP QA Coordinator and ESH Manager report to and support the COO/CFPD. The QA Coordinator also has a matrix reporting relationship to the corporate Regulatory Affairs/QA Director. During the DB phase, the ESH Manager has a matrix reporting relationship to the President/ CEO. These dual reporting relationships for the QA and ESH functions facilitate objective audit, review, advisory and control activities.

During the DB phase, the engineering and construction and related documentation are completed utilizing qualified contractors. The IIFP QA function reviews the DB contractor qualified QA programs in accordance with the IIFP QA (QAP). Approval of vendor, DB contractor and sub-contractor QAPs, where required by the IIFP QA Program Plan (QAPP) (IIFP, 2009a), shall be obtained prior to commencing with the DB and procurement work activities.

Procurement for the commercial plant project is generally performed by the DB contractor, but in some cases may be performed by IIFP or its contractors. The IIFP QA function ensures that evaluation and pre-

approval of vendor qualification is performed where the procurement involves IROFS as identified in the IIFP ISA Summary. This review and pre-approval is to ensure the vendor quality assurance programs are in accordance with the requirements of the IIFP QAP. Likewise, the INIS QA function ensures reviews of vendor performance in accordance with the IIFP QAP, where the procurement involves QA Levels 1 and 2 systems, structures and components as defined by the IIFP QAP documentation.

Configuration management (CM) and design modification safety reviews are discussed in Section 2.31.

Position descriptions of key management personnel in the design and construction organization will be accessible to affected personnel and the NRC.

2.1.3 Transition from Design and Construction to Plant Operations

When the end of construction approaches, the focus of the organization will shift from design and construction to initial startup and operation. Prior to completing construction, IIFP will staff the facility operating organization to ensure readiness of the facility for safely starting and effectively transitioning from construction activities to operation activities. The persons that will take the responsibilities of Plant Engineering and Maintenance Manager and the Operation and Technical Manager are hired well in advance of the scheduled start up of operations, and may serve in DB organizational roles, such as the Startup Manager, until the transition from DB to facility operation.

During this transition, the IIFP plant ESH Manager continues to report to the COO/CFPD for ESH matters related to design and construction. As the COO/CFPD role changes to the COO/PM, the ESH Manager transitions to directly reporting to the IIFP COO/PM on ESH matters for the startup operations. The ESH Manager who has been reporting in a matrix role to the President/CEO now changes to reporting in the matrix role to the Regulatory Affairs/Quality Director (RAQD). The IIFP QA Coordinator likewise reports to the COO/CFPD during the design and construction stage, then transitions to reporting to the IIFP COO/PM. During the design and construction and the transition periods, both the ESH Manager and QA Coordinator have the responsibility and authority to elevate and report any ESH or QA unresolved concern to the corporate Regulatory Affairs/QA Director or directly to the INIS/IIFP President/CEO.

This reporting relationship for the plant ESH and QA managers is intentionally structured to provide significant continued focus on the ESH goals and stop-work authority during design, construction and transition periods when the operating organization is not yet fully implemented.

When construction of the plant and process systems is complete, the systems undergo acceptance testing as in accordance with the QAP and approved written procedures. Following successful completion of acceptance testing, systems are transferred from the DB organization to the operating organization by means of a transition plan. The COO/CFPD and the Startup Manager ensure the development of a transition plan and an orderly, safe and thorough turnover to the IIFP COO/PM, Plant Engineering/Maintenance Manager and Operation/Technical Manager functions. The turnover includes the physical systems, corresponding design information, records of the facility and as-built drawings. Following turnover, the plant organization is responsible for system maintenance, CM and facility safety reviews of modifications affecting the as-built plant.

The design basis for the facility is maintained during the transition from construction to operations through the CM Program described in LA Chapter 11; Management Measures.

2.1.4 IIFP Operations Organizational Structure

The IIFP plant operations organizational structure and lines of communication are shown in Figure 2-2. IIFP has responsibility for pre-operational testing, startup, operation, and maintenance of the FEP/DUP commercial plant.

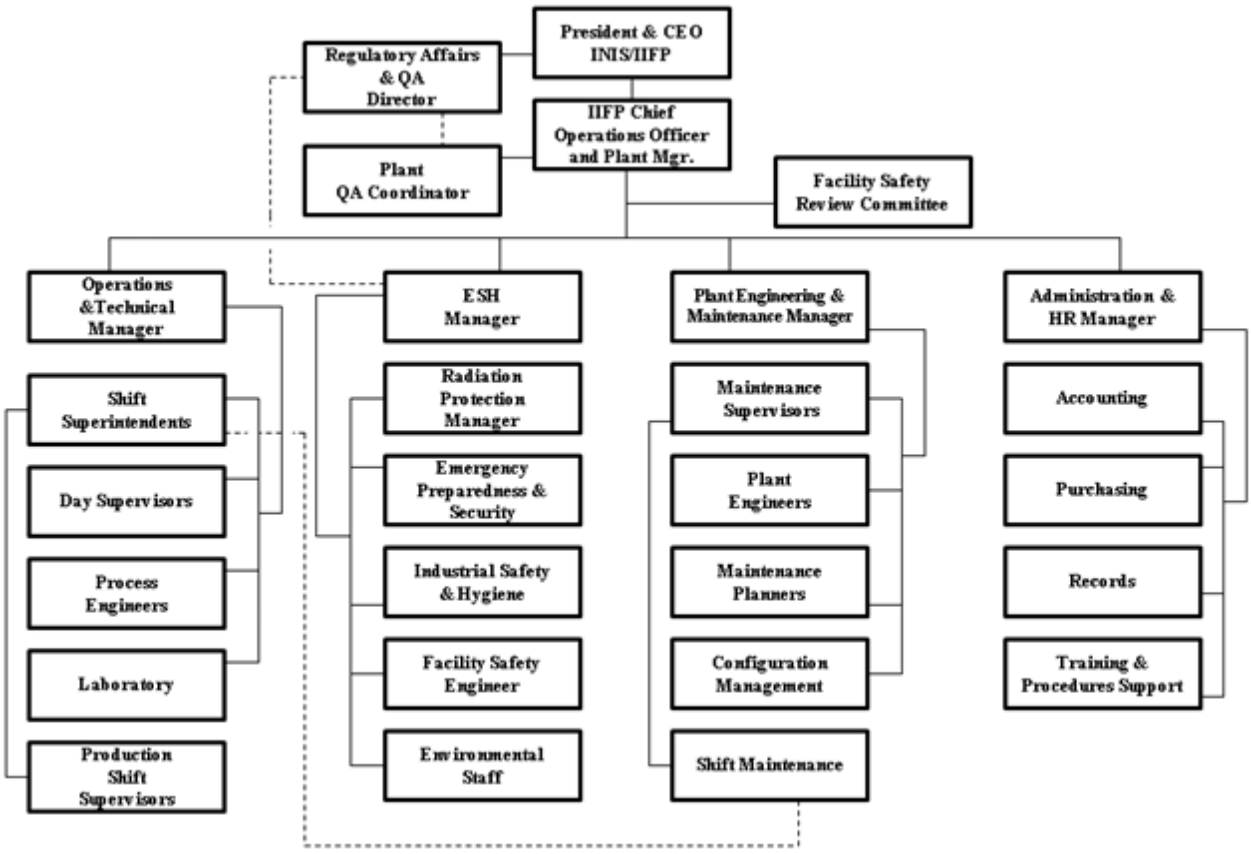


Figure 2-2 Plant Operation Organization

The Chief Operations Officer/Plant Manager (COO/PM) reports to the INIS President/ CEO and is responsible for the overall operation, maintenance, administration and regulatory compliance of the IIFP FEP/DUP commercial facility. In the discharge of these responsibilities, the COO/PM leads the activities of the plant, including the following:

- Quality Assurance,
- Operations/Technical,
- Plant Engineering/Maintenance,
- Administration/Human Resources,
- ESH, and the
- Facility Safety Review Committee (FSRC)/ALARA Committee

The responsibilities, authorities, and lines of communication of key management positions within the plant organization are discussed in Section 2.2, Key Management Positions, Responsibilities, and Qualifications.

In the plant line-organization, related to routine operations of the facility, the IIFP plant ESH Manager and the plant QA Coordinator both report to the COO/PM. In a matrix role, the ESH Manager and the QA Coordinator report to the corporate RAQD. As part of the matrix role, those managers interact with other ESH and QA activities and functions in the corporate structure and receive ESH and QA policy and technical standards guidance from the corporate RAQD.

Additionally, the plant ESH and QA managers have the authority and responsibility to directly contact the INIS President/CEO with any ESH or QA concerns, respectively. These reporting relationships are part of the independence assurance provided by IIFP that concerns or issues in ESH or quality can be directly reported and resolved in alignment with the corporate ESH and QA commitment.

Position descriptions for key management personnel in the operating organization will be accessible to affected personnel and to the NRC.

2.2 Key Management Positions, Responsibilities, and Qualifications

This section describes the key functional positions responsible for managing the safe design and construction and the safe operation of the IIFP FEP/DUP Facility. The responsibilities, authorities, and lines of communication for each key management position are provided in this section

Responsibilities, authorities, and inter-relationships of the IIFP operating organizational groups, who have responsibilities important to safety, are specified in approved written position descriptions.

2.2.1 INIS/IIFP President and Chief Executive Officer

The INIS President and Chief Executive Officer (CEO) reports to, and receives policy direction from, the INIS Board of Directors. The President/CEO is responsible for establishing policies and providing overall direction and management of IIFP activities. The President/CEO also ensures that policies for the ESH and QA Programs are maintained and transmitted to all levels of management and implemented appropriately through approved written procedures. The President/CEO of INIS/IIFP shall have the proven ability in management of a commercial chemical, radiological, or nuclear related facility, overall leadership qualities and the commitment to safety, quality and regulatory compliance.

2.2.2 INIS/IIFP Chief Financial Officer

The Chief Financial Officer (CFO) is appointed by the Board of Directors and directly reports to the INIS/IIFP President/CEO. The CFO oversees all Company accounting practices including financial reporting per regulatory and legal requirements, The CFO ensures that adequate insurance coverage and requirement obligations are met and that financial assurance funds meet required decommissioning regulations. The CFO will have a minimum of 8 to 10 years of experience in a senior role, with two of those years as a Chief Financial Officer, and a bachelor degree in business administration or accounting.

2.2.3 INIS/IIFP Regulatory Affairs and Quality Assurance Director

The Regulatory Affairs and Quality Assurance Director (RAQD) is appointed by the INIS President/CEO and is responsible for ensuring development and communication of ESH and QA policies that will ensure safe operation and meet the licenses and permit requirements. The Director is responsible for establishing an IIFP system that will identify and evaluate potential or new regulatory requirements to determine applicability to the IIFP FEP/DUP Facility. The RAQD is also responsible for ensuring that effective audit, feedback, investigative and corrective action programs are in place both at the IIFP corporate and plant levels that will provide prompt response in preventing and correcting ESH related incidents. The RAQD provides advice, oversight and regulatory consultation in assisting the IIFP COO/PM, ESH Manager and the QA Coordinator in matters of regulatory compliance and ESH and QA programs objectives. The Regulatory Affairs and Quality Assurance Director shall have, as a minimum, a bachelor degree in an engineering or scientific field and five years of related experience in chemical, radiological or nuclear facilities.

2.2.4 Chief Operations Officer and Commercial Facility Project Director

The Chief Operations Officer who will be the Commercial Facility Project Director (COO/CFPD) during the DB project phase is selected by the INIS/IIFP President/CEO. In the role of COO/CFPD, he/she is responsible for managing the design, detailed engineering, construction, pre-startup, procurement, CM, quality assurance, ESH, subcontracting, project control and records. Modifications resulting from design and engineering changes are controlled through CM. The change management is coordinated with the ISA and licensing support group for technical review and analysis, documentation and/or licensing amendments, where required. Where modifications involve existing or new IROFS, the ISA documentation and any licensing amendment require the review and approval, at a minimum, of the QA Coordinator, ESH Manager and COO/CFPD. In addition, any licensing amendment requires the approval of the INIS/IIFP President/CEO, or designee, prior to submitting the amendment to the NRC.

The COO/CFPD shall have the authority to enforce the shutdown of any construction or pre-start activity. The COO/CFPD will also delegate facility shutdown authority to appropriate organizations and line managers. The COO/CFPD must approve restart of any activity that was shut down due to safety and/or regulatory concerns.

The COO/CFPD shall have, as a minimum, a bachelor degree and seven years of experience in chemical, radiological, or nuclear related operations. The experience shall include senior responsible assignments involving engineering and either project management or facility operations management. The COO/CFPD shall be cognizant of the IIFP licensing documentation and the overall ESH requirements of the facility design and construction.

2.2.5 Project Integrated Safety Analysis Lead

The Project ISA Lead (ISAL) is a professional staff contractor working under the Project Oversight and Support contract that is approved by the INIS/IIFP President/CEO. During the design and construction stages, the ISAL either performs or leads a professional staff in ISA and licensing documentation support. This technical support includes, but not limited to: 1) design modifications review and determination of IROFS, 2) design changes review and determinations related to IROFS, in accordance with the IIFP QA Plan, or 3) response to the NRC involving Requests for Additional Information (RAIs) during the IIFP

licensing review. The ISAL ensures that such reviews and analyses are documented, follow requirements of the IIFP QAP and CM Program, and are reported, reviewed and approved in accordance with IIFP procedures during the design and construction of the facility. Once IIFP staffs the Facility Safety Engineer (FSE) position(s) and the role transitions to the FSE, the ISA and related controls and the licensing amendment process become the responsibility of the Facility Safety Engineer(s) as IIFP employees**.** The responsibilities and qualifications for the FSE are described in Section 2.2.17. Contractor technical, ISA and licensing support may continue to provide support, if needed, and will follow the same ISAL qualifications as described below.

The ISAL shall have, as a minimum, a bachelor's degree in engineering or scientific field and a minimum of eight years of experience in a nuclear facility, of which at least five of those years shall be in application of ISA methodologies.

2.2.6 Project Environmental Assessment Lead

The Project Environmental Assessment Lead (EAL) is a professional staff contractor working under the Project Oversight and Support contract that is approved by the INIS/IIFP President/CEO. During the design and construction stages, the EAL ensures that environmental technical and licensing support, as requested by the COO/CFPD or IIFP Regulatory/QA Director, is provided for evaluation and assessment of design or engineering modifications or construction activities. The EAL also provides technical support for the federal, State and local environmental related permit application. A primary responsibility of the EAL during the design/construction stage of the project is to prepare responses and interact with the NRC for Requests for Additional Information relative to the licensing review of the IIFP ER. The above responsibilities transfer to the IIFP ESH Manager and designated environment staff as those positions are filled and the role transition is completed.

The EAL shall have, as a minimum, a bachelor's degree in engineering or scientific field and a minimum of five years in a chemical, radiological or nuclear facility, with at least 3 of those years in responsible environmental assignments. The EAL will have experience in interacting with regulatory agencies and a working knowledge of relevant regulatory requirements.

2.2.7 Design and Build Contractor

The Design and Build Contractor (DBC) is selected by the INIS/IIFP President/CEO, and approved by the INIS Board of Directors. The DBC, under a formal approved written contract with IIFP, is responsible for performing the detailed design, engineering, procurement and construction of the IIFP FEP/DUP plant. The DBC Contractor assigned manager is the lead-official representative of the design/build contract, and reports to the COO/CFPD. The DBC coordinates and works with the project CM, controls and records, subcontractors, inspections, and startup functions to ensure a safe design, construction, acceptance testing and turnover to the Operating Organization.

During the detailed design, construction and startup stage of the project, the DBC will also ensure, as part of the written contract, that design meets all the applicable federal, state and local codes and standards.

The approved DBC shall have, as a minimum, a demonstrated safe record of experience in design, engineering, procurement and construction of chemical, radiological or nuclear facilities at project complexity levels equivalent with that of the IIFP Project. The DBC shall also have the professional and

trade craft capabilities of either performing or subcontracting (with IIFP approval) for design, engineering, procurement, construction and support of acceptance testing for the plant process equipment, systems and facility infrastructure.

2.2.8 Startup Manager

The Startup Manager (SUM) is appointed by the COO/CFPD and approved by the INIS/IIFP President/CEO. Startup management responsibilities are performed by the project contractor during the early stages of the project; then transferred to the IIFP Startup Manager once the position is established and filled. The Startup Manager reports to the COO/CFPD. The SUM has responsibilities for developing safe and effective procedures, training, program plan implementation, staffing of the operating organization, and for ensuring operational readiness and acceptance testing plans, schedules and documentation.

The SUM shall have, as a minimum, a bachelor's degree in engineering, science or related field and four years of related operational supervision experience at a chemical, radiological or nuclear facility.

2.2.9 IIFP Chief Operations Officer/Plant Manager

The IIFP Chief Operations Officer/Plant Manager (COO/PM) is appointed by the INIS President/CEO, and is the individual with the overall responsibility for safety and operational activities at the New Mexico Facility. The COO/PM reports directly to the President/CEO. The responsibilities of the COO/PM are defined by IIFP policies, procedures, and instructions. The COO/PM is ultimately responsible for safety, control of operations, and protection of employees, the environment, emergency preparedness and response, and the public and any other accident consequences as related to the plant site and operations. The COO/PM also has responsibility for regulatory compliance with the facility NRC licenses and other federal, state and local permits or licenses.

The COO/PM ensures proper selection of staff for the key positions including positions of the Facility Safety and Review Committee and ALARA and approval of positions of the ALARA radiation protection committee. The COO/PM appropriately delegates specific responsibilities for implementing ESH and QA related programs to qualified line management and area managers.

The COO/PM shall be cognizant of the safety program as applied to the overall safety of the facility and shall have the authority to enforce the shutdown of any process or building. The COO/PM will also delegate facility shutdown authority to appropriate organizations and line managers. The COO/PM must approve restart of an operation that was shut down due to safety and/or regulatory concerns.

The COO/PM shall have, as a minimum, a bachelor degree and seven years of experience in chemical, radiological, or nuclear related operations. The experience shall include senior responsible assignments involving engineering or facility operations management. The COO/PM shall be cognizant of the IIFP licensing documentation and the overall ESH requirements of the IIFP Facility.

2.2.10 Environmental, Safety and Health Manager

The Environmental, Safety and Health (ESH) Manager at the facility is appointed by the COO/PM with concurrence of the INIS RAQD. The ESH manager reports to the IIFP COO/PM, but also has a reporting

and interacting relationship with the RAQD on matters of ESH policies, regulatory requirements, plant safety and environmental compliance. In addition, the ESH Manager has the authority and responsibility to elevate any ESH concerns to corporate management and the INIS President/CEO.

The IIFP ESH Manager has the responsibility to establish and oversee the Radiation Protection (RP), Licensing, ISA, Industrial Safety, Environmental Protection, Fire Protection, and Emergency Preparedness/Security programs to ensure compliance with applicable federal, state, and local regulations and laws. Those programs are designed to ensure the health and safety of employees and the public, as well as the protection of the environment. The ESH Manager has plant shutdown authority in matters relative to ESH, and ensures through the Shift Superintendent that such shutdowns are implemented in a safe and orderly manner. The ESH Manager, or designee, must approve the restart of any operation shutdown by reasons of ESH matters or by the ESH function.

The ESH Manager shall have, as a minimum, a bachelor degree in engineering, science or related field and five years of responsible assignments of ESH activities at chemical, radiological or nuclear facilities.

2.2.11 Quality Assurance Coordinator

The QA Coordinator at the facility is appointed by the COO/PM with concurrence of the INIS RAQD. The QA Coordinator reports to the COO/PM, but also has a reporting and interacting relationship with the RAQD, and other INIS QA corporate staff, on matters of QA policies, new QA requirements, and overall QA performance. The QA Coordinator is responsible for establishing and maintaining the IIFP QA Program. Line management and their staff are responsible for ensuring implementation of the QA Program and compliance with the Program. The QA Coordinator position is independent from operational and safety organizations. The Coordinator has responsibility and authority to elevate any ESH related concerns to corporate management including the INIS President/CEO

The IIFP QA Coordinator also ensures and oversees the implementation and maintenance of the plant performance assessment and action tracking program relative to ESH and QA.

The QA Coordinator shall have, as a minimum, a bachelor's degree in engineering, science or related field and five years of quality experience in the implementation of a QA Program at a chemical, radiological or nuclear facility.

2.2.12 Production/Technical Manager

The Production/Technical Manager is appointed by, and reports to the COO/PM, and has responsibility and commensurate authority for directing the process operation of the facility. In the absence of the COO/PM, the Production/Technical Manager, when designated, may assume the responsibilities and authorities of the IIFP COO/PM.

The Production/Technical Manager shall have, as a minimum, a bachelor's degree in engineering, science or related field and four years of related operational supervision experience at a chemical, radiological or nuclear facility. Educational requirement may be substituted with relevant military and/or civilian work experience

2.2.13 Plant Engineering/Maintenance Manager

The Plant Engineering/Maintenance Manager reports to the IIFP COO/PM and has responsibilities for providing engineering support for the IIFP plant and for maintaining the CM program.

The Plant Engineering/Maintenance Manager also has responsibility for ensuring the directing and scheduling of maintenance activities, including ensuring safe design and reliability of process and support equipment and providing maintenance support for equipment and systems. The Plant Engineering/Maintenance Manager is responsible for overseeing the development of design changes to the facility. Other responsibilities, typically include, but are not limited to, activities such as: 1) corrective and preventive maintenance of facility equipment, 2) design authority for engineering projects, overseeing development and implementation of design changes and maintenance of the approved design status, 3) preparation and implementation of maintenance procedures, and 4) coordinating and maintaining testing programs for the facility, to include testing of systems, structures, and components (SSCs) to ensure the SSCs are functioning as specified in design documents.

The Plant Engineering/Maintenance Manager shall have, as a minimum, a bachelor's degree in an engineering or scientific field and a minimum of five years experience in implementing and supervising an engineering/maintenance program in a chemical, radiological or nuclear facility. Educational requirement may be substituted with relevant military and/or civilian work experience.

2.2.14 Radiation Protection Manager

The Radiation Protection Manager (RPM) is administratively independent of Operations and reports directly to the IIFP ESH Manager. The RPM also has the responsibility and authority to report to the IIFP COO/PM any unresolved concerns related to ESH and radiation protection. The RPM is responsible for effectively implementing the IIFP Radiation Protection Program and for ensuring the facility is staffed with suitably trained radiation personnel. The RPM must approve restart of any operation that was shut down by the radiation protection (RP) function or as a result of radiation protection concerns. The RP staff, including technicians and support personnel, report to the RPM. Major responsibilities of the RPM and the RP staff include, but not limited to, the following:

- Establish and maintain the RP programs, procedures and training,
- Conduct radiation and contamination monitoring and control programs,
- Evaluate radiation exposures of employees, contractor personnel, and visitors and ensure the maintenance records and reporting of results,
- Establishing and maintaining the ALARA program, including being a key member of the ALARA committee,
- Evaluate the integrity and reliability of radiation detection instruments, and
- Provide support for Integrated Safety Analyses and configuration control.

Additional responsibilities of the RPM and RP staff are provided in the IIFP LA, Chapter 4; Radiation Protection.

The Radiation Protection Manager shall have as a minimum a bachelor’s degree in engineering or a scientific field and a minimum of five years responsible experience that includes assignments involving responsibility for RP and the application and direction of RP programs.

2.2.15 Shift Superintendents

Each operating shift at the IIFP is staffed with a Shift Superintendent, who is appointed by the Production/Technical Manager and approved by the IIFP COO/PM. The Shift Superintendent normally reports to the Production/Technical Manager, but during declared emergencies may act in the capacity of the IIFP COO/PM, as the Emergency Director, until relieved by the COO/PM, or designee. The role and responsibilities of the Shift Superintendent during declared emergencies are specifically stated in the IIFP FEP/DUP Emergency Plan, latest revision (IIFP, 2009b).

The Shift Superintendent is responsible for directing the day-to-day operations on the back-shift, weekend and holiday periods and for ensuring safe operations, and the identification and correction of any off-normal operating conditions. The Shift Superintendent has the authority to stop work and shut down operations in a safe and orderly manner in matters related to ESH or QA. Each Shift Superintendent directs assigned personnel from the production, technical, ESH, maintenance and support functions to provide a continuity of safe and compliant operations.

The Shift Superintendent shall have, as a minimum, a bachelor's degree in an engineering or scientific field, and a minimum of four years of responsible experience in supervising and implementing chemical, radiological or nuclear-related operations programs. Educational requirement may be substituted with relevant military and/or civilian work experience.

2.2.16 Area (Day) and Shift Supervisors

Production and maintenance functions of the IIFP plant have designated day and shift supervisors who are responsible for implementing safe and efficient operations at the plant site.

The Production Day Supervisors report directly to the Production/Technical Manager and have responsibilities in designated production and utility areas plant. Their duties include, but not limited to, the managing of DUF_6 cylinder handling, managing chemical inventories and material logistics, scheduling of production and personnel, and ensuring that usable and adequate supplies of safety, emergency, fire protection, and spill prevention/control equipment are maintained.

Production Day Supervisors shall have, as a minimum, a bachelor's degree in a technical field, and two years of experience in operations of a chemical or nuclear facility; or a high school diploma with five years of operations experience, two of which are in chemical or nuclear facility.

The Production Shift Supervisors report to the Shift Superintendent and have the responsibility of ensuring safe operation of production and support equipment. Each Production Shift Supervisor leads assigned personnel in carrying out reliable and safe plant operations on their assigned shift.

The Production Shift Supervisors shall have, as a minimum, a high school diploma and three years of experience in a chemical or nuclear facility.

The Maintenance Supervisors report to the Plant Engineering/Maintenance Manager and have responsibilities for corrective and preventive maintenance, measuring and test equipment calibrations, equipment fabrication and repairs in the shop and field and development and implementation of

maintenance procedures. The Maintenance Supervisors implement maintenance procedures for ensuring safe and reliable equipment, systems and components and for reviewing maintenance work requests to assist in determining if the work involves IROFS or modifications.

The Maintenance Shift Supervisor reports administratively to the designated Maintenance Supervisors for procedural and technical guidance, but is assigned to the Shift Superintendent for implementation of maintenance on their respective work shift. The Maintenance Shift Supervisor ensures that preventive and corrective maintenance is implemented in a safe and efficient manner in accordance with the work schedule and plan. The Maintenance Shift Supervisor is also the Emergency Response Team Leader (ERTL) on the back-shifts, weekends and holidays and carries out that responsibility as described in the IIFP FEP/DUP Emergency Plan, latest revision (IIFP, 2009b).

Maintenance Supervisors and Maintenance Shift Supervisors shall have, as a minimum, a high school diploma, and at least four years of lead maintenance experience in the field of mechanical, electrical, or instrument maintenance in a chemical, radiological or nuclear facility; or a bachelor's degree in engineering or scientific field with at least two years of practical maintenance experience in a chemical, radiological or nuclear facility.

Designated area and shift supervisors responsibilities typically include, but are not limited to, the following:

- Provide oversight and control to ensure safe and efficient operation and maintenance of plant activities,
- Ensure acceptable environmental effluence is maintained during normal operation,
- Ensure Items Relied On For Safety (IROFS) are available and perform as intended;
- Ensure IROFS are maintained in accordance with QA requirements,
- Ensure that plant work for IROFS is performed using written procedures,
- Oversee activities to ensure radiation doses are ALARA , and
- Provide and/or ensure adequate operator training.

2.2.17 Facility Safety Engineer

The Facility Safety Engineer(s) reports directly to the IIFP ESH Manager and has responsibility for performing technical safety analysis and regulatory evaluations for IROFS relative to modifications and change management.

The FSE also is responsible for determining and providing ISA results and recommendations to the FSRC and plant management. The FSE ensures adequate analysis, ISA summary revisions, and the reporting of such analysis and determinations.

The FSE ensures documentation and recordkeeping of safety analyses and determinations in accordance with the plant QA, CM and document control and records programs.

The FSE shall have as a minimum a bachelor's degree in engineering or a scientific field, and at least four years experience in a radiological or nuclear-related facility of which two of those years shall be in application of safety analysis methodologies.

2.2.18 Industrial Safety/Industrial Hygiene Lead

The Industrial Safety and Industrial Hygiene Lead is a professional staff person that reports to the IIFP ESH Manager, and has responsibility for developing and implementing the plant safety industrial safety, hazards communications and industrial hygiene programs and procedures. This lead professional also develops or provides safety training materials and assists in conducting training of employees in safety.

The Industrial Safety and Industrial Hygiene Lead shall have a bachelor's degree in engineering or occupational safety and health, and a minimum of three years of responsible experience in safety programs at a chemical, radiological or nuclear facility.

2.2.19 Emergency Preparedness/Security Lead

The Emergency Preparedness/Security Lead is a staff person reporting to the IIFP ESH Manager and has responsibilities for developing emergency planning and preparedness programs and procedures. This position also develops and maintains plant security procedures and oversees implementation of plant security. The Lead assesses the effectiveness of the security and facility emergency preparedness programs, designs and ensures the implementation of drills and exercises, and provides feedback to the ESH Manager and emergency response organization for corrections and improvements.

The Emergency Preparedness/Security Lead shall have a minimum of five years responsible experience in the development, implementation and leadership of emergency planning and preparedness programs and procedures. At least two of those years experience must be related to chemical, radiological or nuclear facilities. Additionally, the Emergency Preparedness/Security Lead shall have either one year of responsible industrial physical security experience or an appropriate security training certificate.

2.2.20 Fire Protection Lead

The Fire Protection Lead reports to the IIFP ESH Manager and has responsibilities for developing fire protection plans and procedures and for ensuring that day-to-day fire protection activities are implemented in accordance with the Fire Protection Plan and procedures. The Fire Protection Lead ensures that inspections, audits and surveys are performed on fire protection systems, equipment and controls in accordance with established frequencies and procedures.

The Fire Protection Lead shall be trained in the field of fire protection and have at least two years practical experience in fire protection activities at a chemical, radiological or nuclear facility.

2.2.21 Training/Procedures Support Lead

The IIFP plant Training/Procedures Support Lead (TPSL) reports to the Administration/Human Resource Manager and has responsibilities for leading the training program, developing and maintaining training requirements and procedures. This Lead ensures that training of employees and training documentation and recordkeeping are performed in accordance with procedures and established frequencies. The TPSL also supports line organizations in procedures management and control.

The TPSL shall have a minimum of three years appropriate responsible training experience in an industrial setting.

2.2.22 Environmental Lead

The Environmental Lead reports to the IIFP ESH Manager and has responsibilities in supporting the ESH Manager, including but not limited to: 1) developing of environmental programs and procedures, 2) leading monitoring and measuring activities, 3) developing and maintaining environmental related permits, 4) assisting in training of employees in environmental matters, 5) conducting audits and inspections, 6) preparing and providing environmental data and reports, and 7) interacting with federal, State and local representatives in ensuring compliance with permit requirements and conditions.

The Environmental Lead shall have a Bachelor's degree in engineering or scientific field and at least two years environmental related experience in a chemical, radiological or nuclear facility.

2.2.23 Configuration Management Lead

The CM Lead reports to the Plant Engineering/Maintenance Manager and has responsibility for maintaining the CM program and procedures. This Lead also ensures applicable CM evaluations and decisions are documented and entered into recordkeeping in accordance with plant procedures. The Lead ensures that audits are conducted on CM performance, evaluations, and decisions. Reports of those findings are reported to the FSRC, accordingly.

The CM Lead shall have at least four years of appropriate responsible experience of working with CM program implementation in a chemical, radiological or nuclear facility.

2.2.24 Records/Documents Lead

The Records/Documents Lead reports to the Administration/Human Resources Manager and has responsibilities for adequately controlling documents at the plant and ensuring document control procedures are maintained. This Lead ensures the auditing of document control and records and reporting of findings of the program effectiveness to the plant management.

The Records/Documents Lead shall have a minimum of three years of appropriate responsible experience in the supervision and implementation of a document control/records program.

2.2.25 Facility Safety Review Committee

The FSRC is appointed by the COO/PM. The FSRC reports to the COO/PM in providing technical and administrative review for ISA determinations and decisions that involve IROFS and proposed modifications to equipment, systems, structure or components. The FSRC provides for audits and review of operations that could affect safety or health of the worker, public safety or environmental impacts. The FSRC consists of the Chairperson, who is appointed by the COO/PM and, as a minimum, at least one member from the ESH, radiation protection, QA, operations (production), facility safety engineering, and plant engineering functional disciplines. The ALARA Committee supports the FSRC in matters related to

radiation protection. The ALARA Committee is discussed in LA Chapter 4.The scope of activities reviewed and audited by the FSRC shall include, but are not limited to, the following:

- Changes in facility, equipment, system, structure or component IROFS designs in accordance with the IIFP QA Plan and Program (IIFP, 2009a)
- Radiation protection
- Hazardous chemical safety
- Environmental protection
- Fire protection and safety
- Industrial safety
- ALARA policy implementation

Requirements and minimum frequencies for audits conducted by the FSRC are defined in the IIFP Quality Assurance Plan (IIFP, 2009a)

Members of the FSRC shall have, as a minimum, a bachelor's degree in engineering or scientific field and at least three years appropriate experience in their respective discipline in a chemical or nuclear facility.

2.3 Management Measures

Management measures discussed below are the formal methods applied to maintain IROFS at a needed level of reliability and availability. IIFP may also apply formal management measures to other important aspects of the facility operation. These methods ensure that protection and mitigation features are adequate to keep accidents within the bounds of acceptable risk. Management measures are applied, as a minimum, to all structures, systems and components associated with the performance of any IROFS (See the IIFP LA Chapter 11, Management Measures).

No management measure requirements or guidance is provided in 10 CFR Part 40 (CFR, 2009a), so the program elements defined in 10 CFR 70.4 (CFR, 2009a) were followed, which are discussed below. Management measures are discussed in more detail in Section 11 of the IIFP LA.

2.3.1 Configuration Management

Configuration management program elements are specified in 10 CFR 70.72 (CFR, 2009b). The IIFP is a 10 CFR 40 (CFR, 2009a) licensed facility, but owing to requirements for an ISA of the facility, and associated IROFS, a CM program is applicable. Such a program is implemented to ensure adequate change control for facility operations. Configuration management and control assures that any facility or process changes are evaluated appropriately and such changes are reflected in updated drawings, procedures, and other plant documents. Configuration management ensures that all but "like kind" replacement of equipment and minor non-process changes receives review and approval from the safety and licensing organizations. The impact of these changes (modifications) are evaluated and documented by the individual organizational groups. Corresponding safety and licensing documentation is updated in a timely manner following approval of the change.

2.3.2 Maintenance

The IIFP Maintenance Program shall be implemented prior to beginning the operations phase of the FEP/DUP Facility. Maintenance activities include general repair and upkeep of facilities and processes along with preventive maintenance and testing of IROFS and important process controls. These activities are coordinated through safety group reviews and approval via safety work orders, hot work permits, and radiation work permits (RWPs), as needed. Any maintenance activities on specific systems are evaluated for their impact on other, nearby systems.

2.3.3 Training and Qualifications

Qualifications and training requirements are established for each functional type of work. Qualifications will include minimum education, technical background, experience, etc., along with physical skills needed to perform individual tasks. Employees are provided formal classroom training and on-the-job training specific to their duties, as applicable. Workers shall read, understand, and follow formal area procedures when performing work. Additionally, workers shall understand and obey requirements in work orders, hot work permits, and radiation work procedures (RWPs) along with posted limits and controls. Job Task Analysis is used, as needed, to supplement training when tasks associated with IROFS are involved.

Along with job specific training mentioned above, all employees are given formal general employee training and safety training, as needed. General worker training includes site access information and an overview of site hazards, emergency alarms and evacuation plans. Safety training may include radiation worker training, hazards communication, and general health and safety training. Training and qualification related documentation is maintained as quality records. Continuing training and improvement is stressed for the entire workforce.

2.3.4 Procedures

Production work aside from routine custodial and office duties are governed by approved procedures, where applicable. Additionally, program requirements, including these management measures, are implemented via procedures, where applicable. Procedures are necessary to provide consistent and reliable performance of site wide activities. IROFS and other safety related items are highlighted in work procedures, typically as “cautions” and “warnings.”

Procedures are developed and approved by the responsible organizations. Employees are trained on all procedures they follow as part of their work assignments. Work procedures and supplemental safety related procedures are expected to be located in the general work areas. Temporary work shall be performed under temporary work orders or RWPs.

Facility and process changes require procedure updates in the form of revisions. Such revisions shall be in place before restart of the operation can commence. Changes to safety systems and safety basis documentation shall also be incorporated into respective procedures. Employees are retrained on the revised procedures before the restart of work.

2.3.5 Audits and Assessments

Audits and/or inspections are periodically performed on all operations at the plant site, both for production and nonproduction related activities, where applicable. Assessments are also routinely performed, but are generally focused on support programs such as environmental, health and safety programs. Audits/inspections focus on review of certain aspects of compliance whereas assessments look more generally at program and process performance. The frequency of audits/inspections and assessments vary based on the safety aspects of the activities performed. Inspections are expected to be routine and frequent. Most production areas walk down and inspect work areas daily. Safety organizations perform routine inspections over various process areas. The more formal audits are performed quarterly or annually, and generally focus on safety and regulatory compliance issues. Program or process assessments are performed on an as needed basis based on performance trends and identified needs. Records of audit, inspections and assessments are maintained as a quality record.

2.3.6 Incident Investigations

Incidents and accidents are formally investigated in accordance with the QAP and as described in the LA Chapter 11, Management Measures. Where applicable the investigations are performed by plant personnel with knowledge of the process systems involved, the safety areas affected, and formal incident/accident investigation methodologies. When an incident occurs, management forms a qualified team that determines root causes of the event and develops recommendations to reduce the likelihood of recurrence. Lessons learned are also developed so unaffected organizations can review their operations for similar type initiators.

Incidents/accidents are tracked and trended to identify weaknesses in types and areas of operation and to look for common causes of events. Corrective actions are assigned and tracked programmatically to ensure that timely and adequate corrections to deficiencies are incorporated. Any required plant changes as a result of corrective actions follow the management methods described above. Corrective actions are closed out in plant records when implementation is complete or adequate justification for not implementing the corrective action is properly documented.

2.3.7 Employee Concerns

All IIFP employees and contractor personnel working on-site have the responsibility and right to initiate a “stop work” process, relative to any safety or health concerns, in accordance with the project or plant procedures to ensure the workplace and associated work activities are safe.

Employees are trained to notify the designated-work-activity IIFP supervisor of a concern or questionable safety practice or condition. Contractors and sub-contractors receive orientation on the responsibility and reporting of personnel safety/health concerns. The IIFP supervisor who is notified evaluates the activity or condition and determines if the activity is in safe compliance with the procedure, or if the procedure requires a change to improve the safety of the work or condition. The IIFP supervisor has the authority to stop the work task and request technical assistance and advice from the ESH lead staff for resolving the safety concern before resuming the work activity. If the concerned person remains concerned with the proposed resolution, they have the right and responsibility to elevate the concern to the Shift Superintendent and/or the ESH Manager for further review and resolution.

If a "stop work" decision is made, the Shift Superintendent is notified to ensure the stoppage does not adversely affect the equipment, processes, systems or facility such as to cause unsafe conditions or potential chemical releases. Except in cases of immediate or life-safety emergencies, the Shift Superintendent is notified prior to the actual "stop-work" action.

Employees and contractors are also trained to be aware that other avenues of reporting and resolving safety concerns are available and that employees and other persons on-site have the right and responsibility to utilize those resources. Persons working on-site have access to the following methods for reporting, correcting or improving quality or safety related concerns and suggestions:

- Direct contact with any member of the ESH or QA organizations,
- Immediate notification of any line supervisor, Shift Superintendent or facility management,
- Submittal of a safety suggestion in accordance with the Industrial Safety Suggestion Program procedures,
- Notification to any member of the FSRC or ALARA committee,
- "Open door" with the ESH Manager, QA Coordinator or the COO/PM
- NRC requirements under 10 CFR 19, Notices, Instructions and Reports to Workers: Inspection and Investigations (CFR, 2009c)
- Unusual event or potential problem report form submitted to their immediate supervisor or the Shift Superintendent office per the IIFP Performance Assessment and Improvement procedure.

2.3.8 Records Management

Records associated with the above management measures program elements are retained as quality assurance records. The records are systematically stored and are easily retrievable for individuals, groups, programs and activities. All facility and process design elements and items relating to environmental protection and to the safety and health of workers and the public are maintained as a quality record. The Records Management organization is ultimately responsible for maintaining plant records, though some records retention will be delegated to specific organizations.

2.3.9 Written Agreements with Offsite Emergency Resources

The approach to address site emergencies and the use of offsite emergency resources are described in Section 8 of this LA and the IIFP FEP/DUP Emergency Plan (IIFP, 2009b), respectively.

2.4 References

CFR, 2009a. 10 CFR 40, *Domestic Licensing of Source Material*, U.S. Regulatory Commission, 2009.

CFR, 2009b. 10 CFR 70, *Domestic Licensing of Special Nuclear Material*, U.S. Nuclear Regulatory Commission, 2008.

CFR, 2009c. 10 CFR 19.12, *Instruction to Workers*, U.S. Nuclear Regulatory Commission, 2008.

IIFP, 2009a. International Isotopes Fluorine Products, Fluorine Extraction Process/Depleted Uranium De-conversion Plant Quality Assurance Program Description, 2009

IIFP, 2009b. International Isotopes Fluorine Products, Fluorine Extraction Process/ Depleted Uranium De-conversion Plant Emergency Plan, 2009.

3 Integrated Safety Analysis

The IIFP Depleted Uranium Hexafluoride De-conversion and Fluorine Extraction Processing facility will not be licensed to possess SNM and therefore will be licensed under Title 10 CFR Part 40, *Domestic Licensing of Source Material*. While the current regulations do not require applications submitted under Title 10 CFR Part 40 to include an ISA, NRC staff has been directed to use Title 10 CFR Part 70, Subpart H, performance requirements as part of the licensing basis for the application review of certain new source material facilities as an interim measure pending the completion of Title 10 CFR Part 40 rulemaking (CFR, 2007).

A meeting conducted on May 7, 2009 between the IIFP licensing team and the NRC did conclude that the ISA requirements will be imposed through orders and that these orders would require an ISA similar to that required by Title 10 CFR Part 70, Subpart H. This ISA has been developed and submitted in anticipation of orders and subsequent rulemaking requiring that an ISA for the IIFP facility meet requirements similar to those stipulated in Subpart H, "Additional Requirements for Certain Licensees Authorized to Possess a Critical Mass of Special Nuclear Material", of Title 10 CFR, Part 70, "Domestic Licensing of Special Nuclear Material" (CFR, 2000).

This chapter presents the IIFP ISA commitments and outlines the ISA methodology. The approach used for performing the ISA is based on NUREG-1520, *Standard Review Plan for the Review of a License Application for a Fuel Cycle Facility, Chapter 3, Appendix A, Example Procedure for Accident Sequence Evaluation* (NRC, 2002). This approach employs a semi-quantitative risk index method for categorizing accident sequences in terms of their likelihood of occurrence and their consequences of concern. The risk index method identifies which accident sequences have consequences that could potentially exceed the performance requirements of 10 CFR 70.61, *Performance Requirements* (CFR, 2009a). Items Relied on for Safety (IROFS) and supporting Management Measures are identified to reduce the unmitigated risk of these accidents to acceptable levels. Descriptions of these general types of high and intermediate consequence accident sequences are reported in the ISA Summary.

The ISA is a systematic analysis to identify facility and external hazards, credible initiating events, potential accident sequences, the likelihood and consequences of each accident sequence, and the IROFS implemented to prevent or mitigate each credible high and intermediate consequence accident. The ISA Team reviewed the hazard identified for the credible worst-case consequences. Credible high or intermediate consequence accident scenarios were assigned accident sequence identifiers and accident sequence descriptions, and a risk index determination was made. The risk index method is regarded as a screening method of proving the adequacy or inadequacy of the IROFS for any particular accident.

The primary scope of the ISA included fires, hazardous material releases, radioactive material releases, and explosions that could result in injuries to workers and/or the public, or significant environmental impacts during routine and non-routine (startup, shutdown, emergency shutdown, etc.) operations. The ISA Summary resulting from the ISA identifies which engineered or administrative IROFS must fail to allow the occurrence of consequences that exceed the levels identified in 10 CFR 70.61.

Consistent with the §70.4 definition of *Hazardous chemicals produced from licensed materials*, the safety controls associated with those activities that involve the processing, collection, storage and transfer of hazardous chemicals which have been separated from licensed material will be governed by Process Safety Management of Highly Hazardous Chemicals regulations, developed by OSHA (1996) and Risk

Management Programs for Chemical Accidental Release Prevention regulations, developed by EPA (1994) so long as a release of these chemicals would not adversely affect radiological safety.

For the purposes of this ISA and subsequent licensed operations, hazardous chemicals will be considered "separated from licensed materials" if the source material in any chemical mixture, compound or solution is less than one-twentieth of 1 percent (0.05 percent) of the total weight of the chemical mixture, compound or solution, consistent with the criteria specified in §40.13 *Unimportant quantities of source material*.

3.1 Safety Program and ISA Commitments

The three elements of the Safety Program defined in 10 CFR 70.62(a) (CFR, 2009b) are addressed in the following sections.

3.1.1 Process Safety Information

IIFP has compiled and maintains up-to-date documentation of process safety information. Written process-safety information is used in updating the ISA and in identifying and understanding the hazards associated with the processes. The compilation of written process-safety information includes information pertaining to:

1. The hazards of all materials used or produced in the process that includes information on chemical and physical properties such as those included on Material Safety Data Sheets (MSDSs) meeting the requirements of 29 CFR 1910.1200(g) (CFR, 2009h).

2. Technology of the process that includes block flow diagrams or simplified process flow diagrams, a brief outline of the process chemistry, the range of operating parameters (e.g., temperature, pressure, flow, and concentration), and evaluation of the health and safety consequences of potential process accidents.

3. Equipment used in the process including general information on topics such as the materials of construction, piping and instrumentation diagrams (P&IDs), ventilation requirements, design codes and standards employed, material and energy balances, IROFS (e.g., interlocks, detection, or suppression systems), electrical classification, and relief system design and design basis.

The process safety information described above is maintained up-to-date by the CM Program described in LA Chapter 11.

3.1.2 Integrated Safety Analysis

IIFP has conducted an ISA for each process that identifies radiological hazards, chemical hazards, potential accident sequences, consequences and likelihood of each accident sequence, and IROFS, including the assumptions and conditions under which they support compliance with the performance requirements of 10 CFR 70.61 (CFR, 2009a).

The entire facility was evaluated as part of a plant-wide process hazards analysis with respect to chemical and radiological hazards. However, once the licensed material (depleted uranium) was separated from the

fluoride compounds, further analysis under the ISA methodology was not performed. These purely chemical hazards are addressed under OSHA's PSM program that is administered under INIS's Industrial Safety program (see LA Chapter 6). Efforts are taken to isolate these systems from licensed material-bearing processes to ensure that process upsets from these streams have no effect on the control and safety of licensed materials activities. The same level of safety control and accountability will be maintained on non-licensed material systems, but the safety systems will not be maintained as IROFS from an NRC standpoint. These safety systems are defined as process "safeguards" and are maintained and controlled based on the chemical hazards and risks associated with each process. An appropriate level of quality assurance is provided based on the safety importance of each item.

A summary of the results of the ISA, including the information specified in 10 CFR 70.65(b) (CFR, 2009c), is provided in the ISA Summary (IIFP, 2009).

IIFP commits to implementing programs to maintain the ISA and supporting documentation so that it is accurate and up-to-date. Changes to the ISA Summary are submitted to the NRC in accordance with 10 CFR 70.72 (CFR, 2009d). The ISA update process accounts for design safety basis changes made relative to license materials or hazards potentially affecting licensed materials to the IIFP Facility or its processes. This update will also verify that the initiating event likelihoods and IROFS reliability values that are assumed in the ISA remain valid. Any changes to the ISA required as a result of the update process will be included in a revision to the ISA (and ISA Summary). Management policies, organizational responsibilities, revision time frame, and procedures to prepare and approve revisions to the ISA are described in LA Chapter 11. Evaluation of any facility changes or changes in the process safety information that may alter the parameters of an accident sequence is by the ISA methods. Personnel conducting revisions to the ISA will have qualifications consistent with those described in Regulatory Guide 1513, *Integrated Safety Analysis Guidance Document* (NRC 2001). The following specific commitments ensure that the ISA is maintained in accordance with NRC requirements:

1. Personnel used to update and maintain the ISA and ISA Summary shall be trained in the ISA methods and suitably qualified. Training and qualification of personnel used to update or maintain the ISA are included in the ISA Summary.

2. Proposed changes to the IIFP Facility or its operations shall be evaluated using the ISA methods. New or additional IROFS and appropriate Management Measures shall be designated as required. The adequacy of existing IROFS and associated Management Measures shall be promptly evaluated to determine if they are impacted by changes to the facility and/or its processes. If a proposed change results in a new type of accident sequence or increases the consequences or likelihood of a previously analyzed accident sequence within the context of 10 CFR 70.61 (CFR, 2009a), the adequacy of existing IROFS and associated Management Measures shall be evaluated and the necessary changes made.

3. Unacceptable performance deficiencies associated with IROFS that are identified through updates to the ISA shall be addressed by the IIFP QAP (IIFP, 2009a).

4. Written procedures shall be maintained on site. LA Chapter 11 discusses the document control system.

5. All IROFS shall be maintained so that they are available and reliable when needed.

3.1.3 Management Measures

Management Measures are utilized to maintain the IROFS so that they are available and reliable to perform their safety functions when needed. Management Measures ensure compliance with the performance requirements assumed in the ISA documentation. The Measures are applied to particular structures, systems, components (SSCs), equipment, and activities of personnel, and may be graded commensurate with the reduction of the risk attributable to that IROFS. Management Measures are described in LA Chapter 11.

3.2 Integrated Safety Analysis Summary and Documentation

The following sections provide detail on the contents of the ISA Summary and documentation.

3.2.1 Site Description

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 is contained in ISA Summary, Section 2 and a summary description is in LA Chapter 1.

3.2.2 Facility Description

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

3.2.3 Processes, Process Hazards and Accident Sequences

The ISA Summary (Section 3) provides a description of the IIFP Facility processes, the process hazards, and a general description of the accident sequences evaluated in the ISA.

3.2.4 Compliance with the Performance Requirements of 10 CFR 70.61

The ISA Summary provides information that demonstrates IIFP's compliance with the performance requirements of 10 CFR 70.61 (CFR, 2009a).

3.2.4.1 Accident Sequence Evaluation and IROFS Designation

The ISA Summary provides sufficient information to demonstrate that credible high consequence events are controlled to the extent needed to reduce the likelihood of occurrence to "Highly Unlikely" and *credible intermediate consequence events are controlled to the extent needed to reduce the likelihood of* occurrence to "Unlikely."

3.2.4.2 Description of IIFP Management Measures

The ISA Summary provides a description of the Management Measures to be applied to IROFS for each accident sequence for which the consequences could exceed the performance requirements of 10 CFR 70.61 (CFR, 2009a). Management Measures are further described in LA Chapter 11.

3.2.4.3 New Facilities or New Processes at Existing Facilities

Baseline design criteria (BDC) that must be used for new facilities are specified in 10 CFR 70.64, *Requirements for New Facilities or New Processes at Existing Facilities* (CFR, 2009e). The ISA accident sequences for the credible high and intermediate consequence events for the IIFP Facility includes accidents defined as design basis events (DBE), which includes seismic and other bounding credible events. The IROFS for these events ensure that the associated BDC are satisfied. The BDC in 10 CFR 70.64 are used as bases for the design of the IIFP Facility as described in the following paragraphs.

Quality Standards and Records

SSCs that are determined by the ISA to be IROFS are designed, fabricated, erected, and tested in accordance with the graded levels of the IIFP QAP. Appropriate records of the design, fabrication, erection, procurement, and testing of SSCs that are IROFS are maintained throughout the life of the IIFP Facility. Management Measures applicable to IROFS are discussed in LA Chapter 11.

Natural Phenomena Hazards

SSCs that are determined to be IROFS are designed to withstand the effects of, and be compatible with, the environmental conditions associated with the IIFP Facility operation, maintenance, shutdown, testing, and accidents for which the IROFS are required to function.

Fire Protection

SSCs that are IROFS are designed and located so that they can continue to perform their safety functions effectively under credible fire and explosion exposure conditions. Non-combustible and heat resistant materials are used wherever practical throughout the IIFP Facility, particularly in locations vital to the control of hazardous materials and to the maintenance of safety control functions. Fire detection, alarm, and suppression systems are designed and provided with sufficient capacity and capability to minimize the adverse effects of fires and explosion on IROFS. The design includes provisions to protect against adverse effects that may result from either the operation or the failure of the fire suppression system.

Environmental and Dynamic Effects

SSCs that are IROFS are protected against dynamic effects, including effects of missiles and discharging fluids that may result from natural phenomena; accidents at nearby industrial, military, or transportation facilities; equipment failure; and other similar events and conditions both inside and outside the IIFP Facility.

Chemical Protection

SSCs that are IROFS are protected against chemical risks directly from licensed material and by hazardous chemicals produced from licensed material that have not been separated from licensed material. Chemical risks from hazardous chemicals are not address as IROFS under the ISA methodology provided IIFP Facility conditions or hazardous chemicals do not affect radiological safety

Emergency Capability

SSCs that are required to support the IIFP Emergency Plan (EP) (IIFP, 2009b)are designed for emergencies. The design provides accessibility to the equipment of onsite and available offsite emergency facilities and services such as hospitals, fire and police departments, ambulance service, and other emergency agencies.

Utility Services

On-site utility service systems required to support IROFS are provided. Each utility service system required to support IROFS is designed to perform its function under normal and abnormal conditions. Utility systems are described in the ISA Summary.

Inspection, Testing, and Maintenance

SSCs that are determined to be IROFS are designed to permit inspection, maintenance, and testing.

Instrumentation and Controls

Instrumentation and control systems are provided to monitor variables and operating systems that are significant to safety over anticipated ranges for normal operation, abnormal operation, accident conditions, and safe shutdown. These systems ensure adequate safety of process and utility service operations in connection with their safety function.

The variables and systems that require surveillance and control include process systems having safety significance requiring or involving IROFS including overall confinement system, confinement barriers and their associated systems, and other systems. Controls shall be provided to maintain these variables and systems within the prescribed operating ranges under normal conditions. Instrumentation and control systems are designed to fail into a safe state or to assume a state demonstrated to be acceptable on some other basis if conditions such as disconnection, loss of energy or motive power, or adverse environments are experienced.

Defense-in-Depth Practices

The IIFP Facility and system designs are based on defense-in-depth practices. The design incorporates a preference for engineered controls over administrative controls to increase overall system reliability. Furthermore, the engineered controls preference is for use of passive engineered controls over active engineered controls. The design also incorporates features that enhance safety by reducing challenges to IROFS. The IIFP Facility and system IROFS are identified in the ISA Summary.

3.2.5 Integrated Safety Analysis Methodology

IIFP used methodologies identified in NUREG-1520, Chapter 3, Appendix A (NRC, 2002), to identify hazards and evaluate accident scenarios. This approach employs a semi-quantitative risk index method for categorizing accident sequences in terms of their consequences of concern and their likelihood of occurrence. The risk index method framework identifies which accident sequences have consequences

that could exceed the performance requirements of 10 CFR70.61 (CFR, 2009a) and; therefore, require designation of IROFS and supporting Management Measures. Descriptions of these general types of higher-consequence accident sequences are in the ISA Summary (Section 5). The ISA is a systematic analysis to identify facility and external hazards, potential accidents, accident descriptions, the likelihood and consequences of the accidents, and the IROFS.

The ISA uses a hazard analysis method, the What-If/Checklist Method, to identify the hazards relevant to each node or the IIFP Facility in general. The ISA Team reviewed the hazards identified for the "credible worst-case" consequences. The credible high or intermediate severity consequence accident scenarios were assigned accident description identifiers, accident descriptions, frequency or probability, and then a risk index determination was performed. The risk index was used to evaluate unmitigated risk as unacceptable or acceptable.

For each accident scenario having an unacceptable unmitigated risk index, IROFS were defined and the mitigated likelihood determined for each accident scenario. Using the unmitigated initiating event frequency and the failure probability of each IROFS, the mitigated scenario likelihood and mitigated risk was determined. The risk index method is regarded as a screening method of proving the adequacy or inadequacy of the IROFS for any particular accident. The credible accidents that potentially exceed the levels identified in 10 CFR 70.61 are evaluated using a risk analysis approach.

Figure 3-1, “Integrated Safety Analysis Process Flow Diagram,” describes the ISA process steps. The following sub-sections correspond to the blocks in the flow diagram.

3.2.5.1 Define Nodes to be Evaluated

The first step of the ISA is for the ISA Team to systematically break down the process system, subsystem, facility area, or operation being studied into well-defined nodes. The ISA nodes establish the study area boundaries in which the various process systems and supporting systems entering or exiting the node, or activities occurring in the area, can be defined in order to allow interactions to be studied.

The plant site was divided into four types of facilities as part of the PHA effort: DUF_4 Facility, SiF_4 Facility, BF_3 Facility, and Support Facilities. Specific process operations within these facilities are separated logically into “nodes” for PHA evaluation. The PHA is broken down in this manner to help reduce the complexity of the facility to a manageable level and to organize the PHA process and results in a consistent format. These nodes define process boundaries for the PHA and are unique process steps within the facility. Equipment located outside the process boundary is not evaluated in the node, although interaction between systems and potential initiating events from other systems is considered.

Operations were treated in this manner so that the entire IIFP Facility was evaluated in a logical process flow approach. This approach is also used to evaluate the hazards associated with each process or operation, and to identify any new hazards resulting from modifications made to an existing process or operation. Boundaries were indentified that define the point of process separation of a hazardous chemical as well as segregation points were the release of a hazardous chemical would not adversely affect licensed materials. The IIFP Facility defined nodes are listed in the ISA Summary.

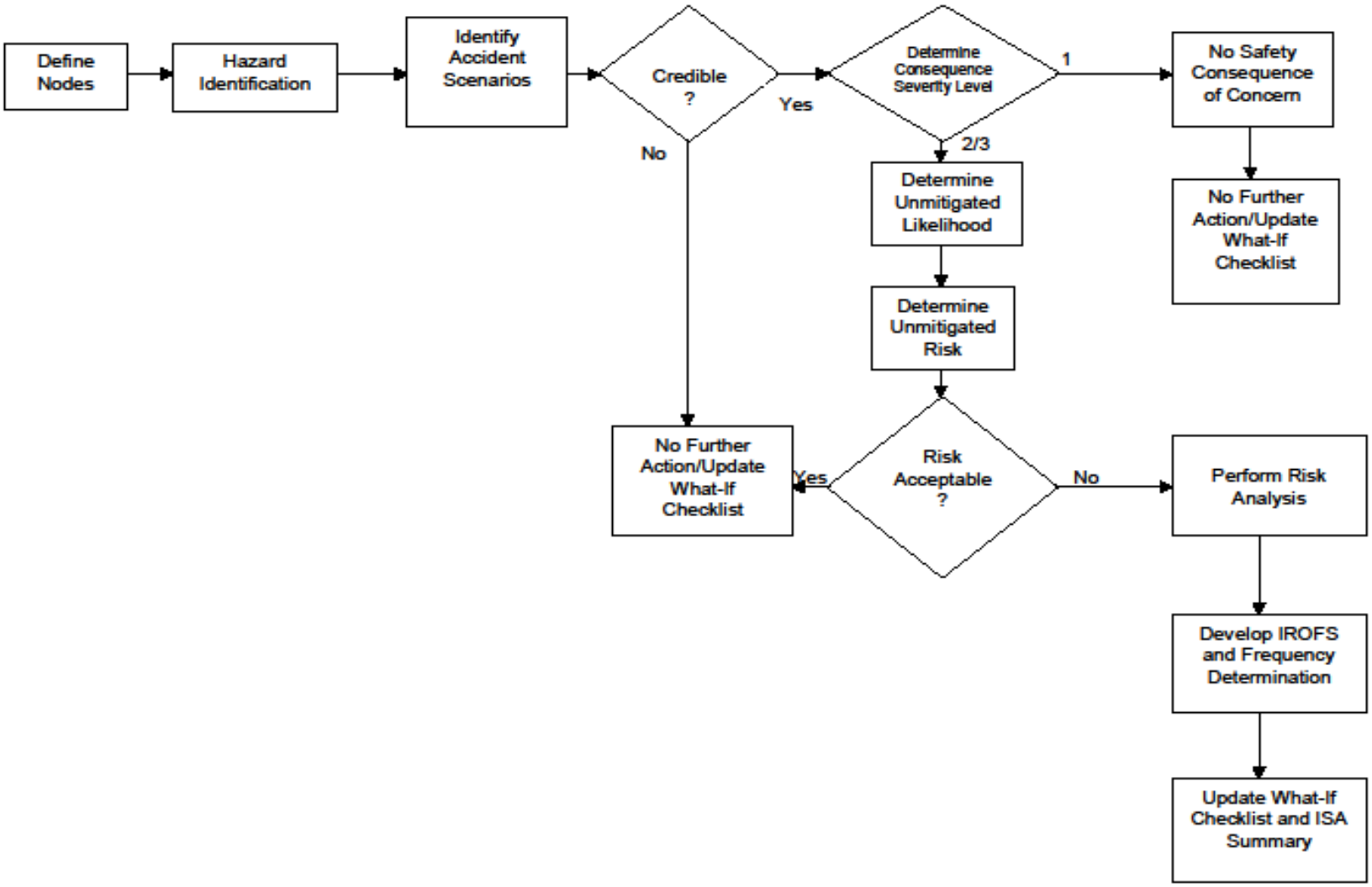


Figure 3-1 Integrated Safety Analysis Process Flow Diagram

Information used to define the nodes and to perform the process hazard analysis (PHA) includes, but are not limited to, the following:

- System descriptions,
- Plot plans,
- Process flow diagrams,
- Topographic maps,
- Equipment arrangement drawings with general equipment layout and elevations,
- Design temperatures and pressures, based on the existing level of design detail, for major process equipment and interconnected piping,
- Materials of construction for major process equipment and interconnected piping based on the existing level of design detail.
- MSDSs for any chemicals involved in the process (including any intermediate chemical reaction products) and other pertinent data for the chemicals or process chemistry (such as, chemical reactivity hazards), and
- Utility system drawings.

3.2.5.2 Hazard Identification

The "What-If" analysis method was used for identifying the hazards for the IIFP process. This method is consistent with the guidance provided in NUREG-1520 (NRC, 2002) and NUREG-1513, *Integrated Safety Analysis Document* (NRC, 2001). The hazard identification process documents materials that are:

- Radioactive,
- Flammable,
- Explosive,
- Toxic, and
- Reactive.

The hazards identification process results in identification of radiological or chemical characteristics that have the potential for causing harm to workers, the public, or to the environment. The hazards of concern for the IIFP Facility are related to either a release (loss of confinement) of UF_6 or hydrogen fluoride (HF) or chemicals that may generate HF. In general, the loss of confinement would initially result in moisture in the air reacting with the UF_6, forming uranyl fluoride (UO_2F_2) and HF as by-products. UO_2F_2 becomes a significant inhalation problem due to its dispersible and small particle size. HF can also be released as the byproduct of DUF_4, or generated by SiF_4 or BF_3 exposure to air. The HF, which is in a gaseous form, and UO_2F_2 could be transported through the IIFP Facility and ultimately beyond the site boundary. Both HF and UO_2F_2 are toxic chemicals with the potential to cause harm to the workers or the public (see LA Chapter 6).

For licensed material or hazardous chemicals produced from licensed materials, chemicals of concern are those that, in the event of release, have the potential to exceed concentrations defined in 10 CFR 70, *Domestic Licensing of Special Nuclear Material* (CFR, 2009f). Criteria for evaluating potential releases and characterizing their consequence as either "High" or "Intermediate" for members of the public and facility workers are presented in Table 3-1, *Consequence Severity Categories Based on 10 CFR 70.61*, and Table 3-2, *AEGL Thresholds from the EPA for Uranium Hexafluoride, Soluble Uranium, and Hydrogen Fluoride*.

Worker exposures were assessed based on 10 minutes; conservatively a sufficient amount of time to evacuate an area of hazardous material leak. Public exposures were estimated to last for 30-minutes duration. This is consistent with self-protective criteria for UF_6/HF plumes listed in NUREG-1140, *A Regulatory Analysis on Emergency Preparedness for Fuel Cycle and Other Radioactive Material Licensees* (NRC, 1988). The Acute Exposure Guideline Levels (AEGL) -1, -2, and -3 values were used as the threshold concentration levels for establishing a low, intermediate, or high severity consequence as shown in Table 3-1. AEGL values for other time periods may be utilized if more appropriate for the accident scenarios in question.

Table 3-1 Consequence Severity Categories Based on 10 CFR 70.61

Severity Ranking	Consequence Description		
	Workers	**Offsite Public**	**Environment**
3	Radiological dose greater than 1 Sv (100 rem)	Radiological dose greater than 0.25 Sv (25 rem)	N/A
	75 mg soluble uranium intake	30 mg soluble uranium intake	
	Chemical exposure greater than 3 AEGL-3 (10 minute exposure)	Chemical exposure greater than AEGL-2 (30 minute exposure)	
	A criticality accident occurs	A criticality accident occurs	
	Dermal exposure from an HF solution that endangers the life of the worker	Dermal exposure to HF solution resulting in irreversible or other serious long-lasting effects	
2	Radiological dose greater than 0.25 Sv (25 rem) but less than, or equal to 1 Sv (100 rem)	Radiological dose greater than 0.05 Sv (5 rem) but less than or equal to 0.25 Sv (25 rem)	Radioactive release greater than 5,000 times 10 CFR 20,Appendix B, Table 2 (CFR, 2009g)
	Chemical exposure greater than AEGL-2 but less than or equal to AEGL-3 (10 minute exposure)	Chemical exposure greater than AEGL-1 but less than or equal to AEGL-2 (30 minute exposure)	
	Dermal exposure to HF solution resulting in irreversible or other serious long-lasting health effects	Dermal exposure from HF solution resulting in mild transient health effects	
	Direct eye contact with any HF solution (leads to irreversible or other serious long-lasting health effects)		
1	Accidents with radiological and/or chemical exposures to workers less than those above	Accidents with radiological and/or chemical exposures to the public less than those above	Radioactive releases to the environment producing effects specified above

10 CFR 70.61 (b)(3) (CFR, 2009a) states (in part) for a high consequence event:

> "An intake of 30 mg or greater of uranium in soluble form by any individual located outside the controlled area identified pursuant to Paragraph(f) of this section…"

The UF_6 concentration in air is not directly equivalent to soluble uranium intake. Therefore, IIFP uses an accepted intake value of 75 mg or greater, corresponding to the threshold for permanent renal damage consistent with a high consequence event to a worker, which is an "acute chemical exposure" as defined in 10 CFR 70.61(b)(4) (CFR, 2009a).

Table 3-2 AEGL Thresholds from the EPA for Uranium Hexafluoride, Soluble Uranium, and Hydrogen Fluoride

Uranium hexafluoride [mg/m^3]					
	10 min	**30 min**	**60 min**	**4 hr**	**8 hr**
AEGL 1	3.6	3.6	3.6	NR	NR
AEGL 2	28	19	9.6	2.4	1.2
AEGL 3	216	72	36	9	4.5
Soluble Uranium [mg/m^3]					
	10 min	**30 min**	**60 min**	**4 hr**	**8 hr**
AEGL 1	2.4	2.4	2.4	NR	NR
AEGL 2	19	13	6.5	1.6	0.8
AEGL 3	145	48	24	6	3.0
Hydrogen fluoride [mg/m^3]					
	10 min	**30 min**	**60 min**	**4 hr**	**8 hr**
AEGL 1	0.8	0.8	0.8	0.8	0.8
AEGL 2	78	28	20	10	10
AEGL 3	139	51	37	18	18

Dermal exposures to HF potentially resulting from gaseous releases have been qualitatively evaluated in the ISA Summary. The criteria for assessing the consequence severity for HF dermal exposures are provided in Table 3-1.

The What-If analysis method was used for identifying process hazards for the UF_6, UF_4, SiF_4, and BF_3 process systems at the IIFP Facility. This PHA technique is used to identify and document items identified in the hazard analysis meetings. For identified single-failure events (that is, those accidents that result from the failure of a single control), the What-If method is the recommended approach.

The results of the ISA Team meetings are summarized in the ISA What-If tables, which forms the basis of the hazards portion of the Hazard and Risk Determination Analysis. The What-If tables are contained in the ISA documentation. The format for this table, which has spaces for describing the node under consideration and the date of the workshop, is provided in Table 3-3, *What-If Example*. The What-If table is divided into nine columns, which are as follows:

1 **Scenario Number** - This is a unique number assigned to each What-If question.

2 **What-If** - This column provides a description of the What-If question to be analyzed.

3 **Causes** - This column provides a description of the initiating event required to cause the accident.

4 **Likelihood Category** - This column is the qualitative assessment of the unmitigated probability or frequency of occurrence for the causes.

5 **Consequences** -This column provides a description of the design basis event (for example, the potential and worst-case consequences from fire, potential release event, etc.)

6 **Consequence Category** -This column provides the qualitative severity category, based on the consequence analysis, affecting workers, the public, and the environment.

7 **Prevention Features** -This column identifies the available design features that are judged to prevent the likelihood and/or consequence of the scenario.

8 **Mitigation Features** - This column identifies the available design features that are judged to mitigate the likelihood and/or consequence of the scenario.

9 **Comments** - This column includes references to related PHAs or other information justifying the information contained in preceding columns.

This approach was used for the process system hazard identification. The results of the unmitigated What-If scenarios are used directly as input to the risk index development. In addition, the hazard identification identifies potentially hazardous process conditions. Most hazards were assessed individually for the potential impact on the discrete components of the process systems. However, hazards were assessed on a facility-wide basis for credible hazards from fires (such as, external to the process system) and external events (such as, seismic, severe weather, etc.).

For the purpose of evaluating the impacts of fire hazards, the ISA Team considered the following:

- Postulated the development of a fire occurring in in-situ combustible material from an unidentified ignition source (such as, electrical shorting, or other source);
- Postulated the development of a fire occurring in transient combustible material from an unidentified ignition source; and
- Evaluated the uranic content in the space and its configuration (for example, UF_6 solid/gas in cylinders, UF_6 gas in piping, UF_6 and/or byproducts bound on chemical traps, UO_2F_2 particulate on solid waste or in solution). The appropriate configuration was considered relative to the likelihood of the target releasing its uranic content as a result of a fire in the area.

In order to assess the potential severity of a given fire and the resulting failures to important systems, a Fire Hazards Analysis (FHA) was conducted; however, since the design supporting the license submittal for this facility is not yet at the detailed design stage, detailed in-situ combustible loading and in-situ combustible configuration information is estimated. Therefore, in order to place reasonable and conservative bounds on the fire scenarios analyzed, the ISA Team estimated in-situ combustible loadings based on the FHA information of the in-situ combustible loading for the IIFP Facility. This information indicates that in-situ combustible loads are expected to be very low.

External events were considered at the site and facility level. The external event ISA considered both natural phenomena and man-made hazards. During the external event ISA Team meeting, each area of the proposed IIFP Facility was discussed as to whether or not it could be adversely affected by the specific external event under consideration. If so, specific consequences were then discussed. If the consequences

Table 3-3 What-If Example

Plant		**Node**	
Drawing		**System**	
Drawing Date		**System Description**	

Scenario Number	What if…	Causes	Likelihood Category	Consequences	Consequence Category	Prevention Features	Mitigation Features	Comments

were known or identified to be a low consequence, then a specific design basis with a likelihood of "Highly Unlikely" would be selected. Each external event was assessed for both the unmitigated case and then for the mitigated case. The mitigated cases could be a specific design basis for that external event, IROFS, or a combination of both.

Natural phenomena hazards (NPH) considered for evaluation included:

- Earthquakes,
- Hurricanes (including topical storms),
- Tornados (including tornado missiles and extreme straight wind),
- Volcanoes,
- Flooding,
- Snow and ice, and
- Precipitation.

External man-made hazards considered for evaluation included:

- Transportation hazards onsite/offsite,
- Onsite facility hazards,
- Aircraft crashes,
- Wildland fires (range fires),
- Pipelines,
- Roadways and highways,
- Nearby industrial facilities,
- Nearby military installations,
- Railways,
- Waterways,
- Underground utilities (onsite use of industrial gases and electrical services),
- Internal flooding from onsite above ground liquid storage tanks, and
- Land use impacts.

3.2.5.3 Identify Accident Scenarios

The goal is to identify credible accident scenarios or sequences by analyzing single initiating events. Using approved methods, the ISA Team identified potential accident scenarios associated with a process or operation, including possible worse-case consequences, causes (events that can initiate the accident), and safeguards or controls that are available to prevent the cause of the event or mitigate the consequences. Safeguards are design features or administrative programs that provide defense-in-depth, but are not credited as IROFS. Consequences of interest include radiological material releases, radiation exposures, chemical/toxic exposures from licensed material or hazardous chemicals produced from licensed material, fires, and explosions. Hazards are defined to be materials, equipment, or energy sources with the potential to cause injury or illness to humans or adversely impact the environment.

An important product of an ISA consists of a description of accident scenarios identified and recorded during the analysis process. An accident scenario involves an initiating event, any factors that allow the accident to propagate (enablers), and any factors that reduce the risk (likelihood and consequence) of the accident (controls). The accident scenario is a scenario of specific potential real events.

When analyzing accident scenarios, the ISA Team considered process deviations, human errors, internal facility events, and credible external events, including natural phenomena. FCSS ISG-08, *Natural Phenomena Hazards* (NRC, 2005), was used as guidance when evaluating natural phenomena hazards as initiating events. The team evaluated common mode failures and systems interactions where preventive actions and/or control measures are required to prevent and/or mitigate accident scenarios. The team-listed scenarios considered not credible. In addition to normal conditions, the team considered abnormal conditions including startup, shutdown, maintenance, and process upsets.

For each accident scenario, enabling conditions, and conditional events that affect the outcome of the accident scenario (for example, conditions that affect the likelihood of the scenario or could mitigate the consequences to either workers or the public) were identified where appropriate. An enabling condition does not directly cause the scenario but must be present for the initiating event to proceed to the consequences described. Enabling conditions are expressed as probabilities and can reflect such things as the mode of operation (for example, percent of operational online availability).

Conditional events that affect the probability of the undesired outcome were also identified. These include probabilistic consideration of individual or administrative actions that would not be considered IROFS but would affect the overall likelihood of the accident. For example, if a scenario involves personal injury hazards, at least one worker must be present in the affected area at the time of the event for the injury to occur. Thus, the presence of workers in the affected area is a conditional modifier for a consequence involving personal injury. Another example of a conditional event is the probability that a worker can successfully evacuate from an area given that a hazard is present.

In considering accident scenarios at the IIFP Facility, it is necessary to determine which scenarios are considered not credible and which are credible. During the PHA, the ISA Team considered each accident scenario as credible, unless the scenario could be determined to be not credible. (See Section 3.2.5.5, for the criteria IIFP used to determine if an accident scenario is credible.)

3.2.5.4 Determine Consequence Severity Level

Table 3-1 presents the radiological and chemical consequences severity limits of 10 CFR 70.61 (CFR, 2009a) for each of the accident consequence categories. Table 3-2 provides information on the chemical dose limits specific to the IIFP Facility.

For each credible accident scenario identified, the ISA Team assigned a severity ranking for the consequences using the consequence severity rankings provided in Table 3-1. Assigning a severity ranking allowed each accident scenario to be categorized in terms of the performance requirements outlined in 10 CFR 70.61 (b), (c), and (d) (CFR, 2009a). The Severity Ranking System is listed below:

- A severity ranking of 3 corresponds to high consequences,
- A severity ranking of 2 corresponds to intermediate consequences, and
- A severity ranking of 1 corresponds to low consequences.

When estimating the possible "worst-case" consequences of an accident scenario, the ISA Team members used experience, guidance from NUREG/CR-6410, *Nuclear Fuel Cycle Facility Accident Analysis Handbook* (NRC, 1998), and best judgment.

10 CFR 70.61 (CFR, 2009a) specifies two categories for a credible accident description consequence: "High Consequence" and "Intermediate Consequence." Implicitly there is a third category for accidents

that produce consequence less than "Intermediate." These are referred to as "Low Consequence" accident descriptions in the ISA. The primary purpose of the PHA is to identify the uncontrolled and unmitigated accident descriptions. These accident descriptions are then categorized into one of the three consequence categories (high, intermediate, low) based on their forecast radiological, chemical, and/or environmental impacts.

The severity of consequences is determined through a multitude of ways, both quantitatively and qualitatively. Quantitative methods include source term and dispersion modeling. Qualitative methods may assume worst case assumptions and/or comparison to similar events where bounding conservative calculations have been made. The consequence of concern is the chemo-toxic exposure to UF_6, UF_4, HF, UO_2 and UO_2F_2. The dose consequence for each of the accident descriptions were evaluated and compared to the CFR criteria for high and intermediate consequences.

The inventory of uranic material for each accident considered was dependent on the specific accident description. Scenarios that resulted in a severity rank of 2 or 3 are: large UF_6/HF release (such as a multiple cylinder failure or process line failure), and an HF release (pressure vessel or process line). For a severity level of 1 (Low), there is "No Safety Consequence of Concern" and no further analysis is required; the What-If table is updated.

3.2.5.5 Determine Unmitigated Likelihood

The likelihood of an accident scenario occurring was determined for the unmitigated case (unmitigated likelihood). Unmitigated likelihood is the likelihood or frequency that the initiating event or cause of the accident sequence occurs despite any actual or potential preventive or mitigating features. Therefore, this likelihood/frequency estimate assumes that none of the available safeguards or IROFS is available to perform their intended safety function. Table 3-4, *Unmitigated Likelihood Categories*, shows the likelihood of occurrence limits of 10CFR70.61 (CFR, 2009a) for each of the three likelihood categories.

Table 3-4 Unmitigated Likelihood Categories

Likelihood Category	Qualitative Description
1	Consequence Category 3 accidents must be "Highly Unlikely"
2	Consequence Category 2 accidents must be "Unlikely"
3	Not Unlikely

The team assigned a likelihood level for each accident scenario using the defined categories in Table 3-5, *Event Likelihood Categories*, and Table 3-6, *Determination of Likelihood Category*. When assigning a likelihood category, the team made use of process knowledge, accident scenario information, operating history, and manufacturers/product information to determine which category of likelihood was appropriate. For accident scenarios where multiple initiating events have been identified, the team estimated the likelihood for the most credible initiating event. This ensured that the accident scenario was screened using the most conservative estimate of risk.

Table 3-5 Event Likelihood Categories

Likelihood	Likelihood Category	Frequency or Probability of Occurrence
Not Unlikely (Credible)	3	More than or equal to 10^{-4} per-event per-year
Unlikely (Credible)	2	Between 10^{-4} and 10^{-5} per-event per-year
Highly Unlikely	1	Less than or equal to 10^{-5} per-event per-year

Table 3-6 Determination of Likelihood Category

Likelihood Category	Likelihood Index T (= sum of index numbers)
1	$T \leq -5$
2	$-5 < T \leq -4$
3	$-4 < T$

The definitions of likelihood terms are presented in the following sections.

Highly Unlikely

The guideline for acceptance of the definition of "Highly Unlikely" has been derived as the highest acceptable frequency that is consistent with a goal of having no inadvertent radioactive or hazardous material release accidents, and no accidents of similar consequences in the industry. To within an order of magnitude, this is taken to mean a frequency limit of less than one such accident in the industry every 100 years. This has been translated into a guideline limiting the frequency of individual accidents to 10^{-5} per-event per-year. As the goal is to have no such accidents, accident frequencies should be reduced substantially below this guideline when feasible.

Unlikely

Intermediate consequence events include significant radiation exposures to workers (those exceeding 0.25 Sieverts or 25 rem). No increase in the rate of such significant exposures is the NRC's goal. This has been translated into a guideline of 4.0×10^{-5} per-event per-year. This guideline may be more generally considered as a range between 10^{-4} and 10^{-5} per-event per-year since exact frequencies at such levels cannot accurately be determined.

Not Credible

The definition of "Not Credible" is taken from NUREG-1520 (NRC, 2002). If an event is "Not Credible," IROFS are not required to prevent or mitigate the event. The fact that an event is "Not Credible" must not depend on any facility feature that could credibly fail to function. One cannot claim that a process does

not need IROFS because it is "Not Credible" due to characteristics provided by IROFS. The implication of "Credible" in 10 CFR 70.61 (CFR, 2009a) is that events that are "Not Credible" may be neglected. Any one of the following independent acceptable sets of qualities could define an event as "Not Credible:"

- An external event for which the frequency of occurrence can conservatively be estimated as less than once in a million years.
- A process deviation that consists of a description of many unlikely human actions or errors for which there is no reason or motive. In determining that there is no reason for such actions, a wide range of possible motives, short of intent to cause harm, must be considered. Necessarily, no such description of events can ever have actually happened in any fuel cycle facility.
- Process deviations for which there is a convincing argument, given physical laws that they are not possible, or are unquestionably extremely unlikely.

Credible

A "Credible" accident is any event that does not meet the definition of "Not Credible" as defined above.

3.2.5.6 Determine Unmitigated Risk

Credible accident scenarios identified for the IIFP Facility, which have the capability of producing conditions that fail to meet the performance requirements of 10 CFR 70.61(b), (c) or (d) (CFR, 2009a) are included in the scope of the ISA Summary. For each credible accident scenario, the ISA Team used the severity category ranking and unmitigated likelihood level to assign an unmitigated risk level. (The unmitigated risk is determined from the product of the severity category and the unmitigated-likelihood category.) The ISA Team used the risk matrix in Table 3-7, *Unmitigated Risk Assignment Matrix*, to determine the unmitigated risk. The unmitigated risk associated with each accident scenario indicates the

Table 3-7 Unmitigated Risk Assignment Matrix

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

relative importance of the associated controls. Accident scenarios in which the consequences and likelihoods yield an unacceptable risk index require further evaluation to determine IROFS and mitigated risk, as described in Section 3.2.5.8.

If the unmitigated risk is less than or equal to 4, the unmitigated risk is acceptable and no further action is required. The What-If table is updated to reflect this conclusion of no further action.

3.2.5.7 Risk Assignment

If the unmitigated risk is more than 4, the unmitigated risk is unacceptable and further risk analysis is required. The risk analysis identifies the IIFP Facility node(s) to which it applies, describes the node operations and operational areas, identifies the PHA reference nodes, accident description, initiating events evaluated, potential preventive and mitigation features, and describes Management Measures. The risk analysis accident evaluations follow analytical methods of NUREG 1520.

3.2.5.8 IROFS and Risk Development

For each accident scenario having an unacceptable unmitigated risk index, IROFS must be defined and the mitigated likelihood determined for each accident scenario. Using the unmitigated initiating event frequency and the failure probability of each IROFS, the mitigated likelihood is determined.

The risk analysis presents an accident evaluation including a detailed discussion concerning the selection of initiating events, IROFS, and the evaluation of the accident sequences. The risk analysis provides sufficient background and operational information to understand and examine accident scenarios that result in undesired outcomes for each initiating event. Each risk analysis provides details concerning an accident scenario's quantification, including: 1) method used, 2) initiating-event frequency determination, 3) the IROFS credited to prevent or mitigate the initiating event(s) being analyzed, 4) the failure probabilities for the credited IROFS, and 5) the overall likelihood estimates. The risk analyses are controlled documents and are maintained up-to-date by the CM Program described in LA Chapter 11. The results from each risk analysis are summarized in the ISA Summary.

The mitigated likelihood of the accident scenario occurring with the preventive or mitigating IROFS in-place must meet the requirements in 10 CFR 70.61 (CFR, 2009a), which requires that unacceptable consequences be limited. The values of the index numbers for an accident scenario, depending on the number of events involved, are added to obtain a total likelihood index, "T." Accident scenarios are then assigned to one of the three likelihood categories of the risk matrix, depending on the value of the likelihood index in accordance with Table 3-5.

The reliability and availability of IROFS to perform are a function of the Management Measures applied to each IROFS. The Management Measures provide the overall management oversight and assurance that the IIFP Safety Program is maintained and functions properly. Management Measures are described in LA Chapter 11. The ISA Summary provides a consolidated list of IROFS.

Safeguards are design features or administrative programs that provide defense-in-depth, but are not IROFS and are not credited with preventing or mitigating accident scenarios. 10 CFR 70.64 (CFR, 2009e) states that the design process must be founded on defense-in-depth principles, and incorporate, to the extent practicable, preference for engineered controls over administrative controls, and reduction of challenges to the IROFS that are frequently or continuously challenged.

Safety controls used at the IIFP Facility can be characterized as either administrative or engineered. Administrative controls are generally not considered to be as reliable as engineered controls since human errors usually occur more frequently than equipment failures. Engineered controls may be categorized as being "Passive" or "Active." Passive controls include pipes or vessels that provide containment. Active controls include equipment such as pumps or valves that perform a specific function related to safety. In general, passive controls are considered to be less prone to failure than active controls.

IROFS are those engineered or administrative controls, or control systems, which comprise the SSCs that form the preventive and/or mitigating barriers identified by the ISA. The IROFS selected for each accident scenario may be a control that helps reduce the likelihood that the initiating event occurs, detects or mitigates the consequences, or helps reduce the amount of hazardous material released. IROFS are the barriers that prevent and/or mitigate the unacceptable consequences identified by the performance requirements of 10 CFR 70.61 (b), (c) and (d) (CFR, 2009a). IROFS must be independent of the initiating event (for example, occurrence of the initiating event does not cause failure of the IROFS) and other credited IROFS (for example, failure of one IROFS does not cause failure of another IROFS).

IIFP commits to identify IROFS as a part of the ISA process and include the identification of the IROFS in the ISA Summary prepared and maintained for the IIFP Facility. The IROFS are defined in such a way as to delineate their boundaries, to describe the characteristics of the preventive/mitigating function, and to identify the assumptions and conditions under which the item is relied on.

3.2.5.9 What-If/Checklist, Risk Index, and ISA Summary

The risk analysis results in the development of IROFS and the overall accident sequence frequency determination based on the evaluation of the potential accident. This information was then used to update the What-If table, including the unmitigated likelihood and the unmitigated risk.

Based on the updated What-If table and the risk analysis, the Accident Sequence Summary and Risk Index (Table 3-8) is completed. For accident sequences that are of low consequence or that have a risk index of 4 or less, the risk is acceptable and Table 3-8 requires no entries (that is, "N/A") for the initiating event frequency, IROFS and their failure probabilities, or likelihood index.

The ISA process is an iterative process. The ISA Summary provides an overview of the ISA based upon the existing design level of detail. The ISA Summary that supports the LA is based on the level of design necessary to establish the safety basis for the IIFP Facility and support the licensing effort.

The final step of the ISA process (see Figure 3-1) is to update supporting ISA documentation and then develop the ISA Summary. As the design of the IIFP Facility progresses, the ISA and supporting documents will be revised, or new supporting documents developed.

Table 3-8 Accident Sequence Summary and Risk Index Evaluation Example

Accident identifier	Initiating event	Safety Parameter 1 or IROFS 1	Failure Probability Index 1	Preventive Safety Parameter 2 or IROFS 2	Failure Probability Index 2	Preventive Safety Parameter 3 or IROFS 3	Failure Probability Index 3	Likelihood Index T Uncontrolled / Controlled (b+d+f+h)	Likelihood Category	Consequence Evaluation Reference	Consequence Category	Risk Index (j x l)	Comments and recommendations
(a)	(b)	(c)	(d)	(e)	(f)	(g)	(h)	(i)	(j)	(k)	(l)	(m)	(n)

3.2.6 ISA Integration

The ISA is intended to give assurance that the potential failures, hazards, accident descriptions, scenarios, and IROFS have been investigated in an integrated fashion, so as to adequately consider common mode and common cause situations. Included in this integrated review is the identification of IROFS functions that may simultaneously be beneficial and harmful with respect to different hazards, and interactions that might not have been considered in the previously completed risk analyses. This review is intended to ensure that the designation of one IROFS does not negate the preventive or mitigation function of another IROFS. The ISA Team performed an integrated review during the process hazard review and an overall integration review after the nodes were completed. Some items that warrant special consideration during the integration process evaluation are:

- Common mode failures and common cause situations.
- Support system failures such as loss of electrical power or water. Such failures can have a simultaneous effect on multiple systems.
- Divergent impacts of IROFS. Assurance must be provided that the negative impacts of an IROFS, if any, do not outweigh the positive impacts; that is, to ensure that the application of an IROFS for one safety function does not degrade the defense-in-depth of an unrelated safety function.
- Other safety and mitigating factors that do not achieve the status of IROFS that could impact system performance.
- Identification of scenarios, events, or event descriptions with multiple impacts, that is, impacts on chemical, fire, and/or radiation safety. For example, a flood might cause both a loss of confinement and active safeguards.
- Potential interactions between processes, systems, areas, and buildings; any interdependence of systems or potential transfer of energy or materials.
- Major hazards or events that tend to be common cause situations leading to interactions between processes, systems, buildings, etc.

3.2.7 Integrated Safety Analysis Team

The ISA was performed, and will be maintained, by a team with expertise in engineering, process safety, safety analysis, and facility process operations. Team member qualifications were consistent with guidance provided in NUREG 1520 (NRC, 2002). The ISA team consisted of a diverse group of individuals with experience and knowledge specific to each process or system being evaluated. The team was comprised of individuals who have experience, individually or collectively, in the following:

- Nuclear facility safety,
- Radiological safety,
- Process hazards analysis,
- Safety analysis and risk assessment,
- Fire safety,
- Chemical process safety,
- Operations and maintenance, and
- ISA methods.

The ISA team leader is trained and knowledgeable in the ISA methods chosen for the hazard and accidents evaluations. Collectively, the team has an understanding of the process operations and hazards

under evaluation. The team leader is responsible for the overall direction of the ISA. Additional information on the ISA Team is provided in the ISA Summary.

3.2.8 Descriptive List of IROFS

The ISA Summary; Section 6, Table 6-1 provides a list of IROFS in the identified high and intermediate accident sequences.

3.2.9 Sole IROFS

There are a very few number of sole IROFS and those are identified in the ISA Summary; Section 8, Table 8-1.

3.3 References

CFR. (2009f). 10 CFR 70, Domestic Licensing of Special Nuclear Material, U.S. Nuclear Regulatory Commission.

CFR. (2009a). 10 CFR 70.61, Performance Requirements, U.S. Nuclear Regulatory Commission.

CFR. (2009b). 10 CFR 70.62, Safety Program and Integrated Safety Analysis, U.S. Nuclear Regulatory Commission.

CFR. (2009e). 10 CFR 70.64, Requirements for New Facilities or New Processes at Existing Facilities, U.S. Nuclear Regulatory Commission.

CFR. (2009c). 10 CFR 70.65, Additional Content of Application, U.S. Nuclear Regulatory Commission.

CFR. (2009d). 10 CFR 70.72, Facility Changes and Change Process, U.S. Nuclear Regulatory Commission.

CFR. (2009g). 10 CFR20, Standards for Protection Against Radiation, U.S. Nuclear Regulatory Commission.

CFR. (2009h). 29 CFR 1910.1200, Toxic and Hazardous Substances, Occupational Safety and Health Administration.

IIFP. (2009b). FEP/DUP Plant Emergency Plan,Rev A December 26, 2009

IIFP. (2009). FEP/DUP Plant Integrated Safety Analysis Summary,Rev A December 23, 2009.

IIFP. (2009a). Quality Assurance Program Description, International Isotopes Fluorine Products.

NRC. (2005). FCSS ISG-08, Natural Phenomena Hazards, U.S. Nuclear Regulatory Commission.

NRC. (1998). NUREG/CR-6410, Nuclear Fuel Cycle Facility Accident Analysis Handbook, U.S. Nuclear Regulatory Commission.

NRC. (1988). NUREG-1140, A Regulatory Analysis on Emergency Preparedness for Fuel Cycle and Other Radioactive Material Licensees, U.S. Nuclear Regulatory Commission.

NRC. (2001). NUREG-1513, Integrated Safety Analysis Guidance Document, U.S. Nuclear Regulatory Commission.

NRC. (2002). NUREG-1520, Standard Review Plan for the Review of a License Application for a Fuel Cycle Facility, U.S. Nuclear Regulatory Commission.

NRC. (2007). Staff Requirements Memorandum –SECY-07-0146 – Regulatory Options for Licenseing New Uranium Conversion and Depleted Uranium Deconversion Facilities.

4 Radiation Protection

The following sections will address the IIFP commitment to radiation protection and the policies and procedures to maintain doses to the workers, the public, and the environment ALARA.

4.1 Commitment to Radiation Protection Program Implementation

This chapter describes the facility Radiation Protection Program (RPP). The RPP provides the foundation necessary to protect the radiological health and safety of the workers, the environment, and the public and complies with the regulatory requirements of 10 CFR 19, *Notices, Instructions and Reports to Workers: Inspection and Investigations* (CFR, 2008a); 10 CFR 20, *Standards for Protection Against Radiation* (CFR, 2008b); and 10 CFR 40, *Domestic Licensing of Source Material* (CFR, 2008c).

Specifically, the RPP meets the requirements of 10 CFR 20 Subpart B, *Radiation Protection Programs* (CFR, 2008d), and is consistent with the guidance provided in Regulatory Guide 8.2, *Guide for Administrative Practices in Radiation Monitoring* (NRC, Regulatory Guide 8.2, 1973). In accordance with 10 CFR 20.1101 (CFR, 2008e), the RPP uses approved written procedures and engineering controls based on sound radiation protection principles to achieve occupation and public doses below the U.S. Nuclear Regulatory Commission (NRC) established limits and to maintain exposure to radiation ALARA. Occupational exposures are maintained ALARA through the following:

- Exposure monitoring is consistent with guidance in 10 CFR 20.1501, General (CFR, 2008f) and 10 CFR 20.1502, *Conditions Requiring Individual Monitoring of External and Internal Occupational Dose* (CFR, 2008g),
- Frequent interactions between the Radiation Safety Committee and Operations personnel, and
- Annual RP program assessments with senior management.

Occupationally exposed personnel annual exposure goals will be established to ensure that personnel doses received are below the limits specified in 10 CFR 20.1201 (CFR, 2008h). The RPP content and implementation are reviewed annually, at a minimum, as required by 10 CFR 20.1101(c) (CFR, 2008e). In addition, controls are established such that no member of the public is expected to receive a total effective dose equivalent (TEDE) in excess of 0.25 milli-Sieverts per year (mSv/yr) or 25 millirems per year (mrem/yr).

4.1.1 Responsibilities of Key Program Personnel

The key program personnel play an important role in the protection of workers and the environment as well as implementation of the ALARA program. Chapter 2, Organization and Administration of the IIFP LA describes the facility organization and administration in described in further detail. Staffing is consistent with guidance provided in Regulatory Guide 8.2 (NRC, Regulatory Guide 8.2, 1973) and Regulatory Guide 8.10, *Operating Philosophy for Maintaining Occupation Radiation Exposures As Low As Is Reasonably Achievable* (NRC, 1977).

4.1.1.1 Chief Operating Officer (COO)/Plant Manger

The COO/Plant Manger has the overall responsibility of ensuring that facility operations are conducted in a manner that protects the employee, the environment and the public from radiological, chemical, and industrial hazards and that the these operations are carried out in accordance with all applicable regulations, licenses and permits. The duties of the COO/Plant Manger are performed in accordance with written policies and procedures. The COO/Plant Manger provides for safety and control of operations and protection of the environment by delegating and assigning responsibility to qualified plant and line supervisors. These qualifications are detailed in Chapter 2 of the IIFP LA.

4.1.1.2 Environment, Safety, and Health Manager

The Environment, Safety and Health (ESH) Manager reports to the IIFP COO/Plant Manger and in a matrix role to the INIS Regulatory Affairs & Quality Assurance Director. The ESH Manager has responsibility for directing the activities to ensure the facility complies with appropriate rules, regulations, and codes. This includes ESH activities associated with radiation protection (RP), chemical safety, environmental protection, industrial hygiene, industrial safety, security, emergency preparedness/response, regulatory affairs and licensing. The ESH Manager works with other managers and supervisors of the plant to ensure consistent interpretations of the requirements, performs independent reviews, and supports facility and operations change control reviews. The ESH organization, and its manager, provides independent oversight of plant operations. The ESH Manager has the responsibility and authority to elevate any ESH or security related issue to the INIS President and CEO. The qualifications for the ESH Manager position are described in the IIFP LA, Chapter 2.

4.1.1.3 Radiation Protection Manager

The Radiation Protection Manager (RPM) reports to the ESH Manager and is responsible for implementing the RPP. In matters involving radiation protection, the Radiation Protection Manager has direct access to the COO/Plant Manger. The Radiation Protection staff, including engineers, technicians, administrative support personnel, and contractors specifically assigned to the Radiation Protection Program report to the Radiation Protection Manager. The Radiation Protection Manager ensures that the facility is staffed with suitably trained radiation protection personnel, and that sufficient resources are provided to implement an effective program. The qualifications for this position are described in Chapter 2 of the IIFP LA.

4.1.1.4 Radiation Protection Staff

The Radiation Protection Manager and his staff are responsible for:

- Establishing and maintaining the RPP
- Developing and maintaining procedures necessary to implement the RPP
- Establishing and maintaining an ALARA program
- Reviewing and auditing the efficacy of the RPP in complying with applicable federal and state regulations and NRC license conditions.
- Adequately staffing the Radiation Protection organization to implement the RPP
- Establishing and maintaining a respiratory protection program
- Developing and maintaining an internal and external dosimetry program

- Calibration and quality assurance of all radiological instrumentation, including verification of required Lower Limits of Detection or alarm levels
- Establishing and maintaining a radiation safety training program
- Establishing and maintaining the radiological environmental monitoring program
- Ensuring restricted and radiological controlled areas (RCAs) are posted in accordance with regulations and license conditions and developing occupancy guidelines as needed.

The qualifications for the staff positions are described in the IIFP LA, Chapter 2.

4.1.1.5 Facility Personnel

Facility personnel are required to work safely and to follow the rules, regulations, and procedures that have been established for their protection and the protection of the public. Personnel whose duties require (1) working with radioactive material, (2) entering radiation areas, (3) controlling facility operations that could affect effluent releases, or (4) directing the activities of others, are trained such that they understand and effectively carry out their responsibilities relative to the RPP.

4.1.2 Independence of the Radiation Protection Program

The RPP remains independent of the routine operations of the facility. The management of the RPP is conducted through the ESH Manager and the RPM both of whom function independent of Operations.

4.1.3 Annual Review of the Radiation Protection Program

In accordance with 10 CFR 20.1101(c) (CFR, 2008e), the RPP is reviewed annually by the ALARA Committee. The review considers facility changes, new technologies, and other process enhancements that could improve overall program effectiveness. Further detail regarding the review is provided in Section 4.2.

4.2 ALARA Program

This section describes the IIFP commitment to an ALARA Program. The ALARA Program functions as a subset of the RPP. The objective of the program is to make every reasonable effort to maintain facility exposures to radiation as far below the dose limits of 10 CFR 20.1201 (CFR, 2008h) as is practical and to maintain radiation exposures to members of the public such that they are not expected to receive the dose limits of 10 CFR 20.1101(d) (CFR, 2008e). The design and implementation of the ALARA program is consistent with guidance provided in Regulatory Guide 8.2 (NRC, 1973), Regulatory Guide 8.13*Instruction Concerning Prenatal Radiation Exposure* (NRC, 1999), Regulatory Guide 8.29, *Instruction Concerning Risks from Occupation Radiation Exposure* (NRC, 1996), and Regulatory Guide 8.37, *ALARA Levels for Effluents from Materials Facilities* (NRC, 1993).

Features of the ALARA Program include:

- Management commitment, demonstrated through a written policy statement, procedures, other directives and periodic management reviews.
- Formal program audits, conducted on at least an annual basis.

- Well-supervised and defined radiation protection capability, including appropriate supervisors and technicians. All personnel on site have the authority to stop work as needed to ensure appropriate safety precautions are observed.
- Appropriate training for the workforce, including training consistent with the requirements of 10 CFR 19.12 (CFR, 2008i) and incorporating appropriate portions of the guidance provided in Regulatory Guides 8.13 (NRC, 1999) and 8.29 (NRC, 1996)
- Appropriate authority vested in radiation protection personnel including stop work authority
- Consideration of the need for plant modifications as warranted for reducing exposures and doses to personnel

Documented RPP policies are implemented to ensure the ALARA goal is met. Procedures incorporate the ALARA philosophy into routine operations and ensure exposures are maintained below 10 CFR 20.1101 limits (CFR, 2008e). As discussed in Section 4.7, Radiation Surveys and Monitoring Program Commitments, RCAs will be established within the facility. These areas are identified through signs, ropes, gates, fences, or other visible means. Each zone will have specific entry requirements, survey requirements, and dosimetry requirements. The establishment of these areas supports the ALARA commitment to minimize the spread of contamination and reduce unnecessary exposure of personnel to radiation.

4.2.1 ALARA Policies and Procedures

To ensure occupational doses are maintained ALARA, work activity restrictions are imposed when an individual's exposure exceeds 80% of the applicable 10 CFR 20.1201 limit (CFR, 2008h).

Doses to declared pregnant workers are maintained below the regulatory limit specified in 10 CFR 20.1208, *Dose Equivalent to an Embryo/Fetus* (CFR, 2008j), and are maintained ALARA. Female employees are advised of the RPP policy for declared pregnant workers during basic radiation safety training. The policy for occupational exposures to declared pregnant workers is consistent with the guidance in Regulatory Guide 8.13 (NRC, 1999).

Approved written procedures dictate atmospheric releases to be monitored and measured. Doses to the public are calculated to ensure compliance with the requirements of 10 CFR 20.1101(d) (CFR, 2008e). Numerous controls exist to ensure public exposure resulting from operations remains below limits specified in 10 CFR 20.1301, *Radiation Dose Limits for Individual Members of the Public* (CFR, 2008k). See Chapter 9, Environmental Protection, for further information regarding implemented measures to keep public doses ALARA.

4.2.2 ALARA Goals

In accordance with 10 CFR 20.1101 (CFR, 2008e), the RPP is designed to achieve occupational and public doses that are ALARA. The Radiation Protection Manager is responsible for the implementation of the ALARA Program. The ALARA Committee provides oversight of the RPP as described in Section 4.2.3, ALARA Committee. In order to keep exposures ALARA, the following principles guide the RPP:

- Radiation exposures and the release of radioactive effluents shall be monitored.
- Individual exposures shall be controlled to less than applicable regulatory limits.

Specific goals of the ALARA Program include maintaining occupational exposures, as well as environmental releases, as far below regulatory limits as is reasonably achievable. The ALARA concept is also incorporated into the design and operation of the facility. The size and number of areas with higher dose rates are minimal. Per approved written procedures, the time spent in these areas is controlled and projects are evaluated to ensure workers receive the minimum exposure. Areas where personnel spend significant amounts of time are designed to maintain the lowest dose rates reasonably achievable.

The RPM is responsible for implementing the ALARA Program and ensuring that adequate resources are committed to make the program effective. The RPM ensures that an annual ALARA Program evaluation report is prepared and submitted to the COO/Plant Manger and the ALARA Committee. The report reviews the following:

- Radiological exposure and effluent release data for trends
- Audits and inspections
- Use, maintenance, and surveillance of equipment used for controlling exposures and effluents.
- Other issues, as appropriate, that may influence the effectiveness of the RPP and ALARA Program

4.2.3 ALARA Committee

The IIFP ALARA Committee is a part of the overall FSRC. The ALARA Committee consists of key members of plant management, supervision, and the workforce and will meet periodically on a frequency established in the RPP ALARA Program. The ALARA Committee uses the guidance provided in Regulatory Guides 8.10 (NRC, 1977) and 8.37 (NRC, 1993) for formulating plant operating philosophy in reducing exposures. Membership of the ALARA Committee includes:

- The COO/Plant Manger,
- The Radiation Protection Manager
- Selected department managers,
- The ESH Manager,
- Selected supervisors and hourly personnel.

The ALARA Program facilitates interaction between radiation protection and operations personnel. The ALARA Committee, comprising staff members responsible for radiation protection and operations personnel, including hourly workers, is utilized in achieving this goal.

The scope of the ALARA Committee's activities include at a minimum annual review of the following:

- Reviewing site radiological operating performance including trends in airborne concentrations, personnel exposures, and environmental monitoring results;
- Reviewing operations and exposure records to determine where exposures may be reduced;
- Reviewing employee training, and methods for utilizing information on-the-job to keep exposure ALARA; and
- Reviewing potential modifications of procedures and equipment when changes will reduce exposure at reasonable cost.

In addition, the ALARA committee reviews major changes in authorized activities affecting radiation protection practices and evaluate contamination minimization and/or removal activities.

The proceedings, findings, and recommendations of the ALARA Committee are reported in writing to the COO/Plant Manger and appropriate line management and area managers responsible for operations reviewed by the committee. Such reports are retained for a minimum of three (3) years. Based upon expected improvement, updated performance data, economics, and consideration of other site priorities, management decides which of the ALARA Committee recommendations will be pursued. If a specific recommendation is pursued, a task owner is assigned and the action is tracked to completion.

4.3 Organization and Personnel Qualifications

The Radiation Protection staff is assigned responsibility for implementation of the Radiation Protection Program functions. Only suitably trained radiation protection personnel are employed at the facility. Staffing is consistent with the guidance provided in Regulatory Guides 8.2 (NRC, 1973) and 8.10 (NRC, 1977). The qualifications for the staff positions are described in Chapter 2 of the IIFP LA.

The RPM reports directly to the ESH Manager and has the responsibility for establishing and implementing the RPP. These duties include the training of personnel in use of equipment, control of radiation exposure of personnel, continuing evaluation and determination of the radiological status of the facility, and conducting the radiological environmental monitoring program. The facility organization chart establishes clear organizational relationships among the radiation protection staff and the other facility line managers. The facility organization is shown in Figure 4-1.

In matters involving radiological protection, the Radiation Protection Manager has responsibility and authority to elevate any radiation safety or environmental issue to the COO/Plant Manger. The RPM is skilled in the interpretation of radiation protection data and regulations and is familiar with the operation of the facility and radiation protection concerns relevant to the facility. The Radiation Protection Manager is a resource for radiation safety management decisions.

Radiation Protection Technicians, engineers, and supervisors perform the functions of assisting and guiding workers in radiological aspects of the job. These individuals have the responsibility and authority to stop work or mitigate the effect of an activity if it is suspected that the initiation or continues performance of a job, evaluation, or test will result in the violation of approved RP requirements.

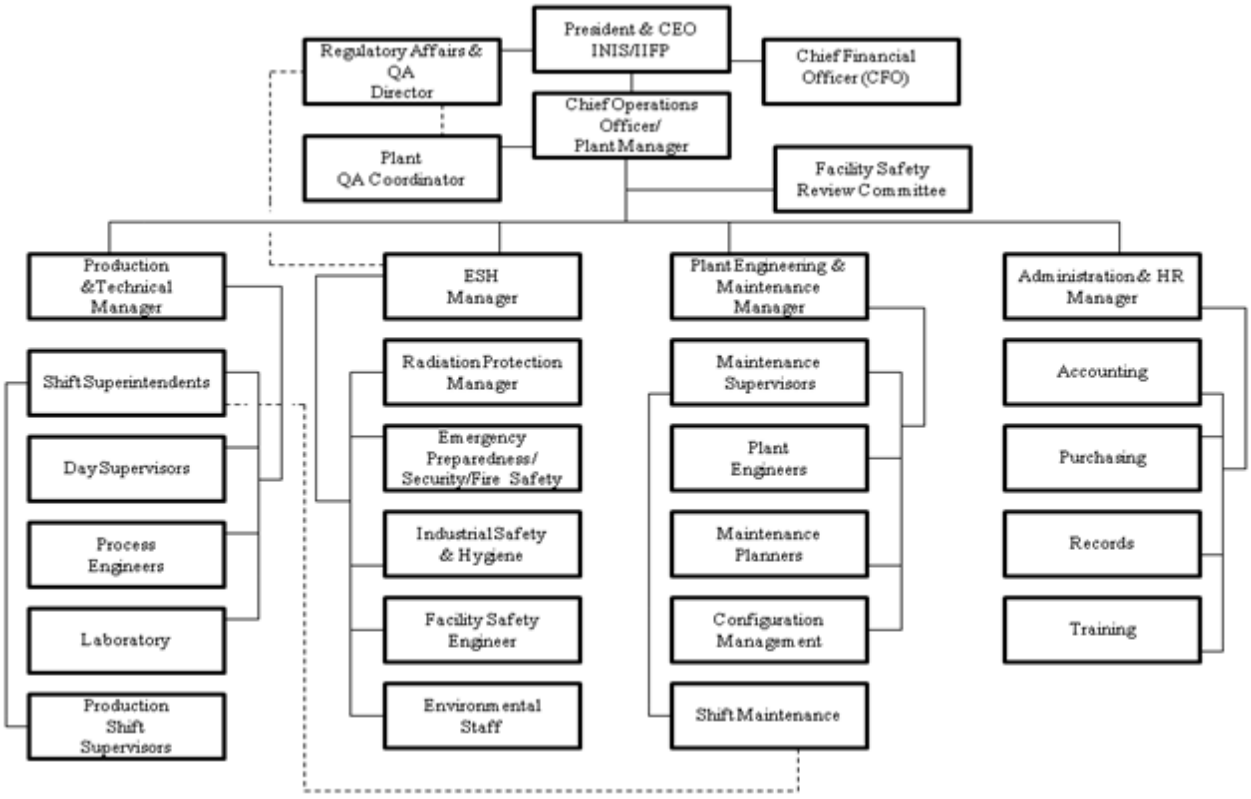


Figure 4-1 IIFP Operations Organization

4.4 Commitment to Written Procedures

Operations at IIFP involving licensed materials are conducted through the use of approved written procedures. Radiation protection procedures are prepared, reviewed, and approved to carry out activities related to the RPP. Approved written procedures are used to control radiation protection activities in order to ensure that the activities are implemented in a safe, effective, and consistent manner. Radiation protection procedures are reviewed and revised, as necessary, to incorporate facility or operational changes or changes to the ISA.

The radiation protection staff prepares draft procedures that are reviewed by affected personnel to ensure the procedures are appropriate and reasonable to implement. The Radiation Protection Manager (or designee) reviews and approves final radiation protection procedures, as well as proposed revisions to radiation protection procedures. Chapter 11, Management Measures, of the IIFP LA provides additional information on IIFP procedures.

4.4.1 Radiation Work Permit Procedures

Routine work involving licensed materials is administered by the use of approved written practices and procedures as described in Chapter 11, Management Measures. Non-routine activities, particularly those performed by non-IIFP employees generally not covered by approved written procedures, are administered by the Radiation Work Permit (RWP) system. The RWP provides a description of the work to be performed defining the authorized activities. The RWP specifies the necessary radiation safety controls, as appropriate, to include personnel monitoring devices, attendance of radiation protection staff,

protective clothing, respiratory protective equipment, special air sampling, and additional precautionary measures to be taken. The RWP also contains a description of the radiological conditions in the immediate work area covered by the RWP. The RWP requires approval by the Radiation Protection Manager or designee. The designee must meet the qualification requirements of Radiation Protection Manager. RWPs have a predetermined period of validity with a specified expiration or termination time. Standing RWPs may be issued for routinely performed activities, such as tours of the plant.

Prior to commencing work that requires an RWP, employees performing the job must review the RWP and document their review. Work is monitored, as required, by a radiation protection technician. RWPs are available to workers for re-review at any time and include expiration dates. A radiation protection technician or the RPM (or designee) reviews the status of issued RWPs on a periodic basis. RWPs are closed when the applicable work activity for which it is written is complete and terminated. A copy of RWPs and any associated records are kept for the life of the facility.

4.5 Training Commitments

The design and implementation of the radiation protection training program complies with the requirements of 10 CFR 19.12 (CFR, 2008i). Records are maintained in accordance with 10 CFR 20.2110 (CFR, 2008l). The development and implementation of the radiation safety training program is consistent with the applicable guidance provided in the following regulatory guidance documents:

- Regulatory Guide 8.10, *Operation Philosophy for Maintaining Occupational Radiation Exposures As Low As is Reasonably Achievable* (NRC, 1977)
- Regulatory Guide 8.13, *Instructions Concerning Prenatal Radiation Exposure* (NRC, 1999)
- Regulatory Guide 8.29, *Instructions Concerning Risks from Occupational Radiation Exposure* (NRC, 1996)
- ASTM C986-89, *Developing Training Programs in the Nuclear Fuel Cycle* (ASTM, ASTM C986-89, 1989)
- ASTM E1168-95, *Radiological Protection Training for Nuclear Facility Workers* (ASTM, 1995)

4.5.1 Training of Personnel and Visitors

Training programs are established for various job functions commensurate with radiation protection responsibilities. Visitors to restricted areas are either trained in the formal radiation protection training program or are given a general training session regarding radioactive materials in the workplace and are escorted by trained personnel.

The periodicity of refresher training required by a worker is dependent on the worker's responsibilities; however, the basic refresher training occurs annually (not to exceed 15 months) and includes an exam. Training requirements are documented and tracked for employees. Training records are managed and stored in accordance with 10 CFR 20.2110 (CFR, 2008l).

4.5.2 Level of Training

The level of radiation protection training is based on the potential radiological health risks associated with an employee's work responsibilities and incorporates the provisions of 10 CFR 19.12 (CFR, 2008i). In accordance with 10 CFR 19.12(a) (CFR, 2008i) any individual working at the facility likely to receive, in one (1) year, an occupational dose in excess of 1 mSv (100 mrem) is:

- Informed of the storage, transfer, or use of radioactive material;
- Instructed in health protection issues associated with exposure to radiation and radioactive material, precautions or procedures to minimize exposure, and the purposes and functions of protective devices employed;
- Required to observe, to the extent within the worker's control, the applicable provisions of the NRC regulations and licenses for protection of personnel from exposure to radiation and radioactive material;
- Instructed of their responsibility to promptly report to management any condition that may lead to or cause a violation of NRC regulations and licenses, or result in unnecessary exposure to radiation and radioactive material;
- Instructed on the appropriate response to warnings made in the event of any unusual occurrence or malfunction that may involve exposure to radiation and radioactive material; and
- Advised of the various notifications and reports that a worker may request pursuant to 10 CFR 19.13 (CFR, 2008m), *Notifications and Reports to Individuals*.

In accordance with 10 CFR 19.12(b) (CFR, 2008i), when determining if a worker is likely to receive 1 mSv (100 mrem), management considers the worker's assigned activities during normal and abnormal situations. The instructions provided to the worker, as described above, are commensurate with potential radiological conditions present in the workplace.

The RPM is responsible for establishing and maintaining the radiation safety training for all personnel, including contractor personnel who may be working at the facility. Records are maintained for each employee documenting the training date, scope of training, identity of the trainer, any test results and other associated information.

4.5.3 Radiation Safety Training

The Radiation Safety Training complies with 10 CFR 19.12 (CFR, 2008i) and 10 CFR 20.2110 (CFR, 2008l) requirements and takes into consideration a worker's normally assigned work activities. The following topics are covered during basic Radiation Safety Training:

- Radiation safety principles, policies, and procedures;
- Radiation hazards and health risks;
- Correct handling of radioactive materials;
- Location of and adherence to RPP procedures;
- Minimization of exposures to radiation and radioactive materials;
- Contamination control;
- Access and egress controls;
- Monitoring for internal and external exposures;
- ALARA and exposure limits;
- Exposure monitoring methods and instrumentation;
- Personal and area dosimetry;
- Donning and doffing of personal protective equipment (PPE); and
- Emergency response.

4.5.4 Review of Radiation Protection Safety Training Program

The contents of the Radiation Safety Training Program are reviewed bi-annually by the RPM. The review addresses changes in policies, procedures, and requirements, and changes to the ISA.

4.6 Ventilation and Respiratory Protection Programs

In accordance with the regulations in 10 CFR 20, Subpart H, *Respiratory Protection and Controls to Restrict Internal Exposure in Restricted Areas* (CFR, 2008n),control of the release of radiation or radioactive materials is a fundamental requirement for facility and equipment design for areas in which uranium and other sources of radiation are handled or used in processes. The following section describes the design and management measures taken to ensure that the installed ventilation and containment systems operate effectively. The section also describes the worker respiratory protection program.

4.6.1 Ventilation Program

The confinement of uranium is a design requirement for the facility. The internal radiation exposure of workers is controlled primarily by the containment of depleted uranium compounds within the respective process equipment.

Areas where uranium is processed that have potential of producing dusts, mists or fumes containing uranium, and other areas where toxic chemicals are processed or produced, are provided with dust collection and/or scrubber systems to protect employees and the environment at exposure levels that are ALARA.

4.6.1.1 Description of Building Ventilation and Process Vents

In the production of DUF_4, a feed supply of DUF_6 is reacted with gaseous hydrogen in a reaction vessel to produce the DUF_4 and gaseous AHF. The solid particulate DUF_4 exits the bottom of the reaction vessel and is sent to temporary storage vessels for later use in the production of fluoride gas products. The off-gas from the reaction vessel primarily contains: 1) AHF with some small quantities of un-reacted gaseous hydrogen, 2) small quantities of particulate DUF_4 entrained in the gas stream, and 3) potential traces of un-reacted DUF_6. The off-gas stream passes through set of high-efficiency filters to remove entrained particles of DUF_4 from the gas stream. The filtered gas stream then flows through a series of carbon-filled bed filters (absorbers) designed to remove DUF_6 and any carryover of DUF_4. The off-gas flow exits the carbon-bed filter system, and in the next step, the gaseous AHF by-product is removed by a two-stage condensing process. The collected liquid AHF is drained to temporary storage tanks, located within a containment-type building, where the AHF later can be loaded into approved truck trailers and shipped to customers. The residual off-gas stream exits the AHF condensing system and is passed through a gas-fired burner system to combust excess hydrogen. The gas stream then flows through the a three-stage potassium hydroxide (KOH) scrubbing system for final treatment.

In the Plant KOH Scrubbing System, the final off- gas stream is contacted with KOH solution in a series of steps where essentially all of the remaining fluoride-bearing components are removed prior to venting to the atmosphere through a stack. The Plant KOH Scrubbing System is utilized to treat final off-gas streams from both the DUF_4 production process (DUF_6 to DUF_4) and the fluoride gas products (fluorine extraction process, FEP). The three-stage KOH scrubbing system is designed for removing fluoride bearing components in the gas streams at efficiencies of greater than 80%, 95% and 95% for the first, second and third stages, respectively. The overall system removal efficiency for normal operations is

designed at greater than 99.9 %. The plant KOH scrubbing system stack is continuously sampled to measure for traces of fluorides or uranium in the vent gas.

The Plant KOH Scrubbing System solution is recycled within each of the scrubbers until the concentration of KOH needs replenishment. The KOH solution concentration is maintained at a safe margin to ensure it effectively reacts (scrubs) with fluoride components in the gas stream. The spent scrubbing solution, containing potassium fluoride (KF), water and some excess KOH is pumped to the EPP where the solution is treated with lime ($CaOH_2$) to form solid particulate calcium fluoride (CaF_2) and regenerated KOH. The resulting products are filtered and the CaF_2 is dried and prepared for shipment to customers or to a licensed Resource Conservation and Recovery Act (RCRA) disposal facility. Representative samples of dried CaF_2 ready for shipment are analyzed for uranium prior to leaving the plant. The KOH liquor is regenerated at a concentration suitable for pumping back to the Plant KOH Scrubbing System for reuse.

In areas where uranium particulate solids are handled or processed, dust capture and collection systems are provided. The two-stage dust collection systems are filter-type dust collectors that are used to remove the uranium-bearing particulates prior to discharging the air flow through a vent stack to the atmosphere. Equipment where uranium bearing powders are handled or stored, such as storage hoppers and enclosed drum packaging stations, are connected to the dust collection intake header ducts. Uranium particulates (powders) captured by the dust collection systems are either recycled back into the respective process operations or packaged and sent to a licensed off-site disposal facility.

Sampling and analysis is routinely conducted for uranium is between each of the dust collector units. If an unacceptable level of uranium carryover is detected on any given bag-house unit, the unit is removed from on-stream service, investigated and corrective action taken, accordingly. Additionally, each dust collector is continuously monitored for differential pressure across the filter bag sections to ensure bag design integrity is maintained. Descriptions of shut-down features are provided in the IIFP ISA Summary Section 3.1.

The fluoride products process (FEP) is located in a building separate from the DUF_4 production process. DUF_4 powder is conveyed through contained piping to the FEP building where it is pre-mixed and reacted with either SiO_2 or boron oxide (B_2O_3) to produce the SiF_4 or BF_3 gas products, respectively.

In the SiF_4 process, the DUF_4 and SiO_2 are mixed in the desired ratios and fed directly to a rotary calciner. Two flow streams exit the rotary calciner and are described as follows:

- One flow stream is the product off-gas that contains some vapors of HF and fluorosilic acid, and potential traces of entrained particulate uranium oxides or fluorides. This off-gas stream flows through high-efficiency metal filters to remove uranium bearing particles. Subsequently, the relatively small quantities of HF and fluorosilic acid vapors are removed from the off-gas flow by cooling in a a pre-condenser system. The collected HF is sent to the Plant KOH Scrubbing System where it is treated in the plant scrubbing system as described above. After removal of the HF and fluorosilic acid impurities, the residual fluoride product gas stream passes through a set of cold trap heat exchanger vessels operating at cryogenic temperatures. The gaseous fluoride product solidifies in the cold trap. The final off-gas stream containing non-condensable gases and trace quantities of fluoride gases then flows to the Plant KOH Scrubbing System where it also is treated as described above.

- The second flow stream exiting the rotary calciner is the resulting waste uranium oxide particulate solids that discharge from rotary calciner. This waste stream is conveyed via enclosed cooling screw equipment to temporary storage to be later packaged and shipped to an off-site licensed disposal facility.

For the BF_3 process, there is an additional step required of pre-heating the mixture of DUF_4 and B_2O_3 before it is fed to the rotary calciner for reacting to produce the BF_3 gas. In the pre-heating step, the mixture passes through a pre-heater reaction vessel that is maintained at a temperature to cause moisture in the mixed powder to react with small amounts of the DUF_4 resulting in HF vapors and uranium oxide solid particles being produced. The pre-heater reaction vessel off-gas contains some nitrogen purge gas, the HF vapors and traces of particulate DUF_4 or uranium oxides that may become entrained in the off-gas stream. The stream passes through a set of high-efficiency filters to remove the uranium component particulates. It then flows to the Plant KOH Scrubbing System for final treatment as described above for the plant scrubbing system. The resulting pre-heated solid particle materials discharge directly from the pre-heater reaction vessel to the inlet of the BF_3 production rotary calciner where the remainder of the process materials and components flows through equipment and is processed as described in the SiF_4 process. Final treatment of the BF_3 process off-gases is accomplished in the Plant KOH Scrubbing System by the same method as the SiF_4 process.

The equipment that handles or stores solid particulate uranium compounds within the fluoride products process building, for both the SiF_4 and BF_3 processes, is connected to its own two-stage dust collector system that removes uranium prior to venting to the atmosphere.

Ventilation systems for the various buildings control the temperature and the humidity of the air inside the building. The general ventilation systems used in areas where uranium is processed or handled consists of a series of fresh-air intakes and a series of roof exhaust fans.

The DUF_6 feed cylinder autoclaves provide secondary containment in event of leakage of a heated DUF_6 cylinder or pigtail connection. The autoclave area is separated from the other processes by a fire barrier wall, and has its own separate building ventilation intakes and roof exhaust fans. Fluoride and radiation detection monitors and alarms are strategically located within the Autoclave and DUF_4 Buildings.

The AHF, SiF_4 and BF_3 final products are chemically separated from licensed materials and physically located separate from licensed materials. (Refer to Chapters 1and the ISA Summary, Section 3.1 for more detailed description of the AHF storage and the AHF, SiF_4 and BF_3 trailer loading systems). Ventilation intakes and exhausts of the AHF Staging Containment Building and the Fluoride Products Trailer Loading Building storage have fluoride detectors and a water spray deluge system and engineered controls which close the ventilation and activate a gas knock-down spray of water in event of fluoride-detector activation in the affected area. The two containment-type buildings are not totally leak tight, but are designed to inhibit and suppress releases to the environment in event of a leak or spill.

Process area Control Rooms that are routinely occupied by workers have environments maintained for comfort and safety. All control rooms located in process areas, where uranium or hazardous chemicals are processed, stored or handled, have separate heating, ventilation and air conditioning (HVAC) systems. The Control Rooms are maintained at a slight positive pressure with dual fresh air intakes located at safe distances from process vent stacks, exhaust fans or equipment containing hazardous chemicals.

The plant laboratory hoods that are used in handling of uranium-bearing materials are checked monthly and adjusted as needed to assure the adequate face velocity per manufacturer's recommendations.

Non-uranium process buildings where hazardous materials are handled, stored, or packaged, have separate ventilation systems with their own fresh-air intakes and roof-exhaust fans. Enclosed hoods are located in SiF_4 and BF_3 small cylinder packaging area to capture the gases in event of a leak. Additionally, area fluoride detectors and engineered controls are located in the fluoride gas packaging areas. The controls provide for closing the area ventilation systems, and evacuating leaks or releases of hazardous gases to an emergency KOH scrubbing system. The treated gas exiting the emergency scrubber then flows to the SiF_4 venturi scrubber and enters the Plant KOH Scrubbing System where the gas stream undergoes further treatment. In the event of activation, the spent KOH scrubbing liquors, resulting from scrubbing of hood ventilation, are sent to the EPP for treatment as described above for the Plant KOH Scrubbing System.

4.6.1.2 Management Measures for Ventilation Systems

The ventilation program, radiation detectors/alarms, process vents, and associated containment systems are checked routinely as part of the operating process controls and preventive maintenance program. Operations and maintenance relative to the ventilation program including calibrations, change management, measurements and analysis are performed using approved written procedures. The procedure system is described in the IIFP LA Chapter 11. Management measures that pertain to preventive and corrective maintenance are described in the IIFP LA Chapter 11; Section 2, Maintenance.

4.6.1.3 Design Criteria for Ventilation Systems

Engineered controls and redundancy are integrated into the design of ventilation systems. Normal operation of the facility does not result in a discharge of radioactive materials that exceeds regulatory limits. Ventilation systems for areas that do not have the potential for contamination are not monitored for radioactivity because radioactive materials are not handled or processed in those areas.

Design requirements for the Plant KOH Scrubbing System provide for a safety margin between normal and abnormal operation. The margin is provided so that in event of abnormally higher concentrations or mass flows of the off-gas, the scrubbing system can effectively handle the operational deviations until such time that engineered controls can either correct or shut down the abnormal operation.

The dust collection system for the DUF_4 process is designed with a primary dust collector followed by a secondary dust collector. Sampling and analysis are routinely performed between the primary and secondary dust collectors and in the vent after the secondary dust collector discharge. Pressure differential across each dust collector is measured, monitored with alarm notification in the Control Room if the differential pressure deviates outside the set administrative control limits. If differential pressures indicate open bags simultaneously on both of the two stage dust collectors, the dust collectors and equipment served by the respective dust collectors are shut down until investigated and corrections made if needed.

The design efficiency of bag-house dust collectors is greater than 95% for each collector. At least two components are used in series to ensure an overall system efficiency of greater than 99.5% in the collection and removal of particulate uranium from the vented process gas.

Design- rated efficiency criteria for uranium particulate dust collection components and process vent off-gas scrubbers are provided in Table 4-1.

Table 4-1 Design Criteria for Vent Off-gas Treatment Equipment

Component	Design Efficiency	Comments
DUF_4 dust collector	>95% particulates	Applies to all primary, secondary and redundant units
FEP uranium oxide dust collector	>95% particulates	Applies to all primary, secondary and redundant units
DUF_4 vacuum cleaner cyclone	>80% particulates	Cyclone discharges to DUF_4 vacuum cleaner dust collector
FEP uranium oxide vacuum cleaner cyclone	>80% particulates	Cyclone discharges to oxide vacuum cleaner
DUF_4 vacuum cleaner dust collector	>95% particulates	Discharges to inlet of DUF_4 secondary dust collector dust collector
FEP uranium oxide vacuum cleaner dust collector	>95% particulates	Discharges to inlet of FEP uranium oxide secondary dust collector dust collector
DUF_4 primary filter	>95% particulates	Removes entrained particulates from the DUF_4 to DUF_6 reactor vessel off-gas
DUF_4 secondary filter	>95% particulates	Removes entrained particulates that may pass through the DUF_4 primary filter
SiF_4 primary filter	>95% particulates	Removes entrained particulates from the SiF_4 rotary calciner off-gas
SiF_4 secondary filter	>95% particulates	Removes entrained particulates that may pass through the SiF_4 primary filter
BF_3 pre-heater primary filter	>95% particulates	Removes entrained particles from the BF_3 pre-heater vessel off-gas
BF_3 pre-heater secondary filter	>95% particulates	Removes entrained particles that may pass through the BF_3 pre-heater primary filter
BF_3 primary filter	>95% particulates	Removes entrained particles from the BF_3 rotary calciner off-gas
BF_3 secondary filter	>95% particulates	Removes entrained particles that may pass through the BF_3 primary filter
FEP oxide vacuum clean dust collector	>95% particulates	Discharges to inlet of FEP oxide secondary dust collector
KOH venturi scrubber	>80% gaseous and particulates	Receives vent gas from DUF_4 and FEP process off-gas system. Exit gas of venturi discharges to packed tower scrubber
KOH packed tower scrubber	>95% gaseous	Second stage system. Exit gas discharges to coke box system

Component	Design Efficiency	Comments
KOH coke box scrubber	99% gaseous	Discharges to atmosphere through plant KOH scrubbing system vent stack
DUF_4 off-gas primary carbon bed	>90% gaseous and particulate uranium	Absorbs UF_6 gas and filters traces of DUF_4
DUF_4 off-gas secondary carbon bed	>95% gaseous uranium	Absorbs UF_6 trace gas that may pass through primary carbon bed
DUF_4 off-gas tertiary carbon bed	>95% gaseous uranium	Absorbs final traces of UF_6 that may pass through the secondary carbon bed and provides added margin of safety in removing gaseous uranium
DUF_4 Hydrogen burner	>99% hydrogen burned	Gas-fired burner to combust excess hydrogen from DUF_6 to DUF_4 reaction vessel off-gas
FEP hood vent system emergency KOH scrubber	>95% gaseous fluoride	Treated gas from emergency scrubber exits to SiF_4 venturi scrubber in the plant KOH scrubbing system for further and final treatment

Design of building ventilation systems in process areas and control rooms are sized with adequate flows and pressure differentials for comfort and to ensure potential airborne concentrations of radioactivity do not exceed the derived air concentration (DAC) values specified by the International Commission on Radiological Protection (ICRP)-68 (ICRP, 1995).

4.6.1.4 Testing of Ventilation Systems

Several measures are in place to ensure effective operation of the ventilation control systems. Differential pressure is monitored and alarmed for High Efficiency Particulate Air (HEPA) filters used for Control Rooms where uranium is processed. Operating procedures specify limits and set points on differential pressure consistent with manufacturer's recommendations. Filters are changed if they fail to function properly or if the differential pressure exceeds the manufacturer's ratings.

Dust collector dust collector units in the DUF_4 and FEP processes are monitored and alarmed for differential pressure. Operating procedures specify limits and set points for acceptable differential pressures and uranium sample results. Operating procedures also specify that at least two dust collector units shall be operated in series or otherwise the process system being serviced by the dust collectors must be placed in a shut down or standby mode.

Filter and dust collector inspection, testing, maintenance, and change out criteria are specified in written procedures approved by Plant Engineering /Maintenance Manager and the RPMM, or designated alternates. Change-out frequency is based on considerations of filter loading, operating experience, differential pressure data and any monitoring data that exceeds set administrative control limits.

Pressures are continuously monitored and controlled for the plant off-gas scrubbing system and across the process system that is being vented to the scrubbing system. Limits are set to ensure adequate safety margin of pressure controls for the vent gas plant scrubbing system. Operation procedures and operator aids also provide for corrective response when alarms are received relative to the system pressure controls.

Air flow rates at exhausted enclosures and close-capture points related to uranium processing and handling areas, when in use, are adequate to preclude escape of airborne uranium and minimize potential for intake by workers. Air flow rates are checked routinely when in use and after modification of any hood, exhausted enclosure, close-capture point equipment or ventilation system serving these barriers.

4.6.2 Respiratory Protection Program

The Respiratory Protection Program is a subset of the RPP and is conducted in accordance with 10 CFR 20, Subpart H (CFR, 2008n) In accordance with 10 CFR 20.1703(c)(1-2), *Use of Individual Respiratory Protection Equipment* (CFR, 2008o) the Respiratory Protection Program includes air sampling to identify potential hazards, permit proper equipment selection, and estimate occupational doses. Surveys and bioassays are also performed, as necessary, to evaluate potential or actual intakes. The Respiratory Protection Program is consistent with the guidance in Regulatory Guide 8.15, *Acceptable Programs for Respiratory Protection* (NRC, 1999).

4.6.2.1 Respiratory Protection Requirements; 10 CFR 20, Subpart H

In accordance with 10 CFR 20.1701 (CFR, 2008p), the IIFP facility is designed and operated to use, to the maximum extent practical, process and engineering controls to minimize the concentration of radioactive material in air. In accordance with 10 CFR 20.1702(a), *Use of Other Controls* (CFR, 2008q), when it is not practical to apply process or other engineering controls, ALARA principles to include access control to the affected area, limitations on exposure times, and use of respiratory protection equipment are applied. In accordance with 10 CFR 20.1703(a) (CFR, 2008o), respiratory protection equipment specifically tested and certified by the National Institute for Occupational Safety and Health (NIOSH) is used.

4.6.2.2 Procedures for Using Respiratory Protection Equipment

In accordance with 10 CFR 20.1703(c) (4) (CFR, 2008o), approved written procedures dictate the following:

- Monitoring, including air sampling and bioassays,
- Supervision and training of respiratory users,
- Fit testing of respirators,
- Respirator selection,
- Breathing air quality,
- Inventory and control of respirators,
- Cleaning of respirators,
- Storage, issuance, maintenance, repair, testing, and quality assurance of respiratory protection equipment,
- Recordkeeping, and
- Limitations on respirator use and relief from respirator use.

Selection of Respiratory Protection Equipment

In accordance with 10 CFR 20.1702(b) (CFR, 2008q) when performing ALARA analysis to determine if respiratory equipment should be used, other safety factors are considered, including the impact of respiratory protection equipment use on industrial safety and health.

In accordance with 10 CFR 20.1703(e) (CFR, 2008o), consideration is given to the limitations appropriate to the type and mode of respiratory device use. Provisions are made for vision correction, adequate communication, low temperature work environments, and the concurrent use of other safety or RP equipment. Per approved written procedure(s), radiation protection personnel select the appropriate type of respiratory device to be used for activities involving potential exposure to airborne radioactivity.

Fitting of Respiratory Protection Equipment

Approved written procedures describe the proper techniques for performing fit tests. An adequate fit is determined for face-sealing respirators using either a quantitative fit test method or a qualitative method. In accordance with 10 CFR 20.1703(c)(6) (CFR, 2008o), qualitative fit testing is acceptable if: it is capable of verifying a fit factor of 10 times the assigned protection factor (APF) for face pieces operated in a negative pressure mode; or it is capable of verifying a fit factor of less than 100 for face pieces operated in a positive pressure mode. Mask fits are re-evaluated at least annually. Also, in accordance with 10 CFR 20.1703(h) (CFR, 2008o), no objects, materials, or substances, such as facial hair, or any conditions that interfere with the face piece seal or valve function and that are under the control of the respirator wearer, are present between the skin of the wearer's face and the sealing surface of a tight-fitting respirator face piece.

Issuance of Respiratory Protection Equipment

Approved written procedures prescribe the actions to be taken when issuing respiratory protection equipment. In accordance with 10 CFR 20.1703(c)(5) (CFR, 2008o), individuals designated to use respiratory protection equipment are evaluated by Medical Doctor professionals to determine if the individual is medically fit to use respiratory protection devices. Individuals are medically evaluated periodically thereafter in accordance with 29 CFR 1910.134(e) (CFR, 2008r).

Maintenance of Respiratory Protection Equipment

Respiratory protection equipment is cleaned, serviced, tested, and inspected in accordance with the instructions specified by the manufacturer per NIOSH for each respiratory protection device. The IIFP facility is equipped with a suitable location for cleaning and storage of respirators and other reusable PPE. Contaminated items must remain inside the RCA where the items are cleaned until they are successfully decontaminated. Cleaned PPE, such as face shields and respirators that come into contact with the wearer's face, must be inspected after cleaning before reuse. Approved written procedures prescribe the actions to be taken for maintenance of respiratory protection equipment. The liquid waste resulting from cleaning respirators and other reusable PPE is sent to the plant De-contamination Building liquid treatment process for removal of uranium that may be in the cleaning waste liquid.

Testing of Respiratory Protection Equipment

In accordance with 10 CFR 20.1703(c) (3) (CFR, 2008o), respirators are tested for operability (user seal check for face-sealing devices and functional check for others) immediately prior to each use, per the instructions in approved written procedures.

Training on the Use of Respiratory Protection Equipment

If there are no medical restrictions precluding respirator use, the individual is provided respiratory training and fitting by a qualified instructor. Additional training on the use and limitations of self-contained breathing devices is provided to designated individuals, per approved written procedures.

In accordance with 10 CFR 20.1703(d) (CFR, 2008o), each respirator user is advised that he/she may leave the area at any time for relief from respirator use in the event of equipment malfunction, physical or psychological distress, procedural or communication failure, significant deterioration of operating conditions, or any other condition that may require such relief.

Monitoring Areas Requiring Respiratory Protection

In accordance with approved written procedures, an area requiring respiratory protection is monitored by the radiation protection staff for airborne radioactivity in order to estimate the dose to the individual wearing respiratory protection. This monitoring could include air sampling, bioassay, and/or other method(s) deemed appropriate by radiation protection personnel.

Recordkeeping for the Use of Respiratory Protection Equipment

Records regarding the use of respiratory protection equipment are maintained in accordance with approved written procedures and comply with 10 CFR 20, Subpart L, *Records* (CFR, 2008s). The Records Management Program is described in LA Chapter 11.

Revision of Respiratory Protection Procedures

In accordance with the LA Chapter 11, respiratory protection procedures are revised, as needed.

Respiratory Protection Program Records

Records of the RPP (including training for respiratory use and maintenance) are maintained in accordance with the Records Management Program as described in LA Chapter 11.

4.7 Radiation Surveys and Monitoring Programs

Routine radiological surveys and monitoring are conducted at a regular frequency to ensure occupational exposures are ALARA. This includes airborne and surface contamination surveys and personnel dosimetry. The survey and monitoring programs are consistent with the guidance in Regulatory Guide 8.2 (NRC, 1973), Regulatory Guide 8.7, *Instructions for Recording and Reporting Occupational Radiation Exposure Data* (NRC, 2005), and Regulatory Guide 8.9, *Acceptable Concepts, Models, Equations, and Assumptions for a Bioassay Program* (NRC, 1993).

4.7.1 Radiation Surveys and Monitoring Programs Meeting Requirements of 10 CFR 20, Subpart F

In accordance with 10 CFR 20.1501(a) and (b) (CFR, 2008f), IIFP conducts surveys that are necessary to comply with the applicable regulations, and are reasonable to evaluate the magnitude and extent of radiation levels, concentrations, or quantities of radioactive material and the potential radiological hazards. Section 4.7.6, Air Sampling Program, discusses air sampling, and Section 4.7.8, Minimization of Contamination, discusses the Contamination Survey Program.

In accordance with 10 CFR 20.1501(b) (CFR, 2008f), instruments and equipment are calibrated periodically. Section 4.7.12, Equipment and Instrumentation Sensitivity, discusses equipment calibrations.

In accordance with 10 CFR 20.1501(c) (CFR, 2008f), personnel dosimeters are processed by a National Voluntary Laboratory Accreditation Program (NVLAP) accredited vendor. Section 4.7.3, External Occupational Radiation Exposures, discusses external dose and personnel dosimetry.

In accordance with 10 CFR 20.1502 (CFR, 2008g), IIFP monitors exposure to radiation and radioactive material to demonstrate compliance with occupational dose limits. Sections 4.7.3 and 4.7.4 discuss monitoring for external and internal dose, respectively.

4.7.2 Approved Procedures for Radiation Surveys and Monitoring Programs

The approved written procedures include survey and monitoring objectives, sampling procedures and data analysis methods, types of equipment and instrumentation to be used, frequency of measurements, recordkeeping and reporting requirements, and actions to be taken in case measurements exceed administrative or regulatory limits.

4.7.3 External Occupational Radiation Exposures

External occupational dose is measured in accordance with 10 CFR 20.1501(a) (CFR, 2008f). Deep-dose equivalent and shallow-dose equivalent from external sources of radiation are determined by individually assigned dosimeters. Per approved written procedures, personnel dosimeters are distributed to individuals based on their job functions, commensurate with the amount of time an individual spends working with or near radioactive materials. Personnel dosimeters are processed by a NVLAP accredited vendor. The capability exists to process dosimeters expeditiously if there is an indication of an exposure in excess of established action guides. Action guides for external exposures are established in approved written procedures. Work activity restrictions are imposed when an individual's exposure exceeds 80 percent of the applicable 10 CFR 20.1201 (CFR, 2008h) limit.

Any time an administrative limit is exceeded, the RPM is notified. He/she then determines the need for investigation and/or corrective action. When the results of individual monitoring are unavailable or are invalidated by unusual exposure conditions, external exposures may be calculated by the radiation protection staff on the basis of data obtained by investigation.

4.7.4 Internal Occupational Radiation Exposures

The Personnel Monitoring Program is designed and implemented for internal occupational radiation exposures based on the requirements of 10 CFR 20.1201 (CFR, 2008h), 10 CFR 20.1204, *Determination of Internal Exposure* ((CFR, 2008t), 10 CFR 20.1502(b) (CFR, 2008g), and 10 CFR 20.1704(i), *Further*

Restrictions on the Use of Respiratory Protection Equipment (CFR, 2008u). Intakes are assigned to individuals based upon one or more types of measurements as follows: air sampling, urinalysis, and/or in vivo lung counting. The type and frequency of measurement(s) for an individual is determined by their job function. The measurements are commensurate with the amount of time an individual spends working with or near radioactive material. Intakes are converted to committed dose equivalent (CDE) and committed effective dose equivalent (CEDE) for the purposes of limiting and recording occupational doses. Action levels are established in approved written procedures to prevent an individual from exceeding the occupational exposure limits specified in 10 CFR 20.1201 (CFR, 2008h). Work activity restrictions are imposed when an individual's exposure exceeds 80 percent of the 10 CFR 20.1201 (CFR, 2008h) limit. Control actions include temporarily restricting the individual from working in an area containing airborne radioactivity, and actions are taken as necessary to prevent recurrence.

4.7.4.1 Urinalysis Program

The Urinalysis Program is conducted primarily to evaluate the intake of soluble uranium to assure the 10 CFR 20.1201(e) (CFR, 2008h) intake limit of 10 milligram (mg) per week is not exceeded. Personnel assigned to work in areas where soluble airborne uranium compounds are present in concentrations likely to result in intakes in excess of 10 percent of the applicable limits in 10 CFR 20.1201 (CFR, 2008h) are monitored by urinalysis. The minimum sampling frequency for these individuals is specified in approved written procedures. Urinalysis may also be used to monitor individuals involved in non-routine operations, perturbations, or incidents.

Urine sampling frequencies and action levels are established in approved written procedures based on the appropriate bio-kinetic models for the present uranium compounds. Results above the applicable action level are investigated. Work activity restrictions are imposed when an individual's exposure (TEDE) exceeds 80 percent of the occupational dose limit in 10 CFR 20.1201(a) (CFR, 2008h). Exceeding action levels will result in a temporary work restriction for the individual to prevent additional exposure and allow a more accurate assessment of the intake.

4.7.4.2 In Vivo Lung Counting Program

In vivo lung counting frequencies are established for personnel who regularly work in areas where insoluble uranium compounds are processed or handled. Baseline and termination counts are typically performed. Lung counting frequencies are based on individual airborne exposure assignments and prior counting results. The minimum count frequency for individuals with an assigned intake greater than 10 percent of the annual limit intake (ALI) is annually.

Actions are taken based on in vivo lung counting results to ensure the ALI is not exceeded. If the individual's lung count indicates an intake and burden greater than the established action level, the individual is restricted from working in areas containing airborne uranium until such time that investigation and re-counting finds the intake to be below the established limits. Work activity restrictions are imposed if an individual exposure were to exceed 80 percent of the occupational dose limit in 10 CFR 20.1201(d) (CFR, 2008h).

4.7.5 Summation of External and Internal Occupational Radiation Exposures

Per approved written procedures, the summation of external and internal occupational radiation exposure is reported as a TEDE and is calculated in accordance with 10 CFR 20.1202(a)-(d), *Compliance with Requirements for Summation of External and Internal Doses* (CFR, 2008v). The calculation is consistent

with the guidance in Regulatory Guide 8.34, *Monitoring Criteria and Methods to Calculate Occupational Radiation Doses* (NRC, 1992a).

4.7.6 Air Sampling Program

An Air Sampling Program is designed and implemented in areas of the IIFP facility that are identified as potential Airborne Radioactivity Areas. This program includes procedures to conduct air surveys, and to calibrate and maintain radiation protection airborne sampling equipment in accordance with the manufacturers' recommendations.

4.7.7 Control of Airborne Radioactive Material

Air samples are continuously taken from each main process area where airborne concentrations are likely to exceed 0.3 DAC when averaged over 40 hours to assess the concentrations of uranium in the air. Per approved written procedure(s), the air samples are collected in such a way that the concentrations of uranium measured are representative of the air which workers breathe. Air sampling results and individual personnel exposure assignments are monitored by the radiation protection function to evaluate the effectiveness of personnel exposure controls.

Evaluations of air sampling effectiveness are performed in accordance with the methods and acceptance criteria in Regulatory Guide 8.25, *Air Sampling in the Workplace* (NRC, 1992b). Filters from air samplers are changed each shift during normal operating periods, or at more frequent intervals following the detection of an event that may have released airborne uranium, based upon knowledge of the particular circumstances. Filters are not changed as frequently during periods when no work is in progress. The filters are processed to determine the uranium concentration in the air for each area.

Grab samples are obtained during maintenance activities that are known to or have the potential to generate airborne radioactivity levels in excess of 1.0 DAC.

Each air sampler is equipped with a flow meter to indicate flow rate of air sampled. These flow meters are calibrated or replaced every 18 months, at a minimum. Air sampling results in excess of 2.5 DAC (eight hour sample), and not resulting from specific known causes, are investigated to determine the probable cause. Operations or equipment will be shut down and immediate corrective action will be taken at locations where an air samples exceeds 10 DAC without a specific known cause.

In addition to the activities described above, exposure to airborne radioactive material is controlled through limiting access to areas, limiting exposure time, and use of respiratory equipment.

4.7.8 Minimization of Contamination

The IIFP facility is designed and operated in accordance with 10 CFR 20.1406 *Minimization of Contamination* (CFR, 2008w), to minimize contamination, facilitate eventual decommissioning, and minimize, to the extent practicable, the generation of radioactive waste. In addition, minimization of contamination is accomplished through compliance with labeling and packaging requirements in 10 CFR 20.1904, *Labeling Containers* (CFR, 2008x), 10 CFR 20.1905, *Exemptions to Labeling Requirements* (CFR, 2008y), 10 CFR 20.1906, *Procedures for Receiving and Opening Packages* (CFR, 2008z), 10 CFR 20, Subpart K, *Waste Disposal* (CFR, 2008aa) The following are examples of methods for minimizing contamination:

- Containment of radioactive material throughout the facility;
- Monitoring for equipment leaks;
- Training on proper techniques for handling radioactive material; and
- Airflow from areas of low radioactivity to higher radioactivity.

4.7.9 Contamination Survey Program

Routine surveys are performed in areas that are most likely to be contaminated. The radiation protection staff determines survey frequencies, compares the survey results to action guide values as specified in approved written procedures, and ensures the appropriate responses are taken. If the results exceed the action guide values, the Radiation Protection Manager (or designee) is informed, and he/she determines if an investigation and/or corrective actions are necessary.

Protective clothing is provided to persons who are required to enter the RCAs, where the potential for personnel contamination exists as determined by the radiation protection staff. The amount and type of protective clothing required for a specific area or operation is determined by operational experience and the potential for contamination. Available clothing includes caps, hoods, laboratory coats, coveralls, safety glasses, boots, overshoes, shoe covers, rubber and cloth gloves, and safety shoes. The protective clothing is removed in the change rooms upon exit. In the Laboratory Area, where uranium is handled, the minimum protective clothing requirement for entry is a laboratory coat and safety glasses. PPE and anti-contamination clothing is segregated and disposed of in accordance with the following:

Labeled radioactive material bags are provided for placement of disposable PPE; and used disposable PPE, respirator cartridges, and other disposable items are containerized and taken to the Radiological Waste Area.

Radiation protection technicians perform routine contamination surveys in the change rooms, plant exit walkways and the Laboratory Area.

4.7.10 Corrective Action Program for Personnel Contamination

Personnel contamination surveys are required for external contamination on clothing and the body by personnel exiting the change rooms. If contamination is found in excess of background levels, the individual attempts self decontamination (except for facial contamination) at the facilities provided in the change rooms. If decontamination attempts are not successful, or if facial contamination is detected, decontamination assistance is provided by the radiation protection function (typically a radiation protection technician). If skin or personal clothing is still contaminated above background levels, the individual is not permitted to leave the area without the prior approval (per approved written procedure) of the RPM.

4.7.11 Corrective Action Program for Airborne Occupational Exposure

Corrective actions are implemented and documented based on the frequency and magnitude of events causing releases of airborne uranium that exceed administrative limits. Routine air sampling is supplemented by portable air sample surveys as required to evaluate non routine activities or breaches in containment. Radiation protection and operations staff investigates the cause of the release and implement recommended actions to prevent future releases.

4.7.12 Equipment and Instrumentation Sensitivity

Appropriate radiation detection instruments are available in sufficient number to ensure adequate radiation surveillance can be accomplished. Selection criteria for portable and laboratory counting equipment are based on the types of radiation detected, maintenance requirements, ruggedness, interchangeability, and upper and lower limits of detection capabilities.

Portable instrumentation is calibrated in accordance with manufacturing recommendations before initial use, after major maintenance, and on a routine basis following the last calibration. Calibration consists of a performance check on each range scale of the instrument with a radioactive source of known activity traceable to a recognized standard such as the National Institute of Standards and Technology (NIST). Prior to each use, operability checks are performed on monitoring and laboratory counting instruments. The background and efficiency of laboratory counting instruments are determined on a daily basis when in use.

4.7.13 Policies for Removal of Equipment and Materials from Radiological Controlled Areas

When removing equipment and materials from RCAs, the guidance contained in Branch Technical Position, *Guidelines for Decontamination of Facilities and Equipment Prior to Release for Unrestricted Use or Termination of Licenses for Byproduct, Source, or Special Nuclear Material* (NRC, 1993b) and ANSI/HPS N13.12 1999, *Surface and Volume Radioactivity Standards for Clearance* (ANSI, 1999) are followed. Per approved written procedure(s), the radiation protection staff has to approve release of equipment and/or materials from RCAs.

4.7.14 Sealed Sources

When not in use, sources shall be stored in a closed container adequately designed and constructed to contain radioactive material that may otherwise be released during storage. The sources shall be tested for leakage in accordance with ISO 2919:1999, *Radiation Protection – Sealed Radioactive Sources – General Requirements and Classifications* (ISO, 1999)

4.7.15 Access Control

Access control is accomplished through compliance with the requirements in 10 CFR 20.1601(a)-(c), *Control of Access to High Radiation Areas* (CFR, 2008bb) and 10 CFR 20.1602, *Control of Access to Very High Radiation Areas* (CFR, 2008cc). For most RCAs, routine access points are established through change rooms. Each change room includes a step off area provided between the contamination controlled and non controlled areas. Instructions controlling entry and exit from RCAs are posted at the entry points. Survey meters are provided in the step off area of each change room for use by personnel leaving the RCA. Posted instructions address the use of the survey meters, donning and doffing protective clothing, and appropriate decontamination methods. Alternate access points to RCAs are established for specific activities not accommodated by the change rooms. Such access is governed by approved written procedures or RWPs, which establish controls to prevent the spread of contamination to non controlled areas.

RCA that may pose a risk to employees are identified and posted in compliance with the requirements in 10 CFR 20.1901, *Caution Signs* (CFR, 2008dd), 10 CFR 20.1902, *Posting Requirements* (CFR, 2008ee), and 10 CFR 20.1903, *Exceptions to Posting Requirements* (CFR, 2008ff). Access to these areas is controlled so that only appropriately trained individuals are allowed entry. Signs are regularly inspected

for conformance. The following areas are identified and posted if applicable in accordance with definitions provided in 10 CFR 20.1003 (CFR, 2008gg)

- Radiation Area,
- High Radiation Area, (unlikely to have but a sealed calibration source may require)
- Airborne Radioactivity Area, and
- Radioactive Material Area.

In addition, contamination areas are posted in accordance with approved written procedures. Signs are posted at the entry points of areas requiring protective clothing. Radiation safety training and approved written procedures instruct employees on requirements for entering and working in posted areas.

4.7.16 Radiation Reporting Program

A Radiation Reporting Program is established to maintain records of the RP Program, radiation survey results, corrective action program referrals, RWPs, and planned special exposures. The Radiation Reporting Program is consistent with the guidance in Regulatory Guide 8.7 (NRC, 2005).

The Radiation Reporting Program commits to report, to the NRC, any event resulting in an occupational exposure to radiation exceeding the dose limits in 10 CFR 20.1201 (CFR, 2008h), within the time specified in 10 CFR 20.2202, *Notification of Incidents* (CFR, 2008hh), 10 CFR 30.50, *Reporting Requirements* (CFR, 2008ii), 10 CFR 40.60, *Reporting Requirements* (CFR, 2008jj), and 10 CFR 70.74, *Additional Reporting Requirements* (CFR, 2008kk). The Radiation Reporting Program also commits to prepare and submit, to the NRC, an annual report of individual monitoring results, as required by 10 CFR 20.2206(b), *Reports of Individual Monitoring* (CFR, 2008ll).

Radiation exposure data for an individual, and the results of any measurements, analyses and calculations of radioactive material deposited or retained in the body of an individual, shall be reported to the individual as specified in 10 CFR 19.13 (CFR, 2008m). Individuals are advised of their right to request radiation exposure data in Basic Radiation Safety Training. In accordance with 10 CFR 19.11, *Posting of Notices to Workers* (CFR, 2008mm), IIFP management posts current copies, or locations where they may be reviewed of the following documents:

- The regulations in 10 CFR 19 (CFR, 2008a) and 10 CFR 20 (CFR, 2008b);
- The license, license conditions, or documents incorporated into the license by reference, and amendments thereto; and
- The operating procedures applicable to licensing activities.

4.8 Additional Program Commitments

The following sections provide commitments to achieve compliance with the regulations in 10 CFR 20, Subpart L (CFR, 2008s), 10 CFR 20, Subpart M, *Reports* (CFR, 2008nn), and 10 CFR 70.74 (CFR, 2008kk).

4.8.1 Records

In accordance with 10 CFR 20, Subpart L (CFR, 2008s), IIFP maintains records of the RPP (including program provisions, audits, and reviews of the program context and implementation), radiation survey

results (air sampling, bioassays, external exposure data from monitoring individuals, internal intakes of radioactive material), and results of corrective action program referrals, RWPs, and planned special exposures. Recordkeeping is further described in LA Chapter 11.

4.8.2 Event Reporting

Approved written procedures dictate that IIFP will report to the NRC, within the time specified by 10 CFR 20, Subpart M (CFR, 2008nn), and 10 CFR 70.74 (CFR, 2008kk), any event resulting in an occupational exposure to radiation exceeding the dose limits in 10 CFR 20 (CFR, 2008b). Approved written procedures contain instructions for when and how to report events to the NRC and other regulatory agencies.

4.8.3 Annual Dose Monitoring Report

IIFP prepares and submits an annual report of the results of individual monitoring, as required by 10 CFR 20.2206(b) (CFR, 2008ll), to the NRC.

4.8.4 Corrective Action Reporting

Any radiation incident resulting in an occupational exposure that exceeds the dose limits in 10 CFR 20.1201 (CFR, 2008h), or is required to be reported per 10 CFR 20, Subpart M (CFR, 2008nn), 10 CFR 30.50 (CFR, 2008ii), 10 CFR 40.60 (CFR, 2008jj), and 10 CFR 70.74 (CFR, 2008kk) will be evaluated within the IIFP Corrective Action Program. The corrective actions taken (or planned) to protect against a recurrence and the proposed schedule to achieve compliance are reported to the NRC.

4.9 References

ANSI. (1999). ANSI/HPS N13.12. *Surface and Volume Radioactivity Standards for Clearance* . American National Standards Institute.

ASTM. (1989). ASTM C986-89. *Developing Training Programs in the Nuclear Fuel Cycle* . American Society for Testing and Materials.

ASTM. (1995). ASTM E1168-95. *Radiological Protection Training for Nuclear Facility Workers* . American Society for Testing and Materials.

CFR. (2008a). 10 CFR 19. *Notices, Instructions, and Reports to Workers: Inspection and Investigations* . U.S. Nuclear Regulatory Commission.

CFR. (2008mm). 10 CFR 19.11. *Posting of Notices to Workers* . U.S. Nuclear Regulatory Commission.

CFR. (2008i). 10 CFR 19.12. *Instructions to Workers* . U.S. Nuclear Regulatory Commission.

CFR. (2008m). 10 CFR 19.13. *Notifications and Reports to Individuals* . U.S. Nuclear Regulatory Commission.

CFR. (2008b). 10 CFR 20. *Standards for Protection Against Radiaton* . U.S. Nuclear Regulatory Commission.

CFR. (2008d). 10 CFR 20 Subpart B. *Radiation Protection Programs* . U.S. Nuclear Regulatory Commission.

CFR. (2008n). 10 CFR 20 Subpart H. *Respiratory Protection and Controls to Restrict Internal Exposure in Restricted Areas* . U.S. Nuclear Regulatory Commission.

CFR. (2008aa). 10 CFR 20 Subpart K. *Waste Disposal* . U.S. Nuclear Regulatory Commission.

CFR. (2008s). 10 CFR 20 Subpart L. *Records* . U.S. Nuclear Regulatory Commission.

CFR. (2008nn). 10 CFR 20 Subpart M. *Reports* . U.S. Nuclear Regulatory Commission.

CFR. (2008gg). 10 CFR 20.1003. *Definitions* . U.S. Nuclear Regulatory Commission.

CFR. (2008e). 10 CFR 20.1101. *Radiation Protection Programs* . U.S. Nuclear Regulatory Commission.

CFR. (2008h). 10 CFR 20.1201. *Occupational Dose Limits for Adults* . U.S. Nuclear Regulatory Commission.

CFR. (2008v). 10 CFR 20.1202. *Compliance with Requirements for Summation of External and Internal Doses* . U.S. Nuclear Regulatory Commission.

CFR. (2008t). 10 CFR 20.1204. *Determination of Internal Exposure* . U.S. Nuclear Regulatory Commission.

CFR. (2008j). 10 CFR 20.1208. *Dose Equivalent to an Embryo/Fetus* . U.S. Nuclear Regulatory Commission.

CFR. (2008k). 10 CFR 20.1301. *Radiation Dose Limits for Individual Members of the Public* . U.S. Nuclear Regulatory Commission.

CFR. (2008w). 10 CFR 20.1406. *Minimization of Contamination* . U.S. Nuclear Regulatory Commission.

CFR. (2008f). 10 CFR 20.1501. *General* . U.S. Nuclear Regulatory Commission.

CFR. (2008g). 10 CFR 20.1502. *Conditions Requiring Individual Monitoring of External and Internal Occupational Dose* . U.S. Nuclear Regulatory Commission.

CFR. (2008bb). 10 CFR 20.1601. *Control of Access to High Radiation Areas* . U.S. Nuclear Regulatory Commission.

CFR. (2008cc). 10 CFR 20.1602. *Control of Access to Very High Radiation Areas* . U.S. Nuclear Regulatory Commission.

CFR. (2008p). 10 CFR 20.1701. *Use of Process or Other Engineering Controls* . U.S. Nuclear Regulatory Commission.

CFR. (2008q). 10 CFR 20.1702. *Use of Other Controls* . U.S. Nuclear Regulatory Commission.

CFR. (2008o). 10 CFR 20.1703. *Use of Individual Respiratory Protection Equipment* . U.S. Nuclear Regulatory Commission.

CFR. (2008u). 10 CFR 20.1704. *Further Restrictions on the Use of Respiratory Protection Equipment* . U.S. Nuclear Regulatory Commission.

CFR. (2008dd). 10 CFR 20.1901. *Caution Signs* . U.S. Nuclear Regulatory Commission.

CFR. (2008ee). 10 CFR 20.1902. *Posting Requirements* . U.S. Nuclear Regulatory Commission.

CFR. (2008ff). 10 CFR 20.1903. *Exceptions to Posting Requirements* . U.S. Nuclear Regulatory Commission.

CFR. (2008x). 10 CFR 20.1904. *Labeling Containers* . U.S. Nuclear Regulatory Commission.

CFR. (2008y). 10 CFR 20.1905. *Exemptions to Labeling Requirements* . U.S. Nuclear Regulatory Commission.

CFR. (2008z). 10 CFR 20.1906. *Procedures for Receiving and Opening Packages* . U.S. Nuclear Regulatory Commission.

CFR. (2008l). 10 CFR 20.2110. *Form of Records* . U.S. Nuclear Regulatory Commission.

CFR. (2008hh). 10 CFR 20.2202. *Notification of Incidents* . U.S. Nuclear Regulatory Commission.

CFR. (2008ll). 10 CFR 20.2206. *Reports of Individual Monitoring* . U.S. Nuclear Regulatory Commission.

CFR. (2008ii). 10 CFR 30.50. *Reporting Requirements* . U.S. Nuclear Regulatory Commission.

CFR. (2008c). 10 CFR 40. *Domestic Licensing of Source Material* . U.S. Nuclear Regulatory Commission.

CFR. (2008jj). 10 CFR 40.60. *Reporting Requirements* . U.S. Nuclear Regulatory Commission.

CFR. (2008kk). 10 CFR 70.74. *Additional Reporting Requirements* . U.S. Nuclear Regulatory Commission.

CFR. (2008r). 29 CFR 1910. *Occupational Safety and Health Standards* . Occupational Safety and Health Administration.

ICRP. (1995). ICRP-68. *Dose Coefficients for Intakes of Radionuclides by Workers* . International Commission on Radiological Protection.

ISO. (1999). ISO 2919:1999. *Radiation Protection - Sealed Radioactive Sources - General Requirements and Classificaitons* . International Organization for Standardization.

NRC. (1993b). Branch Technical Position. *Guidelines for Decontamination of Facilities and Equipment Prior to Release for Unrestricted Use or Termination of Licenses for Byproduct Source or Special Nuclear Material* . U.S. Nuclear Regulatory Commission.

NRC. (1977). Regulatory Guide 8.10. *Operating Philosophy for Maintaining Occupational Radiation Exposures As Low As Is Reasonably Achievable* . U.S. Nuclear Regulatory Commission.

NRC. (1999). Regulatory Guide 8.13. *Instruction Concerning Prenatal Radiation Exposure* . U.S. Nuclear Regulatory Commission.

NRC. (1999). Regulatory Guide 8.15. *Acceptable Programs for Respiratory Protection* . U.S. Nuclear Regulatory Commission.

NRC. (1973). Regulatory Guide 8.2. *Guide for Administrative Practices in Radiation Monitoring* . U.S. Nuclear Regulatory Commission.

NRC. (1992b). Regulatory Guide 8.25. *Air Sampling in the Workplace* . U.S. Nuclear Regulatory Commission.

NRC. (1996). Regulatory Guide 8.29. *Instruction Concerning Risks from Occupational Radiation Exposure* . U.S. Nuclear Regulatory Commission.

NRC. (1992a). Regulatory Guide 8.34. *Monitoring Criteria and Methods to Calculate Occupational Radiation Doses* . U.S. Nuclear Regulatory Commission.

NRC. (1993). Regulatory Guide 8.37. *ALARA Levels for Effluents from Materials Facilities* . U.S. Nuclear Regulatory Commission.

NRC. (2005). Regulatory Guide 8.7. *Instructions for Recording and Reporting Occupational Radiation Exposure Data* . U.S. Nuclear Regulatory Commission.

NRC. (1993). Regulatory Guide 8.9. *Acceptable Concepts, Models, Equations, and Assumptions for a Bioassay Program* . U.S. Nuclear Regulatory Commission.

5 Nuclear Criticality Safety

The IIFP FEP/DUP facility does not possess or process enriched uranium or other fissile material outside of check-sources and various standards for radiological measurement calibration. As such, no criticality safety programs or procedures are maintained or implemented at the facility; however, the IIFP ISA, as documented in the ISA Summary (IIFP, 2009), did evaluate the potential for a criticality accident at the site. The only potential method of having a criticality accident at the facility involves the inadvertent receipt and processing of fissile material, which is addressed in the ISA.

Controls are established to verify that no enriched UF_6 is received and processed at the facility. The cylinders processed at the IIFP facility are the large, 14 ton UF_6 tails cylinders, not the 2 ½ ton enriched cylinders. Processing equipment at the plant, namely the autoclaves, is not sized to handle these smaller cylinders, so there is no method to feed enriched material into the processing plants. Additionally, each cylinder will be scanned with a detector to verify that the incoming cylinders do not contain fissile material. The scan does not determine the shipper's assay exactness for the cylinder contents, but does provide a reasonable indication if the cylinder is depleted or enriched. Both the receipt inspection and the scan for the assay at the plant site are maintained as IROFS controls. Also, feed suppliers (UF_6 enrichment plants) have redundant and diverse controls on enrichment that prevent mistakenly shipping fissile material instead of tails, which makes it unlikely that the facility will ever receive fissile material. As a result, all scenarios associated with a criticality accident are shown to be not credible.

5.1 References

International Isotopes Fluorine Products (IIFP), Inc, *Integrated Safety Analysis (ISA) Summary for the FEP/DUP Facility*, November 2009.

6 Chemical Process Safety

This Chapter describes the chemical classification process, the hazards of process chemicals of concern, process interactions with chemicals affecting licensed materials and/or hazardous chemicals produced from licensed material, the methodology for evaluating hazardous chemical consequences, and the chemical safety assurance features.

The IIFP Chemical Process Safety (CPS) Program has been developed consistent with the guidance in Chapter 6 of NUREG-1520, *Standard Review Plan for the Review of a License Application for a Fuel Cycle Facility* (NRC, 2002), NUREG-1513, *Integrated Safety Analysis Guidance Document* (NRC, 2001), NUREG-1601, *Chemical Process Safety at Fuel Cycle Facilities* (NRC, 1997a), NUREG/CR-6410, *Nuclear Fuel Cycle Facility Accident Analysis Handbook* (NRC, 1998), and NUREG/CR-6481, *Review of Models Used for Determining Consequences of UF_6 Release* (NRC, 1997b). The CPS Program also complies with 10 CFR 70.61, *Performance Requirements* (CFR, 2009a), 10 CFR 70.62, *Safety Program and Integrated Safety Analysis* (CFR, 2009b), and 10 CFR 70.64, *Requirements for New Facilities or New Processes at Existing Facilities* (CFR, 2009c).

6.1 Process Chemical Hazards

Throughout this Chapter in the discussion of the chemical aspects of uranium hexafluoride, uranium tetrafluoride and uranium oxide (dioxide) , the conventional chemical formula is used often rather than always referring to those as the “depleted” assay uranium compounds in the IIFP facility.

The chemical process hazards associated with the IIFP facility include handling and storage of chemical materials, including DUF_6, depleted uranium oxide (DUO_2), DUF_4, AHF, hydrofluoric acid (HF), hydrogen (H_2), BF_3, and SiF_4. Other hazardous chemicals, such as depleted uranyl fluoride (DUO_2F_2), are produced during accident sequences. The detailed chemical reaction processes are described in the ISA Summary, Section 3 (IIFP, 2009).

The FEP Product Storage and Packaging Building, AHF Staging Containment Building and the Fluoride Products Trailer Loading Building and equipment within these Buildings are separated physically from areas involving licensed materials, including separate ventilation systems. The AHF, SiF_4 and BF_3 chemicals stored and handled in these Buildings have been chemically separated from licensed materials through several process separation stages. The BF_3 and SiF_4 products although produced from fluorine extracted from DUF_4 have been purified before being transferred to these storage and packaging areas. A PHA is conducted for chemicals and equipment in these areas to ensure safe design relative to industrial chemical safety, but the safety analysis and design for controls in these areas are outside the ISA envelope.

A summary of the major process hazardous chemicals is provided below. Detailed hazard data are contained in the facility Material Safety Data Sheet (MSDS) information and documents and available to employees and contractors.

DUF_6 is source material received at the IIFP Facility used to produce DUF_4. Uranium is radioactive and decays into a series of other radioactive elements, emitting low levels of radiation. DUF_6 released to the atmosphere produces other uranium compounds (DUO_2F_2) and HF by reaction with moisture in the air. Uranium is a heavy metal that, in addition to being radioactive, can have toxic chemical effects (primarily on the kidneys) if it enters the bloodstream by means of ingestion or inhalation. Exposure to uranium may cause cancer.

DUO_2 is a by-product generated at the IIFP Facility from reaction of SiO_2 + DUF_4 or boron oxide ($B_2O_{3)}$ + DUF_4. The substance may spontaneously ignite on contact with air when heated above 700°C. The substance is irritating to the eyes and can be absorbed into the body by inhalation of its aerosol. Lungs may be affected by repeated or prolonged exposure to dust DUO_2 particles. DUO_2 has similar chemical toxicity as uranium.

DUF_4 is the intermediate product generated at the IIFP Facility from reaction of DUF_6 + H_2. It is used as the major raw material to generate SiF_4 and BF_3. It can be harmful by inhalation, ingestion and through prolonged skin contact. DUF_4 has similar chemical toxicity as uranium.

AHF is a by-product generated at the IIFP Facility from reaction of DUF_6 + H_2. There can also be HF in a form that is not anhydrous and contains different percentage amounts of water. HF can result from reaction of DUF_6 with moisture in the atmosphere or with water. HF can also result from the reaction of SiF_4 or BF_3 with water or moisture in the atmosphere. AHF or HF is very toxic by inhalation. If it comes in contact with the skin, and if swallowed, it causes severe burns. Inhalation of vapors in high concentration may cause shortness of breath (lung edema). Ingestion causes burns of the upper digestive and respiratory tracts. When there is dermal exposure, the HF penetrates skin and attacks underlying tissues and bone. There is a risk of serious damage to eyes. Hydrogen fluoride is nonflammable but can, when it has sufficient presence of water, generate hydrogen by reaction with the iron in carbon steel cylinders. The gas has a pungent, acid type, odor.

Hydrogen (H_2) gas is a feedstock chemical received at the IIFP Facility used to generate HF and DUF_4. Hydrogen poses a hazard to human safety from potential detonations and fires when mixed with air. Inhalation of air with high concentration of hydrogen acts as an asphyxiate. Hydrogen is explosive and highly flammable.

BF_3 is a product generated at the IIFP Facility from reaction of B_2O_3 + DUF_4. Boron trifluoride is corrosive and can cause irritation of eye, nose, throat, and skin. Acute toxicity may lead to hypoxemia or lung edema. It decomposes on contact with water, forming toxic and corrosive hydrogen fluoride, fluoroboric acid, and boric acid. The gas has a pungent, suffocating odor.

SiF_4 is a product generated at the IIFP Facility from reaction of SiO_2 + DUF_4. The substance is noncombustible, but decomposes on heating, producing toxic and corrosive fumes including hydrogen fluoride. It reacts with water to form hydrogen fluoride and fluorosilicic acid. It attacks many metals in the presence of water, releasing hydrogen. The substance is corrosive to the eyes, the skin, and the respiratory tract. Inhalation of this gas may cause lung edema.

B_2O_3 is a feedstock chemical received at the IIFP Facility used to generate BF_3. The substance is very hazardous in case of ingestion, hazardous in case of skin contact (irritant), or eye contact (irritant), and slightly hazardous in case of inhalation. The substance is toxic to blood, kidneys, and liver. Repeated or prolonged exposure to the substance can damage target organs.

SiO_2 is a feedstock chemical received at the IIFP Facility used to generate SiF_4. Inhaling finely divided crystalline silica dust in very small quantities [U.S. Occupational Health and Safety Administration (OSHA) allows 0.1 mg/m^3] over time can lead to silicosis, bronchitis or cancer. The substance is non-flammable, inert, and harmless (except for inhalation over time).

KOH (potassium hydroxide) solution is used as a scrubbing media in the Plant KOH Scrubbing System with concentrations ranging from 1-20%. It is received in tank trucks as a solution at concentrations near

45% and loaded into the KOH inventory holding tank. It is diluted for recharging the scrubbing system when necessary. Most of the KOH in the inventory is from the regeneration of spent scrubber solution to a 15-25% concentration for recycling back to the facility scrubbing system. Occasionally, a fresh charge of 45% KOH is made to the scrubber system as needed and that material is transferred from the KOH inventory holding tank. KOH (45% solution) is a clear, colorless liquid with a boiling point of slightly above 212 degrees-F. It is stable under normal temperatures and pressures. It reacts with acids, organic materials, nitro compounds, acrolein, halogens, anhydrides, phosphorous and metals that react with water. Decomposition products are generally potassium oxide and hydrogen gas. KOH can cause severe eye and skin burns, and if ingested can cause burns and perforations internally. Inhalation may lead to chemical pneumonitis and pulmonary edema. Prolonged or repeated skin contact may cause dermatitis.

CaF_2 (calcium fluoride) is produced in the EPP as a result of neutralizing or reacting fluoride bearing liquors with hydrated lime (calcium hydroxide). It is slightly soluble in water and reacts with concentrated acids to liberate HF. It is has an acute oral toxicity of LD50 (rat) of 4250. It is relatively harmless unless ingested or inhaled in measurable amounts over time.

6.2 Process Chemical Risk and Accident Sequences

The workplace environmental, safety and health programs are intended to minimize the risk of chemical exposure from licensed material and other hazardous chemicals to employees, the public, and the environment. This is accomplished through the controls resulting from the ISA, where licensed materials are involved and through the implementation of the CPS Program. The Program is documented in Chemical Process Safety Plan (IIFP, 2009a) and written procedures that ensure processes and operations comply with applicable federal and state regulations pertaining to chemical safety. The CSP Plan incorporates and satisfies the requirements of the U.S. Occupational Health and Safety Administration (OSHA), *Process Safety Management of Highly Hazardous Chemicals* (PSM) (CFR, 2009f).

This section discusses chemical safety issues related to: radiation risks of licensed materials; chemical risks of licensed materials and hazardous chemicals produced from licensed material; and facility conditions that may affect the safety of licensed material resulting in an increased risk to workers, the public, or the environment. In the Process Hazard Analysis of the ISA, these chemical hazards, where applicable as part of licensed materials or affecting licensed materials, are treated with the same analysis rigor as radiological hazards and have included engineered controls or prevention measures to meet or exceed acceptable risk determined in the ISA.

6.2.1 Process Descriptions

The facility process descriptions are provided in the ISA Summary, Section 3 (IIFP, 2009). The descriptions provide a basic understanding of the chemical process hazards (including radiological hazards caused by, or involving, chemical accidents) and allow development of potential accident scenarios. Summaries of the process descriptions are also included in LA Chapter 1, General Information.

6.2.2 Consequences and Likelihoods of Accident Sequences

An ISA has been performed as required by 10 CFR 70.62 (CFR, 2009b). The ISA provides a list of the accident sequences that have the potential to result in radiological and non-radiological releases of chemicals and provides estimates for the likelihood and consequence of each accident identified. The ISA also identifies the engineering and/or administrative controls for each accident sequence of significance. These controls are intended to satisfy the Baseline Design Criteria (BDC) in 10 CFR 70.64 (CFR, 2009c)

and performance requirements in 10 CFR 70.61 (CFR, 2009a) by applying defense-in-depth techniques to high-risk chemical release scenarios. The ISA provides sufficient quantities and types of controls so that engineered controls and prevention measures will satisfactorily perform their safety function and purpose when needed.

Accident sequences involving licensed materials and those chemicals that may impact licensed materials have been analyzed in the ISA and are presented in the ISA Summary (IIFP, 2009). The accident sequences identified by the ISA were categorized into one of three consequence categories (high, intermediate, or low) based on their radiological, chemical, and/or environmental impacts.

The radiological and chemical consequence severity limits for the high and intermediate categories, defined by 10 CFR 70.61 (CFR, 2009a), are presented in Table 6-1, Chemical Consequence Severity Levels. The ISA considers the potential interactions of process chemicals with confinement vessels, and with process equipment in which initiating events incorporate releases of DUF_6 from equipment, including vessels, pipes, valves, and cylinders. Interactions between process chemicals and personnel are considered both in the ISA, and during the preparation of facility operating procedures, to include industrial safety practices.

Table 6-1 Chemical Consequence Severity Levels (Defined by 10 CFR 70.61)

Consequence	Workers	Offsite Public	Environment
High	Radiological dose greater than 1 Sv (100 rem) Chemical exposure greater than AEGL-3 (10 minute exposure) A criticality accident occurs	Radiological dose greater than 0.25 Sv (25 rem) 30 mg soluble uranium intake Chemical exposure greater than AEGL-2 (30 minute exposure) A criticality accident occurs	A criticality accident occurs
Intermediate	Radiological dose greater than 0.25 Sv (25 rem) but less than or equal to 1 Sv (100 rem) Chemical exposure greater than AEGL-2 but less than or equal to AEGL-3 (10 minute exposure)	Radiological dose greater than 0.05 Sv (5 rem) but less than or equal to 0.25 Sv (25 rem) Chemical exposure greater than AEGL-1 but less than or equal to AEGL-2 (30 minute exposure)	Radioactive release greater than 5,000 times 10 CFR 20, Appendix B, Table 2 (CFR, 2009d)

The measures to mitigate the consequences of accident sequences identified in the ISA Summary are consistent with protective actions described in the IIFP Emergency Plan (EP) (IIFP, 2009c) and its implementing procedures.

In addition to the chemical exposure criteria identified above in Table 6-1, the ISA Summary addresses the hazards and consequence of dermal exposure to HF, which obviously does not specifically impact the offsite public or environment. The exposure levels of concern with respect to dermal HF hazards are delineated in the ISA Summary.

6.2.3 Chemical Release Scenario Techniques and Assumptions

The techniques and assumptions used to estimate the concentrations or to predict the toxic "footprint" for potential releases of hazardous chemicals to workers and the public produced by licensed material, or by abnormal facility conditions that could affect the safety of licensed materials, are described in the following sections.

6.2.3.1 Worker Exposure

Any release from UF_6 systems and/or cylinders at the IIFP Facility would predominately consist of hydrogen fluoride (HF), uranyl fluoride (UO_2F_2), and potentially lesser quantities of UF_6. Other sources of HF could result from by-product reaction of SiF_4 and BF_3 with water following a release. These releases would cause a visible cloud and a pungent odor. HF has a strong irritating odor that is discernable at concentrations of about 0.04 ppm (ATSDR, 2009). The irritating effects of HF are typically intolerable at concentrations well below those that cause permanent injury or which produce escape impairing symptoms. Workers are trained in proper actions to take in response, i.e., escape a release upon sensing initial HF effects. For the purpose of evaluating personnel exposure in cases where a worker would be expected to be in the immediate proximity of a release, conservative 10-minute Acute Exposure Guideline Levels (AEGL) values have been used for HF and UF_6 (EPA, 2009a). Table 6-2, Chemical Consequence Values, shows the numeric values used as chemical consequence thresholds. Once a release is detected, the worker is assumed to evacuate the area of concern. A conservative sufficient time is available for the worker to reliably detect and evacuate the area of concern to avoid permanent injury.

Table 6-2 Chemical Consequence Values

Consequence	Workers	Offsite Public	Environment
Category 3 High	Soluble U intake > 75 mg HF > 170 ppm UF_6 > 216 mg/m^3	Soluble U intake > 30 mg HF >34 ppm UF_6 >19 mg/m^3	N/A
Category 2 Intermediate	HF > 95 but $\leq$ 170 ppm UF_6 > 28 but $\leq$ 216 mg/m^3	HF> 1 but $\leq$ 34 ppm UF_6 > 3.6 but $\leq$ 19 mg/m^3	Radioactive release>5000 times of 10 CFR 20, Appendix B, Table 2 (CFR, 2009d)
Category 1 Low	Accidents of lower radiological and chemical exposures than those above.	Accidents of lower radiological and chemical exposures than those above	Radioactive releases with lower effects than those above.

6.2.3.2 Public Exposure

Potential exposures to the public were evaluated using conservative assumptions for both exposure concentrations and durations. Exposure was evaluated for consequence severity against chemo-toxic, radiotoxic, and radiological dose. Public exposures were estimated for duration of 30 minutes. This is consistent with self protection criteria for UF_6/HF plumes listed in NUREG-1140, *A Regulatory Analysis on Emergency Preparedness for Fuel Cycle and Other Radioactive Material Licensees* (NRC, 1988).

6.2.4 Source Term and Dispersion Models

The methodologies used to determine the source term are those prescribed in NUREG/CR-6410, *Nuclear Fuel Cycle Facility Accident Analysis Handbook* (NRC, 1998) and supporting documents. The specific modeling methods utilized follow consistent and conservative methods for source term determination, release fraction, dispersion factors, and meteorological conditions. For releases inside of buildings, conservative leak path fractions were assumed as recommended by NUREG/CR-6410.

6.2.5 Description of Chemical Dispersion Models

The computer code used in chemical consequence analyses is HGSYSTEM version 3.0. (NTIS, 1995). It is widely accepted by the nuclear industry as appropriate for chemical dispersion modeling. A more detailed description of HGSYSTEM analysis is provided in the ISA Summary.

6.2.6 Chemical Exposure Standards

To quantify criteria of 10 CFR 70.61 (CFR, 2009a) for chemical exposure, standards for each applicable hazardous chemical must be applied to determine exposure that could: endanger the life of a worker; lead to irreversible or other serious long term health effects in an individual; and cause mild transient health effects to an individual. Exposure standards include the AEGLs established by the *National Advisory Committee for Acute Exposure Guideline Levels for Hazardous Substances* (EPA, 2009a). The IIFP Facility uses the AEGL standard to assess the consequences of postulated chemical releases. The accident sequences resulting in chemical consequences exceeding the criteria in 10 CFR 70.61 involves the release of UF_6 and its hydrolysis products: HF and UO_2F_2. These accident sequences are presented in the ISA Summary (IIFP, 2009).

From a production standpoint, AHF is produced as a result of the reaction between DUF_6 and H_2. The AHF product is transferred to storage vessels and ultimately to transport vehicles for offsite delivery to customers. Potential dermal exposures to HF for these processes have been evaluated in the ISA Summary. The criterion for assessing dermal exposure consequences is identified therein.

6.3 Items Relied on for Safety and Management Measures

This section describes the identification of chemical process IROFS and their associated management measures.

6.3.1 Chemical Safety Approach

The ISA Summary (IIFP, 2009) describes the basis for providing successive levels of protection such that health and safety of employees and the public is ensured within the acceptable risks determined by the

ISA structured risk analyses. Additionally, in many and most parts of the processes, safety is further assured by added measures through implementation of designed operational control features and the defense-in-depth engineering design philosophy. Descriptions of some of the more significant added measures are summarized in the Section 3.1, Process Description of the IIFP ISA Summary.

The schemes employed to ensure safe operation of the facility include management measures that provide for the reliability of IROFS. These measures include a risk-based graded approach for the application of CM, maintenance, procedures, training, audits/ assessments, emergency planning, incident investigation, human factors, records, and reporting. Management measures are fully described in LA Chapter 11, Management Measures. The IIFP Facility management is committed to identifying and correcting any unacceptable performance deficiencies and to maintain chemical process safety records.

6.3.1.1 Chemical Process Safety Program

The Chemical Process Safety (CPS) Program is applicable to the chemicals associated with the authorized activities described in LA Chapter 1, General Information, and includes UF_6, HF, as well as other hazardous chemicals associated with licensed material activities. The CPS Program provides oversight of the handling, use, and storage of chemicals at the IIFP Facility.

The CPS Program development, maintenance, and oversight are the responsibility of the Environmental, Health, and Safety (EHS) organization. Its implementation overlaps with several other disciplines including: Operations, Maintenance, Radiation Protection (RP), Emergency Preparedness, Environmental Protection, and Industrial Safety. Prior to starting a new activity involving chemicals, a Job Hazards Analysis (JHA) is performed to ensure that the work is conducted safely and that appropriate training, authorizations, and procedures are completed. This ensures that appropriate controls are in place for adequate protection of the general public and safe use by employees, and that the use of chemicals does not create potential conditions that have not been evaluated in the ISA or could adversely affect the handling of licensed materials. Employees and contractors using hazardous materials are trained to ensure safe handling, use, and disposal. The site emergency response team is prepared to respond to various emergency conditions, including a chemical accident.

EHS management reviews and approves JHAs prior to initial issuance. The review and approval is to affirm that the radiation, chemical, process, fire, and explosion risks associated with the process or facility under evaluation is understood and proper safety measures are in place. LA Chapter 2, Organization and Management, contains a description of the IIFP Facility Organization, including the responsibilities of the EHS Manager.

The IIFP Facility satisfies the OSHA Process Safety Management (PSM) initial requirement on process safety information through the ISA work for NRC licensing for most processes. NRC requirements for maintaining and updating process safety information could be utilized to maintain the PSM Plan also. For chemical hazards associated with materials that have been separated from licensed materials, the IIFP Facility will apply standard PSM programs to evaluate and control the hazard and risk associated with these chemicals. The IIFP Facility uses a graded approach in meeting requirements of the PSM standard by identifying applicable areas requiring PSM and applying the program to those specific areas based on the process safety information.

The IIFP Facility will develop a thorough, orderly, systematic approach for identifying, evaluating and controlling processes involving highly hazardous chemicals. A PSM Plan will be developed and used by the IIFP Facility to meet requirements in each of the program elements and applicable plant process areas.

The program development and implementation will be incorporated into other plant-related systems, such as emergency plans and response, contractor orientation/training and change management, as appropriate.

Procedure and training programs will be developed and utilized by the IIFP Facility for process safety plant operations and maintenance. PSM requirements will be addressed in plant ESH procedures and incorporated into specific operation and maintenance procedures.

The mechanical integrity element of PSM requires that equipment used to process, store, or handle highly hazardous chemicals be designed, installed, and maintained to minimize the risk of release of such chemicals. The IIFP Facility will have a mechanical integrity program in place to assure the continued integrity of process equipment. The components of the mechanical integrity program include:

- Identification and categorization of equipment and instrumentation.
- Development of written maintenance procedures.
- Training for process maintenance activities.
- Inspection and testing.
- Correction of deficiencies in equipment that are outside acceptable limits defined by the process safety information.
- Apply the appropriate level of quality assurance to maintain mechanical integrity for safety controls and process systems.

Portions of the PSM mechanical integrity requirements are met through implementation of programs designed to comply with other ESH and NRC requirements. Specific baseline and periodic tests and inspections for mechanical integrity are included in the Facility preventive maintenance program and procedures.

The IIFP Facility takes immediate action when there is a leak or accident involving highly hazardous chemicals. The IIFP Facility establishes and implements an Emergency Plan (EP) in accordance with the provisions of 29 CFR 1910.38(a), *Emergency Action Plans* (CFR, 2009h); including procedures for handling small releases. The IIFP Facility incorporates applicable provisions of the Hazardous Waste and Emergency Response Standard, 29 CFR 1910.120(a), (p), and (q) (CFR, 2009i) into the EP through the Emergency Plan Implementing Procedures (EPIPs).

A Spill Prevention, Control and Countermeasure (SPCC) Plan will be implemented during construction to minimize both the possibility of spills of hazardous substances, and to minimize the environmental impact of actual spills.

The IIFP Facility maintains an active cylinder management program to maintain optimum storage conditions in the cylinder yard, to monitor cylinder integrity by conducting routine inspections for breaches, and to perform cylinder maintenance and repairs to cylinders and the storage yard, as needed. Handling and storage procedures and practices are adopted at the IIFP Facility to mitigate adverse events, by either reducing the probability of an adverse event or reducing the consequence should an adverse event occur.

Chemical Evaluation and Approval

Prior to new hazardous materials being brought onsite or being used in an activity, the materials are approved through a formal process initiated when a request for procurement of a new chemical is submitted. Before a new chemical is ordered, the requester must obtain approval from the chemical

review team which is comprised of a representative of the EHS Organization, an area manager, and others as deemed appropriate by the EHS representative. The EHS representative leads the review and is a qualified chemical safety reviewer. The process for approval includes reviewing the health and safety risks of the chemical, as well as appropriate handling, storage, and disposal information. Every effort is made to limit the amount of hazardous chemicals used, including identifying feasible alternative chemicals or processes. The EHS representative coordinates with representatives from Environmental Protection, Industrial Safety, and RP. The formal approval process consists of evaluations for the physical, health and fire/explosive hazards; as well as the potential impact on handling of licensed material. The results of this approval process may dictate some or all of the following for assurance of chemical process safety:

- new procedures or changes to existing procedures,
- maintenance programs for equipment,
- CM controls,
- addition of Material Safety Data Sheet(s) to safety information database,
- emergency planning modifications, and/or
- training requirements

The process for approving new hazardous materials being brought onsite or used in a process is applicable to employees and contractors. If a contractor desires to use a new chemical, the contractor must notify the IIFP Facility point of contact, and the IIFP Facility new chemical approval process is initiated. If an existing hazardous chemical is to be used in a new plant process or affects an existing process involving an IROFS that has not previously used the chemical, then the change would also be evaluated through the 10 CFR 70.72, *Facility Changes and Change Process* (CFR, 2009e), process described in LA Chapter 11.

Labeling and Identification

Hazardous materials containers or conveyance systems are labeled and identified to comply with applicable regulations. The proper identification of hazardous materials decreases the likelihood and potential negative consequences of improper use, handling, or disposal of those materials.

The hazards of chemicals are identified for personnel through the MSDSs. These documents are available in the workplace.

Chemical Inventories

Most chemical inventories at the IIFP Facility are maintained below the threshold quantities set forth in OSHA 29 CFR 1910.119, *Process Safety Management of Highly Hazardous Chemicals* (CFR, 2009f) and the Environmental Protection Agency (EPA) 40 CFR 68, *Chemical Accident Prevention Provisions* (CFR, 2009g). Inventories of chemicals are tracked through the procurement process. In addition, the EP contains an inventory, including amounts and locations, of bulk chemicals as required by EPA's Emergency Planning and Community Right-to-Know Act (EPCRA), Section 312, Tier II (EPA, 2009b). The EP and the MSDS are provided to applicable offsite responders. The EP is updated annually. Process chemicals, such as HF and other fluorine bearing chemicals, are typically at inventory levels above threshold quantity levels and are controlled under the provisions of Process Safety Management defined in 29 CFR 1910.119 (CFR, 2009f). Additionally, the IIFP Facility has an agreement with the State of New Mexico that limits the maximum amount of certain depleted uranium materials and certain containers that are permitted to be held in on-site inventories (NMED, 2009). A copy of the agreement is provided to the NRC to be incorporated into the IIFP Facility LA review and approval.

Hazardous Chemicals and Chemical Interactions

Chemicals utilized at the IIFP Facility that have the potential to affect licensed material, either directly or indirectly, are evaluated to determine the consequence level for a particular accident sequence. The main chemicals of concern at the IIFP Facility are DUF_6, and HF. If UF_6 is released into the atmosphere, the uranium compounds and HF that are formed by reaction with moisture in the air are chemically toxic. Uranium is a heavy metal that, in addition to being radioactive, can have toxic chemical effects primarily on the kidneys if it enters the bloodstream by means of ingestion or inhalation. HF is an extremely corrosive gas that can damage the lungs and cause death if inhaled at sufficiently high concentrations (see Section 6.1). A similar effect occurs with releases of SiF_4 and BF_3, though there is no radiological component with such releases.

6.3.1.2 Materials of Construction, Sizing of Equipment, System Fabrication, and Process Control Schemes

The design of the chemical process systems includes numerous controls for maintaining safe conditions during operations. These controls include, but are not limited to, the following:

- managing the arrangement and size of material containers and processes;
- selection and use of materials compatible with process chemicals;
- providing inherently safe operating conditions (such as UF_6 confinement); and,
- providing process interlocks, controls, and alarms within the chemical processes

These facility and equipment features help prevent chemical releases. Process piping and components (such as reaction vessels, conveyors, traps, vents, etc.) is maintained safe by limits placed on their operating parameters.

Materials of Construction

Interactions between process equipment and process fluids/gasses were considered in the design of the IIFP Facility. The IIFP Facility will utilize Materials of Construction throughout the process and operations areas that are compatible and/or are corrosion resistant to UF_6, HF, SiF_4, and BF_3. The Materials of Construction are also compatible with the process operational physical parameters of pressure and temperature accordingly. The Materials of Construction meet the applicable standard engineering specifications required by the International Building Code (IBC, 2009) and/or other building codes, and their use is consistent with standard industry practice for processing UF_6, HF, SiF_4, and BF_3.

Standard steel (or Monel) containers, valves, and piping are used at the IIFP Facility for transport, processing, and storage of UF_6 (ANSI, 2001). These containers are appropriate due to the resistance of the materials to corrosion by UF_6. The DUF_6 cylinders, used for transport and storage, are painted to resist corrosion from atmospheric conditions. The cylinders are also inspected on a routine basis to assess corrosion and corrosion rates. The storage and transport containers for HF, SiF_4, and BF_3 are specified to be corrosion-resistant to these chemicals under all normal and anticipated abnormal environments.

Sizing of Equipment

The sizing of process equipment is based on the amount of material to be used in the process. The design of preventive and/or mitigation features is based on conservative assumptions to allow for unusual conditions. For example, tanks that contain bulk chemicals are designed to provide for more than the

maximum volume expected during normal operations. In addition, overflow alarms and mitigation devices (such as curbs, sumps, overflow tanks) are available for use during upset conditions and conservative margins of safety in containing a spill.

System Fabrication

Within the IIFP Facility, systems are fabricated with safety as a priority. Materials of construction are chosen to avoid or minimize corrosion. Fabrication operations, such as machining, drilling, welding, heating, and grinding, are established to prevent and/or mitigate hazards to the worker and minimize releases to the public and the environment. Preventive maintenance is routinely scheduled for replaceable parts. The systems are designed to provide easy access for maintenance.

Process Control Schemes

Process control schemes are chosen with safety as a priority. The process control schemes that are associated with IROFS are described in the ISA Summary (IIFP, 2009). Minimum impacts to environment, safety and health are addressed through an engineering design philosophy that includes:

- minimum necessary inventories of chemicals and subsequent minimum source terms,
- secondary containment of potential chemical hazards, where needed,
- redundancy on selected key safety systems,
- defense-in-depth layers of protection with first priority on engineered controls where needed, and
- multi-treatment devices configured in series

6.3.2 Chemical Process Safety Controls (IROFS)

Chemical process safety controls, where chemicals are part of licensed materials or affect licensed materials, including engineered controls and administrative controls are identified in the ISA Summary. The ISA Summary describes the controls to prevent or mitigate chemical process risks, the hazard being mitigated, and the risk category.

In addition to IROFS, many operational control features (safeguards which are not considered IROFS) are incorporated as defense-in-depth to support worker safety. These items, such as lab hoods, eye wash station, and safety showers are established as part of a standard industrial safety program and were assumed to be available as part of the evaluations conducted in the ISA. Safeguards are also applied to process systems that involve hazardous chemicals that have been separated from licensed materials.

A defense-in-depth approach is followed during the design of chemical process systems. The ISA Summary has identified a number of generic and inherent safeguards for protecting against or mitigating process material releases. Many of these reduce the likelihood or severity of hazardous material releases from process equipment. Others help the operators respond more quickly and/or efficiently to limit the effects of releases of hazardous material. These safeguards include, in order of preference, passive controls (such as curbs around chemical tanks), active engineered controls (such as high temperature shutdown interlocks), and administrative controls (such as operator training and approved written procedures). Some safeguards, such as gas alarm systems, provide a mitigation function by alerting operators to evacuate the facility rapidly, thus limiting radiation and chemical exposure during an event. These safeguards are identified in Section 3.1 of the ISA Summary and are identified with respect to the type of control (i.e., passive, active, administrative, etc.) Examples of chemical hazard design, including both IROFS and safeguard level controls, include the following:

- UF_6 cylinders are locked inside a containment autoclave when being heated or fed to the process.
- UF_6 cylinders are not lifted or transported when the material inside the cylinder is in a liquid state.
- Areas where HF is collected or stored and where significant HF potential source terms are involved, such as HF distillation, storage tanks, and loading, are in a containment building. The containment building is not totally leak tight, but provides for substantial mitigation of released vapors by initiation of water spray inside the building.
- Exhaust hood and capture systems are located in selected general areas where there are hazardous materials to provide back-up emergency control and evacuation in event of leak.
- Process areas where chemicals or hazardous materials are stored or used are provided with concrete and sealed pad areas, including containment dike walls, to contain any one full storage or process vessel.
- Lab hoods and sink controls are provided to drain/vent hazardous chemicals.
- Area eye wash stations and showers are installed in strategic locations to mitigate the consequences of exposures.
- Area fluoride (HF) detection systems and alarms are strategically located to support worker evacuations during a hazardous chemical release.

6.3.3 Chemical Process Safety Management Measures

There are a number of safety features in place to help prevent, detect, and mitigate potential releases of UF_6 and HF. Some of these features are classified as IROFS as determined in the ISA. A listing of chemical process IROFS is presented in the ISA Summary (IIFP, 2009). Management measures for chemical process IROFS, as described in LA Chapter 11, are implemented to assure the reliability and availability of chemical process IROFS.

The safety management measures provide the overriding management oversight and assurance that the CPS Program is maintained and functions properly. The IIFP Facility applies management measures in a graded approach based on unmitigated risks as described in the ISA Summary. According to criteria defined in approved written procedures, the relative importance of IROFS is determined, using both the severity of consequence and unmitigated likelihood of an initiating event. Based on the assigned importance, the appropriate type and number of management measures are assigned to assure the IROFS are functional when needed.

6.3.3.1 Procedures to Ensure Reliable Operation of Engineered Controls

The IIFP Facility maintains approved written procedures to ensure reliable operation of engineered controls (such as inspection and testing procedures and frequencies, calibration programs, functional tests, corrective and preventive maintenance programs, and criteria for acceptable test results). Additionally, programs and procedures address construction and configuration controls to ensure CM during design and construction.

6.3.3.2 Procedures to Ensure Proper Implementation of Administrative Controls

The IIFP Facility maintains approved written procedures to ensure administrative controls are correctly implemented, when required (such as employee training and qualification in procedures, refresher training, safe work practices, development of procedures, and training program evaluation).

6.4 Requirements for New Facilities

The proposed IIFP Facility is a new chemical process facility. LA Chapter 3, Integrated Safety Analysis, and the ISA Summary (IIFP, 2009) describe the methodology for satisfying the principles of the facility Base Design Criteria (BDC) in 10 CFR 70.64 (CFR, 2009c). The ISA Summary describes how the chemical safety BDC is applied in establishing the design principles, features, and control systems of the new process.

The IIFP Facility is designed with the defense-in-depth approach for protecting against chemical accidents. In accordance with 10 CFR 70.64(a)(5) (2009c) and NUREG-1601, Section 2-4 (NRC, 1997a), the design provides for adequate protection against chemical risks produced from licensed material, facility conditions that affect the safety of licensed material, and hazardous chemicals produced from licensed material. For chemical process safety, the facility design considered the following:

- Preference for the selection of engineered controls over administrative controls to increase overall system reliability;
- Preference for prevention over mitigation and operator intervention; and
- Operational design features that enhance safety by adding extra measures and reducing challenges to IROFS.

There are a number of operational design features that are not IROFS and no credit is taken for these features in the risk-base ISA, but as extra measures in addition to IROFS, these features do help ensure chemical process safety. These features include robust and chemical compatible equipment, piping, connections and valves that confine hazardous chemicals during the conversion process. Physical barriers include fire walls throughout the facility (as determined by the Fire Hazards Analysis described in LA Chapter 7, Fire Protection) (IIFP, 2009c). Vented hoods are appropriately provided in the Decontamination and Maintenance Areas. Isolation and check valves are used in piping containing hazardous chemical. Temperature, pressure controls, sensors and alarm point and control valves are included, beyond the IROFS Systems, Structures, and Components (SSCs), for most of the processes and these provide data and operational controls that assist in safe operation of the facility.

The IIFP Facility is not proposing any facility-specific or process-specific relaxations or additions to the Basic Design Criteria of 10 CFR 70.64 (2009c).

6.5 References

ANSI, 2001. American National Standards Institute Inc., “Nuclear Materials: Uranium Hexafluoride—Packaging for Transport,” ANSI N14.1-2001, February 1, 2001.

ATSDR, 2009. Agency for Toxic Substances & Disease Registry, "Medical Management Guidelines for Hydrogen Fluoride," 2009.

CFR, 2009a. Title 10, Code of Federal Regulations, Section 70.61, "Performance Requirements", U.S. Nuclear Regulatory Commission, 2009.

CFR, 2009b. Title 10, Code of Federal Regulations, Section 70.62," Safety Program and Integrated Safety Analysis", U.S. Nuclear Regulatory Commission,2009.

CFR, 2009c. Title 10, Code of Federal Regulations, Section 70.64, "Requirements for New Facilities or New Processes at Existing Facilities," U.S. Nuclear Regulatory Commission, 2009.

CFR, 2009d. Title 10, Code of Federal Regulations, Section 20, "Standards for Protection Against Radiation," U.S. Nuclear Regulatory Commission, 2009.

CFR, 2009e. Title 10, Code of Federal Regulations, Section 70.72, "Facility Changes and Change Process," U.S. Nuclear Regulatory Commission, 2009.

CFR, 2009f. Title 29, Code of Federal Regulations, Section 1910.119, "Process Safety Management of Highly Hazardous Chemicals," U.S. Occupational Safety and Health Administration, 2009.

CFR, 2009g. Title 40, Code of Federal Regulations, Section 68, "Chemical Accident Prevention Provisions," U.S. Environmental Protection Agency, 2009.

CFR, 2009h. Title 29, Code of Federal Regulations, Section 1910.38(a), "Emergency Action Plans," U.S. Occupational Safety and Health Administration, 2009.

CFR, 2009i. Title 29, Code of Federal Regulations, Section 1910. 120, "Hazardous Waste and Emergency Response Standard," U.S. Occupational Safety and Health Administration, 2009.

EPA, 2009a. U.S. EnvironmentalProtection Agency, National Advisory Committee for the Development of Acute Exposure Guideline Levels (AEGLs) for Hazardous Substances, 2009.

EPA, 2009b. U.S. Environmental Protection Agency, "Emergency Planning and Community Right to Know Act (EPCRA)", Section 312, Tier II, 2009.

IBC, 2009. International Code Council, International Building Code, 2009.

IIFP, 2009. International Isotopes Fluorine Products, Inc., Integrated Safety Analysis Summary, 2009.

IIFP, 2009a. International Isotopes Fluorine Products, Inc., Chemical Process Safety Plan, 2009.

IIFP, 2009b. International Isotopes Fluorine Products, Inc., Emergency Plan, 2009.

IIFP, 2009c. International Isotopes Fluorine Products, Inc., License Application, Chapter 7, Fire Protection, 2009

NMED, 2009, New Mexico Environmental Department, "Memorandum jof Agreement Between International Isotopes, Inc. and New Mexico Environmental Department, October 2009.

NRC, 1988. U.S. Nuclear Regulatory Commission, "A Regulatory Analysis on Emergency Preparedness for Fuel Cycle and Other Radioactive Material Licensees," NUREG-1140, 1988.

NRC, 1997a. U.S. Nuclear Regulatory Commission, "Chemical Process Safety at Fuel Cycle Facilities," NUREG-1601, 1997.

NRC, 1997b. U.S. Nuclear Regulatory Commission, "Review of Models Used for Determining Consequences of UF6 Release", NUREG/CR-6481, 1997.

NRC, 1998. U.S. Nuclear Regulatory Commission, "Nuclear Fuel Cycle Facility Accident Analysis Handbook", NUREG/CR-6410, 1998.

NRC, 2001. U.S. Nuclear Regulatory Commission, "Integrated Safety Analysis Guidance Document", NUREG-1513, 2001.

NRC, 2002. U.S. Nuclear Regulatory Commission, “Standard Review Plan for the Review of a License Application for a Fuel Cycle Facility”, NUREG-1520, 2002.

NTIS, 1995. National Technical Information Service, HGSYSTEM version 3.0, “Dispersion Models for Ideal Gases,” Shell Research Ltd. Thornton (United Kingdom), 1995.

7 Fire Safety

This chapter documents the IIFP, Integrated Fluorine Extraction Process and Depleted Uranium De-Conversion Plant (FEP/DUP) fire safety program. The fire safety program is intended to reduce the risk of fires and explosions at the facility and documents how the facility administers the fire safety program at the facility. The FEP/DUP fire safety program meets the acceptance criteria in Chapter 7 of NUREG-1520 (USNRC, 2002) and is developed, implemented, and maintained in accordance with the requirements of 10 CFR 70.62 (CFR, 2009d), 10 CFR 70.22 (CFR, 2009b) and 10 CFR 70.65 (CFR, 2009f), which bounds any requirements imposed by 10 CFR Part 40 (CFR, 2009a). In addition, the fire safety program complies with 10 CFR 70.61 (CFR, 2009c), 10 CFR 70.62 (CFR, 2009d) and 10 CFR 70.64 (CFR, 2009e). NUREG/CR-6410 (USNRC, 1998), NUREG-1513 (USNRC, 2001) and Generic Letter 95-01 (USNRC, 1995) are utilized as guidance in developing this chapter and the fire protection program along with the various NFPA (NFPA, 2008) standards listed below:

Table 7-1 NFPA Standards

Standard	Title of Standard
NFPA 10	Portable Fire Extinguishers
NFPA 13	Installation of Sprinkler Systems
NFPA 14	Standard for the Installation of Standpipe and Hose Systems
NFPA 15	Standard for Water Spray Fixed Systems for Fire Protection
NFPA 20	Installation of Stationary Pumps for Fire Protection
NFPA 22	Water Tanks for Private Fire Protection.
NFPA 24	Installation of Private Fire Service Mains and Their Appurtenances
NFPA 30	Flammable and Combustible Liquids Code
NFPA 45	Fire Protection for Laboratories Using Chemicals.
NFPA 54	National Fuel Gas Code.
NFPA 55	Storage, Use and Handling of Compressed Gases and Cryogenic Fluids in portable and Stationary Containers, Cylinders and Tanks.
NFPA 70	National Electric Code
NFPA 70E	Standard for Electrical Safety in the Workplace®
NFPA 72	National Fire Alarm Code
NFPA 80	Standard for Fire Doors and Other Opening Protectives
NFPA 80A	Recommended Practice for Protection of Buildings from Exterior Fire Exposures
NFPA 85	Boiler and Combustion Systems Hazards Codes
NFPA 90A	Installation of Air-conditioning and Ventilating Systems
NFPA 90B	Installation of Warm Air Heating and Air-conditioning Systems
NFPA 91	Standard for Exhaust Systems for Air Conveying of Vapors, Gases, Mists, and Noncombustible Particulate Solids
NFPA 101	Life Safety Code
NFPA 110	Emergency and Standby Power Systems
NFPA 430	Storage of Liquid and Solid Oxidizers
NFPA 220	Standard on Types of Building Construction
NFPA 221	Standard for High Challenge Fire Walls, Fire Walls, and Fire Barrier Walls

Standard	Title of Standard
NFPA 251	Standard Methods of Tests of Fire Resistance of Building Construction and Materials
NFPA 600	Standard on Industrial Fire Brigades
NFPA 780	Standard for the Installation of Lightning Protection Systems
NFPA 801	Standard for Fire Protection for Facilities Handling Radioactive Materials
NFPA 1410	Standard on Training for Initial Emergency Scene Operations

The information provided in this chapter, the corresponding regulatory requirement and the section of NUREG-1520, Chapter 7 (USNRC, 2002) containing the Nuclear Regulatory Commission (NRC) acceptance criteria, are presented below:

Table 7-2 NRC Acceptance Criteria

Information Category and Requirement	10 CFR 70 Citation	NUREG-1520 Chapter 7 Reference
Section 7.1 Fire Safety Management Measures	70.62(a), (d) & 70.64(b)	7.4.3.1
Section 7.2 Fire Hazards Analysis	70.61(b), (c) & 70.62(a)&(c)	7.4.3.2
Section 7.3 Facility Design	70.62(a), (c) & 70.64(a)	7.4.3.3
Section 7.4 Process Fire Safety	70.64(a)	7.4.3.4
Section 7.5 Fire Protection and Emergency Response	70.62(a), (c) & 70.64(b)	7.4.3.5

7.1 Fire Safety Management Measures

Fire safety management measures establish the fire protection policies for the site. The objectives of the fire safety program are to prevent fires from starting and to detect, control, and extinguish those fires that do occur. The fire protection organization and fire protection systems at the FEP/DUP Plant provide protection against fires and explosions based on the structures, systems, and components (SSC) and defense-in-depth practices described in this chapter. Fire barriers, protective measures and administrative controls are considered fire protection items relied on for safety (IROFS) where determined by the ISA process.

7.1.1 Fire Protection IROFS

Fire protection IROFS are designed to prevent or mitigate chemical and radiological risks associated with postulated fire events and are identified and defined in the IIFP ISA Summary.

7.1.2 Management Policy and Direction

IIFP is committed to ensuring that the IROFS, as identified in the ISA Summary, are available and reliable, and that the facility maintains fire safety awareness among employees, controls transient ignition sources and combustibles, and maintains a readiness to extinguish or limit the consequences of fire. The facility maintains fire safety awareness among employees through its General Employee Training Program. The training program is described in the IIFP LA Chapter 11, “Management Measures”.

The responsibility for fire protection rests with the Environmental, Safety and Health (ESH) Manager who reports directly to the Chief Operating Officer (COO)/Plant Manager of the IIFP facility. The ESH Manageris assisted by a Facility Safety Engineer on fire protection engineering and safety analysis matters and is supported in the day-to-day maintenance of fire protection items by fire safety personnel who are trained in the field of fire protection.

Engineering support is provided by the Plant Engineering/Maintenance Manager. The personnel qualification requirements for the ESH Manager, Plant Engineering/Maintenance Manager and the Facility Safety Engineering are presented in the LA Chapter 2, “Organization and Administration”. The Facility Safety Engineer assigned to fire protection program is trained in the field of fire protection and has practical day-to-day fire safety experience at nuclear or chemical facilities. This Facility Safety Engineer is responsible for the following:

- Fire protection program and procedural requirements;
- Fire safety considerations;
- Maintenance, surveillance, and quality of the facility fire protection features;
- Review of design changes as they relate to fire protection;
- Documentation and record keeping as they relate to fire protection;
- Fire prevention activities (i.e., administrative controls and training);
- Organization and training of the fire brigade; and
- Pre-fire planning.

Engineering review of the fire safety program is accomplished under the CM program. CM is discussed in the LA Chapter 11.

7.1.3 Fire Prevention

Administrative controls are used to maintain the performance of the fire protection systems and to assign and define the responsibilities of personnel with respect to fire safety. The primary fire safety administrative controls are those that relate to fire prevention. These fire prevention controls are implemented by using procedures and primarily control the storage and use of combustible materials and the use of ignition sources. The controls include, but are not limited to, the following:

- Limiting the use of combustible materials used in construction of the buildings at the facility.
- Controlling the handling of transient combustibles in buildings containing IROFS, including work-generated combustibles.
- Implementing a permit system to control ignition sources that may be introduced by welding, flame cutting, brazing, or soldering operations.
- Conducting formal periodic fire prevention inspections to (1) ensure that transient combustibles adhere to established limits based on the Fire Hazard Analysis; (2) ensure the availability and acceptable condition of fire protection systems/equipment, fire stops, penetration seals, and fire-retardant coatings; and (3) ensure that prompt and effective corrective actions are taken to correct conditions adverse to fire protection and preclude their recurrence.
- Performing periodic housekeeping inspections.
- Implementing a permit system to control the disarming of fire detection or fire suppression systems, including appropriate compensatory measures.
- Implementing fire protection system inspection, testing, and maintenance procedures.

7.1.4 Inspection, Testing, and Maintenance of Fire Protection Systems

An inspection, testing and maintenance program is implemented through procedures to ensure that fire protection systems and equipment remain operable and function properly when needed to detect and suppress fire. Fire protection procedures are written to address such topics as training of the fire brigade, reporting of fires, and control of penetration seals. The facility ESH organization has responsibility for fire protection procedures in general; with the facility's Plant Engineering/Maintenance organization having responsibility for certain fire protection procedures such as control of repairs to facility penetration seals. Further information about management measures for procedures and maintenance is provided in the LA Chapter 11.

7.1.5 Emergency Organization Qualifications, Drills and Training

The Fire Brigade is organized, operated, trained and equipped in accordance with NFPA 600. The Fire Brigade is comprised of facility employees that have normal job responsibilities and also serve in a dual role on the Fire Brigade. The Fire Brigade is considered an incipient fire brigade as classified under NFPA 600, and its members are not required to wear thermal protective clothing nor self-contained breathing apparatus (SCBA) during firefighting. The intent of the facility Fire Brigade is to be able to handle all minor fires and to be a first response effort to supplement the local fire department for major fires at the facility. The Fire Brigade members are trained and equipped to respond to fire emergencies and contain fire damage until offsite response from a neighboring fire department arrives. The plant Fire Brigade response includes the use of hand held portable and wheeled fire extinguishers as well as hoses to fight interior/exterior incipient fires and to fight larger exterior fires in a defensive mode (e.g., vehicle fires). The FEP/DUP Plant Emergency Plan (IFFP, 2009a) also discusses the use of offsite emergency organizations, drills and training.

7.1.6 Pre-Fire Plans

Detailed pre-fire plans will be developed for use by the facility fire brigade. The pre-fire plans include the facility layout, access, contents, construction, hazards, hazardous materials, types and locations of fire protection systems, location of fire protection, power supply and ventilation isolation means, important plant equipment in the area and other information considered necessary by fire emergency response personnel.

7.2 Fire Hazards Analysis

An initial Fire Hazards Analysis (FHA) has been developed for the facility including the fire areas and fire zones which, if uncontrolled, could release DUF_6 or chemicals affecting licensed materials. DUF_6 is present in the Autoclave Building, the DUF_6 handling area, the DUF_4 Process Building and the cylinder pads.

The FHA has been developed in accordance with NFPA 801 and presents the bounding credible fire scenarios and then assesses the consequences of unmitigated fire. The results of the FHA are utilized in the ISA to identify possible fire initiators and accident sequences leading to radiological consequences or chemical consequences resulting from chemical releases affecting licensed materials.

The FHA for the facility consists of the following:

- A description of the facility's use and function,
- The specific fire hazards and potential fire scenarios within the fire areas and fire zones,
- The methods of consequence analysis,
- Description of the facility occupancy and construction requirements,
- Life safety requirements,
- The boundaries and barriers of the fire areas and fire zones,
- The facility response to the postulated fires, and
- Defense or mitigation strategy for overall facility protection.

In addition to building and process-related fire scenarios, the FHA also addressed small, mid-sized and large vehicle fires, including the DUF_6 cylinder hauler.

The FHA is reviewed and updated as necessary to incorporate significant changes and modifications to the facility, its processes, or combustible inventories. The FHA changes or modification are controlled by CM as discussed in the LA Chapter 11 to ensure that the information and analysis presented in the FHA are consistent with the current state of the facility.

7.3 Facility Design

The design of the facility and the individual buildings incorporates the following:

- Utilization of non-combustible construction as much as practicable,
- Class I roof decking on all process buildings,
- Automatic sprinkler protection for all major facilities,
- Minimization of number of buildings and areas containing Uranium,
- Design of facilities, equipment, and utilities to facilitate decontamination.

7.3.1 Building and Cylinder Pad Construction

The facility consists of several different buildings and functional areas:

- DUF_4 Autoclave Building,
- DUF_4 Process Building,
- Decontamination Building,
- UF_4 Container Storage Building
- UF_4 Container Staging Building
- FEP Process Building,
- FEP Oxide Staging Building,
- FEP Product Storage and Packaging Building
- AHF Staging Containment Building,
- Fluoride Products Trailer Loading Building,
- Maintenance & Stores Building,
- EPP Building,
- Lime Silo Storage Shed,
- Material Warehouse,
- Utilities Building,
- Main Switchgear Building,
- Fire Pump House,
- Water Treatment Building,
- Process Offices & Lab,
- Administrative Building, and
- Guard House.

All buildings will be designed and constructed to meet applicable codes as shown in Table 7-3.

All buildings, with the exception of the Lime Silo Storage Shed, have automatic sprinkler protection per NFPA 13 and the New Mexico Commercial Building Code (NMCBC).

See Figure 7-1 for location of the buildings on the 40-acre site.

7.3.2 Fire Area Determination and Fire Barriers

The facility buildings are subdivided into fire areas by barriers with fire resistance commensurate with the potential fire severity, in accordance the NMCBC. The design and construction of fire barrier walls is in accordance with NFPA 221. These fire areas are provided to limit the spread of fire, protect personnel and limit the consequential damage to the facility.

The fire resistance rating of fire barrier assemblies is determined through testing in accordance with NFPA 251. Openings in fire barriers are protected consistent with the designated fire resistance ratings of the barriers they penetrate.

Penetration seals between the AHF Staging Containment Building and the Fluoride Products Trailer Loading Building and between the DUF_4 Process Building and DUF_4 Autoclave Building are provided for electrical and mechanical openings and are listed to meet the guidance of American Society of Testing and Materials, ASTM -814 (ASTM, 2008) or UL 1479 (UL, 2006). Penetration openings for ventilation systems are protected by fire dampers having a rating equivalent to that of the barrier. Door openings in fire rated barriers are protected with listed fire rated doors, frames and hardware in accordance with NFPA 80.

7.3.3 Electrical Installation

All electrical systems at the facility are installed in accordance with the New Mexico Electric Code (NMEC, based on the National Electric Code, NFPA 70). Switchgear, motor control centers, panel boards, variable frequency drives, uninterruptible power supply systems and control panels are mounted in metallic enclosures and contain only small amounts of combustible materials.

Cable trays and conduits are metallic, and the cables in cable trays are flame retardant and tested in accordance with the guidance provided in ANSI / IEEE 383, IEEE 1202, UL 1277, or ICEA T-29-520.

Lighting fixtures are constructed of non-combustible materials. Lighting ballasts contain only an insignificant amount of combustible material. Incandescent, Fluorescent and Metal Halide fixtures are used.

All indoor transformers are dry type. The size and placement of the primary outdoor oil-filled power transformers is yet to be determined, but their location does not offer an exposure to plant facilities. An auxiliary power system is provided to supply power for temporary lighting, ventilation and system monitoring equipment where a potential hazard exists.

Figure 7-1 ~~HFP Site Plan~~ – Redacted Security Related Information

See Table 7-3 below for building design conformance with applicable codes:

Table 7-3 Building Conformance to Applicable Codes

BUILDING **(Areas where uranium is processed or stored are marked in "bold" print")**	**DIMENSIONS (feet)**			**APPROXIMATE AREA** **(square feet)**	**APPROXIMATE VOLUME** **(cubic feet)**
PHASE 1 PLANT	**LENGTH**	**WIDTH**	**EAVE HEIGHT**		
DUF_6 Autoclave Building	90	60	40	5,400	216,000
DUF_4 Process Building	50	50	70	2,500	175,000
UF_4 Container Storage Building	40	40	18	1,600	28,800
UF4 Container Staging Building	25	25	18	625	11,250
Decontamination (Decon) Building	50	30	30	1500	45,000
FEP Process Building (SiF_4 and BF_3)	60	40	60	2400	144,000
FEP Oxide Staging Building	40	20	30	800	24,000
FEP Product Storage & Packaging Building	50	35	18	1750	31,500
AHF Staging Containment Building	40	30	30	1,200	36,000
Fluoride Products Trailer Loading Building	90	20	20	1,800	36,000
Maintenance & Stores Building	60	50	15	3,000	45,000
EPP Building	40	30	18	1,200	21,600
Lime Silo Storage Shed	20	20	8	400	3,200
Utilities Building	50	50	18	2,500	45,000
Material Warehouse	100	50	18	5,000	90,000
Main Switchgear Building	50	40	18	2,000	36,000
Fire Pump House	10	10	15	100	1,500
Water Treatment Building	30	15	15	450	6750
Process Offices	50	30	15	1,500	22,500
Laboratory (**Small uranium samples handled)**	30	30	15	900	13,500
Administrative Building	80	50	15	4,000	60,000
Guard House	25	20	10	500	5,000

7.3.4 Life Safety

The buildings are provided with means of egress, illumination, and protection in accordance with the NMCBC. Barriers with fire resistance ratings consistent with the NMCBC and the FHA are provided to prevent unacceptable fire propagation.

All of the buildings are provided with emergency lighting for the illumination of the primary exit paths and the essential operations areas where personnel are required to operate valves, dampers and other controls in an emergency. Emergency lighting is considered a critical load.

All critical loads are fed from the uninterruptible power supply (UPS). In the essential areas, the UPS system is connected to power sources which can be fed from diesel powered electric generators.

Marking of means of egress, including illuminated exit signs with battery backup, are provided in accordance with the NMCBC, and NFPA 101.

7.3.5 Ventilation

Ventilation for the DUF_4 and FEP process buildings is provided with roof mounted exhaust fans and wall mounted intake louvers. Steam is used as the main heat source for the process building environment. Process Control Room areas are heated, ventilated and cooled by electrical heat pump units with electric auxiliary heat. The Control Room HVAC units create positive pressure in each of the Control Rooms with alarms to indicate loss of pressure. Process equipment areas are open and of large volumes, so steam heating is practical. Cooling of other process and storage areas is provided with wall mounted exhaust fans and intake louvers. The ventilation and HVAC systems meet NFPA 90A, *Installation of Air-conditioning and Ventilating Systems,* and NFPA 90B, *Installation of Warm Air Heating and Air-conditioning Systems.*

The ventilation systems are not engineered for smoke control but are designed to shutdown in the event of a fire. Smoke control is provided by the off-site Fire Department utilizing portable smoke removal equipment.

7.3.6 Drainage

Buildings, building aprons and process area outdoor pads, where chemicals or licensed materials are stored or processed, have curbs and/or dikes to prevent drainage of contaminated liquids outside the spill controlled areas. Water from activation of the sprinkler system or from fire fighting activities could contain contaminated materials, or flammable and combustible liquids. During the initial period of sprinkler activation or generation of fire water in an area, the water collects in the spill controlled area and is handled and treated as any other type spillage or liquid. Areas that have dikes for non-uranium hazardous chemical or oil spill control have installed pumps that can either automatically or manually be activated to pump spilled liquids or water to the EPP for treatment. Areas where licensed materials are processed or stored, and have curbing or dikes, are not automatically pumped to the EPP. If fire water accumulates in those areas in excess of the holding capacity, the water may be pumped either to another licensed material curb/dike area or to holding tanks in the Decontamination Building or to the large HF Recycle Tank, where it can be sampled and disposition determined. Portable pumps are also available for emergency pumping of liquids to other holding areas, tanks or treatment if necessary. If the volume of the fire water reaches a level that exceeds the respective spill control area, it is pumped to other outside spill control areas not directly affected by the fire response. If the water drains and enters the plant storm sewer drain system, it then flows to the Storm Water Retention Basin where it is sampled and a decision is made about its disposal. In the event of a fire in the cylinder storage pad areas, it is unlikely the fire water will become contaminated. Water runoff from the Full Cylinder Storage Pad is collected in the Full DUF_6 Cylinder Pad Stormwater Retention Basin. Water runoff from the Empty DUF_6 Cylinder Storage Pad is collected in the Stormwater Retention/Evaporation Basin. Liquid effluent monitoring associated with the stormwater retention basins is discussed in the IIFP ER.

7.3.7 Lightning Protection

The potential for lightning strikes to the buildings is considered possible; however, the structural design with metal beam and columns, and connections to the underground grounding loops surrounding the buildings is permissible in lieu of air terminals per NFPA 780, *Standard for the Installation of Lightning Protection Systems,* and is considered to be effective lightning protection.

7.3.8 Criticality

Criticality is not a concern for this facility. DUF_6 cylinders are inspected upon arrival and are accepted only when determined to contain non-fissile (non-enriched) material (See Chapter 5 of the IIFP LA).

7.3.9 Hydrogen Control

Hydrogen is utilized as a raw material reactant within the DUF_4 Building, where it is injected into the reaction vessel mixing head and mixes with the DUF_6 to carry out the de-conversion process.

Hydrogen is produced in a packaged generation unit located outside and remotely from buildings or process equipment. Piping remains external to the DUF_4 Process Building for as much of the run-length as possible with only the shortest distance necessary entering the DUF_4 reaction vessel area. Internal piping is protected from mechanical damage, such as mobile cranes or vehicles. Hydrogen is produced at a rate of approximately 6-9 lbs per hour where is it stored in an external storage tank of approximately 5-7 cubic feet capacity, adjacent to the remote located generator. The hydrogen is dispensed into the piping system at an estimated range of 6-12 psig. A more detailed description of the hydrogen supply packaged system is provided in the ISA Summary, Section 3.1.

The Process Hazard Analysis (PHA) and ISA evaluated the hydrogen control scenario and determined any controls required for an acceptable risk. In order to prevent fire or explosion in the areas where hydrogen might accumulate, the areas are protected the following features:

- Hydrogen piping is provided with excess flow control valves,
- Hydrogen supply for the DUF_6 –to DUF_4 de-conversion process is isolated by emergency shutoff valves interlocked with detectors in any the process enclosed building area(s) served by the hydrogen piping and at the hydrogen generation source,
- Mechanical ventilation is provided to ensure that hydrogen concentrations do not exceed 25% of the lower explosive limit. Ventilation is continuous or is interlocked to start upon the detection of hydrogen in the area. Mechanical ventilation is provided with airflow sensors to sound an alarm if one of the exhaust fans becomes inoperative. Additionally, the DUF_4 Process Building is not a leak-tight enclosure, and the potential of accumulation of the light-gas hydrogen is lessened, unless relatively large leaks and flows rates are incurred,
- Hydrogen may also be generated at battery charging stations in the facility. In order to prevent the possibility of explosion or fire, areas where hydrogen might accumulate are protected by a design which incorporates the measures, as necessary, that are identified in NFPA 70E and/or ANSI C2.

7.3.10 Environmental Concerns

There is no normal process water discharge from the facility. Sanitary water (estimated at approximately 3000-4000 gallons per day) is tertiary treated and then used onsite for landscape or tree watering or is evaporated. Storm water runoff drains to the Storm water Retention/Evaporation Basin for evaporation and/or sampling and approved discharge. The potential effects to the environment of water resulting from fire fighting are mitigated by the drainage control and disposal discussed in Section 7.3.6 above.

Radiological and chemical monitoring and sampling are performed, as specified in IIFP ER, Chapter 6, *Environmental Measurements and Monitoring Programs*, on potentially contaminated facility liquid effluent discharge, including water used for firefighting purposes.

7.3.11 Physical Security Concerns

In no case will security requirements prevent safe means of egress, as required by NFPA 101 and the NMCBC. The Physical Security Plan (PSP) addresses the establishment of permanent and temporary Controlled Areas. The PSP identifies the ingress and egress methodology during both normal and emergency conditions. This includes emergency response personnel both onsite and offsite.

7.3.12 Baseline Design Criteria and Defense-In-Depth

The FHA and the ISA demonstrate that the design and construction of the facility comply with the baseline design criteria (BDC) of 10 CFR 70.64 (CFR, 2009e), the defense-in-depth requirements of 10 CFR 70.64 (CFR, 2009e), and that they are consistent with the guidance provided in NFPA 80. The design provides for adequate protection against fire and explosion. This design achieves a balance between preventing fires from starting; quickly detecting fires; controlling and promptly extinguishing those fires that do occur; and protecting structures, systems and components so that a fire that is not promptly extinguished or suppressed will not lead to an unacceptable consequence.

The ISA Summary (IIFP, 2009) describes the basis for providing successive levels of protection using IROFS such that health and safety of employees and the public is ensured within the acceptable risks determined by the ISA structured risk analyses. Additionally, in many and most parts of the processes, safety is further assured by added measures through implementation of designed operational control features, that are not IROFS, but do apply the defense-in-depth engineering design philosophy. Descriptions of some of the more significant added measures are summarized in the ISA Summary, Section 3.1.

7.4 Process Fire Safety

Chapter 6, *Chemical Process Safety*, describes the chemical classification process, the hazards of chemicals, chemical process interactions affecting licensed material and/or hazardous chemicals produced from licensed material, the methodology for evaluating hazardous chemical consequences, and chemical safety assurance. The ISA evaluates the hazards associated with the processes used at the facility. The ISA, in concert with the Fire Hazard Analysis (FHA), identifies processes that represent a process fire safety hazard to the facility. A listing of the major chemicals and estimated average and maximum inventories is provided in the ISA Summary; Section 3.1, “Process Description”

The IIFP DUF_6 cylinder storage pads are characterized as having minimal fire hazards due to the lack of structures, and storage. Non-combustible concrete cylinder saddles are used to support the cylinders. With

the exception of the cylinder hauler, no other fuel burning vehicles are permitted within the perimeters of the storage pads. A fire involving the cylinder hauler is a credible scenario affecting a DUF_6 cylinder, and is addressed by the ISA and the resulting IROFS for ensuring an acceptable risk.

Hydrogen filled equipment and piping, if uncontrolled, (See Section 7.3.9) is the most likely credible scenario leading to significant impact to buildings or equipment. It is addressed by the ISA to ensure an acceptable risk.

7.5 Fire Protection and Emergency Response

This section documents the fire protection systems and fire emergency response organizations provided for the facility.

7.5.1 Fire Protection System

The facility fire protection system consists of a dedicated fire water supply and distribution system, automatic suppression systems (sprinklers and alternate systems), standpipe and hose systems, portable fire extinguishers, fire detection and alarm systems, fire pump control systems, valve position supervision, system maintenance and testing, fire prevention program, fire department response and pre-fire plans. See Figure 7-2 for the Exterior Fire Protection Overall Site Plan

7.5.1.1 Fire Water Supply and Distribution System

System Description

Automatic sprinkler system coverage is provided for all buildings onsite, except the Lime Silo Storage Shed. Automatic sprinkler design is per NFPA 13 *Standard for the Installation of Sprinkler Systems.* The sprinkler systems are not yet designed; however, the minimum design for any of the process buildings is based on the classification of Ordinary, Group 2 for chemical plants with a minimum design density of 0.2 gallons per minute (gpm) per square foot over the hydraulically most remote area of 1,500 square feet. A minimum hose stream requirement of 250 gpm for inside and outside hose streams is provided. The office areas are considered to be Light Hazard. The design density in those areas is 0.1 gpm per square foot (ft^2) over the hydraulically most remote 1500 ft^2.

A reliable fire protection water supply and distribution system of adequate flow, pressure, and duration is provided based on the characteristics of the site and the FHA. The fire protection water supply and distribution system is based on the largest fixed fire suppression system demand, including a hose stream allowance, in accordance with NFPA 13. The minimum fire flow required to be available per Appendix B of the International Fire Code is 1,500 gpm at 20 psi for a minimum duration of two hours and a minimum of 180,000 gallons in storage. Redundant (100,000-gallon minimum) fire water storage tanks, designed and constructed in accordance with NFPA 22, are provided. Separate storage tanks are used for the fire protection water supply and the sanitary water supply.

Figure 7-2 ~~Exterior Fire Protection Overall Site Plan~~ – Redacted Security Related Information

Two fire water booster pumps are provided for the facility. The primary booster pump is driven by an electric motor fed from the facility electrical system, and the emergency backup booster pump is diesel driven. Each booster pump, capable of delivering 600 gpm at approximately 100 psi, is a horizontal, centrifugal, fire booster pump designed and installed in accordance with NFPA 20.

For redundancy, the capacity of the fire protection water supply ensures that 100% of the required flow rate and pressure are available in the event of failure of one of the water storage tanks or fire pumps.

The maximum demand anticipated is based on the maximum combined sprinkler and hose stream demand and duration determined in accordance with NFPA 13.The tanks are arranged so that one tank will be on stream at all times.

The fire water service main for the plant is designed and installed in accordance with NFPA 24. The source of fire water supply, which is isolated from the Sanitary Water System, is a 6-inch underground circulating water main designed in accordance with NFPA 24, *Standard for the Installation of Private Fire Service Mains and Their Appurtenances.*

The Fire Water System maintains approximately 65 psi static pressure at the base of the risers inside the buildings. The underground water mains that feed the sprinkler systems and fire hydrants are constructed of 6 inch PVC pipe, UL listed and/or FM approved for fire main use. The fire protection water supply and distribution system design is based on the largest fixed fire suppression system demand, including a hose stream allowance, in accordance with NFPA 13.

The distribution system, including piping associated with the fire pumps, is looped and arranged so that a single pipe break or valve failure will not totally impair the system per the Fire Hazard Analysis and NFPA 801. Through appropriate valve alignment, either fire pump can take suction from the storage tank(s) and discharge through either leg of the underground piping loop. The system piping is sized so that the largest sprinkler system demand (including hose stream allowance) is met with the hydraulically shortest flow path assumed to be out of service.

Valves are arranged to provide adequate sectional control of the fire main loop to minimize protection impairments. All fire protection water system control valves are monitored under a periodic inspection program, and their proper positioning is supervised in accordance with NFPA 801. Exterior fire hydrants, equipped with separate shut-off valves on the branch connections, are provided at intervals to ensure complete coverage of all facility structures, including the Full DUF_6 Cylinder Storage Pad.

The primary fire water booster pump and the emergency back-up diesel fire water booster pump are separated from each other by two-hour fire-rated barrier construction. Each pump is equipped with a dedicated listed controller. The pumps are arranged for automatic start functions upon a drop in the system water pressure as detected by pressure switches contained within the pump controllers. The start pressure logic prevents simultaneous operation of both pumps. Each fire water pump controller interfaces with the site-wide protective signaling system for all alarm and trouble conditions recommended by NFPA 20, which are monitored and annunciated at the central alarm panel in the DUF_4 Process Building Control Room and the Shift Superintendent's work area. Once activated, the pumps can only be shut-off at the pump controller location. Pumps, suction and discharge piping, and valves are provided and arranged in accordance with the recommendations of NFPA 20. A dedicated diesel fuel tank is provided for the diesel driven fire pump. The tank is located in the Fire Pump House and is sized to provide a minimum eight hour supply of fuel in accordance with the recommendations of NFPA 20. A jockey pump

is provided in the Fire Pump House to maintain pressure in the fire protection system during normal operation. The Fire Pump House is provided with automatic sprinkler protection.

System Interfaces

The Fire Protection Water Supply System does not interface with the sanitary, cooling or process water supply. Independent pumps supply water to the fire water supply storage tanks. The fire water supply is independent of the other water supply systems.

Safety Considerations

The system is designed to assure water supply to automatic fire protection systems, standpipe systems and to fire hydrants located around the facility. This is accomplished by providing redundant water storage tanks and redundant fire pumps which are not subject to a common failure, electrical or mechanical.

7.5.1.2 Standpipe and Hose Systems

As required by the FHA, Class I and Class II standpipe systems and interior fire hose stations are provided and installed in accordance with NFPA 14 in the multi-story process buildings.

The standpipe systems are designed in accordance with NFPA 14 and are separated from the building sprinkler systems either by check valves or separate piping. Connections are provided to allow pressurizing each standpipe or sprinkler system or both, independently, from nearby fire hydrants. The separation ensures that a single impairment does not disable both the sprinklers and standpipe system.

In addition to fixed standpipes and fire hose stations, the IIFP FEP/DUP facility is provided with fire hoses on mobile apparatus and/or at strategic locations throughout the facility. The amount of hose provided is sufficient to ensure that all points within the facility are reached by at least two 64 mm (2½-inch) diameter backup hoses consistent with NFPA 1410. These hoses are intended for use by the fire brigade in the event of a structural fire. Hydraulic margin for these hose lines is sufficient to ensure minimum nozzle pressures of 4.5 bar (65 psia) for attack hoses and 6.9 bar (100 psia) for backup hose lines.

7.5.1.3 Portable Extinguishers

Portable fire extinguishers are installed throughout all buildings in accordance with NFPA 10.

Multi-purpose extinguishers are provided generally for Class A, B, or C fires. The portable fire extinguishers are spaced within the travel distance limitation and provide the area coverage specified in NFPA 10. Specialized extinguishers are located in areas requiring protection of particular hazards.

7.5.1.4 Automatic Suppression Systems

Wet pipe sprinkler systems are engineered to protect specific hazards in accordance with parameters established by the FHA. Water flow detectors are provided to alarm and annunciate sprinkler system actuation. Sprinkler system control valves are monitored under a periodic inspection program, and their proper positioning is supervised in accordance with NFPA 801 to ensure all systems remain operable.

Automatic wet pipe sprinkler systems, designed and tested in accordance with NFPA 13, are provided in all buildings except the Lime Silo Storage Shed.

7.5.1.5 Fire Detection Systems

All facility structures are provided with automatic fire detectors in accordance with NFPA 72 and as required by the FHA. Automatic fire detectors are installed in accordance with NFPA 72, International Fire Code and as required by the FHA.

7.5.1.6 Manual Alarm Systems

All facility structures are provided with manual fire alarm pull stations in accordance with the New Mexico Commercial Building Code, NFPA 72, International Fire Code, and as required by the FHA.

7.5.1.7 Fire Alarm System

Each building of the facility is equipped with a listed, fire alarm control panel installed in accordance with NFPA 72. Each panel has a dual power supply, consisting of normal building power and backup power by either 24-hour battery or the facility UPS. The method of backup power is to be determined in final design. The panel and system use individually-addressable devices. Sprinkler system and hose station water flow devices are installed. Smoke and/or heat detectors, as well as manual pull stations are also employed. Each device is removable from service for maintenance or trouble shooting without disabling the entire system.

Features to avoid detector false alarms are also incorporated into the design. Activation of a fire detector, manual pull station or water flow detector results in an audible and visual alarm at the building control panel and at the central alarm panel.

The central alarm panel, located in the plant shift managers' work area, is a listed, microprocessor-based addressable console. The central alarm panel has dual power supplies, consisting of normal building power and backup power by either 24-hour battery or the facility UPS. The method of backup power is to be determined in final design. The central alarm panel monitors all functions associated with the individual building alarm panels and the fire pump controllers. All alarm and trouble functions are audibly and visually annunciated by the central alarm panel and automatically recorded via printout. Failure of the central alarm panel does not result in failure of any building fire alarm control panel functions.

The following conditions are monitored by the central alarm console through the fire pump controllers:

• Pump running,

• Pump failure to start,

• Pump controller in "off" or "manual" position,

• Battery failure,

• Diesel over-speed,

• Diesel high engine jacket coolant temperature,

• Diesel low oil pressure, and

• Battery charger failure.

Both pumps are maintained in the automatic start condition at all times, except during periods of maintenance and testing. Remote manual start switches are provided in the Control Room adjacent to the alarm console. Pumps are arranged for manual shut-off at the controllers only.

All fire protection water system control valves are monitored under a periodic inspection program, and their proper positioning is supervised in accordance with NFPA 801.

7.5.2 Fire Emergency Response

The following sections address the IIFP fire emergency response.

7.5.2.1 Fire Brigade

A plant Fire Brigade is organized, operated, trained and equipped in accordance with NFPA 600. The Fire Brigade is considered an incipient fire brigade as classified under NFPA 600, and its members are not required to wear thermal protective clothing nor self-contained breathing apparatus (SCBA) during firefighting. The intent of the facility Fire Brigade is to be able to handle all minor fires and to be a first response effort to supplement the local fire department for major fires at the facility. The Fire Brigade members are trained and equipped to respond to fire emergencies and contain fire damage until offsite help from a neighboring fire department arrives. The plant Fire Brigade response includes the use of hand held portable and wheeled fire extinguishers as well as hoses to fight interior/exterior incipient fires and to fight larger exterior fires in a defensive mode (e.g., vehicle fires).

When the local off-site fire department arrives at the IIFP site, the off-site fire department personnel assume control and responsibility for the fire fighting activities. The transition of fire fighting control to the off-site Fire Department is coordinated through the on-shift plant Field Incident Commander (FIC) or the plant Emergency Director (EMD) (See the IIFP Emergency Plan for the FIC and EMD descriptions and responsibilities). Smoke control is accomplished by the off-site Fire Department utilizing portable smoke removal equipment.

Periodic training is provided to offsite assistance organization personnel in the facility emergency planning procedures. Facility emergency response personnel meet at least every two years with each offsite assistance group to accomplish training and review items of mutual interest including relevant changes to the program. This training includes facility tours, information concerning facility access control (normal and emergency), potential accident scenarios, emergency action levels, notification procedures, exposure guidelines, personal monitoring devices, communications, contamination control, and the offsite assistance organization role in responding to an emergency at the IIFP facility, as appropriate.

7.5.2.2 Off-Site Organizations

IIFP will use the services of local, offsite fire departments to supplement the capability of the facility Fire Brigade. The two primary agencies available for this response are the City of Eunice, New Mexico Fire and Rescue Agency and the City of Hobbs, New Mexico Fire Department. Both of these agencies are signatories to the Lea County, New Mexico Mutual Aid agreement and can request additional mutual aid from any of several county fire departments/fire districts.

The Hobbs Fire Department is the primary response agency, and is comprised of a roster of approximately 70 paid personnel, staffing three fire stations in a three-shift rotation. The department has structural engines, ladder truck, heavy rescue truck, grass fire trucks, water tanker, several command vehicles and ambulances, each equipped to provide advanced level life support. Firefighters are trained to Firefighter Level I and EMT – Basic as a minimum, per New Mexico standards. Shift assigned ambulance personnel are EMT – Paramedics per New Mexico standards.

Eunice Fire and Rescue, is the secondary response agency, and is comprised of a roster of approximately 20 volunteers. Eunice has structural fire engines, grass fire trucks, water tanker, command vehicles, and ambulances each equipped to provide intermediate level life support. Firefighters are trained, as a minimum, to Firefighter Level I and ambulance personnel, as a minimum, to (EMT) – Basic per New Mexico standards. In the event of a fire, the IIFP fire brigade responds and the Hobbs and Eunice Fire and Rescue Departments are notified to respond. If the fire is incipient, the IIFP fire brigade fights the fire utilizing hand portable/wheeled fire extinguishers and/or 38 mm (1½-in) hose lines. The estimated response time to the facility has not been verified at this time, but response from the Hobbs Fire Department is estimated at less than 15 minutes and between 20-30 minutes from the Eunice Department. Once the MOU's are in signed with these organizations, the response times will be confirmed in the MOU.

Through a combination of onsite capability, offsite responders, or contract arrangements, the IIFP Emergency Plan and implementing procedures ensure that capabilities are in place to respond to other events such as, hazardous material releases, confined space rescue, trench rescue, high angle rescue, and other technical emergencies as required. The IIFP fire brigade/ emergency response team equipment is inventoried, inspected and tested in accordance with recognized standards. These response areas and response equipment will be reassessed after detailed facility design is completed to ensure adequate response capabilities are in place and applicable training is completed. Additional reassessments will be conducted to ensure the response capabilities are in place prior to startup operations.

Actions to respond to emergencies, including fires, at the International Isotopes Fluorine Product, Lea County, New Mexico facility are addressed in the site Emergency Plan (IIFP, 2009). The facility Emergency Plan identifies outside response organizations that are expected to respond to emergencies at the IIFP facility per Memorandums-of- Understanding (MOU). The Emergency Plan also conforms with and addresses the acceptance criteria specified in Chapter 8 of NUREG-1520, *Standard Review Plan for the Review of a License Application for a Fuel Cycle Facility* (NRC, 2002). The site Emergency Plan is submitted to the NRC under a transmittal letter separate from the LA (See the IIFP LA Chapter 8).

7.6 References

ASTM, 2008. American Society for Testing and Materials, ASTM E-814. *Standard Test Method for Fire Tests of Through-Penetration Fire Stops*, 2008

CFR, 2009a. Title 10, Code of Federal Regulations, Part 40, Domestic Licensing Of Source Material, 2009.

CFR, 2009b. Title 10, Code of Federal Regulations, Section 70.22, Contents of applications, 2009.

CFR, 2009c. Title 10, Code of Federal Regulations, Section 70.61, Performance requirements, 2009.

CFR, 2009d. Title 10, CFR Code of Federal Regulations, Section 70.62, Safety program and integrated safety analysis, 2009.

CFR, 2009e . Title 10, Code of Federal Regulations, Section 70.64, Requirements for new facilities or new processes at existing facilities, 2009.

CFR, 2009f. Title 10, Code of Federal Regulations, Section 70.65, Additional content of applications, 2009.

ICC, 2006. ICC International Fire Code® (IFC) 2006 as amended by City of Hobbs Ordinance No. 991, 2006.

IIFP. (2009b). FEP/DUP Plant Emergency Plan,Rev A December 26, 2009.

IIFP, 2009b. International Isotopes Fluorine Products, Inc., FEP/DUP Site Fire Hazards Analysis, November, 2009.

NFPA, 2002. *SFPE Handbook of Fire Protection Engineering*, 2nd Edition and 3rd edition, National Fire Protection Association, Quincy, MA, 2002.

NFPA, 2003. Fire Protection Handbook, 19th Edition, National Fire Protection Association, Quincy, MA,

2003.

NMCBC, 2006. Title 14, New Mexico Commercial Building Code, Chapter 7, Part 2 *2006 New Mexico Commercial Building Code*, 2006.

UL, 2006. Underwriters Laboratories, UL 1479, *Fire Tests of Through-Penetration Firestops*, 2006

USNRC, 1977. US Nuclear Regulatory Commission, Generic Letter 77-02, *Fire Protection Functional Responsibilities, Administrative Control and Quality Assurance*, August, 1977.

USNRC, 1995. U.S. Nuclear Regulatory Commission, Generic Letter 95-01, *NRC Staff Technical Position on Fire Protection for Fuel Cycle Facilities*, January 1995.

USNRC, 1998. U.S. Nuclear Regulatory Commission NUREG/CR-6410 *Nuclear Fuel Cycle Facility Accident Analysis Handbook*, 1998.

USNRC, 2001. U.S. Nuclear Regulatory Commission ,NUREG-1513, *Integrated Safety Analysis Guidance Document*,2001.

USNRC, 2002. U.S. Nuclear Regulatory Commission NUREG-1520, *Standard Review Plan for the Review of a License Application for a Fuel Cycle Facility*, 2002.

8 Emergency Management

Actions to respond to emergencies at the International Isotopes Fluorine Product, Lea County, New Mexico facility are addressed in the site Emergency Plan. The Emergency Plan (IIFP, 2009) is developed in accordance with 10 CFR 40.31(j) (CFR, 2009) and conforms to the guidance presented in Regulatory Guide 3.67, *Standard Format and Content for Emergency Plans for Fuel Cycle and Materials Facilities* (NRC, 1992). This Emergency Plan also conforms with and addresses the acceptance criteria specified in Chapter 8 of NUREG-1520, *Standard Review Plan for the Review of a License Application for a Fuel Cycle Facility* (NRC, 2002). The site Emergency Plan, Revision A, December 24, 2009 is submitted to the NRC under a transmittal separate from the LA chapters.

The site Emergency Plan identifies outside response organizations that review the Emergency Plan pursuant to the requirement in 10 CFR 40.31(j). As part of the EP development, the offsite response organizations, that are expected to respond to an accident event at the IIFP facility, were provided the final draft of the IIFP Emergency Planf or their review and comment. The following is a list of those response organizations that were requested to comment on the EP, and to support IIFP Memorandums of Understanding for response to accidental events at the facility.

- Eunice, New Mexico Fire and Rescue
- City of Eunice, New Mexico Police Department
- Lea Regional Medical Center, Lea County, New Mexico
- Lea County, New Mexico Emergency Management, including comments and support representing the Lea County Volunteer Fire Departments of Monument, Knowles and Maljamar, New Mexico
- Hobbs, New Mexico Fire Department
- Lea County, New Mexico Sheriff Department
- New Mexico State Department of Homeland Security

Comments on the final draft of the IIFP EP were received from each of the above response organizations via letter and verbal communications. Comments received via verbal communications where documented on the International Isotopes Fluorine Products – Emergency Plan Comment Sheet. All of the response organizations comments were incorporated into the EP as Revision 1 of the Plan, some of which were redundant. Questions were resolved via verbal communications or through email correspondence. Copies of these correspondences are included as Section 8.1. Some of comment providers marked some key point in their correspondence with “yellow” highlight. Those highlight markings remain on the attached comment correspondence. A record of the comment resolutions is provided as Section 8.2, ‘Summary of Comment Resolution”.

8.1 Local Responder Correspondence:
8.1.1 Eunice, New Mexico Fire and Rescue

EUNICE FIRE AND RESCUE
1107 Avenue J
P.O. Box 147
Phone: 575-394-3258
Fax: 575-394-3495
Chief Ron Grogan

To Whom It May Concern:

Here are my comments in regards to the Emergency Plan Review Request that I received.

Page 3: New Mexico SR 209 does not run south from Hobbs to Eunice and Jal. NM SR 18 does run south from Hobbs to Eunice and Jal.

Page 37: Needs to be modified in the first paragraph to include Monument, NM Fire Department. Their fire district borders the proposed site on the west side and south side. While they do not have EMS transport capabilities, they do have EMT's, fire, and rescue capabilities.

Page 38: Same as above needs to be modified to include Monument, NM Fire Department.

While I am not very knowledgeable about the process, the plan appears to be well thought and prepared.

Ronald Grogan
Chief
Eunice Fire & Rescue

JJM-2009-52 September 25, 2009

International Isotopes Fluorine Products – Emergency Plan Comment Sheet

Reviewing Organization: Eunice Fire and Rescue Services
Organization Address: P.O. Box 747
Eunice NM, 88231

Reviewer Name: Chief Ron Grogan
Phone Number:
Email Address:
Date Received: Date Completed:

Use Additional Sheets as Necessary

Page	Section	Comment
3	2.2.1	New Mexico SR 209 does not run south from Hobbs to Eunice and Jal. NM SR 18 does run south from Hobbs to Eunice and Jal.
37	7.4.2	Needs to be modified in the first paragraph to include Monument, NM Fire Department. Their fire district borders the proposed site on the west side and south side. While they do not have EMS transport capabilities, they do have EMT's, fire, and rescue capabilities.
38	7.4.2	Same as above needs to be modified to include Monument, NM Fire Department
Comments provided via letter, comments transcribed to form by John Miller		

8.1.2 City of Eunice, New Mexico Police Department

CITY OF EUNICE, NEW MEXICO
POLICE DEPARTMENT
P.O. BOX 159, EUNICE, NM 88231
PHONE 575-394-2112
FAX 575-394-9025

"Friendly People, Proud Town"

Chief Kevin P. Burnam
chiefburnam@valornet.com

Date: 10/13/09

To: L. Velasquez

Re: Isotopes plant

Lorenzo,

Per our conversations I have reviewed most of the Isotopes emergency plan. Even though the Eunice Police Dept. is not listed as a backup agency in case of an emergency we would make our officers available if requested. As Chief of Police of Eunice I think the Isotopes plant is another strong addition to the economy of Lea County, NM. If you need anything from my agency please feel free to call.

Best regards,

Kevin Burnam

Chief of Police

8.1.3 Lea Regional Medical Center, Lea County, New Mexico

LEA REGIONAL
MEDICAL CENTER

Facility Management Department

John Miller
International Isotopes
4137 Commerce Circle
Idaho Falls, ID 83401

Mr. John Miller:
Lea Regional Medical Center (LRMC) has received a copy of your draft emergency response plan for the facility that will be located west of Hobbs, NM. At this time, we do not have any issues with the information provided. We look forward to working with the facility in the future.

If you have any questions or require assistance from LRMC, please contact me by email or the phone numbers listed below.

Sincerely,

Scott Norred
Facility Management Director / Safety Officer
Lea Regional Medical Center
5419 N. Lovington Hwy
Hobbs, NM 88240
Telephone 575-492-5382
Fax 575-492-5556

8.1.4 Lea County, New Mexico Emergency Management

Lea County Emergency Management
100 North Main, Suite 4
Lovington, New Mexico 88260

Phone (575) 396-8607
Fax (575) 396-2093
lvelasquez@leacounty.net

John Miller
International Isotopes
4137 Commerce Circle
Idaho Falls, ID 83401

Mr. John Miller

Lea County Emergency Management has received a copy of your draft emergency response plan for the facility that will be located West of Hobbs NM on State Road 483. Thank you for talking to me and addressing some of the changes to the plan concerning police and fire agencies. We look forward to working with you in the future. I am writing this letter of support to include our Lea County Volunteer Fire Departments (Monument) (Knowles) and (Maljamar).

If you have any questions or require assistance from Lea County Emergency Management. Please contact me by email or the phone numbers listed below.

Lorenzo Velasquez
Lea County Emergency Management
100 N. Main Suite 4
Lovington, NM 88260

O- (575) 396-8607
C- (575) 605-6561

JJM-2009-56 September 25, 2009

International Isotopes Fluorine Products – Emergency Plan Comment Sheet

Reviewing Organization: Lea County
Organization Address: 100 N. Main St., Suite 4
Lovington, NM 88260

Reviewer Name: Lorenzo Velasquez
Phone Number: _____
Email Address: _____
Date Received: _____ Date Completed: _____

Use Additional Sheets as Necessary

Page	Section	Comment
37	7.4	Change second sentence of 1st paragraph to read: When contacted via 911, the Central Dispatch in Lea County Sherriff's department will dispatch fire, Emergency Medical Services (EMS) and local law enforcement personnel.
37	7.4	Delete the last sentence of 1st paragraph: If emergency fire and medical services personnel in Lea County are not available, the mutual aid agreements are activated and the Hobbs Central Dispatch will contact the appropriate local agencies for the services requested at the facility.
37/38	7.4.2	Change 2nd sentence of 2nd paragraph to read: If additional fire equipment is needed, or if the Hobbs Fire and Rescue is unavailable, the Central Dispatch will call the Monument Volunteer Fire Department.
38	7.4.3	Change 2nd sentence of 1st paragraph to read: The Lea County Sheriff's Department provides initial response with the Hobbs Fire and Rescue.
Above Comments provided to John Miller via telecom.		

8.1.5 Hobbs, New Mexico Fire Department

Hobbs Fire Department
301 E White
Hobbs, NM 88240
575-397-9308

October 6, 2009

Lorenzo Velasquez
Emergency Preparedness Coordinator
100 N. Main, Suite 4
Lovington, NM 88260

Mr. Velasquez,

This letter is providing you and your office a formal response from the City of Hobbs Fire Department referencing "The International Isotopes Incorporated" emergency plan. A review of this plan and its content was conducted by senior staff members of the Hobbs Fire Department. Minor questions and changes have been recommended in the attached comment sheet provided. The City of Hobbs Fire Department is committed to support this plan within its jurisdictional authority and/or resources, as well as, the operation of International Isotopes Incorporated.

Please feel free to contact me with any additional.

Sincerely,

Manuel R. Gomez
Fire Chief

International Isotopes Fluorine Products – Emergency Plan Comment Sheet

Reviewing Organization: Hobbs Fire Department
Organization Address: 301 East White St.
Hobbs, NM 88240

Reviewer Name: Chief Gomez
Phone Number: 575-397-8608
Email Address: mgomez@hobbsnm.org
Date Received: 09-29-2009 Date Completed: 10-6-2009

Use Additional Sheets as Necessary

Page	Section	Comment
pg.32	7.3.1	What method of communication will the EMD or CMO utilize with local Fire Department's?
pg.33	7.3.4	What level of training/certification does your Haz Mat team possess?
pg.34	7.3.5	Upon site emergency
pg.37	7.4.2	Fire support HFD in addition to resources listed we have a fully equipped Haz Mat
		response vehicle with 19 fully trained Haz Mat technicians, and all other
		personnel are Operations/Ops Decon certified.
pg.37	7.4	Remove Hobbs Fire and Rescue
pg.37	7.4.1	Remove Hobbs Fire and Rescue, replace with Hobbs Fire Department
pg.37	7.4.2	Remove Hobbs Fire and Rescue, replace with Hobbs Fire Department
pg.37	7.4.2	Class rating of 4- What is this rating?
pg.37	7.4.2	Remove Eunice Fire Department, replace with Monument Volunteer Fire, Monument is Adjacent/Adjoining response coverage Area.

John J. Miller

From: John J. Miller [jjmiller@intisoid.com]
Sent: Thursday, November 05, 2009 9:59 AM
To: 'mgomez@hobbsnm.org'
Subject: Hobbs Fire Department Comments
Attachments: EP_Comments_Hobbs_FireDept.pdf

Chief Gomez,

Thank you for the detailed review of the Emergency Plan. You provided valuable comments and raised some important questions. I believe I have addressed your comments and resolved the questions as follows:

1st Comment regarding communications – Initial calls would be made utilizing land line or cell phone via 911, as referenced in Section 7.. More importantly would be communications between IIFP response team and off-site response team. Without getting into too much I have revised a responsibility bullet for the FIC as follows:

- Ensures that a liaison is established with any community fire-fighting, medical support or other off-site organizations that may be called into IIFP. Ensures that direction is provided to off-site response units that may arrive at the IIFP facility and provides information on location of the emergency, best routes for entry to the emergency scene, and status of the incident. Ensures communication capability exists between IIFP response teams and off-site responders, i.e. two-way radio operating on common frequency.

2nd comment regarding level of training – I reworded sections 7.3.4 (Emergency Response Team Leader) and 7.3.13 (Emergency Response Team Members) as follows:

7.3.4- The ERTL reports directly to the FIC. The ERTL is trained as a hazardous materials first-responder (§1910.120 (q) (6) (ii))

7.3.13- The ERT consists of plant employees who are first-responder (§1910.120 (q) (6) (ii)) and fire brigade (§1910.156 (c)) trained as identified by the requirements described in the plant EPIPs. A select number of ERT members will be trained to the hazardous materials technician level (§1910.120 (q) (6) (iii)).

3rd comment "Upon Site Emergency" – I reread Section 7.3.5 and then other sections and feel that the caveat you suggest "Upon site emergency" is implied through the title of Section 7.3 so I left section 7.3.5 unchanged.

4th comment regarding department details – revised description in Section 7.4.2 to read:

It has 19 paramedics and 43 EMT-1, and 2 SWAT medics and a fully equipped Hazardous Materials Response Vehicle and 19 responders trained at the hazardous materials technician level (§1910.120 (q) (6) (iii)).

5th, 6th, 7th comment regarding proper name – Replaced Hobbs Fire and Rescue with Hobbs Fire Department (6 instances)

8th comment regarding class rating – This is in reference to the Insurance Service Public Protection rating. Revised Section 7.4.2 to read: Hobbs Fire Department includes 72 employees and an Insurance Service Office (ISO) Class rating of 4.

9th comment regarding Monument VFD – Same comment received from Lorenzo Velasquez. 7.4.2 revised:

If the Emergency Director determines that off-site fire support is needed, the Hobbs Central Dispatch will dispatch the Monument Volunteer Fire Department and/or Hobbs Fire Department, located approximately 20 and 23 km (12 and 14 mi) respectively from the facility.

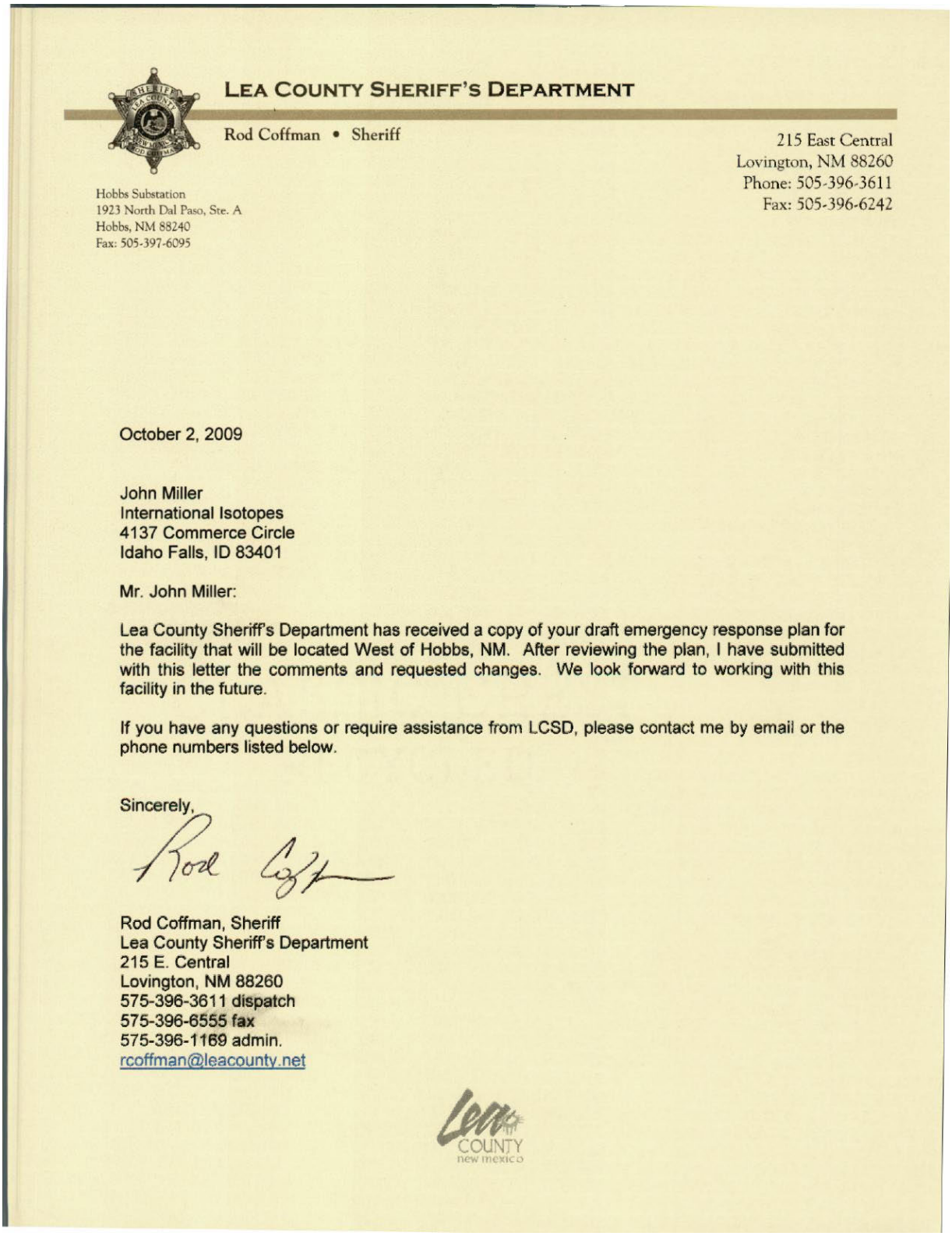
Hobbs Fire Department includes 72 employees and an Insurance Service Office (ISO) Class rating of 4. It has 19 paramedics and 43 EMT-1, and 2 SWAT medics and a fully equipped Hazardous Materials Response Vehicle and 19 responders trained at the hazardous materials technician level (§1910.120 (q) (6) (iii)). The inventory of EMS units has increased to seven. If additional fire equipment is needed, or if the Hobbs Fire Department is unavailable, the Central Dispatch will call the Monument Volunteer Fire Department. In instances where radioactive/hazardous materials are involved, knowledgeable members of the facility EO provide information and assistance to the responding off-site personnel.

Please let me know if these revision have adequately addressed your comments and questions.

John J. Miller, CHP
Radiation Safety Officer
International Isotopes, Inc.

Ph.: 208.524.5300
Fax.: 208.524.1411
Cell.: 208.589.1580

8.1.6 Lea County, New Mexico Sheriff Department



LEA COUNTY SHERIFF'S DEPARTMENT

Rod Coffman • Sheriff

215 East Central
Lovington, NM 88260
Phone: 505-396-3611
Fax: 505-396-6242

Hobbs Substation
1923 North Dal Paso, Ste. A
Hobbs, NM 88240
Fax: 505-397-6095

October 2, 2009

John Miller
International Isotopes
4137 Commerce Circle
Idaho Falls, ID 83401

Mr. John Miller:

Lea County Sheriff's Department has received a copy of your draft emergency response plan for the facility that will be located West of Hobbs, NM. After reviewing the plan, I have submitted with this letter the comments and requested changes. We look forward to working with this facility in the future.

If you have any questions or require assistance from LCSD, please contact me by email or the phone numbers listed below.

Sincerely,

Rod Coffman, Sheriff
Lea County Sheriff's Department
215 E. Central
Lovington, NM 88260
575-396-3611 dispatch
575-396-6555 fax
575-396-1169 admin.
rcoffman@leacounty.net

Lea COUNTY new mexico

JJM-2009-57 September 25, 2009

International Isotopes Fluorine Products – Emergency Plan Comment Sheet

Reviewing Organization: Lea County Sheriff's Office
Organization Address: 215 E. Central St
Lovington, NM 88260

Reviewer Name: Rod Coffman, Sheriff
Phone Number: (575) 396-3611 (575) 390-8474 cell
Email Address: rcoffman@lea County.net
Date Received: 10/2/09 Date Completed: 10/01/09

Use Additional Sheets as Necessary

Page	Section	Comment
37	7.4	ALL 911 CALLS FROM THIS SITE ROUTE TO THE LEA COUNTY SHERIFFS DEPARTMENT DISPATCH, WHICH WILL DISPATCH THE APPROPRIATE RESOURCES
38	7.4.3	LEA COUNTY SHERIFFS DEPARTMENT WILL PROVIDE INITIAL RESPONSE TO ALL CALLS FOR OUTSIDE EMERGENCY ASSISTANCE ALONG WITH FIRE OR RESCUE PERSONNEL. NEW MEXICO STATE POLICE ARE RESPONSIBLE FOR ALL HAZ-MAT OPERATIONS IN THE STATE. HOBBS POLICE DEPARTMENT MAY BE REQUESTED FOR ASSISTANCE BY THE LEA COUNTY SHERIFFS DEPT, IF NEEDED.

Rod Coff

8.1.7 New Mexico State Department of Homeland Security and Emergency Management

Bill Richardson
Governor

John W. Wheeler
Secretary

DEPARTMENT OF HOMELAND SECURITY
AND EMERGENCY MANAGEMENT

November 19, 2009

John J. Miller, CHP
Radiation Safety Officer
International Isotopes, Inc.

Dear Mr. Miller:

I have reviewed the International Isotopes Fluorine Extraction facility emergency site plan and have added the following changes to the document.

Section:
7.3.10 First Aid officer Training level: we would like more detail at what EMS level the officer is trained, example being Basic First Aid, EMT Basic, EMT Intermediate or EMT Paramedic. This gives us an indication of your onsite medical capability.

7.3.13 Respiratory Protection: we would like more detail as to what type of respiratory protection is on site, examples are face mask, Air-Purifying Respirator or Atmosphere supplying respirator. Again this gives us an indication of the inhalation hazards the onsite response team will be exposed to.

7.4 Local Off site Assistance to Facility: change to show NMDHSEM instead of DPS OEM
Also noted why is an MOU needed with our agency?

7.4.3: Law Enforcement: I have added the requirement by state statute that State Police are contacted and any emergency hazmat operations be run according to the states HMER plan.

8.2.2: Site Area Emergency Classification: change to reflect NMDHSEM instead of DPS OEM.

9.2.1.3: Radio System: change to reflect NMDHSEM instead of DPS OEM.

If you or your staff has any questions, please feel free to contact Don Shainin of my staff at (505) 476-9628.

Sincerely,

John Martinez, Deputy Cabinet Secretary
New Mexico Department of Homeland Security & Emergency Management

P.O. Box 27111
Santa Fe, New Mexico 87502
(505)476-9600

John J. Miller

From: Shainin, Don, DHSEM [don.shainin@state.nm.us]
Sent: Friday, December 04, 2009 7:17 AM
To: John J. Miller
Subject: RE: Emergency plan

Thanks, that will work for us.

From: John J. Miller [mailto:jjmiller@intisoid.com]
Sent: Thursday, December 03, 2009 3:21 PM
To: Shainin, Don, DHSEM; Martinez, John, DHSEM
Subject: RE: Emergency plan

John/Don

You had two Red-Lines in the EP that were questions requiring clarification more so than requested changes in text:

Section 7.3.10 – you insert the question: what level are these employees trained at? Basic, Intermediate or Technician I reworded the paragraph from:

A vehicle will be kept on standby for prompt dispatch to the emergency site. Trained employees will be organized into first aid teams to care for injured personnel under direction of the First Aid Officer or his designee. The First Aid Officer also requests ambulances and off-site medical support services as required.

To:

A vehicle will be kept on standby for prompt dispatch to the emergency site. EMT employees trained in basic first aid and CPR will be organized into first aid teams to care for injured personnel under direction of the First Aid Officer or his designee. The First Aid Officer also requests ambulances and off-site medical support services as required.

Section 7.3.13 5th bullet – you raise the question: Dons appropriate personal protective equipment. What type of respiratory protection is to be used?

PPE, including the respiratory protection will be selected according to the specific emergency conditions. I can tell you we intend to have both air purifying and air supplied respiratory protection available for emergency response. Air purifying respiratory equipment would only be used when we are dealing with radioactive particulates at concentrations low enough to be supported by the protection factor offered by the respirator. Emergencies involving fluoride gas compounds would require air supplied respiratory protection. We have yet to identify specific models that we will utilize.

I changed the bullet to read. - **Dons the appropriate level of personal protective equipment as the hazard dictates.** I think this addresses your question.
All of your other red-lined comments were incorporated as they were written.

We really appreciate the time you spent reviewing the document and your valuable input. We will submit the plan with all responder comments addressed. We will then forward the final plan as approved by the NRC to each off-site response organization. Please contact me if you have questions regarding the EP and the comment resolution.

John J. Miller, CHP
Radiation Safety Officer

1

8.2 Summary of Comment Resolution

Reviewing Organization	Section	Comment	Resolution
Lea County Sheriff's Office	7.4	All 911 calls, from this site, route to the Lea County Sheriff's Department Dispatch, which will dispatch the appropriate resources.	Incorporated in EP
Lea County Sheriff's Office	7.4.3	Lea County Sheriff's Department will provide initial response to all calls for outside emergency assistance along with fire and rescue personnel. New Mexico State Police are responsible for all HAZMAT Operations in the state. Hobbs Police Department may be requested for assistance by the Lea County Sheriff's Department, if needed.	Incorporated in EP
Eunice Fire and Rescue	2.2.1	New Mexico SR209 does not run south from Hobbs to Eunice and Jal. NM SR18 does run south from Hobbs to Eunice and Jal.	Incorporated in EP
Eunice Fire and Rescue	7.4.2	Needs to be modified in the first paragraph to include Monument, NM Fire Department. Their fire district borders the proposed site on the west and south sides. While they do not have EMS transport capabilities, they do have EMT's, fire and rescue capabilities.	Incorporated in EP
Eunice Fire and Rescue	7.4.2	Same as above needs to be modified to include Monument, NM Fire Department.	Incorporated in EP
Lea Regional Medical Center		No comments at this time.	
City of Eunice, Police Dept.	7.4.3	Even though the Eunice Police Department is not listed as a backup agency in case of an emergency we would make our officers available, if requested.	Incorporated in EP
Hobbs Fire Department	7.3.1	What method of communication will the EMD and or CMO utilize with the local Fire Departments?	1.Land Line 2. Radio

			3. Cell Phone
Hobbs Fire Department	7.3.4	What level of training/certification does your HAZMAT team possess?	40 Hours Initial 24 Hours Yearly
Hobbs Fire Department	7.3.5	Upon site emergency?	Site Area Emergency is one that requires off-site assistance
Hobbs Fire Department	7.4.2	Hobbs Fire Department, in addition to fire and rescue, has a fully equipped HAZMAT response vehicle with 19 fully trained HAZMAT technicians, and all other personnel are Operations/OPS Decontamination certified.	Incorporated in EP
Hobbs Fire Department	7.4	Remove Hobbs Fire and Rescue and replace with Hobbs Fire Department.	Incorporated in EP
Hobbs Fire Department	7.4.1	Remove Hobbs Fire and Rescue and replace with Hobbs Fire Department.	Incorporated in EP
Hobbs Fire Department	7.4.2	Remove Hobbs Fire and Rescue and replace with Hobbs Fire Department	Incorporated in EP
Hobbs Fire Department	7.4.2	Class rating of -4. What is this rating?	Insurance Service Office (ISO) Class Rating of 4. – Incorporated into EP.
Hobbs Fire Department	7.4.2	Remove Eunice Fire Department, replace with Monument Volunteer Fire. Monument is adjacent/adjoining response coverage area.	Incorporated in EP
NMDHSEM	6.3	Change reference to Office of Emergency Management (OEM) to NM Department of Homeland Security and Emergency Management	Incorporated in EP
NMDHSEM	7.3.10	Clarify level of employee first aid training.	Clarification incorporated into EP (Basic first aid and CPR)
NMDHSEM	7.3.13	5th bullet – what type of respirator protection?	Respiratory protection assigned according to specific hazard – no change to EP, bullet remains as “Dons appropriate personal

			protective equipment.
NMDHSEM	7.4	Change agency name to reflect NM DHSEM	Incorporated in EP
NMDHSEM	7.4	Change agency name to reflect NM DHSEM (4th paragraph)	Incorporated in EP
NMDHSEM	7.4.3	Add reference to NM Hazardous Material Emergency Response Plan.	Incorporated in EP
NMDHSEM	8.2.2	5th bullet change agency name to reflect NMDHSEM	Incorporated in EP
NMDHSEM	8.4.2	3rd paragraph change agency name to reflect NMDHSEM	Incorporated in EP
NMDHSEM	9.2.1.3	2nd bullet change agency name to reflect NMDHSEM	Incorporated in EP

8.3 References

CFR, 2009. Title 10, Code of Federal Regulations, Section 40.31(j), *Application for specific licenses*, 2009.

IIFP. (2009b). FEP/DUP Plant Emergency Plan,Rev A December 26, 2009.

NRC, 1992, Standard Format and Content of Emergency Plans for Fuel Cycle and Materials Facilities, Regulatory Guide 3.67, U.S. Nuclear Regulatory Commission, January 1992.

NRC, 2002, Standard Review Plan for the Review of a License Application for a Fuel Cycle Facility, NUREG-1 520, U.S. Nuclear Regulatory Commission, March 2002.

9 Environmental Protection

The environmental protection section of the LA contains the two major components that provide the basis for adequate environmental protection assurance during both normal and credible abnormal operations for the IIFP facility that is proposed to be built near Hobbs, New Mexico. These two distinct components are: (1) the ER (IIFP, 2009), and (2) the environmental protection measures. The ER evaluates the environmental impacts of the proposed facility whereas the environmental protection measures define the programs and analyses necessary to maintain adequate environmental assurance during the operating lifetime of the facility.

The IIFP project and facility is described in the IIFP LA Chapter 1 and details of the facility and its processes are fully described in Section 3 of the IIFP ISA Summary. Section 9.1 below is a brief summary of what is contained in the ER, and where specific detailed information is located, and is not the ER itself. The full ER is provided to the Nuclear Regulatory Commission (NRC) as a second and independent document submittal. The ER includes facility, site and process descriptions, and it addresses construction, operation, transportation, socioeconomic, and other impacts to the environment including comparison of the Proposed Action with No-Action and Reasonable Alternatives.

It also should be noted, that in addition to the proposed facility of this submitted LA, the ER evaluates the environmental effects of an add-on DUF_6 process for direct de-conversion to uranium oxide, referred to as Phase 2. The future Phase 2 process was evaluated in the current ER submittal owing to the plans to begin adding this process to the original facility within approximately 3-4 years of the first facility operation. The DUF_6-to-oxide de-conversion plant is not part of this initial LA. Plans are to amend the LA for the future Phase 2 process at the appropriate time.

The ER considers and evaluates impacts of the IIFP facility during construction and operation. IIFP intends to request an exemption for some pre-license construction that could start as early as 3rd Quarter of 2010. In the ER, pre-license construction is considered in evaluating the environmental impacts. It is anticipated that pre-license approval will be obtained and some selective construction activities will be accomplished prior to issuance of a license by NRC. These pre-license construction activities will be preparatory in nature and will not involve any process or safety related equipment or systems.

The selected pre-license construction activities only affect the timing of work and do not increase the scope of the environmental impact of overall facility construction. Some pre-license construction activities that are proposed and considered in the ER include the following:

- Clearing land
- Site grading and erosion control
- Install main entrance roadbed and drainage to highway
- Install construction trailer
- Prepare preliminary site roadways and gravel parking area
- Drill water wells, if needed
- Construct power substation
- Stub in gas line to meter
- Begin administration building construction
- Install geothermal heating/cooling loops
- Begin general warehouse (no contents) construction
- Install firewater tanks

In summary, the pre-license construction was evaluated in each impact area of the ER. The impacts of pre-license construction were found to be no greater than if included during the time of full construction itself and are expected to be "Small". The full construction impacts are determined in the ER to be SMALL except that during construction the transportation impact and ecological impacts along some travel corridors are both determined to be MODERATE. A National Pollution Discharge Elimination System (NPDES) Construction General Permit and a Spill Prevention, Control and Countermeasures (SPCC) plan will likely be required and implemented earlier for the pre-license construction as it otherwise would have been later for full construction.

Figure 9-1 Location of the Proposed IIFP Site

9.1 Environmental Report

The ER (IIFP, 2009) constitutes one portion of an application to be submitted by IIFP to construct and operate a facility that offers de-conversion services of DUF_6 and extracts the fluoride from the DUF_6 to produce high-purity fluoride gas products and anhydrous hydrofluoric acid (AHF). During this Phase 1 process the DUF_6 uranium will be de-converted into depleted uranium (DU) tetrafluoride (DUF_4) and then into DU oxide in the fluorine extraction process. In the future Phase 2 facility, an additional process will be used for direct de-conversion of DUF_6 to AHF and depleted uranium oxide. In both processes, the

fluorine products and AHF are sold, and the depleted uranium oxide is sent for off-site to a licensed low-level radioactive waste disposal facility. The proposed facility, and planned phase 2 expansion, will be located near Hobbs, New Mexico (Figure 9-1). The ER for the proposed facility serves two primary purposes. First, it provides information that is specifically required by the Nuclear Regulatory Commission (NRC) to assist it in meeting its obligations under the National Environmental Policy Act (NEPA) of 1969 (NEPA, 1969) and the Environmental Protection Agency's (EPA) NEPA-implementing regulations. Second, it demonstrates that the environmental protection measures proposed by IIFP are adequate to protect both the environment and the health and safety of the public.

IIFP has prepared the ER to meet the requirements specified in 10 CFR 51, Subpart A, particularly those requirements set forth in 10 CFR 51.45(b)-(e), *Environmental Report* (CFR, 2009a). The organization of the ER is generally consistent with NUREG-1748, *Environmental Review Guidance for Licensing Actions Associated with NMSS Programs, Final Report*, (NRC, 2003).

The full ER evaluates the environmental impacts of the proposed facility near Hobbs, New Mexico. Accordingly, the ER discusses the proposed action, the need for and purposes of the proposed action, and applicable regulatory requirements, permits, and required consultations. The ER is presented to the NRC in separate documentation comprised of the following list:

- Chapter 1, *Introduction of the Environmental Report*, identifies briefly the general Proposed Action, the affected region and site area, the Proposed Action schedule for implementation and the applicable regulations with the current status.

- Chapter 2, *Alternatives*, describes in more detail the Proposed Action, process descriptions and considers the No-Action and Reasonable Alternatives, if any, to the Proposed Action.

- Chapter 3, *Description of the Affected Environment*, describes the proposed IIFP facility and the environment potentially affecting the proposed action,

- Chapter 4, *Environmental Impacts*, presents and compares the potential impacts resulting from the proposed action and its alternatives,

- Chapter 5, *Mitigation Measures*, identifies mitigation measures that could eliminate or lessen the potential environmental impacts of the proposed action,

- Chapter 6, *Environmental Measurements and Monitoring Programs*, describes environmental measurements and monitoring programs,

- Chapter 7, *Cost-Benefit Analysis*, provides a cost benefit analysis,

- Chapter 8, *Summary of Environmental Consequences*, summarizes those environmental consequences, and

- Listings of references and preparers are also provided in Chapter 9, *References*, and Chapter 10, *List of Preparers*, respectively.

9.1.1 Date of Application

As required by 10 CFR 40.31(f), *Application for Specific Licenses* (CFR, 2009b), the submittal date of December 2009 is at least nine months prior to facility construction, which is scheduled to begin in late 2011. The proposed startup date for the facility is scheduled for late 2012.

9.1.2 Environmental Considerations

The IIFP ER (IIFP, 2009) addresses the requirements of 10 CFR 51.45(b) (CFR, 2009a) as discussed below.

9.1.2.1 Description of Proposed Action

The proposed action, briefly described in ER Section 1.2, Proposed Action, and described in detail in ER Section 2.1, Proposed Action, is the issuance of an NRC license under 10 CFR 40 (CFR, 2009b) for the possession of up to 750,000 kilograms of uranium (KgU) and for construction and operation of a facility for de-conversion of DUF_6, and the production of fluoride products and anhydrous hydrofluoric acid (AHF). During this Phase 1 process the depleted uranium will be de-converted into DUF_4 and then into DU oxide in the fluorine extraction process. In the future Phase 2 facility, an additional process will be used for direct de-conversion of DUF_6 to AHF and uranium oxide. In both processes, the fluorine products and AHF are sold, and the depleted uranium oxide is sent to an off-site licensed low-level radioactive waste disposal facility.

A description of the IIFP site is contained in ER Chapter 1.3.3, The Proposed Site. A detailed description of the proposed facility and specific process descriptions are included in ER2.1, Proposed Action. A discussion of the method utilized to extract fluorine products from the source material (DUF_6) is also described in ER Chapter 2.1. Additional information regarding the facility design, the site, and the facility operating features is contained in the ISA Summary (IIFP, 2009d).

9.1.2.2 Purpose and Need for Proposed Action

The IIFP ER Chapter 1.2, Purpose and Need for the Proposed Action, demonstrates the need for DUF_6 de-conversion facilities to support additional uranium enrichment capacity in the United States. The proposed action is intended to de-convert DUF_6 (tails) into chemically stable depleted uranium oxide while extracting the valuable fluorine to produce fluoride products for commercial use. It is estimated that new commercial uranium enrichment facilities will start operations in 2010 and will eventually be producing more than an approximately 85 million pounds of DUF_6 tails each year in the U.S. While the U.S. Department of Energy is building their own de-conversion facilities, those facilities will not be able to provide de-conversion of these new commercial tails for an estimated 25 years. Without this proposed IIFP commercial de-conversion facility, it is likely that over a billion pounds of commercial tails will be accumulated in the U.S. over that time and most of the valuable fluorine trapped in this inventory will be wasted. The IIFP facility offers a solution beginning in the near-term to depleted uranium storage, conducts recycling and recovery of important fluorine, and produces products using just a fraction of the energy required to produce those fluoride products using conventional methods.

9.1.2.3 Description of Affected Environment

IIFP ER Chapter 3, Description of the Affected Environment, contains a description of the affected environment. The chapter provides a baseline characterization of the New Mexico site and its

environment prior to any activities associated with construction, operation, or decommissioning of the facility. IIFP ER Chapter 3 addresses the following topics:

- Land Use;
- Transportation;
- Geology and Soils;
- Water Resources;
- Ecological Resources;
- Meteorology, Climatology, and Air Quality;
- Noise;
- Historic and Cultural Resources;
- Visual/Scenic Resources;
- Socioeconomics;
- Public and Occupational Health; and
- Waste Management.

Each subsection discusses the regional, local, and site conditions as they currently exist in order to establish a baseline. IIFP ER Chapter 4, Environmental Impacts, describes how the baseline environment is potentially impacted as a result of the construction, operation, and decommissioning of the IIFP FEP/DUP Facility. Basic supporting information was gathered from Federal, State, and County sources, along with specific onsite data. The information represents both seasonal and long-term environmental trends.

9.1.2.4 Discussion of Considerations

The following discussion summarizes the information in the IIFP ER (IIFP, 2009) with respect to the environmental impacts from, and the alternatives to, both the FEP/DUP process and the Hobbs, New Mexico site.

Impact of the Proposed Action on the Environment

In accordance with 10 CFR 51.45(b)(1) (CFR, 2009a), the IIFP ER Chapter 4 discusses the impact of the proposed action on the environment. Each subsection in IIFP ER Chapter 3 has a corresponding subsection in IIFP ER Chapter 4, which ensures that each environmental aspect is addressed with respect to its impact from the proposed facility.

Adverse Environmental Effects

The adverse environmental effects are discussed in each subsection of IIFP ER Chapter 4, as well as in IIFP ER Section 8.3, *Short-Term and Long-term Impacts*, and Section 8.4, *Relationship between Short-Term Use of the Environment and the Maintenance and Enhancement of Long-Term Productivity*. These sections satisfy the requirements in 10 CFR 51.45(b)(2) (CFR, 2009a). There were no identified areas as having moderate adverse environmental effects requiring mitigation. Radiation and chemical releases from operations, in general, may cause adverse impacts. However, the releases and corresponding exposures from the IIFP facility would be well below regulatory limits and proportionally very small. No moderate level impacts were identified during construction and decommissioning.

IIFP ER Chapter 4 has an additional section that discusses Environmental Justice, a Federal policy under which each agency identifies and addresses disproportionately high and adverse human health or environmental effects of agency policies and activities on minority and low-income populations. For the nearby National Enrichment Facility (NEF), and essentially the same populous, the NRC staff concluded that no disproportionately high and adverse impacts would occur to minority and low-income populations living near the proposed NEF or along likely transportation routes into and out of the proposed NEF as a result of the proposed action.

Alternatives to the Proposed Action

Alternatives to the proposed action are discussed in IIFP ER Chapter 2, Alternatives, pursuant to Section 102(2)(E) of the NEPA (NEPA, 1969) and 10 CFR 51.45(b)(3) (CFR, 2009a). Environmental impacts of the proposal and alternatives, including the no-action alternative, are presented in comparative form. A discussion of site selection and design alternatives is also included.

Relationship of Short-Term Uses and Long-Term Productivity

In accordance with 10 CFR 51.45(b)(4) (CFR, 2009a), Chapter 8 of the IIFP ER, Summary of Environmental Consequences (IIFP, 2009), discusses the relationship between local short-term uses of the environment and the maintenance and enhancement of long-term productivity from the IIFP New Mexico operation.

During construction, the potential short-term impacts are soil erosion and fugitive emissions from dust and construction equipment; minor disruption to ecological habitats and cultural resources, noise from equipment; and traffic from worker transportation and supply deliveries. These impacts are temporary and limited in scope during the construction process to the greatest extent possible. During operation, the no-action alternative would avoid increased traffic due to feed/product deliveries and shipments, and worker transportation; increased demand on utility and waste services; and public and occupational exposure from effluent releases. However, those impacts are minimal because the local roadway (U.S. Highways 62/180) already has significant traffic of similar nature; there is sufficient capacity of utility and waste services in the region; and effluent releases are strictly controlled, monitored, and maintained below regulatory limits. No adverse impact on the long-term productivity of the environment, after decommissioning of the facility, has been identified.

While the no-action alternative would have no significant impact on the socioeconomic structure of the Lea County, New Mexico area, the proposed action would have moderate to significant beneficial effects (see the Cost Benefit Analysis in Chapter 7 of the IIFP ER). The results of the economic analysis show that substantial positive fiscal impacts are derived from the 14-18 month construction period associated with the proposed facility. There is a large beneficial impact on local business revenues as a result of local construction expenditures. Significant impacts on household earnings and jobs are associated with construction payroll and employment projected during the construction period. Operation of the facility also has a significant net positive impact on the nine-county area and will help diversify the regional economy and provide some additional insulation from the volatility of the oil and gas dependent economy of the region.

Irreversible and Irretrievable Commitments of Resources

In accordance with 10 CFR 51.45(b)(5) (CFR, 2009a), Chapter 8 of the IIFP ER also discusses the irreversible and irretrievable commitments of resources necessary to construct, operate, and

decommission the facility. No commitments of environmental resources at, or in proximity to, the Hobbs, New Mexico site were identified for the construction, operation, and decommissioning of the IIFP facility that ultimately could not be restored (that is, become irretrievable) after facility closure and decommissioning of the site for unrestricted use. Soils found at the site are applicable for range, wildlife and recreation areas, and not for any standard agricultural activities. Construction and operation of the IIFP plant are thus not anticipated to displace any potential agrarian use.

9.1.3 Analysis of Effects of Proposed Action and Alternatives

The analysis of the effects in regards to the proposed action compared to alternatives in accordance with 10 CFR 51.45(c) (CFR, 2009a) is discussed in the IIFP ER Chapter 2 (IIFP, 2009). The comparison of effects considers information about the environmental, economic, social, and other benefits and costs associated with the IIFP Proposed Action. . IIFP ER Chapter 4 contains a description of impacts. IIFP ER Chapter 7 discusses the economic and environmental cost and benefits of the IIFP Proposed Action.

The analysis presented in IIFP ER Chapter 2 considered and balanced the environmental effects of the proposed action, the environmental impacts of alternatives to the proposed action, and alternatives available for reducing or avoiding adverse environmental effects. The analysis considered technology alternatives to the FEP/DUP technology, design alternatives, and alternative site locations.

9.1.4 Status of Compliance

In addition to the NRC licensing and regulatory requirements, a variety of environmental regulations apply to the IIFP facility during the construction, and operation phases. These regulations require permits from, consultations with, or approvals by, other governing or regulatory agencies. IIFP ER Chapter 1(IIFP, 2009) summarizes the applicable environmental regulatory requirements, permits, licenses, or approvals, as well as the current status of each, as of the effective date of the ER. An agreement has been obtained with the New Mexico Environment Department (NMED) on the type and maximum quantities of depleted uranium and container possession limits. The NMED Agreement is incorporated into this IIFP LA.

9.1.5 Adverse Information

In accordance with 10 CFR 51.45(b) (2) and (e) (CFR, 2009a), several sections in the IIFP ER discuss adverse environmental effects. IIFP ER Chapter 2 considers the potential impacts of the IIFP facility to the alternatives. IIFP ER Chapter 4 details environmental and socioeconomic impacts due to site preparation/construction, operation, and decommissioning of the FEP/DUP New Mexico site. IIFP ER Chapter 5, *Mitigation Measures*, describes mitigation measures to minimize potential adverse impacts. Lastly, IIFP ER Chapter 8 provides a summary of the environmental consequences.

The overall environmental impacts resulting from the IIFP facility construction, operation, and decommissioning have been determined to be a SMALL value (where SMALL is defined as environmental impacts that are non-detectable or so minor that those impacts will neither destabilize nor noticeably alter any important attribute of an applicable environmental resource). Furthermore, minor impacts are controlled to the greatest extent possible through the use of mitigation measures and best management practices, described in Chapter 5 of the IIFP ER.

9.2 Environmental Protection Measures

Environmental protection measures will be maintained at the IIFP facility as part of the IIFP Environmental Protection Program. The primary purpose of the EPP is to maintain radiological and chemical effluent control such that exposure of the workers, public, and environment to radioactive materials or chemicals from facility operations is kept ALARA. This is accomplished through facility design, effluent engineering controls, administrative controls, and staff training and qualification. Effluent and environmental monitoring is an additional best management practice to document and verify that any effluent emissions and performance of the EPP is consistent with the guidance contained in Regulatory Guide 8.37, *ALARA Levels for Effluents from Materials Facilities* (NRC, 1993). In addition, IIFP will comply with the air quality permitting requirements specified in New Mexico Administrative Code Title 20 Chapter 2.

9.2.1 Radiation Safety

The following sections address the four acceptance criteria that describe the facility Radiation Protection Program (RPP) as it applies to Environmental Protection. The RPP is discussed further in Chapter 4, Radiation Protection, of the LA. Supplemental information can also be found in various sections of the LA as well as the IIFP ER.

9.2.1.1 Radiological (ALARA) Goals for Effluent Control

ALARA Goals are set to demonstrate compliance with 10 CFR 20, *Standards for Protection Against Radiation* (CFR, 2009c) with respect to doses to the public, doses to the worker, and environmental effluents, and are typically 10-20% of the 10 CFR 20 Appendix B values. Goals are set by the IIFP ALARA Committee and reviewed annually to assess the need to adjust specific values based on what may be ALARA for the particular measure. Compliance with the ALARA goals is demonstrated through monitoring, analysis, and evaluation of air emissions, liquid effluents, and disposition of solid waste. Trends are assessed using the monitoring results to evaluate the following: (1) facility operations control and containment of contamination; (2) projections of potential dose to offsite populations; and (3) detection of any unanticipated pathways for transport of radionuclide(s) within the environment. In accordance with the ALARA Program, these monitoring results are summarized and presented to the ALARA Committee on an annual basis. The ALARA Program and associated goals are further described in LA Chapter 4, Radiation Protection.

9.2.1.2 Effluent Controls to Maintain Public Doses ALARA

Effluent controls are used to maintain public doses ALARA. Gaseous effluents, that may contain depleted uranium, pass through pre-filters, high efficiency filters, and carbon-bed filters prior to entering the plant scrubber system (three-stages, in series). After scrubbing, the effluents are discharged to the atmosphere via the scrubber system stack. Certain storage vessels, powder transfer systems, and packaging stations, where depleted uranium particles are involved, are connected to two-or-three –stage dust removal systems to ensure capture and recovery of depleted uranium particles, prior to being vented to the atmosphere. The stacks are continuously sampled and are routinely analyzed to measure radioactivity of the exhaust gases. Chapter 2 of the IIFP ER (IIFP, 2009) addresses the process description and the effluent controls incorporated into the design of the facility, and Chapter 6 (IIFP, 2009) of the IIFP ER describes the stack sampling and measurements.

Plant process water discharges are treated and are contained on-site either by recycling and reusing in the process or by evaporating. Cooling water is recycled. The facility liquid effluent collection and recycle systems provide a means to control liquid waste and maintain a process-water practical mass balance using flow-surge tanks, scrubber solution regeneration/recycle, and evaporation equipment. There is no discharge to a Publicly Owned Treatment Works (POTW). Sanitary water usage is minimized through efficient designs; the sanitary water discharge is triple treated to render it suitable for watering of the facility shrubs and trees. Storm-water runoff from process building roofs and pads is collected and transported to an approved design retention basin via the plant storm-water sewer system. The storm water is temporarily stored in the retention basin until it is sampled and then evaporated or discharged.

9.2.1.3 ALARA Reviews and Reports to Management

In accordance with the ALARA Program, the environmental protection aspects of the Radiation Protection Program (RPP) are reviewed as part of the annual ALARA review. Review of the ALARA Program is addressed in LA Chapter 4, Radiation Protection. The ALARA review includes analysis of trends in release concentrations, environmental monitoring data, and radionuclide usage; the review then determines the need for operational changes to achieve the ALARA effluent goals and evaluate designs for system installations or modifications. The results of the ALARA review are reported to senior management, along with recommendations for changes in facilities or procedures that are necessary to achieve ALARA goals.

9.2.1.4 Waste Minimization

The highest priority has been assigned to minimizing the generation of waste through reduction, reuse, or recycling. The IIFP facility utilizes various engineered waste-minimization systems and operational procedures that aim at conserving materials and recycling important compounds; such as the regeneration and reuse of the plant scrubbing system potassium hydroxide solution. The facility is designed and operated in accordance with 10 CFR 20.1406, *Minimization of Contamination* (CFR, 2009d) to minimize contamination, facilitate eventual decommissioning, and minimize to the extent practicable the generation of radioactive waste. The waste minimization practices during design, construction, and operation of the facility are consistent with the guidance in Regulatory Guide 4.21, *Minimization of Contamination and Radioactive Waste Generation: Life-Cycle Planning* (NRC, 2008).

9.2.2 Effluent and Environmental Controls and Monitoring

Effluent and environmental controls and monitors are maintained at and around the facility to ensure that doses to the workers, the public, and the environment remain ALARA. In addition, monitors provide indication of potential off-normal occurrences requiring further investigation. Guidance provided in Regulatory Guide 4.16, *Monitoring and Reporting Radioactivity in Releases of Radioactive Material in Liquid and Gaseous Effluents from Nuclear Fuel Processing and Fabrication Plants and Uranium Hexafluoride Production Plants* (NRC, 1985) has been utilized in the preparation of the environmental protection aspects of the RPP (IIFP, 2009b), where applicable.

9.2.2.1 Effluent Monitoring

The following sections address the acceptance criteria related to effluent monitoring for liquid, solid, and air effluents.

Expected Concentrations

The expected concentrations, based on calculations and modeling, of radioactive materials in airborne and solid effluents were estimated using conservative assumptions. Those estimated values are provided in the IIFP ER, Chapter 4. The concentrations are controlled to be ALARA and below the limits specified in 10 CFR 20, Appendix B, Table 2 (CFR, 2009c). As stated above, the plant liquid effluents, that have potential for containing uranium, are recycled, reused and maintained on the IIFP site.

Calculation of Total Effective Dose Equivalent

Dose projections to members of the public are performed routinely to ensure the annual dose to members of the public are kept ALARA and within the regulatory limit in accordance with approved written procedures. Compliance as described in 10 CFR 20.1302, *Compliance with Dose Limits for Individual Members of the Public* (CFR, 2009e); is demonstrated through either the calculation of the total effective dose to the individual likely to receive the highest dose, or through the calculation of annual average concentrations of radioactive material released in gaseous and liquid effluents. The guidance in Regulatory Guide 4.20, *Constraint on Releases of Airborne Radioactive Materials to the Environment for Licensees Other than Power Reactors* (NRC, 1996), is followed to determine compliance with dose limits to members of the public. Compliance with the dose limits to the members of the public is reported to the NRC in the semi-annual effluent report as required by 10 CFR 40.65 *Effluent Monitoring Reporting Requirements* (CFR, 2009f)**.**

Effluent Discharge Locations

The IIFP ER Chapter 6 (IIFP, 2009) addresses the estimated locations of the airborne effluent discharges and monitoring estimated locations for the site. Liquid plant effluents are maintained on the IIFP site and there is no discharge of process wastewater.

Continuous Sampling Airborne Effluents

The IIFP ER Chapter 6 addresses the Effluent Monitoring Program (EMP) (IIFP, 2009c). The effluent stacks are sampled continuously and is routinely analyzed to measure radioactivity of the exhaust air. The collection filters in the sample systems are removed periodically and analyzed for gross alpha and beta activity. The filters are composited periodically and an isotopic analysis is performed. Radiological analyses are performed on ventilation air filters, if there is a significant increase in gross radioactivity, or when a process change or other circumstances cause significant changes in radioactivity concentrations.

Sample Collection and Analysis

The EMP establishes appropriate sample collection and analysis methods and frequencies for the effluent medium and the radionuclide(s) sampled. Sampling methods ensure that representative samples are obtained using appropriate sampling equipment and sample collection and storage procedures. Monitoring instruments are calibrated at least annually or more frequently if suggested by the manufacturer. IIFP ensures that sampling equipment (pumps, pressure gages, and air flow calibrators) are calibrated by qualified individuals. Sampling equipment and lines are inspected for defects, obstructions, and cleanliness as part of the plant preventive maintenance procedures.

Radionuclide-Specific Analysis

Radionuclide-specific analyses are performed on selected composited samples as indicated in Chapter 6.1.1 of the IIFP ER (IIFP, 2009). Because uranium in gaseous effluent may exist in a variety of compounds (e.g., UF_6, uranium oxide, UF_4, and UO_2F_2), effluent data is maintained, reviewed, and assessed by the facility's Radiation Protection Manager to assure that gaseous effluent discharges comply with regulatory release criteria for uranium. Monitoring reports, which include the quantities of individual radionuclide(s) estimated on the basis of methods other than direct measurement, include an explanation and justification of how the results were obtained.

Radionuclide analysis may be performed more frequently at the beginning of the monitoring program until a predictable and consistent composition is established. Likewise, the analysis frequency may be increased when there is a significant increase in gross radioactivity in effluents or a process change or other circumstance that might cause a significant variation in the radionuclide composition.

Minimum Detectable Concentrations

ER Chapter 6 (IIFP, 2009) presents the required minimum detectable concentration (MDC) for gross alpha analyses performed on gaseous effluent samples.

Laboratory Quality Control

Monitoring and sampling activities, laboratory analyses, and reporting of facility-related radioactivity in the environment are conducted in accordance with industry-accepted and regulatory-approved methodologies. The Quality Control (QC) procedures used by the laboratories performing the environmental monitoring are adequate to validate the analytical results and to conform to the guidance in Regulatory Guide 4.15, *Quality Assurance for Radiological Monitoring Programs* (NRC, 2006). These QC procedures include the use of established standards such as those provided by the National Institute of Standards and Technology (NIST), as well as standard analytical procedures such as those established by the National Environmental Laboratory Accreditation Conference (NELAC).

Action Levels

Administrative action levels are established for effluent samples and monitoring instrumentation as an additional step in the effluent control process. All action levels are sufficiently low so as to permit implementation of corrective actions before regulatory limits are exceeded. Effluent samples that exceed the action level are cause for an investigation into the source of elevated radioactivity. Processes are designed to include, when practical, provision for automatic shutdown in the event action levels are exceeded.

Federal and State Standards for Discharges

New Mexico Statutes Annotated (NMSA), Chapter 74, "Environmental Improvement," Article 2, "Air Pollution," (NMSA, 2009a) and implementing regulations in the New Mexico Administrative Code (NMAC) Title 20, "Environmental Protection," Chapter 2, "Air Quality," (NMAC, 2009a) establishes air-quality standards and permit requirements prior to construction or modification of an air-contaminant source. These regulations also define requirements for an operating permit for major producers of air pollutants and impose emission standards for hazardous air pollutants. Accordingly, IIFP will file applications and obtain appropriate air construction and operating permits, where applicable.

40 CFR 122, *National Pollutant Discharge Elimination System* (NPDES) *General Permit for Industrial Storm Water* (EPA, 2009) is required for point source discharge of storm water runoff from industrial or commercial facilities to the waters of the state. All new and existing point source industrial storm water discharges associated with industrial activity require a NPDES Storm Water Permit from the EPA Region 6 and an oversight review by the New Mexico Water Quality Bureau. Most common is a general permit which is available to almost any industry, but there is also an option to obtain an individual NPDES permit. IIFP will file and obtain a Storm Water Permit prior to pre-license construction or full construction in accordance with the EPA and State requirements.

NMSA, Chapter 74, Article 6, *Water Quality*, (NMSA, 2009b) and implementing regulations found in NMAC Title 20, Chapter 6, "Ground and Surface Water Protection," (NMAC, 2009b) establishes water-quality standards and applies to permitting prior to construction, during operation, closure, post-closure, and abatement, if necessary. Generally, a permit is required for discharges that could impact surface or ground water. Any impoundments for sewage treatment facilities, cooling water, or other discharges that exceed the standards listed in 20.6.2.3103 NMAC, or contain toxic constituents require a permit. IIFP is working with the State to determine and meet the permitting requirements prior to construction or operation, as applicable.

Leakage Detection Systems

The design status of leak detection (and mitigation procedures) for ponds and tanks has not yet progressed to final design. The facility conceptual design does include appropriate spill and leak control pads and containment dikes. The IIFP facility will conform to leak detection recommendations in NUREG-1520, *Standard Review Plan for the Review of a License Application for a Fuel Cycle Facility,* (NRC, 2002). Permits, if any, will be obtained through the State of New Mexico for requirements on design, leak detection, monitoring and maintenance of the storm water retention/evaporation basins.

Releases to Sewer Systems

All liquid process effluents are to be maintained on the FEP/DUP New Mexico site. In lieu of connecting to the local sewer system, sanitary waste is routed to the sanitary treatment system for primary and secondary treatment. After removal of the biomass, the liquids are sand filtered, treated by ultraviolet radiation and rendered suitable for on-site horticultural purposes. The biomass is shipped offsite to an approved disposal facility.

Reporting Procedures

Effluent recording procedures implement the guidance specified in Regulatory Guide 4.16 (NRC, 1985). The semi-annual effluent record contains the concentrations of principle radionuclide(s) released to unrestricted areas in liquid and gaseous effluents and includes the MDC for the analysis and the error for each data point.

Waste Management Procedures

The design of the IIFP facility includes treatment of fluoride-bearing waste liquors to regenerate solutions for reuse and recycle in the plant scrubber system. Relatively small volumes of miscellaneous waste liquors, that have potential to contain uranium, are concentrated, filtered and treated to remove the uranium from liquid steams. Uranium removed from liquid streams is collected and sent to a licensed low-level-waste disposal site along with the waste uranium oxides produced by the de-conversion

processes. The IIFP ER Chapter 2.1, Proposed Action (IIFP, 2009), provides an overview of the liquid waste treatment systems.

Solid waste management facilities, with sufficient capability to enable preparation, packaging, storage, and transfers to licensed disposal sites in accordance with the regulations, are incorporated into the design and are maintained in proper operating condition as required to support the operation of the facility.

Descriptions of the proposed IIFP waste management systems are provided in the IIFP Chapter 3.

Environmental Monitoring

The following sections address the acceptance criteria related to environmental monitoring.

Background and Baseline Measurements Prior to facility operations, soil and groundwater samples will be collected from the site and analyzed to determine a baseline to be used in evaluating changes in potential environmental conditions caused by facility operations. Air and water samples will be collected from remote locations in order to provide background data during operations.

Monitoring The EMP (IIFP, 2009c) at the IIFP facility is a major part of the effluent compliance program. It provides a supplementary check of containment and effluent controls, establishes a process for collecting data for assessing radiological impacts on the environs and estimating the potential impacts on the public, and supports the demonstration of compliance with applicable radiation protection standards and guidelines. The types and frequency of sampling and analyses are summarized in the IIFP ER Chapter 6.1., Radiological Environmental Monitoring Program. Environmental media identified for sampling consist of ambient air, groundwater, soil/sediment, direct radiation, and vegetation.

9.2.3 Integrated Safety Analysis

IIFP has prepared an ISA (IIFP, 2009d) in accordance with 10 CFR 70.62, *Safety Program and Integrated Safety Analysis* (CFR, 2009f), which includes the evaluation of high and intermediate consequence events involving releases of radioactive material to the environment. The ISA process is described in detail in LA Chapter 3, Integrated Safety Analysis, and the ISA details and results are provided as the IIFP ISA Summary.

9.3 References

CFR, 2009. Title 10, Code of Federal Regulations, Section 51.45, *Environmental Report*, U.S. Nuclear Regulatory Commission, 2009.

CFR, 2009b. Title 10, Code of Federal Regulations, Section 40.31, *Application for Specific Licenses*, U.S. Nuclear Regulatory Commission, 2009.

CFR, 2009c. Title 10, Code of Federal Regulations, Section 20, *Standards for Protection Against Radiation*, U.S. Nuclear Regulatory Commission, 2009.

CFR, 2009d. Title 10, Code of Federal Regulations, Section 20.1406, *Minimization of Contamination*, U.S. Nuclear Regulatory Commission, 2009.

CFR, 2009e. Title 10, Code of Federal Regulations, Section 20.1302, *Compliance with Dose Limits for Individual Members of the Public*, U.S. Nuclear Regulatory Commission, 2009.

CFR, 2009f. Title 10, Code of Federal Regulations, Section 70.62, *Safety Program and Integrated Safety Analysis*, U.S. Nuclear Regulatory Commission, 2009.

EPA, 2009. Title 40, Code of Federal Regulations Section 122, *EPA Administered Permit Programs: The National Pollutant Discharge Elimination System*, U.S. Environmental Protection Agency, 2009.

IIFP, 2009a. International Isotopes Fluorine Products Inc., Environmental Report, 2009.

IIFP, 2009b. International Isotopes Fluorine Products Inc., Radiation Protection Program, 2009.

IIFP, 2009c. International Isotopes Fluorine Products Inc., Effluent Monitoring Program, 2009.

IIFP, 2009d. International Isotopes Fluorine Products Inc., Integrated Safety Analysis, 2009.

IIFP, 2009e. International Isotopes Fluorine Products Inc., Quality Assurance Program Description, 2009.

NEPA, 1969. National Environmental Policy Act, *National Environmental Policy Act of 1969*, as amended, 1969.

NMAC, 2009a. New Mexico Administrative Code, Title 20, *Environmental Protection*, Chapter 2, *Air Quality*, New Mexico Administrative Code, 2009.

NMAC, 2009b. New Mexico Administrative Code, Title 20, Chapter 6, *Ground and Surface Water Protection*, 2009.

NMSA, 2009a. New Mexico Statutes Annotated, Chapter 74, *Environmental Improvement*, Article 2, *Air Pollution*, State of New Mexico, 2009.

NMSA, 2009b. New Mexico Statutes Annotated, Chapter 74, Article 6, *Water Quality*, State of New Mexico, 2009.

NRC, 1985. Regulatory Guide 4.16, *Monitoring and Reporting Radioactivity in Releases of Radioactive Materials in Liquid and Gaseous Effluents from Nuclear Fuel Processing and Fabrication Plants and Uranium Hexafluoride Production Plants*, U.S. Nuclear Regulatory Commission, 1985.

NRC, 1993. Regulatory Guide 8.37, *ALARA Levels for Effluents from Materials Facilities*, U.S. Nuclear Regulatory Commission, 1993.

NRC, 1996. Regulatory Guide 4.20, *Constraint on Releases of Airborne Radioactive Materials to the Environment for Licensees Other than Power Reactors*, U.S. Nuclear Regulatory Commission, 1996.

NRC, 2002. NUREG-1520, *Standard Review Plan for the Review of a License Application for a Fuel Cycle Facility*, U.S. Nuclear Regulatory Commission.

NRC, 2003. NUREG-1748, *Environmental Review Guidance for Licensing Actions Associated with NMSS Programs, Final Report*, U.S. Nuclear Regulatory Commission, 2003.

NRC, 2006. Regulatory Guide 4.15, *Quality Assurance for Radiological Monitoring Programs*, U.S. Nuclear Regulatory Commission, 2006.

NRC, 2008. Regulatory Guide 4.21, *Minimization of Contamination and Radioactive Waste Generation: Life-Cycle Planning*, U.S. Nuclear Regulatory Commission, 2008.

10 Decommissioning

This chapter presents the International Isotopes Fluorine Products, Inc. (IIFP) Plant initial Decommissioning Funding Plan for its Fluorine Extraction Process and Uranium De-conversion Plant (FEP/DUP). This Decommissioning Funding Plan (DFP) has been developed following the guidance provided in NUREG-1757 (NRC, 2006).

The IIFP facility will be constructed in two phases, with Phase 1 completing the UF_6 to UF_4 process and the UF_4 to fluorine products processes and the supporting infrastructure of the plant. IIFP plans to expand the facility de-conversion capacity by constructing a Phase 2 plant approximately 4 years later. The current licensing application, Integrated Safety Analysis (ISA) and Decommission Funding Plan submittal are for Phase 1 construction and operation only. Separate or amended licensing and a revised DFP will be developed and submitted at an appropriate time during the licensing process of the Phase 2 project. The Phase 2 will consist of the additional processing equipment to convert UF_6 directly into uranium oxide.

IIFP, Inc., as a wholly owned subsidiary of International Isotopes, Inc. (INIS), commits to decontaminate and decommission the facility at the end of its operation so that the facility and grounds can be released for unrestricted use. The Decommissioning Funding Plan will be reviewed and updated as necessary at least once every three years starting from the time of the start of operations. Prior to facility decommissioning, a Decommissioning Plan will be prepared in accordance with 10 CFR 40.42 (CFR, 2008a) and submitted to the NRC for approval.

This chapter fulfills the applicable provisions of NUREG-1757 (NRC, 2006) through submittal of information in tabular form (Tables 10-1 through 10-18) as suggested by the NUREG.

10.1 Decommissioning Strategy

The Decommissioning Funding Plan addresses the overall strategy for decommissioning the entire Phase 2 facility. However, because of the two-phase construction approach to this facility, the DFP only provides a detailed cost estimate, schedule and the financial assurance plan for the Phase 1 equipment and the infrastructure equipment that will be common to both phases. This initial DFP, including cost estimates, schedule and financial assurance, assumes that only a Phase 1 facility would exist at the time that decommission is required. This strategy of preparing and submitting an initial DFP for Phase 1 facilities only, in this license application, conservatively considers that IIFP would cease business before Phase 2 is constructed or that Phase 2 would not materialize. This contingency strategy does provide for the financial assurance of the Phase 1 facility in any case. Expansion of the plant to Phase 2 will require amendments to the IIFP license, and the DFP will be updated and re-submitted to the NRC for approval prior to the introduction of nuclear materials into the Phase 2 portion of the facility.

The overall strategy for decommissioning is to decontaminate or remove all materials from the site in order to release the facility and the site for unrestricted use. This approach avoids long-term storage and monitoring of wastes on site. The type and volume of wastes produced at the FEP/DUP facility do not warrant delays in waste removal normally associated with a deferred dismantlement option.

At the end of useful plant life, the FEP/DUP facility will be decommissioned such that the site and remaining facilities may be released for unrestricted use as defined in 10 CFR 20.1402 (CFR, 2008b).

All remaining facilities will be decontaminated where needed to acceptable levels for unrestricted use. Hazardous wastes will be treated or disposed of in licensed hazardous waste facilities. Disposal of radioactive or hazardous material will not occur at the plant site, but at licensed facilities located elsewhere. Following decommissioning, the facilities and site will be available for reuse.

Financial arrangements are made to cover costs required for returning the Phase 1 portions of the site to unrestricted use. Updates on cost and funding will be provided as described above. A detailed updated Decommissioning Plan will be submitted at a date near end of plant life, in accordance with 10 CFR 40.42 (CFR, 2008a).

The following describes decommissioning plans and funding arrangements. This information was developed in support of the decommissioning cost estimate. Specific elements of the planning may change with the submittal of the decommissioning plan required at the time of license termination.

10.1.1 IIFP Phase 1 Facility Description

The IIFP FEP/DUP facility and site are described in Chapter 1 of this License Application (LA) and the FEP/DUP Integrated Safety Analysis Summary. Information relating to the following topics can be found in the referenced chapters listed below:

- A general description of the facility and plant processes is presented in the IIFP LA Chapter 1; General Information. A detailed description of the plant site and facility and the safety aspects of the plant processes are presented in the IIFP FEP/DUP Integrated Safety Analysis Summary.

- A description of the specific quantities and types of licensed materials used at the facility is provided in LA Chapter 1; Institutional Information.

- A general description of how licensed materials are used at the facility is provided in LA Chapter 1; General Information.

10.1.2 Decommissioning Design Features

The following sections describe the IIFP decommissioning design features.

10.1.2.1 Overview

Decommissioning planning begins with ensuring design features are incorporated into the plant's initial design that will simplify eventual dismantling and decontamination. The plans are implemented through proper management and health and safety programs. Decommissioning policies address radioactive waste management, radioactive contamination control, physical security, and material control.

Major features incorporated into the facility design to facilitate decontamination and decommissioning are described below.

10.1.2.2 Radioactive Contamination Control

The following features primarily serve to prevent the spread of radioactive contamination during operation, and therefore simplify eventual plant decommissioning. As a result, worker exposure to radiation and radioactive waste volumes are minimized as well.

- Building areas where uranium is processed and handled are separated physically from other building rooms and areas where there is no need to have uranium present. These areas have separate ventilation and filtration systems to preclude contamination spread. Boundary control stations and hand/foot and portable monitors are used at applicable locations to verify that personnel and items exiting uranium process areas are not spreading radiological materials into non-uranium areas. The DUF_4 Process Building, FEP Oxide Staging Building, the plant operations Decontamination Building, DUF4 Container Storage Building, DUF4 Container Staging Building and the FEP Process Building (in areas where licensed material is processed) meet these specific design features.
- All areas of the plant are sectioned into Unrestricted and Restricted Areas. Restricted Areas limit access for the purpose of protecting individuals against undue risks from exposure to radiation and radioactive materials. Radiation Areas and potential Airborne Contamination Areas have additional controls to inform workers of the potential hazard in the area and to help prevent the spread of contamination. All procedures for these areas fall under the Radiation Protection Program, and serve to minimize the spread of contamination and simplify the eventual decommissioning.
- Routine radiological surveys will be conducted throughout the facilities' operations life that will minimize the likelihood that radioactive contamination goes undetected and will provide a historical record which will simplify the site characterization process.
- Non-radioactive process equipment and systems are minimized in locations subject to potential contamination. This limits the size of the Restricted Areas and limits the activities occurring inside these areas.
- Local air filtration is provided for areas with potential airborne contamination to preclude its spread. Containment equipment with hoods that exhaust through dust collectors, that are designed with high removal efficiencies, are used where uranium materials are being packaged or withdrawn from process systems.
- The hazardous material processes include designs for purge and evacuation (P&E) systems and dust-collection equipment as a means to provide effective clean out of residual chemicals or dust from equipment or piping prior to opening systems for maintenance. The P&E and dust collector systems have multiple collection equipment in series (defense-in-depth) to ensure removal and treatment efficiency, redundancy, effectiveness and reliability.
- Storm water runoff via the plant storm sewer system flows to a retention basin for either evaporation, for landscape watering or discharge. Prior to discharging collected storm water can be sampled if needed. It is not likely that collected storm water would exceed acceptable or regulate at levels but routine sampling for reuse or discharge are conducted for further assurance. Domestic sanitary waste water is tertiary treated to meet all discharge standards, and is either evaporated or used as harvested water for facility trees, grass and shrubs. The facility is designed for no liquid process water discharges. Engineered systems are used to provide for regeneration of scrubbing solutions and recycle within the process systems.

10.1.2.3 Worker Exposure and Waste Volume Control

The following features primarily serve to minimize worker exposure to radiation and minimize radioactive waste volumes during decontamination activities. As a result, the spread of contamination is minimized as well.

- During construction, a washable coating is applied to designated floors and walls in the Restricted Areas that have the higher potential to become radioactively contaminated during operation. The coating will serve to lower waste volumes during decontamination and simplify the decontamination process.
- Sealed, nonporous pipe insulation is used in areas with higher potential to become contaminated. This will facilitate cleaning in event of a spill and will reduce waste volume during decommissioning.
- Ample access is provided for efficient equipment dismantling and removal of equipment that may be contaminated. This minimizes the time of worker exposure.
- Tanks have access for entry and decontamination. Design provisions are also made to allow complete draining of the wastes contained in the tanks.
- Connections in the process systems, provided for required operation and maintenance, allow for thorough purging at plant shutdown. This will remove a significant portion of radioactive contamination prior to disassembly.
- Design drawings, produced for all areas of the plant, will simplify the planning and implementing of decontamination procedures. This in turn will shorten the durations that workers are exposed to radiation.
- Worker access to contaminated areas is controlled to assure that workers wear proper protective equipment and limit their time in the areas.

10.1.2.4 Management Organization

An appropriate organizational structure will be developed to support the decommissioning strategy. The organizational strategy will ensure that adequate numbers of experienced and knowledgeable personnel are available to perform the technical and administrative tasks required to decommission the facility.

IIFP intends to be the prime Decommissioning Operations Contractor (DOC) responsible for decommissioning the FEP/DUP In this capacity, IIFP will have direct experience with the plant operations and have control and oversight over all decommissioning activities. IIFP also plans to secure contract services to supplement its capabilities, as necessary. Management of the decommissioning program will assure that proper training and procedures are implemented to assure worker health and safety. Programs and procedures, based on existing operational procedures, will focus heavily on minimizing waste volumes and worker exposure to hazardous and radioactive materials. Qualified contractors assisting with decommissioning will likewise be subject to facility training requirements and procedural controls.

10.1.2.5 Health and Safety

As with normal operation, the policy during decommissioning shall be to keep individual and collective occupational radiation exposure as low as reasonably achievable (ALARA). A health physics program will identify and control sources of radiation, establish worker protection requirements, and direct the use of survey and monitoring instruments.

10.1.2.6 Waste Management

Radioactive and hazardous wastes produced during decommissioning will be collected, handled, and disposed of, in accordance with all regulations applicable to the facility at the time of decommissioning. Generally, procedures will be similar to those described for wastes produced during normal operation. These wastes will ultimately be disposed in licensed radioactive or hazardous waste disposal facilities located elsewhere. Non-hazardous and non-radioactive wastes will be disposed in a manner consistent with good industrial practice, and in accordance with applicable regulations.

10.1.2.7 Security/Material Control

Requirements for physical security and for material control and accounting will be maintained as required during decommissioning in a manner similar to the programs in force during operation. The IIFP plan for completion of decommissioning, submitted near the end of plant life, will provide a description of any necessary revisions to these programs.

10.1.2.8 Recordkeeping

Records important for safe and effective decommissioning of the facility will be stored in the FEP/DUP Records Management System until the site is released for unrestricted use. Information maintained in these records includes:

1. Records are maintained of spills or other unusual occurrences involving the spread of contamination and cleanup around the facility, equipment, or site. These records will include any known information on identification of involved nuclides, quantities, forms, concentrations, and survey results after cleanup of any spill area.
2. Routine radiological survey records of restricted and unrestricted areas will be retained indefinitely to support historical site assessment and facility characterization at the time of decommissioning.
3. As-built drawings and modifications of structures and equipment in restricted areas are maintained where radioactive materials are used and/or stored. Required drawings will be referenced as necessary, although each relevant document will not be indexed individually. If drawings are not available, appropriate records of available information concerning these areas and locations will be substituted.
4. The following will be contained in a single records document, updated every two years, except for areas containing only sealed sources:

    - All areas designated and formerly designated as Restricted Areas as defined under 10 CFR 20.1003; (CFR, 2008c);
    - All areas outside of Restricted Areas that require documentation specified in item 1 above;
    - All areas outside of Restricted Areas where current and previous wastes have been buried as documented under 10 CFR 20.2108 (CFR, 2008d); and
    - All areas outside of Restricted Areas that contain material such that, if the license expired, the licensee would be required to either decontaminate the area to meet the criteria for decommissioning in 10 CFR 20, subpart E, (CFR, 2008e) or apply for approval for disposal under 10 CFR 20.2002 (CFR, 2008f).

5. Records of the cost estimate performed for the decommissioning funding plan or of the amount certified for decommissioning, and records of the funding method used for assuring funds if either a funding plan or certification is used.

10.1.3 Decommissioning Process

The following section describes the IIFP decommissioning process.

10.1.3.1 Overview

Preparation for decommissioning is expected to begin for the facility upon a decision to cease operations permanently and this preparation step is estimated to be completed in approximately one year, including NRC review and approval of the final plan.

Actual decontamination and decommissioning would follow shortly upon approval of the plan and the award of any subcontracts. The decommissioning plan schedule for the Phase 1 facility is shown as Figure 10-1. At the time of required decommissioning, if only a Phase 1 plant exists, then upon decommissioning and final survey and confirmation by the NRC, the license would be terminated and the site/facility could be released for reuse. If a Phase 2 also exists at the time of required decommissioning, the updated future DCF Plan for Phase 2 will have indentified the costs, schedule and any decontamination and decommission requirements for the DUF_6 to oxide process beyond those already identified in the Phase 1 Plan.

Prior to completely shutting down all the processes, the bulk work-in-process (WIP) inventory of uranium materials would be processed as much as practical into depleted uranium oxide and the fluoride gas products, similar to the normal operations. This activity would render the bulk materials into products for shipment to customers and into DU oxide approved for disposal as was during normal plant operations. Based on the estimated maximum-average WIP inventories, the amount of time required to orderly process out this material into its final form is estimated at 12-15 days. After processing the bulk WIP, any residual inventory of uranium or contaminated materials would be included in the decommissioning steps that follow the decommission preparation and NRC approvals to proceed. The estimated residual amounts of uranium chemicals or uranium contaminated chemicals expected to be disposed as low-level contaminated waste (LLW) are approximately 1700 cubic feet and shown in Table 10-1.

Prior to beginning decommissioning operations, a radiological survey of the facility will be performed in conjunction with a historical site assessment. The findings of the radiological survey and historical site assessment will be presented in a Decommissioning Plan to be submitted to the NRC. The Decommissioning Plan will be prepared in accordance with 10 CFR 40.42 (CFR, 2008a) and the applicable guidance provided in NUREG-1757.

Decommissioning activities will generally include: (1) outfitting of size reduction and packaging areas (2) purging of process systems, (3) dismantling and removal of equipment, , (4) sales of salvaged materials, (5) packaging and disposal of wastes, and (6) completion of a final radiation survey. Credit is not taken for any salvage value that might be realized from the sale of potential assets during or after decommissioning.

Decommissioning, using the IIFP approach, requires residual radioactivity to be reduced below specified levels so the facilities may be released for unrestricted use. Current Nuclear Material Safety and Safeguards guidelines for release serve as the basis for decontamination costs estimated herein. Portions

of the facility that do not exceed contamination limits may remain as is without further decontamination measures applied. The intent of decommissioning the facility is to remove all uranium process-related equipment from the buildings, such that only the building shells and site infrastructure remain. The removed equipment includes all piping and components from systems providing UF_6 or UF_4 containment, uranium oxide containment, systems in direct support of uranium processing (such as refrigerant and chilled water), radioactive and hazardous waste handling systems, contaminated HVAC filtration systems, etc. The remaining site infrastructure after decommissioning is complete will include the steam facilities, electrical power facilities, water supply systems, sanitary water treatment systems, fire protection systems, HVAC systems, cooling water systems, and communication systems.

Existing plant buildings, such as the Decontamination Building and Material Warehouse, will be outfitted to accommodate handling and packaging of components and materials for disposal. These areas will be the primary location for size reduction and packaging activities during the decommissioning process. Limited capabilities for decontamination will exist for mildly contaminated items that may be decontaminated to free release criteria in a cost effective manner.

Contaminated portions of the buildings will be decontaminated as required. Potential contamination is limited to the structures in the Restricted Areas. Good housekeeping practices during normal operation will maintain the other areas of the site clean and routine radiological contamination surveys will ensure radioactive contamination will not go undetected or be allowed to build-up to levels difficult to control.

When decontamination is complete, all areas and facilities on the site will be surveyed to verify that further decontamination is not required. Decontamination activities will continue until the entire site is demonstrated to be suitable for unrestricted use.

10.1.3.2 Size Reduction and Packaging Facility Outfitting

Existing facilities can be adapted to accommodate the size reduction and packaging activities associated with decommissioning to avoid the expense of constructing dedicated facilities to do so. The existing decontamination building and material warehouse is considered suitable for these purposes. Estimated time for equipment installation is approximately two months. These newly outfitted facilities will be completed in time to support the dismantling of the Phase 1 equipment. These facilities are described in Section 10.1.4.3, Size Reduction and Packaging Facilities Description.

10.1.3.3 System Preparation

At the end of the useful life of each process line, the uranium process is shut down and UF_6, UF_4 and uranium oxides are removed to the extent practicable by normal process operation. This is followed by evacuation and purging with nitrogen and the application of a fixative, where applicable. The shutdown and preparation of the decommissioning process is estimated to take approximately three months.

10.1.3.4 Dismantling

Dismantling requires cutting and disconnecting all components requiring removal. Dismantling operations are labor intensive and generally require the use of protective clothing. The work process will be optimized, considering the following:

- Minimizing the spread of contamination and the level protective clothing using fixative coatings;

- Balancing the number of cutting and removal operations with the resultant size reduction and disposal requirements;
- Optimizing the rate of dismantling with the rate of size reduction facility throughout;
- Providing storage and lay down space required, as impacted by retrieving, security, etc; and
- Balancing the cost of salvage with the cost of disposal.

Details of the complex optimization process will necessarily be decided near the end of plant life, taking into account specific contamination levels, market conditions, and available waste disposal sites. This decommissioning funding plan will assume most items that were continuously in contact with UF_6, UF_4 or uranium oxide will be disposed of at a LLW disposal facility rather than employing rigorous decontamination techniques. Large contaminated components may be disassembled to separate contaminated and uncontaminated portions of the component. To avoid lay down space and contamination problems, dismantling should be allowed to proceed generally no faster than the downstream size reduction and packaging process.

The time frame to accomplish both dismantling and size reduction at FEP/DUP is estimated to be approximately 18 months for Phase 1 equipment.

10.1.3.5 Decontamination / Size Reduction

The decontamination and size reduction process is addressed separately in detail in Section 10.1.4.

10.1.3.6 Salvage of Equipment and Materials

Items to be removed from the facilities can be categorized as potentially re-usable equipment, recoverable scrap, and wastes. However, based on a 40-year, or beyond, operating equipment is assumed to have no reuse value. Wastes will also have no salvage value.

With respect to scrap, some amounts of uncontaminated metal (steel, copper, Monel) may be recovered and sold. Contaminated materials will be disposed of as low-level radioactive waste. No credit is taken for any salvage value that might be realized from the sale of potential assets during or after decommissioning.

10.1.3.7 Disposal

All wastes produced during decommissioning will be collected, handled, and disposed of in a manner similar to that described for those wastes produced during normal operation. Wastes will consist of normal industrial trash, non-hazardous chemicals and fluids, small amounts of hazardous materials, and radioactive wastes. The radioactive waste will consist primarily of piping, tanks, hoppers, and compactable trash generated during the dismantling process.

Radioactive wastes will ultimately be disposed of in licensed low-level radioactive waste disposal facilities. Hazardous wastes will be disposed of in hazardous waste disposal facilities. Non-hazardous and non-radioactive wastes will be disposed of in a manner consistent with good industrial practice and in accordance with all applicable regulations. A complete estimate of the wastes and effluent to be produced during decommissioning will be provided in the Decommissioning Plan that will be submitted prior to initiating the decommissioning of the plant.

10.1.3.8 Final Radiation Survey

A final radiation survey must be performed to verify proper decontamination to allow the site to be released for unrestricted use. The evaluation of the final radiation survey is based in part on an initial radiation survey performed prior to initial operation. The initial survey determines the natural background radiation of the area; therefore it provides a datum for measurements which determine any increase in levels of radioactivity.

The final survey will systematically measure radioactivity over the entire site. The intensity of the survey will vary depending on the location (i.e. the buildings, their immediate areas, and the remainder of the site). Throughout the operating life of the facility, routine surveys are conducted of licensed material areas and records maintained. The survey records will be used as part of the final survey evaluation and may reduce the amount of sampling in some areas where the survey history shows low potential for contamination. The final survey in some cases is a verification of historical surveys. The survey procedures and results will be documented in a report. The report will include, among other things, a map of the survey site, measurement results, and the site's relationship to the surrounding area. The results will be analyzed and shown to be below allowable residual radioactivity limits; otherwise, further decontamination will be performed.

For decommissioning funding purposes, samples will be taken within the 12.1 ha (40acre) FEP/DUP Restricted Area (area within the security fence). Samples will be taken based on a sampling grid pattern approximately 91 m by 91 m (100 yd by 100 yd). Outside of the Restricted Area, but within the site boundaries, the likelihood for contamination is extremely remote. Therefore, the grid will be expanded such that samples will be taken on a grid approximately 610 m by 610 m (667 yards by 667 yards). Analysis of the samples will be provided by a third party since, at the time of performance of the final radiation survey, no analysis facilities will be available on site.

10.1.3.9 Decommissioning Impact on Integrated Safety Analysis (ISA)

As was described in Section 10.2.3.1, Summary of Costs, decommission of the FEP/DUP Phase 1 facility will be conducted over a time frame of 1 year for preparation and about 18 months additionally for actual dismantle, decontamination and disposition.

Although decommissioning steps are planned to be underway while some activities considered in the ISA continue to occur in the other portions of the plant, the current ISA has not fully evaluated these decommissioning risks. An updated ISA will be performed at a later date, but prior to decommissioning, to evaluate the risks from decommissioning operations on concurrent operations.

10.1.4 Decontamination/Size Reduction Process

The following sections address the decontamination and size reduction process.

10.1.4.1 Overview

The facilities, procedures, and expected results of decontamination and size reduction are described in the paragraphs below. Reprocessed uranium will not be used as feed in any of the commercial uranium enrichment facilities that will supply DUF_6 to the FEP/DUP Phase 1 facility for depleted tails de-conversion. Therefore, no consideration of ^{232}U, transuranic alpha-emitters and fission product residues is necessary for the decontamination/size reduction process. Only contamination from ^{238}U, ^{235}U, ^{234}U, and

their daughter products will require handling by the decontamination and size reduction processes. The primary contaminants throughout the plant will be in the form of small amounts of UF_4, UO_2F_2, UO_2 and U_3O_8.

10.1.4.2 Methodology

It is assumed that decontamination of components and equipment that have been in direct contact with uranium compounds will not achieve levels that would support free release. Therefore decontamination efforts to a level of free-release would not be feasible and would increase the volume of low level radioactive waste requiring disposal. Instead the most cost effective approach is to clean equipment and components sufficiently to be able to cut and remove and to fix residual radioactivity in place and size reduce by disassembly or mechanical means. Non-contaminated portions of system components and equipment would be surveyed and once verified free of contamination released as un-contaminated scrap for reuse or disposal. The methodology to be used during FEP/DUP facility decommissioning will employ conventional fixative, size reduction and decontamination techniques. The buildings and components are characterized with respect to radioactive contamination immediately prior to the start of decommissioning. The non-contaminated components are removed, monitored again and free released for disposal offsite. Non-uranium handling components (e.g. electrical cabinets, cable runs, utility pipe work, etc.) are expected to be free of any contamination. If these items are found to be contaminated then simple decontamination techniques using mild cleaning solutions may be sufficient to remove residual radioactivity to levels that support free release. Components that are known to be contaminated will only be decontaminated to the extent necessary to prevent the spread of contamination during removal, size reduction and packaging for disposal. In many cases fixing residual radioactivity utilizing a fixative coating or expandable foam would provide adequate containment of residual radioactivity to support removal, size reduction and packaging activities.

- Sections of DUF_6 piping and uranium oxide vacuum transfer piping may be contained in situ by dry cleaning to remove excess loose material, then filling with an expandable foam or fixative. This piping will then be taken down, transferred to the decontamination/size reduction facility, sized to reduce volume, and packaged for disposal at licensed disposal facility.
- Some larger equipment and piping will be dismantled into sections suitable for transport to the size reduction and packaging facility. In these rooms, the sections will be further dismantled. The components will be subject to a disposition evaluation. The evaluation will check that the item is open to the free flow of fixative or cleaning solutions and will allow for monitoring of the component after decontamination, should this be attempted. Components failing the feasibility review will be consigned to volume reduction and preparation for shipment to a licensed disposal facility.
- Mildly contaminated items with readily accessible surfaces will be designated for decontamination. These items will be decontaminated using a mild cleaning solution.

10.1.4.3 Size Reduction and Packaging Facilities Description

Size reduction and packaging facilities will be required to accommodate decommissioning. These facilities are needed for optimal handling of equipment to be packaged for disposal. It is assumed that existing areas such as the decontamination building and the material warehouse can be outfitted to serve effectively as the size reduction and packaging facilities for decommissioning.

The decontamination facilities will have six functional areas that include: (1) a disassembly area, (2) a stock staging area, (3) a size reduction area, (4) a decontaminating and clean-up area (5) a scrap storage

area for cleaned stock and (6) a packaging for disposal area. Barriers and other physical measures will be installed and administrative controls implemented, as needed, to prevent the spread of contamination

The size reduction and packaging facilities will be equipped with the types of equipment listed below as determined in the final decommissioning plan. Examples include:

- Transport and manipulation equipment,
- Dismantling tables,
- Sawing machines,
- Nibblers
- Degreasers,
- Contamination monitors,

10.1.4.4 Procedures

Formal procedures for all major decommissioning activities will be developed and approved by authorized project management to minimize worker exposure and waste volumes, and to assure work is carried out in a safe manner.

At the end of plant life, some of the equipment, most of the buildings, and all of the outdoor areas should be acceptable for release for unrestricted use. If they are accidentally contaminated during normal operation, they would be cleaned up when the contamination is discovered. This limits the scope of necessary decontamination at the time of decommissioning.

Contaminated plant components will be processed through the size reduction packaging facilities. Contamination of site structures will be limited to a few areas for Phase 1 (for example; the DUF_6-DUF_4 autoclave room, the DUF_4 process building, the SiF_4 and BF_3 process parts of the FEP buildings, and the FEP oxide staging building), and these areas will be maintained throughout plant operation by regular cleaning. Through the application of special protective coatings, to surfaces that might become radioactively contaminated during operation, and good housekeeping practices, final decontamination of these areas is assumed to require minimal removal of surface concrete or other structural material.

10.1.4.5 Results

Recoverable items will have been decontaminated and made suitable for reuse, except for a very small amount of intractably contaminated material. Buildings and the site will be decontaminated and decommissioned to a level to release for reuse.

The majority of radioactive waste requiring disposal in the FEP/DUP facility will include crushed tanks, hoppers, process piping and residual materials from the work-in-process inventory that is not recovered for reuse or sale, and possible residues from the final de-contamination equipment and process. Items, equipments and scrap, that remain contaminated beyond free-release levels, will have been disposed at approved and licensed disposal sites.

10.2 Site-Specific Cost Estimate

The following sections describe the site-specific decommissioning cost estimate.

10.2.1 Cost Estimate Structure

The decommissioning cost estimate includes:

- Major assumptions for the cost estimate;
- A summary of the number of major facility components, dimensions and type of disposal; and
- The estimated costs (including labor costs, non-labor costs, and a contingency factor)

10.2.2 Decommissioning Cost Estimate

The following sections address specifics of the decommissioning cost estimate.

10.2.2.1 Summary of Costs

The decommissioning cost estimate for the FEP/DUP facility is approximately $12.2 million (2009 dollars). The decommissioning cost estimate and supporting information are presented in Tables 10-1 through 10-18, consistent with the applicable provisions of NUREG-1757 Volume 3, "*Consolidated NMSS Decommissioning Guidance - Financial Assurance, Recordkeeping and Timeliness*" (NRC, 2006)

The decommissioning project schedule is presented in Figure 10-1. Depending on market conditions related to fluorine products, condition of equipment, availability of DUF_6 de-conversion services and other uncertainties, the decommissioning strategy may need revision in the future. Whenever the strategy is revised, the DFP will be updated, including the cost estimate for decommissioning, and will be resubmitted for approval.

10.2.2.2 Major Assumptions

Key assumptions underlying the decommissioning cost estimate are listed below:

- Inventories of materials and wastes at the time of decommissioning will be in amounts that are consistent with routine plant operating conditions over time.
- Costs are not included for the removal or disposal of non-radioactive structures and materials beyond that necessary to terminate the NRC license. Non-radioactive structures will be available for other industrial use following completion of decontamination and decommissioning (D&D).
- Credit is not taken for any salvage value that might be realized from the sale of potential assets (e.g., recovered materials or decontaminated equipment) during or after decommissioning.
- Decommissioning activities are performed in accordance with current day regulatory requirements.
- Cost estimate adjusted using the required contingency factor of 1.25.
- Decommissioning costs are presented in 2009 dollars.

10.3 Financial Assurance Mechanism

The following sections address the financial assurance mechanisms for decommissioning.

10.3.1 Decommissioning Funding Mechanism

IIFP presently intends to utilize a surety bond and Standby Trust Fund method to provide reasonable assurance of decommissioning funding will be available at the time of decommissioning. At least six months prior to startup, IIFP will provide NRC the financial assurance instrument that IIFP intends to execute. Upon finalization of the specific funding instrument to be used and at least 21 days prior to the commencement of operations, IIFP will supplement its application to include the signed, executed documentation. The surety bond will provide assurance that decommissioning costs will be paid in the unexpected event IIFP is unable to meet its decommissioning obligations at the time of decommissioning. In this case funds drawn from the surety bond will be placed directly into a standby trust fund naming the US Nuclear Regulatory Commission as the beneficiary.

10.3.2 Adjusting Decommissioning Costs and Funding

In accordance with 10 CFR 40.36(d) (CFR, 2008h), IIFP will update the decommissioning cost estimate for the FEP/DUP, and the associated funding levels, over the life of the facility. Updates will take into account changes resulting from inflation or site-specific factors, such as changes in facility conditions or expected decommissioning procedures. Funding level updates will also address anticipated operation of Phase 2 portions of the facility prior to introducing nuclear materials into that equipment.

Such updating will occur approximately every three years. A record of the update process and results will be retained for review as discussed in Section 10.3.3, below. The NRC will be notified of any material changes to the decommissioning cost estimate and associated funding levels (e.g., significant increases in costs beyond anticipated inflation). To the extent the underlying instruments are revised to reflect changes in funding levels, the NRC will be notified as appropriate.

For the first four year period of operations, IIFP intends to provide decommissioning funding assurance for only the Phase 1 portions of the facility. In 2009 dollars, the facility decommissioning cost estimate would be assured. Applying a 25% contingency factor to the decommissioning cost estimate, yields a total projected decommissioning cost for Phase 1 FEP/DUP facility operation, for which financial assurance would be provided, of nearly $12.2 million (expressed in 2009 U.S. dollars).

10.3.3 Recordkeeping Plans Related to Decommissioning Funding

In accordance with 10 CFR 40.36(f) (CFR, 2008h), the FEP/DUP will retain records, until the termination of the license, of information that could have a material effect on the ultimate costs of decommissioning. These records will include information regarding: (1) spills or other contamination that cause contaminants to remain following cleanup efforts; (2) as built drawings of structures and equipment, and modifications thereto, where radioactive contamination exists (e.g., from the use or storage of such materials); (3) original and modified cost estimates of decommissioning; and (4) original and modified decommissioning funding instruments and supporting documentation

Table 10-1 ~~Estimated Number and Dimensions of Facility Components – DUF4 Process Building~~ Redacted Security Related Information

Component	Number of Components	Dimensions of Components	Total Dimensions (ft^3)	Reduced Size Volume (ft^3)	Type Disposal

Component	Number of Components	Dimensions of Components	Total Dimensions (ft^3)	Reduced Size Volume (ft^3)	Type Disposal
Equipment/Materials					

Component	Number of Components	Dimensions of Components	Total Dimensions (ft^3)	Reduced Size Volume (ft^3)	Type Disposal

Component	Number of Components	Dimensions of Components	Total Dimensions (ft^3)	Reduced Size Volume (ft^3)	Type Disposal

Table 10-2 ~~Estimated Number and Dimensions of Facility Components – Operations Decontamination Building~~
Redacted Security Related Information

Component	Number of Components	Dimensions of Components	Total Dimensions (ft3)	Reduced Size Volume (ft3)	Type Disposal
Equipment/materials					

Component	Number of Components	Dimensions of Components	Total Dimensions (ft3)	Reduced Size Volume (ft3)	Type Disposal

Table 10-3 ~~Estimated Number and Dimensions of Facility Components – SiF4 Process Building~~
Redacted Security Related Information

Component	Number of Components	Dimensions of Components	Total Dimensions (ft^3)	Reduced Size Volume (ft^3)	Type Disposal
Equipment/Materials					

Component	Number of Components	Dimensions of Components	Total Dimensions (ft^3)	Reduced Size Volume (ft^3)	Type Disposal

Component	Number of Components	Dimensions of Components	Total Dimensions (ft^3)	Reduced Size Volume (ft^3)	Type Disposal

Table 10-4 ~~Estimated Number and Dimensions of Facility Components - BF3 Process Building~~
Redacted Security Related Information

Component	Number of Components	Dimensions of Components	Total Dimensions (ft^3)	Reduced Size Volume (ft^3)	Type Disposal
Equipment/Materials					

Component	Number of Components	Dimensions of Components	Total Dimensions (ft^3)	Reduced Size Volume (ft^3)	Type Disposal

Component	Number of Components	Dimensions of Components	Total Dimensions (ft^3)	Reduced Size Volume (ft^3)	Type Disposal

Table 10-5 ~~Estimated Number and Dimensions of Facility Components – EPP Building~~
Redacted Security Related Information

Component	Number of Components	Dimensions of Components	Total Dimensions(ft^3)	Reduced Size Vol. (ft^3)	Type Disposal
Equipment/Materials					

Component	Number of Components	Dimensions of Components	Total Dimensions(ft^3)	Reduced Size Vol. (ft^3)	Type Disposal

Component	Number of Components	Dimensions of Components	Total Dimensions(ft^3)	Reduced Size Vol. (ft^3)	Type Disposal

Table 10-6 ~~Number and Dimensions of Facility Components – Ventilation~~
Redacted Security Related Information

Component	Number of Components	Dimensions of Components	Total Dimensions (ft^3)	Reduced Size Volume (ft^3)	Type Disposal

Table 10-7 Planning and Preparing (Labor Hours)

Task	Project Mgt.	Health Physicist/ Safety Officer	Engineer	Clerical
	(hr)	(hr)	(hr)	(hr)
Project Plan and Schedule	320	40	160	65
Site characterization Plan	400	150	200	94
Decommissioning Plan	1,800	675	900	422
NRC Review Support	600	225	300	141
Specification for services	400	150	200	94
Project Procedures	720	270	360	169
Total Hours	4240	1510	2120	984
Hourly Rate	$71	$62	$62	$17
	$301,040	$93,620	$131,440	$16,728
Administrative supplies:	$1,200			
Margin Adjustment:	1.25			
			Total	$680,035

Table 10-8 Facility Characterization

Interior Areas	Project Mgt. (hr)	Health Physicist/ Safety Officer (hr)	HP Technician (hr)	Clerical (hr)
Autoclave room	9	9	73	11
DUF_4 Process Building 1st level	4	4	36	6
DUF_4 Process Building 2nd level	3	3	23	4
DUF_4 Process Building 3rd level	3	3	23	3
DUF_4 Process Building 4th level	3	3	24	4
DUF_4 Process Building 5th level	5	5	39	6
Decontamination Building	6	6	45	7
FEP Process Building 1st Level plus oxide	9	9	75	12
FEP Process Building 2nd Level	4	4	31	5
FEP Process Building 3rd Level	4	4	34	5
FEP Process Building 4th Level	6	6	46	7
HF Day Tank Building	3	3	21	3
HF Truck Loading Building	3	3	21	3
Maintenance and Stores	3	3	25	4
EPP Building & Scrubber Systems	6	6	50	8
Lime Storage Shed	1	1	7	1
Material Warehouse	5	5	42	6
Utilities Building	3	3	25	4
Main Switchgear Building	3	3	25	4
Fire Pump House	0	0	2	0
Water Treatment Bldg	1	1	6	1
Process Offices & Labs	3	3	26	4
Administrative Building	5	5	38	6
Guard House	1	1	5	1
Exterior of Buildings	46	46	369	58
Total Hours	138	138	1107	173
Hourly Rate	$71	$62	$57	$17
	$9,822	$8,583	$62,863	$2,865
Administrative supplies:	$1,800			
Margin Adjustment:	1.25			
		Total		$107,416

Table 10-9 Decontamination or Dismantling of Radioactive Components

	Project Mgt.	Health Physicist/ Safety Officer	Laborer	Craftsman	Supervisor	HP Tech	Engineer	Clerical
	(hr)	(hr)	(hr)	(hr)	(hr)	(hr)	(hr)	(hr)
Autoclave Room	442	885	3,540	885	885	365	20	168
DUF_4 Process Building 1st level	46	92	368	92	92	51	20	20
DUF_4 Process Building 2nd level	80	159	638	159	159	75	20	32
DUF_4 Process Building 3rd level	3	6	24	6	6	3	20	4
DUF_4 Process Building 4th level	32	64	256	64	64	89	20	15
DUF_4 Process Building 5th level	148	296	1185	296	296	142	20	58
Decontamination Building	629	1258	5031	1258	1258	496	0	236
FEP Process Building 1st Level plus oxide annex	188	376	1,504	376	376	197	20	73
FEP Process Building 2nd Level	23	47	186	47	47	20	20	11
FEP Process Building 3rd Level	77	155	618	155	155	70	20	31
FEP Process Building 4th Level	260	520	2,081	520	520	234	20	100
HF Day Tank Building	11	22	87	22	22	11	20	7
EPP Building	252	505	2,019	505	505	243	0	95
Lime Storage Shed	45	89	357	89	89	36	0	17
Total Hours	2237	4474	17894	4474	4474	2033	220	866
Hourly Rate	$71	$62	$43	$39	$57	$57	$62	$17
	$158,710	$277,362	$772,451	$172,422	$253,936	$115,383	$13,640	$14,342

Misc./Administrative supplies:	$269,500
Margin Adjustment:	1.25

Total: $2,559,682

Table 10-10 Restoration of Contaminated Areas on Facility Grounds (Labor hours)

Activity	Labor Category	Labor Category	Labor Category	Labor Category	Labor Category
Backfill and Restore Site (Note 1)					

Note 1: The facility is designed to contain and prevent contamination outside the equipment and building areas and the controlled containment areas; including measures of ALARA radiological controls that will result in a low likelihood of contaminating the facility grounds at levels that would require excavation or restoration. In the event of a small spill, the limited area affected will be cleaned, surveyed and de-contaminated, if needed, at the time as part of the required cleanup immediately following any such spill.

Table 10-11 Final Radiation Survey (Labor hours)

Interior Areas	Project Mgt. (hr)	Health Physicist (hr)	HP Technician (hr)	Clerical (hr)
Autoclave Room	13	13	102	16
DUF_4 Process Building 1st level	5	5	43	7
DUF_4 Process Building 2nd level	5	5	37	6
DUF_4 Process Building 3rd level	5	5	40	6
DUF_4 Process Building 4th level	5	5	40	6
DUF_4 Process Building 5th level	5	5	37	6
Decontamination Building	3	3	23	4
FEP Process Building 1st Level plus oxide annex	7	7	56	9
FEP Process Building 2nd Level	6	6	47	7
FEP Process Building 3rd Level	7	7	56	9
FEP Process Building 4th Level	7	7	56	9
HF Day Tank Building	1	1	9	1
HF Truck Loading Building	1	1	12	2
Maintenance and Stores	2	2	16	2
EPP Building & Scrubber Systems	1	1	8	1
Lime Storage Shed	0	0	1	0
Material Warehouse	3	3	25	4
Utilities Building	2	2	14	2
Main Switchgear Building	2	2	14	2
Fire Pump House	0	0	1	0
Water Treatment Bldg	0	0	4	1
Process Offices & Labs	5	5	43	7
Administrative Building	3	3	27	4
Guard House	1	1	4	1
Data Evaluation	70	370	70	64
Close Out Radiological Survey Report	90	280	40	51
Total Hours	249	739	822	226
Hourly Rate	$71	$62	$57	$17
	$17,665	$45,816	$46,642	$3,741
Administrative supplies:	$4,680			
Margin Adjustment:	1.25			
			Total	$148,180

Table 10-12 Site Stabilization and Long Term Surveillance (Labor hours)

Activity	Labor Category	Labor Category	Labor Category	Labor Category	Labor Category
(Note 2)					

Note 2: The facility is designed to contain and prevent contamination outside the equipment and building areas and the controlled containment areas; including measures of radiological ALARA controls that will result in a low likelihood of contaminating the facility grounds at levels that would require excavation or restoration. In the event of a small spill, the limited area affected will be cleaned, surveyed, and decontaminated, if needed, as part of the required cleanup immediately following any such spill. Therefore, site stabilization and long-term surveillance will not be required and associated decommissioning costs are not provided.

Table 10-13 Total Work Days by Labor Category (Labor days)

	Project Mgt.	Health Physicist/ Safety Officer	Laborer	Craftsman	Supervisor	HP Tech	Engineer	Clerical
	(days)	(days)	(days)	(days)	(days)	(days)	(days)	(days)
Planning and Preparation	530	189	0	0	0	0	265	123
Facility Characterization	17	17	0	0	0	138	0	22
Decontamination/ Dismantling Restoration of contaminated areas (Note 1)	280	559	2237	559	559	254	28	108
Packaging	0	0	1928	0	643	643	643	0
Final Survey Site stabilization and long term surveillance (Note 1)	31	92	0	0	0	103	0	28
Total Work Days	858	858	4164	559	1202	1138	935	281

Note 1: The facility is designed to contain and prevent contamination outside the equipment and building areas and the controlled containment areas; including measures of ALARA radiological controls that will result in a low likelihood of contaminating the facility grounds at levels that would require excavation or restoration. In the event of a small spill, the limited area affected will be cleaned, surveyed and de-contaminated, if needed, at the time as part of the required cleanup immediately following any such spill.

Table 10-14 Worker Unit Cost Schedule

	Project Mgt.	Health Physicist/ Safety Officer	Laborer	Craftsman	Supervisor	HP Tech	Engineer	Clerical
Salary & Fringe ($/year)	$118,068	$103,168	$71,831	$64,134	$94,454	$94,454	$103,168	$27,549
Overhead Rate (%)	25%	25%	25%	25%	25%	25%	25%	25%
Total Cost per Year	$147,585	$128,960	$89,788	$80,168	$118,068	$118,068	$128,960	$34,436
Total Cost per Work Day	$568	$496	$345	$308	$454	$454	$496	$132

- Based on 2,080 work hours per year and 8 hours per working day.

Table 10-15 Total Labor Cost by Major Decommissioning Task

	Project Mgt.	Health Physicist/ Safety Officer	Laborer	Craftsman	Supervisor	HP Tech	Engineer	Clerical
Planning and Preparation	$300,846	$93,620	$0	$0	$0	$0	$131,440	$16,287
Facility Characterization	$9,822	$8,583	$0	$0	$0	$62,863	$0	$2,865
Decontamination/ Dismantling	$158,710	$277,362	$772,451	$172,422	$253,936	$115,383	$13,640	$14,342
Restoration of contaminated areas (Note 1)								
Packaging	$0	$0	$665,641	$0	$291,764	$291,764	$318,680	$0
Final Survey	$17,665	$45,816	$0	$0	$0	$46,642	$0	$3,741
Site stabilization and long term surveillance (Note 1)								
Total Cost per Task	$487,043	$425,380	$1,438,092	$172,422	$545,699	$516,652	$463,760	$37,235

Note 1: The facility is designed to contain and prevent contamination outside the equipment and building areas and the controlled containment areas; including measures of ALARA radiological controls that will result in a low likelihood of contaminating the facility grounds at levels that would require excavation or restoration. In the event of a small spill, the limited area affected will be cleaned, surveyed and de-contaminated, if needed, at the time as part of the required cleanup immediately following any such spill.

Table 10-16 Shipping and Disposal of Radioactive Wastes

	Packaging Cost	LLW Disposal Cost	Transportation Cost
	($)	($)	($)
Autoclave Room	$27,758	$75,549	$16,867
DUF_4 Process Building 1st level	$24,402	$106,796	$21,359
DUF_4 Process Building 2nd level	$81,138	$279,572	$55,914
DUF_4 Process Building 3rd level	$3,660	$2,696	$573
DUF_4 Process Building 4th level	$43,924	$55,478	$11,213
DUF_4 Process Building 5th level	$245,853	$1,044,718	$209,126
Decontamination Building	$260,190	$1,088,157	$218,381
FEP Process Building 1st Level plus oxide annex	$134,213	$433,479	$86,990
FEP Process Building 2nd Level	$76,867	$41,392	$8,288
FEP Process Building 3rd Level	$174,477	$163,263	$32,711
FEP Process Building 4th Level	$237,618	$701,865	$141,723
HF Day Tank Building	$3,660	$0	$244
EPP Building	$234,567	$153,344	$32,458
Lime Storage Shed	$19,522	$0	$891
Total Cost	$1,567,849	$4,146,309	$836,741
Packaging Supplies	$300,000		
Transportation Supplies	$100,000		
Margin Adjustment:	1.25		
Packaging Total	$2,334,811		
Transportation & Disposal Total	$ 6,353,813		
Total	$8,688,624		

Table 10-17 Total Decontamination Equipment (Supplies) Cost by Major Decommissioning Task

Decommissioning Tasks	Equipment Cost
Planning and Preparation	$1,200
Facility Characterization	$1,800
Decontamination/ Dismantling	$269,500
Restoration of contaminated areas (Note 1)	
Packaging & Transport	$400,000
Final Survey	$4,680
Site stabilization and long term surveillance (Note 1)	
Total Cost per Task	$677,180

Table 10-18 Total Decommissioning Cost

	Total	Total w/ contingency
Planning and Preparation	$544,028	$680,035
Facility Characterization	$85,932	$107,416
Decontamination/ Dismantling Restoration of contaminated areas (Note 1)	$2,047,745	$2,559,682
Packaging	$1,867,849	$2,334,810
Transportation/Disposal Cost	$5,083,050	$6,353,813
Final Survey	$118,544	$148,180
Site stabilization and long term surveillance (Note 2)		
Total Project Cost	$9,747,148	$12,183,937

Note 1: The facility is designed to contain and prevent contamination outside the equipment and building areas and the controlled containment areas; including measures of ALARA radiological controls that will result in a low likelihood of contaminating the facility grounds at levels that would require excavation or restoration. In the event of a small spill, the limited area affected will be cleaned, surveyed and de-contaminated, if needed, at the time as part of the required cleanup immediately following any such spill.

Note 2: As described in Note 1 above, there is a low likelihood of contaminating the facility grounds at levels that would require excavation or restoration. Therefore, site stabilization and long-term surveillance will not be required and associated decommissioning costs are not provided.

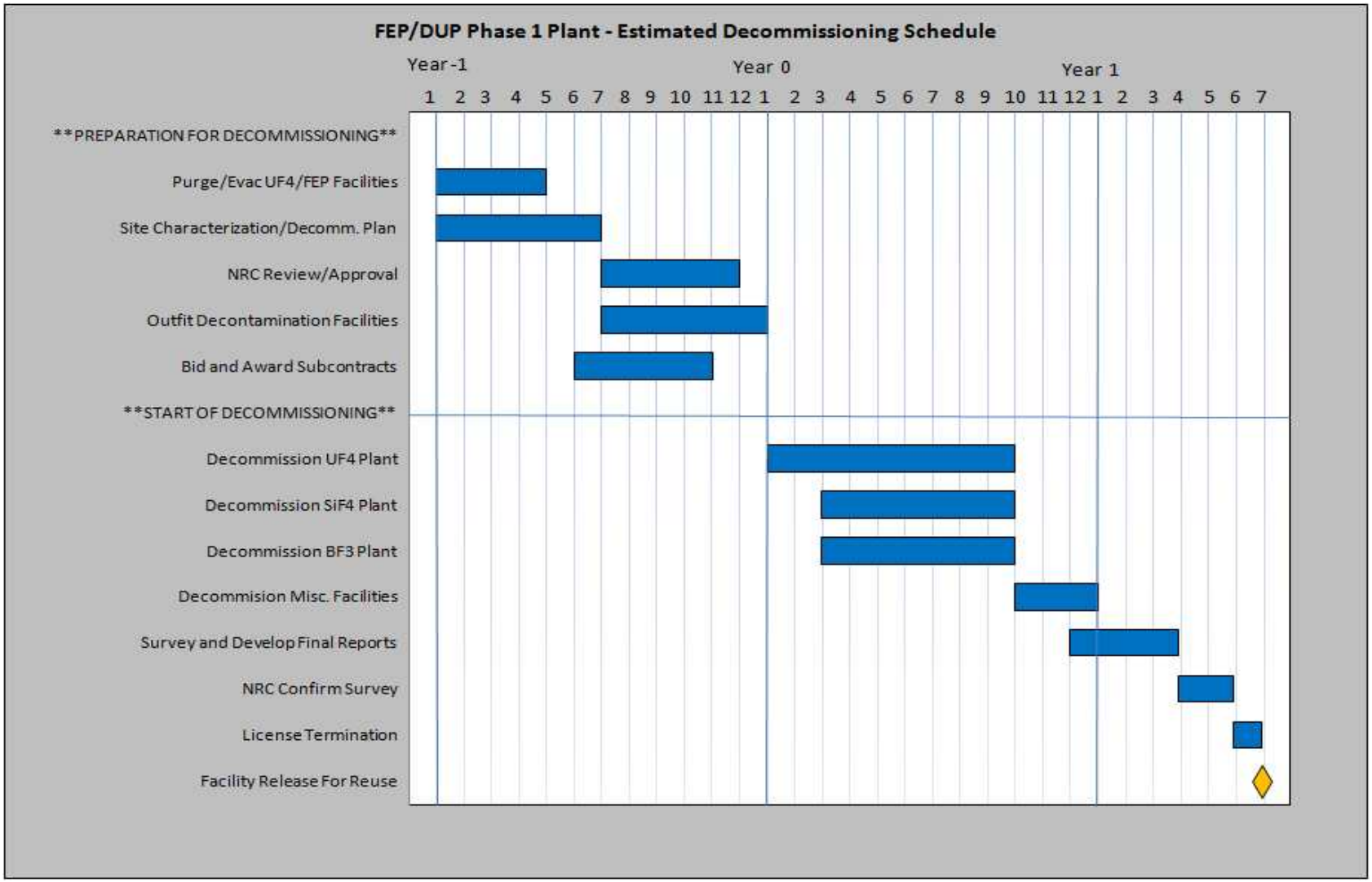


Figure 10-1 Estimated Decommissioning Schedule

10.4 References

CFR, 2008a. Title 10, Code of Federal Regulations, Section 40.36, Financial assurance and recordkeeping for decommissioning, 2003.

CFR, 2008b. Title 10, Code of Federal Regulations, Section 20.1402, Radiological criteria for unrestricted use, 2003.

CFR, 2008c. Title 10, Code of Federal Regulations, Part 20.1003, Definitions, 2003.

CFR, 2008d. Code of Federal Regulations, Title 10, Part 20.2108, Records of waste disposal, 2003.

CFR, 2008e. Title 10, Code of Federal Regulations, Part 20, Subpart E, Radiological Criteria for License Termination, 2003.

CFR, 2008f. Title 10, Code of Federal Regulations, Part 20.2002, Method for obtaining approval of proposed disposal procedures, 2003.

CFR, 2008g. Title 10, Code of Federal Regulations, Section 40.42, Expiration and termination of licenses and decommissioning of sites and separate buildings or outdoor areas, 2003.

CFR, 2008h. Title 10, Code of Federal Regulations, Part 40, Appendix A, Criteria Relating to the Operation of Uranium Mills and the Disposition of Tailings or Wastes Produced by the Extraction or Concentration of Source Material From Ores Processed Primarily for Their Source Material Content, 2003.

CFR, 2008i. Title 10, Code of Federal Regulations, Part 20.2003, Disposal by release into sanitary sewerage.

CFR, 2008j. Title 10, Code of Federal Regulations, Part 20.2004, Treatment or disposal by incineration.

CFR, 2008l. Title 10, Code of Federal Regulations, Part 61, Licensing Requirements for Land Disposal of Radioactive Waste

CFR, 2008m. Title 10, Code of Federal Regulations, Part 20, Subpart E--Radiological Criteria for License Termination

NRC 2002a. U.S. Nuclear Regulatory Commission, Standard Review Plan for the Review of a License Application for a Fuel Cycle Facility, NUREG-1520, March 2002.

NRC, 2002b. U.S. Nuclear Regulatory Commission, Revised Analyses of Decommissioning Reference Non-Fuel-Cycle Facilities, NUREG/CR-6477, December 2002.

NRC, 2003. U.S. Nuclear Regulatory Commission, Assuring the Availability of Funds for Decommissioning Nuclear Reactors, Regulatory Guide 1.159, 3, October 2003.

NRC, 2006. U.S. Nuclear Regulatory Commission, Consolidated NMSS Decommissioning Guidance - Financial Assurance, Recordkeeping, and Timeliness, NUREG-1757, Volume 3, September 2006.

NRC, 2005. U.S. Nuclear Regulatory Commission, Safety Evaluation Report for the National Enrichment Facility, Lea County, New Mexico, NUREG - 1827, 2005.

11 Management Measures

This chapter of the IIFP LA describes the management measures that are applied to Items Relied on for Safety (IROFS) for the IIFP Fluorine Extraction Process/Depleted Uranium De-conversion Process (FEP/DUP) plant to be built in Hobbs, New Mexico. The IIFP facility is being licensed under Title 10 CFR Part 40. Throughout this Chapter, where there is discussion on management measures applied to IROFS, it also includes application to those items that affect IROFS.

In the absence of Nuclear Regulatory Commission (NRC) final rulemaking for depleted uranium de-conversion facility requirements, IIFP is anticipating that NRC will amend Part 40 to include ISA completions and require de-conversion plant licensees to meet requirements similar to those in Subpart H of Title 10 CFR Part 70 (CFR, 2009g), or equivalent. Likewise, because the IIFP facility is a Part 40 licensed facility, and more related to chemical plant operations, a graded approach is used to apply management measures based on the risk-based results of the ISA. This graded approach for management measures is implemented in accordance with a QAP as described in the IIFP QA Program Description in Appendix A of the IIFP LA. The QA graded levels are defined in Section 11.8.4 below. The relative importance of an IROFS is determined using both the severity of the consequence and unmitigated likelihood of an initiating event. Based on the assigned safety importance, the appropriate types and number of management measures are applied to assure the IROFS are functional when needed. The QAP also provides measures for ensuring that the design, construction, operation and decommissioning of IROFS are controlled commensurate with their importance to safety.

IIFP maintains full responsibility for assuring the FEP/DUP facilities are designed, constructed, tested, and operated in conformance with good engineering practices, applicable regulatory requirements and specified design requirements and in a manner to protect the health and safety of the public.

IIFP is a wholly owned subsidiary of International Isotopes, Inc. (INIS). The President and Chief Executive Officer (CEO) is the highest level of management responsible for IIFP's corporate QA policies, goals, and objectives. The IIFP project is currently in its development, initial conceptual design and licensing application phase. Management measures described in this Chapter become effective and applicable The IIFP project is currently in its development, initial conceptual design and licensing application phase. The provisions contained in this QA Program Description are applicable during design and construction of the IIFP Facility for design activities taking place beginning on the date the DB contactor assumes the detailed design and engineering role and establishes the design organization and controls during design and construction phase of the IIFP Facility beginning on the date the DB contactor assumes the detailed design and engineering role and establishes the design organization and controls Once the design, engineering and construction phase (referred to as design/build (DB)) of the FEP/DUP project begins, the IIFP Chief Operations Officer/ Commercial Facility Project Director (COO/CFPD), to be appointed by the President and CEO and reporting to the INIS President/CEO, is responsible for implementing the management measures necessary for safe design and construction in accordance with the graded QA Program (See Figure 11-1, IIFP Organization during Design and Construction of the FEP/DUP Facility).

Upon completion of construction, the operating organization takes responsibility for startup and operation of the facility; led by the IIFP Chief Operations Officer/Plant Manager (COO/PM) who reports to the INIS President/CEO. The COO/PM is responsible for implementing and maintaining the management systems for the operating facility. The FEP/DUP facility line managers are responsible, with commensurate delegated authority, for implementing and maintaining the management measures policies and procedures in accordance with the approved facility safety design basis, licenses and permit

requirements and the QAP. The FEP/DUP facility operating organization is shown in Figure 11-2. In the operating organization, the Plant Engineering/Maintenance Manager and the Production/Technical Manager have key roles in ensuring the safe design and operation of the facility is maintained.

The IIFP QA Coordinator and Environmental, Safety and Health (ESH) Manager have key management measure responsibilities and authorities independent of production, engineering and maintenance organizational functions. The QA Coordinator and the ESH Manager provide authorized oversight and technical direction in ensuring the QAP and management measures are implemented such that production never takes priority over the safety and protection of employees, publics and the environment with respect to the plant construction and operation. The QA Coordinator and the ESH Manager report to the COO/PM directly. The QA Coordinator has a matrix-organization reporting responsibility to the INIS Regulatory Affairs and Quality Director who reports directly to the INIS President/CEO. The ESH Manager also has a matrix reporting responsibility to the INIS Regulatory Affairs and Quality Director.

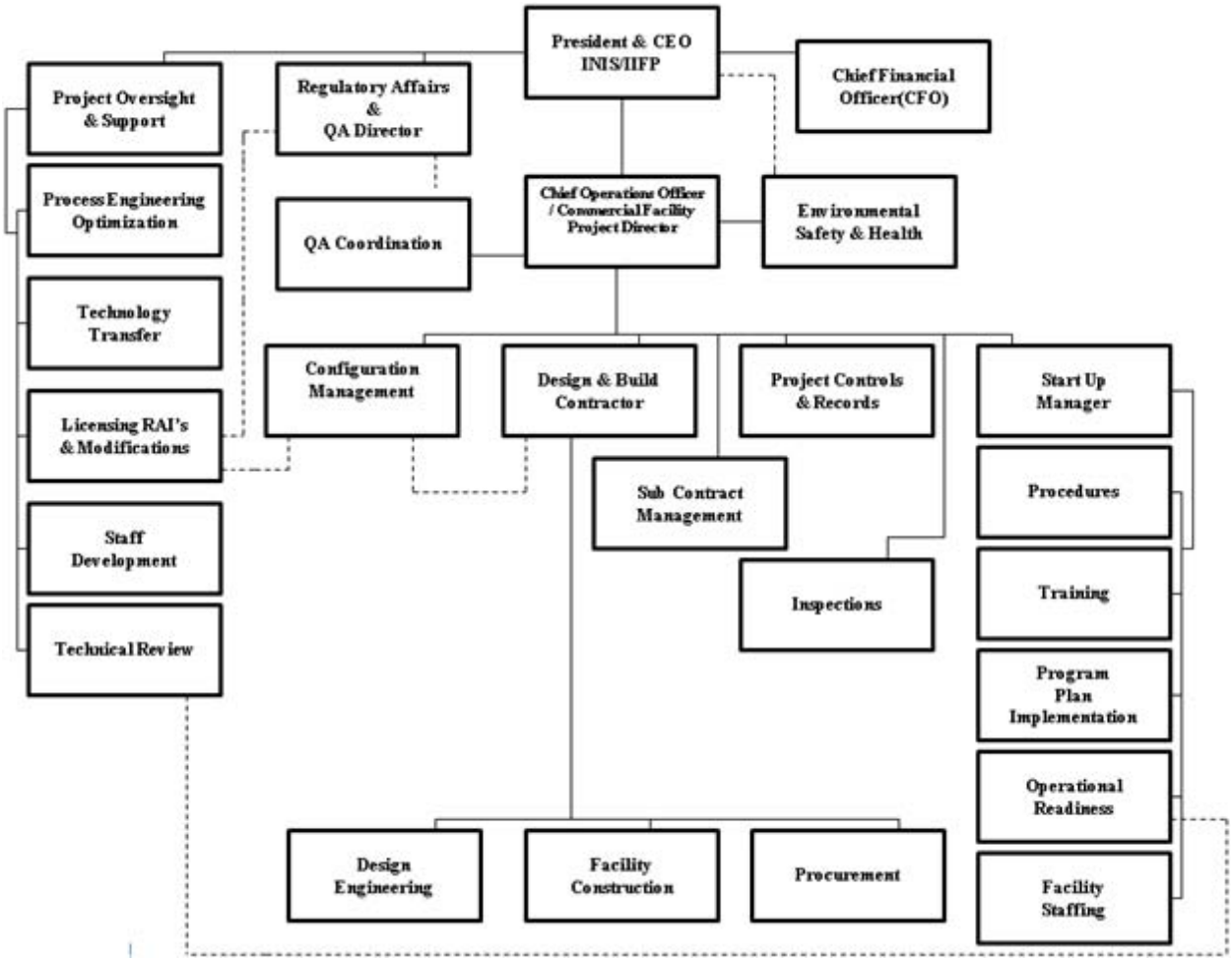


Figure 11-1 INIS/IIFP Organization during Design and Construction of the FEP/DUP Facility

More descriptive details of key management responsibilities and qualifications are provided in the IIFP LA Chapter 2, Organization and Administration and in the LA Appendix-A, Quality Assurance Program Description.

11.1 Configuration Management

This section describes the CM program for IIFP. Configuration management for IIFP is implemented through requirements of the QAP and associated procedures.

11.1.1 Configuration Management Policy

The IIFP project is currently in the conceptual design and development phase and when it transitions to detailed design and build of the facility, CM will be provided throughout facility design, construction, testing, and operation. A design and build contract is planned and the design and engineering is expected to begin by mid-2010. A qualified and experienced Design and Build (DB) contractor will be selected with an assigned Configuration Manager (CMM) and Design Engineering Manager (DEM) as shown in Figure 11-1. During the project design and construction, the DEM (under the Design and Build contract), with oversight and support of the CMM, has responsibility for CM through the engineering established design control process. The DEM and the CMM have reporting responsibilities to the COO/CFPD (See Figure 11-1 above). Selected documentation, including the ISA, is controlled under the CM system in accordance with procedures associated with design control, document control, and records management. Design changes undergo formal review, including interdisciplinary reviews as appropriate, in accordance with these procedures and the graded-level requirements of the QAP. This interdisciplinary review includes, as a minimum, the review for ISA impacts.

Configuration management provides the means to establish and maintain a technical baseline for the facility based on clearly defined requirements. During the design phase of the project, CM is based on the design control provisions and associated procedural control of the design documents to establish and maintain the technical baseline. Design documents that provide design input, design analysis, or design results specifically for IROFS, are identified with the appropriate QA level. These design documents undergo interdisciplinary review during the initial issue and during each subsequent revision. See Figure 11-1, IIFP Organization during Design and Construction of the FEP/DUP Facility.

During the construction, changes to drawings and specifications issued for construction, procurement, or fabrication shall be systematically reviewed and verified, evaluated for impact, including impact to the ISA, and approved prior to implementation. Proper implementation is verified and reflected in the design basis documentation.

Configuration management provides the means to establish and maintain the essential features of the design basis of IROFS included in the ISA. As the project progresses from design and construction to operation, CM responsibilities are transferred to the Plant Engineering & Maintenance organization as the overall focus of activities changes.

Upon startup and operation of the facility, measures continue to be implemented to ensure that the quality of IROFS is not compromised by planned changes (modifications). After the facility operations begin, the Plant Engineering and Maintenance Manager, and the INIS Regulatory Affairs and QA Director, or designee are responsible for ensuring the design and control of modifications to facility IROFS (See Figure 11-2, IIFP Plant Organization during Operations of the FEP/DUP Facility). The design and implementation of modifications are performed in a manner so as to assure quality is maintained in a manner commensurate with the remainder of the system which is being modified, or as dictated by applicable license requirements.

More detailed description of the configuration change control process, as it applies to the design, construction and operation phases, is provided below in sections 11.1.5.1, 11.1.5.2 and 11.1.5.3, respectively.

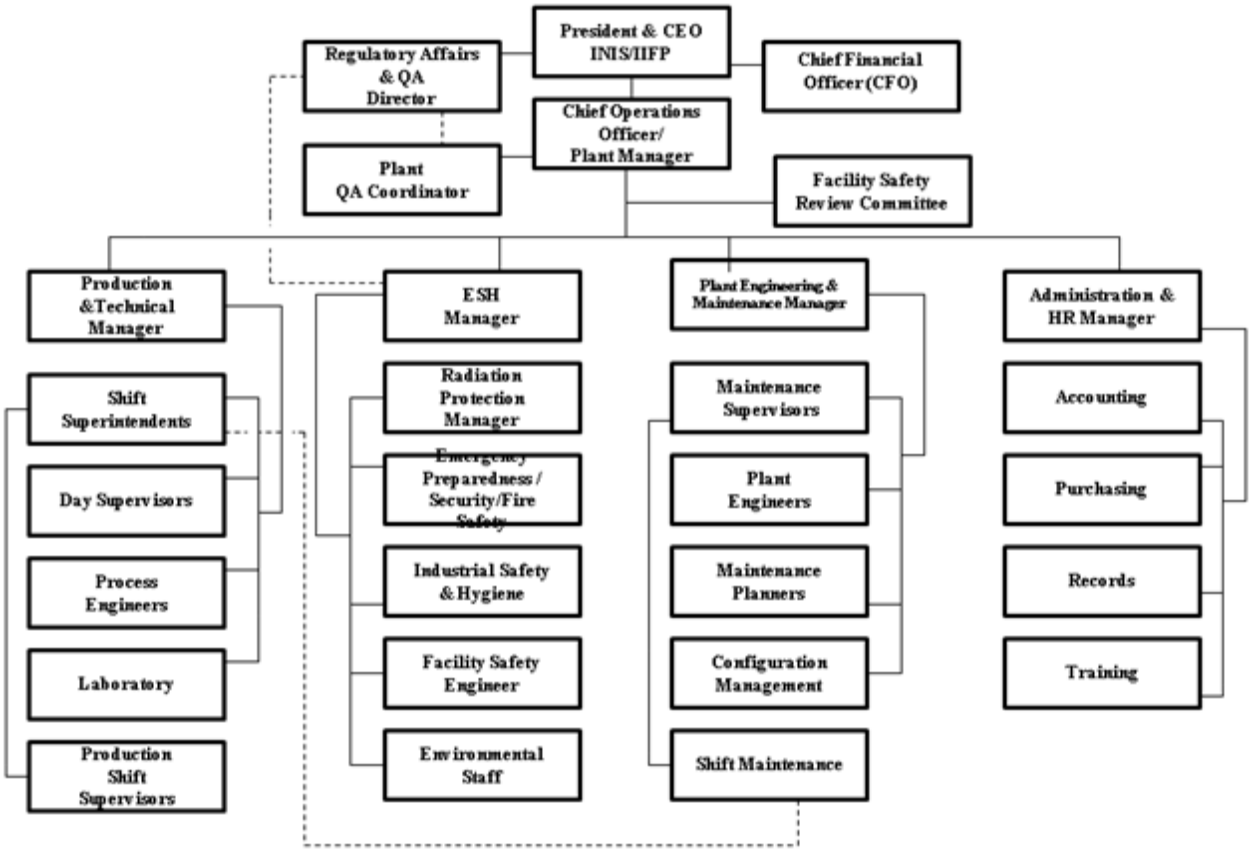


Figure 11-2 IIFP Plant Organization during Operations of the FEP/DUP Facility

11.1.1.1 Scope of Structures, Systems, and Components

The scope of Structures, Systems, and Components (SSCs) under CM includes all IROFS identified by the ISA of the design basis and any items which may affect the function of the IROFS. Design documents subject to CM include calculations, safety analyses**,** design criteria, engineering drawings, system descriptions, technical documents, and specifications that establish design requirements for IROFS. During the design phase, these design documents are maintained under CM when initially approved.

The scope of documents included in the CM program expands throughout the design process. As drawings and specification sections related to IROFS or items affecting the functions of IROFS are prepared and issued for procurement, fabrication, or construction, these documents are included in CM.

During construction, initial startup, and operations, the scope of documents under CM similarly expands to include, as appropriate:

- vendor data;
- test data;

- inspection data; and
- initial startup, test, operating and administrative procedures as applicable to IROFS

These documents include documentation related to IROFS that is generated through functional interface with QA, maintenance, and training and qualifications of personnel. Configuration management procedures will provide for evaluation, implementation, and tracking of changes to IROFS, and processes, equipment, computer programs, and activities of personnel that impact IROFS.

11.1.1.2 Objectives of Configuration Management

The objectives of CM shall be to ensure design and operation within the design basis of IROFS by:

- identifying and controlling preparation and review of documentation associated with IROFS;
- controlling changes to IROFS; and
- maintaining the physical configuration of the facility consistent with the approved design

The ISA determines the IROFS and establishes the safety function(s) associated with each IROFS. Configuration control is accomplished during design through the use of procedures for controlling design. The controlling procedures address preparation, review (including interdisciplinary review), verification of design, where appropriate, approvals and distribution for use. Engineering documents are assessed for QA level classification. Changes to the approved design are subject to a review to ensure consistency with the design basis of IROFS. Configuration verification is also accomplished through design verification, which ensures that design documents are consistent and that design requirements for IROFS are met. During construction and testing, this verification also extends to verification that as-built configurations are consistent with the design, and that testing that is specified to demonstrate performance of IROFS is accomplished successfully. Periodic audits and assessments of the CM program and of the design confirm that the system meets its goals and that the design is consistent with the design basis. The corrective action process occurs in accordance with the QAP and associated procedures in the event problems are identified. Prompt corrective actions are developed as a result of incident investigations or in response to audit or assessment results.

11.1.1.3 Description of Configuration Management Activities

Configuration management includes those activities conducted under design control provisions for ensuring that design and construction documentation is prepared, reviewed, and approved in accordance with a systematic process. This process includes interdisciplinary reviews appropriate to ensure consistency between the design and the design basis of IROFS. During construction, it also includes those activities that ensure that construction is consistent with design documents. Finally, it includes activities that provide for operation of the IROFS in accordance with the limits and constraints established in the ISA, and that provide for control of changes to the facility in accordance with 10 CFR 70.72 (CFR, 2009e). Configuration management also includes records to demonstrate that personnel conducting activities that are relied on for safety or that are associated with IROFS are appropriately qualified and trained to conduct that work.

Implementing documents are controlled within the document control system. These documents support CM by ensuring that only reviewed and approved procedures, specifications and drawings are used for procurement, construction, installation, testing, operation, and maintenance of IROFS, as appropriate.

11.1.1.4 Organizational Structure and Staffing Interfaces

The CM program is administered by the Design Engineering Manager during design and construction. Design Engineering includes the engineering disciplines. The discipline engineers have primary technical responsibility for the work performed by their disciplines. The Configuration Manager is responsible for ensuring the conduct of interdisciplinary reviews as discussed previously in this section. Reviews are also conducted, as appropriate, by construction management, QA, and procurement personnel. The design control process also interfaces with the document control and records management process via procedures.

The various IIFP departments and contractors of IIFP perform quality-related activities. The primary IIFP contractors are responsible for development of their respective QA Programs and CM elements, which are consistent with the requirements of the IIFP QA Program for those activities determined to be within the scope of the IIFP QA Program. The interfaces between contractors and IIFP or among contractors are documented. IIFP and contractor personnel have the responsibility to identify quality problems. If a member of another area disagrees, that individual is instructed to take the matter to appropriate management. The disagreement may either be resolved at this level or at any level up to and including the INIS President.

Configuration management is implemented through or otherwise related to other management measures. Key interfaces and relationships to other management measures are described below.

Quality Assurance

The QAP establishes the framework for CM and other management measures for IROFS and items that affect the function of the IROFS.

Records Management

Records associated with IROFS and items affecting IROFS are generated and processed in accordance with the applicable requirements of the QAP and provide evidence of the conduct of activities associated with the CM of those IROFS.

Maintenance

The maintenance requirements are established as part of the design basis, which is controlled under CM. Maintenance records for IROFS and items affecting IROFS shall provide evidence of compliance with preventive and corrective maintenance schedules.

Training and Qualifications

Training and qualifications are controlled in accordance with the applicable provisions of the QAP. Personnel qualifications and/or training to specific processes and procedures are management measures that support the safe operation, maintenance, or testing of IROFS. Also, work activities that are themselves IROFS, (i.e., administrative controls) are included in procedures; and personnel shall be trained and qualified to these procedures. Training and qualification requirements and documentation of training may be considered part of the design basis controlled under CM.

Incident Investigation/Audits and Assessments

Audits, assessments, and incident investigations are described in Sections 11.5, Audits and Assessments, and 11.6, Incident Investigations and Corrective Action Process. Corrective actions identified as a result of these management measures may result in changes to design features, administrative controls, or other management measures (e.g., operating procedures). The Corrective Action Program is described in Section 11.6, Incident Investigations and Corrective Action Process. Changes are evaluated under the provisions of CM through the QA Program and procedures. Periodic assessments of the CM program are also conducted in accordance with the audit and assessment program described in Section 11.5.

Procedures

Operating, administrative, maintenance, and emergency procedures are used to conduct various operations associated with IROFS and items affecting IROFS and are reviewed for potential impacts to the design basis. Also, work activities that are themselves IROFS, (i.e., administrative controls) are contained in procedures.

11.1.2 Design Requirements

Design requirements and associated design basis are established and maintained by the design engineering organization (designated by the Configuration Manager and approved by the COO/CFPD) during the design/construction phase and designated/approved by the Plant Engineering/Maintenance Manager after operations begin. The CM controls on design requirements and the ISA of the design basis are described previously in this section.

Design requirements are documented in design requirement documents i.e. calculations, safety analysis, design criteria, engineering drawings, system descriptions, technical documents, and specifications. The design requirements and basis of design documents are controlled under the design control provisions of the CM program as described above and are subject to the same change control as analysis, specifications, and drawings.

IROFS and any items that affect the function of the IROFS are designated as QA Level 1 or QA Level 2 (see Section 11.8). The associated design documents are subject to interdisciplinary reviews and design verification. Changes to the design are evaluated to ensure consistency with the design basis. Computer codes used in the design of IROFS are also subject to these design control measures, with additional requirements as appropriate for software control, verification, and validation.

IROFS are listed in the ISA Summary. This list is augmented and maintained current as appropriate during detailed design of the facility.

A qualified individual who specifies and includes the appropriate codes, standards, and licensing commitments within the design documents prepares each design document, such as a calculation, specification, procedure, or drawing. This individual also notes any deviations or changes from such standards within the design documentation package. Each design document is then checked by another individual qualified in the same discipline and is reviewed for concept and conformity with the design inputs. These design inputs are in sufficient detail to permit verification of the document. The manager having overall responsibility for the design function approves the document. The Configuration Manager ensures that the designated engineering organization documents the entire review process in accordance with approved procedures. These procedures include provisions to assure that appropriate quality

standards are specified in design documents, including quantitative or qualitative acceptance criteria. The QA Coordinator conducts audits on the design control process using independent technically qualified individuals to augment the QA audit team.

During the check and review, emphasis is placed on assuring conformance with applicable codes, standards and LA design commitments. The individuals in engineering assigned to perform the check and review of a document have full and independent authority to withhold approval until questions concerning the work have been resolved. Design reviews, alternative calculations, or qualification testing accomplishes verification of design. The basis for a design, such as analytical models, theories, examples, tables, codes and computer programs must be referenced in the design document and their application verified during check and review. Model tests, when required to prove the adequacy of a concept or a design, are reviewed and approved by the responsible qualified individual. Testing used for design verification shall demonstrate adequacy of performance under conditions that simulate the most adverse design conditions. The tests used for design verification must meet all the design requirements.

Qualified individuals other than those who performed the design may be from the same organization performing design verification. Verification may be performed by the supervisor of the individual performing the design, provided this need is documented, approved in advance by the supervisor's management, and the supervisor did not specify a singular design approach or rule out certain design considerations, and did not establish the design inputs used in the design or, provided the supervisor is the only individual in the organization competent to perform the verification.

Independent design verification shall be accomplished before the design document (or information contained therein) is used by other organizations for design work or to support other activities such as procurement, construction, or installation. When this is not practical due to time constraints, the unverified portion of the document is identified and controlled. In all cases, the design verification shall be completed before relying on the item to perform its function or installation becomes irreversible. Any changes to the design and procurement documents, including field changes, must be reviewed, checked and approved commensurate with the original approval requirements.

After design documents have been properly prepared, checked, reviewed, and approved by the appropriate parties, the responsible engineer sends the document to document control for distribution. When required, each recipient of a design document verifies receipt of such document to the document control center. The document control center, after verification of distribution to a recipient, maintains the required documentation in its files.

When deficiencies are identified which affect the design of IROFS, such deficiencies are documented and resolved in accordance with approved Corrective Actions procedures. In accordance with these procedures, the report is forwarded for appropriate review to the responsible manager, who coordinates further review of the problem and revises all design documents affected by the deficiency as necessary. Where required, the responsible manager forwards the report to the engineers in other areas, who coordinate necessary revisions to their affected documents.

Design interfaces are maintained by communication among the principals. Methods by which this is accomplished include the following:

- Design documents are reviewed by the responsible engineer or authorized representative. As appropriate, subsequent review or waiver of review by the other area engineers is documented.

- Project review meetings are scheduled and held to coordinate design, procurement, construction and pre-operational testing of the facility. These meetings provide a primary working interface among the principal organizations.

- Reports of nonconformance are transmitted and controlled by procedures. As required by the nonconformance procedure, the QA Coordinator approves resolution of reports of nonconformance.

During the operational phase, measures are provided to ensure responsible facility personnel are made aware of design changes and modifications that may affect the performance of their duties.

11.1.3 Configuration Management Controls on the Design Requirements

Configuration control is accomplished during design through the use of procedures for controlling design, including preparation, review, design verification, approval, and release and distribution for use. Engineering documents are assessed based on the QA level classification of the item being reviewed. Changes to the approved design also are subject to a review to ensure consistency with the design basis of IROFS.

Configuration verification is also accomplished through design verification, which ensures that design documents are consistent and that design requirements for IROFS are met. During construction and testing, this verification also extends to verification that as-built configurations are consistent with the design, and that testing that is specified to demonstrate performance of IROFS is accomplished successfully.

The QAP requires procedures that specify that work performed is accomplished in accordance with the requirements and guidelines imposed by applicable specifications, drawings, codes, standards, regulations, quality assurance criteria and site characteristics.

Acceptance criteria established by the designer shall be incorporated in the instructions, procedures and drawings used to perform the work. Documentation is maintained, including test results, and inspection records, demonstrating that the work has been properly performed. Procedures also provide for review, audit, approval and documentation of activities affecting the quality of items to ensure that applicable criteria have been met.

Maintenance, modification, and inspection procedures are reviewed by qualified personnel knowledgeable in the quality assurance disciplines to determine:

- The need for inspection, identification of inspection personnel, and documentation of inspection result, and
- That the necessary inspection requirements, methods, and acceptance criteria have been identified.

Facility procedures are reviewed by an individual knowledgeable in the area affected by the procedure on a frequency determined by the age and use of the procedure to determine if changes are necessary or desirable. Procedures are also reviewed to ensure procedures are maintained up-to-date with facility configuration. These reviews are intended to ensure that any modifications to IROFS are reflected in current maintenance, production and other facility procedures.

11.1.4 Document Control

Procedures are established which control the preparation and issuance of documents such as manuals, instructions, drawings, procedures, specifications, design documents, procurement documents and supplier-supplied documents, including any changes. Procedures are established to control the life-cycle of documents that pertain to the CM function. Measures are established to ensure documents, including revisions, are adequately reviewed, approved, and released for use by authorized personnel.

Document control procedures require documents to be transmitted and received in a timely manner at appropriate locations including the location where the prescribed activity is to be performed. Controlled copies of these documents and their revisions are distributed to and used by the persons performing the activity.

Superseded documents are destroyed or are retained only when they have been properly labeled. Indexes of current documents are maintained and controlled.

Document control is implemented in accordance with procedures. A document management system is used both to file project records and to make available the latest revision (i.e., the controlled copy) of design documents. The system provides a record copy of the current controlled document, and personnel are trained to use this system to retrieve controlled documents. The system is capable of generating indices of controlled documents, which are uniquely numbered (including revision number). Controlled documents are maintained until cancelled or superseded. Cancelled or superseded documents are maintained as a record, currently for the life of the project or termination of the license, whichever occurs later. Hardcopy distribution of controlled documents is provided when needed in accordance with applicable procedures (e.g., when an electronic document management system is being used but is not available).

11.1.5 Change Control

Procedures control changes to the technical baseline includes an appropriate level of technical, management, and safety review and approval prior to implementation. During the detailed design phase of the project, the method of controlling changes is the design control process described in the IIFP QAP. This process includes the conduct of interdisciplinary reviews that constitute a primary mechanism for ensuring consistency of the design with the design basis. During construction and operation, appropriate reviews to ensure consistency with the design basis of IROFS and the ISA similarly ensures that the design is constructed and operated/modified within the limits of the design basis. Additional details are provided below.

11.1.5.1 Design Phase

Changes to the design include a systematic review of the design basis for consistency. In the event of changes ISA and other documents affected by design basis of IROFS are properly modified, reviewed, and approved prior to implementation. Approved changes are made available to personnel through the document control function discussed previously in this section.

During detailed design, the method of ensuring consistency between documents, including consistency between design changes and the safety assessment, is the interdisciplinary review process.

The interdisciplinary reviews ensure design changes either:

- do not impact the ISA,
- are accounted for in subsequent changes to the ISA, or
- are not approved or implemented

11.1.5.2 Construction Phase

When the project enters the construction phase, changes to documents issued for construction, fabrication, and procurement are documented, reviewed, approved, and posted against each affected design document. Vendor drawings and data will also undergo an interdisciplinary review to ensure compliance with procurement specifications and drawings, and to incorporate interface requirements into facility documents.

During construction, design changes will continue to be evaluated against the approved design basis. Changes are expected to the design as detailed design progresses and construction begins. A systematic process consistent with the process described above will be used to evaluate the IIFP Materials License, the configuration change process will fully implement the provisions of 10 CFR 70.72 (CFR, 2009e), including reporting of changes made without prior NRC approval as required by 10 CFR 70.72(d)(2) and (3). Any change that requires Commission approval, will be submitted as a license amendment request as required by 10 CFR 70.72(d)(1) and the change will not be implemented without prior NRC approval.

11.1.5.3 Operations Phase

Changes to design will also be documented, reviewed, and approved prior to implementation. IIFP will implement a change process that implements the provisions of 10 CFR 70.72. Measures are provided to ensure responsible facility personnel are made aware of design changes and modifications that may affect the performance of their duties.

To provide for the continued safe and reliable operation of the IROFS, measures are implemented to ensure that the quality of these IROFS is not compromised by planned changes (modifications). Upon acceptance by the Production and Technical organization, the Plant Engineering and Maintenance organization is responsible for the design of and modifications to facility IROFS. The design and implementation of modifications are performed in a manner so as to assure quality is maintained in the remainder of the system that is being modified, or as dictated by applicable regulations.

The administrative instructions for modifications are contained in a procedure that is approved (including revisions) by the ESH Manager, or ESH designee. The modification procedure contains the following items necessary to ensure quality in the modification program:

- The technical and quality requirements which are met to implement a modification, and

- The requirements for initiating, approving, monitoring, designing, verifying, and documenting modifications.

The facility modification procedure shall be written to ensure that policies are formulated and maintained to satisfy the requirements specified in the IIFP QA Program, as applicable.

Each change to the facility shall have an evaluation performed, and a review of the ISA, in accordance with the requirements of 10 CFR 70.72 (2009e), as applicable. Each modification shall also be evaluated

for any required changes or additions to the facility's procedures, personnel training, testing program, or regulatory documents.

Each modification is also evaluated and documented for radiation exposure to minimize worker exposures in keeping with the facility ALARA program, worker safety requirements and/or restrictions. Other areas of consideration in evaluating modifications may include, but are not limited to the review of:

- QA requirements,
- Lessons learned from similar completed modifications,
- Potential operability or maintainability concerns,
- Constructability concerns,
- Post-modification testing requirements,
- Environmental considerations,
- Human factors, and
- Modification costs

After completion of a modification to an IROFS structure, system or component, the Production and Technical Manager, or designee, shall ensure that all applicable testing has been completed to ensure correct operation of the system(s) affected by the modification and documentation regarding the modification is complete. To ensure operators are able to operate a modified system safely, when a modification is complete, all documents necessary, e.g., the revised process description, checklists for operation and flow sheets are made available to production and maintenance departments prior to the startup of the modified system. Appropriate training on the modification is completed before a system is placed in operation. A formal notice of a modification being completed is distributed to all appropriate managers. As-built drawings incorporating the modification are completed promptly in accordance with the design control procedures. These records are retained in accordance with the records management procedures.

11.1.6 Assessments

Initial and periodic assessments of the CM program are conducted to determine the system's effectiveness and to correct deficiencies. These assessments include review of the adequacy of documentation and system walk downs of the as-built facility. Such audits and assessments are conducted, documented, and scheduled in accordance with procedures. Planned internal and independent assessments of the CM program and of the design confirm that the system meets its goals and that the design is consistent with the design basis. Incident investigations occur in accordance with the QAP and associated corrective action procedures in the event problems are encountered. Prompt corrective actions are developed as a result of incident investigations or in response to adverse audit/assessment results, in accordance with these procedures.

More detail discussion is provided below in Section 11.6, Audits and Assessments.

11.2 Maintenance

This section outlines the maintenance and functional testing programs to be implemented for the operations phase of the facility. Preventive maintenance activities, surveillance, and performance trending provide reasonable and continuing assurance that IROFS will be available and reliable to perform their safety functions.

The purpose of planned and scheduled maintenance for IROFS is to ensure that the equipment and controls are maintained in a condition of readiness to perform the planned and designed functions when required. Appropriate plant management is responsible for ensuring the operational readiness of IROFS under this control. For this reason, the maintenance function is administratively closely coupled to the engineering function.

11.2.1 Maintenance Program

To provide for the continued safe and reliable operation of the facility IROFS, measures are implemented to ensure that the quality of these IROFS is not compromised by planned changes (modifications) or maintenance activities. Change management for modifications is described in Section 11.1 above. In maintenance of the facility, IIFP utilizes a systems-based program for planning, scheduling, tracking and maintaining records for maintenance activities where those affect IROFS. Use of approved maintenance procedures for IROFS related maintenance is a vital part of that program. The details of maintenance procedure acceptance criteria, reviews, and approval are provided in Section 11.4, Procedures Development and Implementation.

As applicable, contractors that work on or near IROFS identified in the ISA Summary will be required by IIFP to follow the same maintenance procedures described for the corrective, preventive, functional testing, or surveillance/monitoring activities listed above for the maintenance function.

Maintenance procedures involving IROFS commit to the topics listed below for corrective and preventive maintenance, post-maintenance testing, and surveillance/monitoring maintenance activities:

- Pre-maintenance activities require reviews of the work to be performed, including procedure reviews for accuracy and completeness.
- Steps that require notification of all affected parties (production personnel and appropriate managers) before performing work and on completion of maintenance work. The discussion includes potential degradation of IROFS during the planned maintenance.
- Control of work by comprehensive procedures to be followed by maintenance technicians.

11.2.2 Types of Maintenance

Maintenance activities generally fall into the following categories:

- Surveillance/monitoring,
- Corrective maintenance,
- Preventive maintenance, and
- Functional testing

These maintenance categories are discussed in the following sections.

11.2.2.1 Surveillance/Monitoring

Surveillance/monitoring activities are utilized to detect degradation and adverse trends of IROFS so that action may be taken prior to component failure. The monitored parameters are selected based upon their ability to detect predominate failure modes of the critical components. Data sources include the following:

- surveillance,
- periodic and diagnostic test results,
- plant computer information,
- operator rounds,
- walk downs,
- as-found conditions,
- failure trending, and
- predictive maintenance

Surveillance/monitoring and reporting are required for IROFS and any administrative controls that could impact the functions of an IROFS.

Plant performance criteria are established to monitor plant performance and to monitor IROFS functions and component parameters. These criteria are established by industry experience, operating data, surveillance data, and plant equipment operating experience. These criteria ensure the reliability and availability of IROFS. The performance criteria are also used to demonstrate that the performance or condition of an IROFS is being effectively controlled through appropriate predictive and repetitive maintenance strategies so that IROFS remain capable of performing their intended function.

Surveillance of IROFS is performed at specified intervals. The purpose of the surveillance program is to measure the degree to which IROFS meet performance specifications. The results of surveillances are trended, and when the trend indicates potential IROFS performance degradation, preventive maintenance frequencies are adjusted or other appropriate corrective action is taken.

Incident investigations may identify root causes of failures that are related to the type or frequency of maintenance. The lessons learned from such investigations are factored into the surveillance/monitoring and preventive maintenance programs as appropriate.

Maintenance procedures prescribe compensatory measures, if appropriate, for surveillance tests of IROFS that can be performed only while equipment is out of service.

Records showing the current surveillance schedule, performance criteria, and test results for all IROFS will be maintained in accordance with the Record Management System.

Results of surveillance/monitoring activities related to IROFS via the CM program is evaluated by the appropriate safety disciplines to determine any impact on the ISA and any updates needed.

11.2.2.2 Corrective Maintenance

Corrective maintenance involves repair or replacement of equipment that has unexpectedly degraded or failed. Corrective maintenance of IROFS restores the equipment to acceptable performance through a planned, systematic, controlled, and documented approach for the repair and replacement activities.

Following any corrective maintenance on IROFS, and before returning an IROFS to operational status, post testing of the IROFS, if necessary, is performed to ensure the IROFS performs its intended safety function. If the performance of a repaired or replaced component could be different from that of the original component, the change to the safety control is specifically reviewed and approved under the CM program and pre-operationally tested to ensure it will perform its desired function when needed.

Results of corrective maintenance activities related to IROFS via the CM program will be evaluated by the facility safety function, including appropriate interdisciplinary reviews, to determine any impact on the ISA and any updates needed.

11.2.2.3 Preventive Maintenance

Preventive maintenance (PM) includes preplanned and scheduled periodic refurbishment, partial or complete overhaul, or replacement of IROFS, if necessary, to ensure their continued safety function. Planning for preventive maintenance includes consideration of results of surveillance and monitoring, including failure history. PM also includes instrument calibration and testing.

The basis for the PM tasks is developed through a review of available industry standards, manufacturer recommendations and historical operating information, where available. Formal documentation of the basis and tasks for PM are developed, evaluated and approved by the Plant Engineering and Maintenance functional organization and includes input from the operating organization and various disciplines within the engineering organization. New PM tasks may be added, or task may be changed or deleted upon review, evaluation and approval of the Plant Engineering and Maintenance organization. Changes to PM tasks that may affect IROFS require review and evaluation by the facility safety and regulatory functions, including appropriate interdisciplinary reviews.

In determining the frequency of PM, consideration is given to appropriately balancing the objective of preventing failures through maintenance against the objective of minimizing unavailability of IROFS because of PM. Specifically, preventive measures to alleviate premature failures may be added to the PM schedule, or the frequency of a particular PM activity may be reduced due to as-found conditions indicating that the PM is occurring more often than needed. In addition, feedback from PM and corrective maintenance and the results of incident investigations and identified root causes are used, as appropriate, to modify the frequency or scope of preventive maintenance.

The PM program procedures and calibration standards (traceable to the national standards system or to nationally accepted calibration techniques, as appropriate) enable the facility personnel to calibrate equipment and monitoring devices important to plant safety and safeguards. Testing performed on IROFS that are not redundant will provide for compensatory measures to be put into place to ensure that the IROFS function is performed until it is put back into service.

After conducting preventive maintenance on IROFS, and before returning an IROFS to operational status, post-maintenance testing of the IROFS, if necessary, is performed to ensure the IROFS performs its intended safety function.

All records that pertain to PM of IROFS, and items affecting IROFS, are maintained in accordance with the Records Management System (Section 11.7).

Results of preventive maintenance activities related to IROFS via the CM system are evaluated by the facility safety function, including appropriate interdisciplinary reviews, to determine any impact on the ISA and any updates needed.

11.2.2.4 Functional Testing

Functional testing of engineered IROFS is performed as appropriate, following initial installation as part of periodic surveillance testing and after corrective maintenance, PM, or calibration to ensure that the

item is capable of performing the designed safety function when required. IIFP commits to perform functional tests in accordance with approved written procedures that define the method for the test and the required acceptable results. The results of the tests are recorded and maintained as quality records.

Administrative controls that are identified as IROFS are documented in approved written procedures. Administrative controls are assured to be available and reliable prior to and during operations by applying the applicable management measures described above, including the use of procedures and the employee training programs. See Section 11.3, Training and Qualifications, and Section 11.4, Procedures Development and Implementation, for additional information on how these management measures are applied to administrative controls.

Pre-Operational Testing

Preoperational testing at the facility consists of testing conducted to initially determine various facility parameters and to initially verify the capability of SSCs to meet performance requirements. The major objective of preoperational testing is to verify that IROFS, essential to the safe operation of the facility, are capable of performing their intended function. Initial startup testing is performed beginning with the introduction of UF_6 and ending with the startup of UF_4, SiF_4, and BF_3 operations. The purpose of initial startup testing is to ensure safe and orderly UF_6 feeding, and to verify parameters assumed in the ISA. Records of the preoperational and startup tests required prior to operation are maintained. These records include testing schedules and results for IROFS.

Post-Maintenance Testing

Post-maintenance testing (PMT) is established to provide assurance that IROFS will perform their intended function following maintenance activities. This test confirms that the maintenance performed was satisfactory, the identified deficiency has been corrected, and the maintenance activity did not adversely affect the reliability of the item. This test is performed, with acceptable results, prior to returning the equipment to service.

PMT requirements are developed and included in work packages, where IROFS or during the work planning process. The Production Organization may provide support to the Plant Engineering and Maintenance Organization in identifying PMT requirements. The PMT meets applicable codes and technical requirements and specifies acceptance criteria. The results of the PMT are documented and retained in the work package with other documentation generated during the maintenance evolution.

11.2.3 Procurement, Receipt Inspection Control, and Issuance of Repair Parts, Materials, and Services

The QAP describes the requirements for procurement control, and the control of purchased material, equipment, and services. Procurement of items is performed in accordance with plant procedures.

Repair parts, components and material requirements for IROFS are listed on the engineering approved specifications. The engineering approved specifications and associated inspection plans provide the design criteria and inspection requirements needed when procuring such parts, components, and materials for IROFS.

Purchasing obtains the latest engineering approved specifications and inspection requirements and reviews for changes. Commercial grade items are procured according to catalog specifications from the

manufacturer or factory authorized dealer or distributor. Upon receipt, the item is placed in a segregated area for inspection and acceptance. Inspection criteria is defined and documented by engineering prior to the purchase of an IROFS item. The inspection department has access to the inspection criteria to determine acceptability of the item. A unique identification number is placed on the item for traceability. If the item is rejected by Inspection, it is placed in a segregated area or tagged until the nonconformance disposition decision is made by the appropriate QA Coordinator or designee.

Traceability of repair parts, components, and materials shall be maintained when they are received and placed in stores for use. Configuration management provides for parts traceability after they are installed in the plant.

11.2.4 Control of Measuring and Test Equipment

To maintain accuracy within specified limits, the maintenance program requires that Measuring and Test Equipment (M&TE) be properly controlled, calibrated, and adjusted at specified periods in accordance with program procedures.

The following M&TE items are included in IIFP procedures:

- A unique identifier,
- Calibration intervals defined and entered into a recall system,
- A label to indicate calibration status,
- An inventory listing of controlled M&TE,
- Evaluation of calibrations using M&TE that is subsequently found out of tolerance,
- Preparation and maintenance of calibration records, and
- Measures for the storage and control of M&TE.

M&TE is calibrated in accordance with procedures. Standards used to calibrate devices have the required accuracy, stability, and range for the intended use and are certified and traceable to the National Institute of Standards and Technology. If no national standards exist, the basis for calibration is documented.

11.3 Training and Qualifications

This section describes the training program for operations of the facility, including preoperational functional testing and initial startup testing. Training is provided to each individual commensurate with the roles and responsibilities. Training program requirements shall be applicable to, but not limited to, those plant personnel who perform activities that affect IROFS, or items that may affect the function of IROFS.

The QAP provides training and qualification requirements, during the design, construction, and operations phases, for QA training of personnel performing QA levels 1 and 2 work activities (See Section 11.8.4); for nondestructive examination, inspection, and test personnel; and for QA auditors.

The principle objective of the IIFP training program system is to ensure job proficiency of facility personnel through effective training and qualification. The training program system is designed to accommodate future growth and meet commitments to comply with applicable established regulations and standards. Employees are provided with training to establish the knowledge foundation and on-the-job training (OJT) to develop work performance skills. Continuing training will be provided, as required,

to maintain proficiency in these knowledge and skill components, and to provide further employee development.

Qualification is indicated by successful completion of prescribed training, demonstration of the ability to perform assigned tasks, and the maintenance of requirements established by regulation. A graded approach to systematic training will be used that applies the level of detail needed relative to safety. This graded approach incorporates methods to accomplish the analysis, design, development, implementation, and evaluation of training.

11.3.1 Organization and Management of the Training Function

Line managers have responsibility and commensurate authority to develop and effectively conduct training for their personnel. The training functional organization provides support to line managers by facilitating the planning, directing, analyzing, developing, conducting, evaluating, and controlling the performance-based training process.

Facility procedures establish the requirements for the training of personnel performing activities related to IROFS. Additionally these procedures ensure the training program is conducted in a reliable and consistent manner. Procedures also allow for exceptions from training when justified and properly documented and approved by appropriate management.

Lesson plans or other approved process controlling documents are used for classroom and on-the-job training to provide consistent presentation of subject matter. When design changes or facility modifications are implemented, updates of applicable lesson plans, where IROFS are affected, are included in the change control process of the CM program.

Training programs and training records at the facility are the responsibility of the Training Lead. Training records are maintained to support management information needs associated with personnel training, job performance, and qualification. Records are maintained on each employee's qualifications, experience, and training. The employee training file shall include records of all general initial site training, safety training, technical training, and employee development training conducted at the facility. The employee training file shall also contain records of special company sponsored training conducted by others. The training records for each individual are maintained so that they are accurate and retrievable. Training records are retained in accordance with the records management procedures.

11.3.2 Analysis and Identification of Functional Areas Requiring Training

A needs/job analysis is performed, and tasks are identified to ensure that appropriate training is provided to personnel working on tasks related to IROFS. Identification of job hazards are referred to as precautions and limitations in the procedure related to that task. These limits and precautions will be part of the needs/job analysis performed for that task.

The Training lead consults with management personnel to develop a list of tasks for which personnel training for specific jobs is required. The list of tasks selected for training are reviewed and compared to the training materials as part of the evaluation of training effectiveness. The task list will also be updated periodically as necessitated by changes in procedures, processes, plant systems, equipment, or job scope.

11.3.3 Position Training Requirements

Minimum training requirements are developed for those positions whose activities are related to IROFS. Entry-level criteria (e.g., education, technical background, and/or experience) for these positions are contained in position descriptions.

The training program will be designed to prepare initial and replacement personnel for safe, reliable and efficient operation of the facility. Appropriate training for personnel of various abilities and experience backgrounds will be provided. The level at which an employee initially enters the training program is determined by an evaluation of the employee's past experience, level of ability, and qualifications.

Training is made available to facility personnel to initially develop and maintain minimum qualifications. The objective of the training shall be to ensure safe and efficient operation of the facility and compliance with applicable established regulations and requirements. Training requirements are applicable to, but not necessarily restricted to, those personnel within the plant organization who have a direct relationship to the operation, maintenance, testing or other technical aspect of the facility IROFS. Training courses are updated prior to use to reflect plant modifications and changes to procedures when applicable.

Continuing training courses shall be established when applicable to ensure that personnel remain proficient. The training may consist of periodic exercises, instruction, and review of subjects as appropriate to maintain proficiency of personnel assigned to the facility.

11.3.4 Training Basis and Objectives

The training program is designed to prepare initial and replacement personnel for safe, reliable, and efficient operation of the IIFP facility. Emphasis is placed on safety requirements where human actions are important to safety.

Learning objectives are established to identify the training content and to define satisfactory trainee performance for the task, or a group of tasks, selected for training from the job analysis.

11.3.5 Organization of Instruction, Using Lesson Plans and Other Training Guides

Lesson plans or other approved process controlling documents are developed from the learning objectives that are based on job performance requirements. These documents and other training guides are developed under the guidance of the training functional organization. The documents are reviewed by the training function and, generally, by the organization cognizant of the subject matter. These documents are approved prior to issue or use. These documents are used for classroom training and on-the-job training (OJT) as required and include standards for evaluating acceptable trainee performance.

Learning objectives identify the training content, as established by needs/job analyses and position-specific requirements. The task list from the needs/job analysis is used to develop action statements that describe the desired post-training performance.

11.3.6 Evaluation of Trainee Learning

Trainee understanding and command of learning objectives is evaluated through observation and demonstration, oral, or written tests as appropriate. Such evaluations measure the trainee's skills and

knowledge of job performance requirements. Evaluations are performed by individuals qualified in the training subject matter.

11.3.7 Categories of Required Training

The following sections describe the categories of required training.

11.3.7.1 General Employee Training

General Employee Training (GET) encompasses the quality assurance, radiation protection, safety, emergency response, and administrative policies and general procedures established by facility management and applicable regulations. The industrial safety training for IIFP complies with the applicable sections of Occupational Safety and Health Administration (OSHA) regulations such as 29 CFR 1910 (Occupational Safety and Health Standards) (CFR 2009j), 10 CFR 19 (Notices, Instructions and Reports to Workers: Inspection and Investigations)(CFR, 2009h) 1910.1200 (Hazard Communication) (CFR, 2009k), and with NRC regulations. Continuing training in these areas is conducted as necessary to maintain employee proficiency. All persons under the supervision of facility management (including contractors) must participate in GET; however, certain facility support personnel, depending on their normal work assignment, may not participate in all topics of this training. Temporary maintenance and service personnel receive GET to the extent necessary to assure safe execution of their duties. Personnel access procedures ensure the completion of the appropriate level of GET training prior to permitting unescorted access into the CAA.

GET topics are listed below:

- General administrative controls and procedure use;
- Quality assurance policies and procedures;
- General radiological (includes the use of dosimeters, protective clothing and equipment);
- Industrial safety, health and general first aid;
- Emergency Plan and implementing procedures associated with alarm response and evacuation;
- Facility Security awareness and general requirements;
- Chemical Safety (hazard communication);
- New employee orientation;
- General environmental and waste management controls; and
- Fire protection and fire extinguisher use.

11.3.7.2 Radiological Safety Training

Training programs are established for the various types of job functions (e.g., production, maintenance, radiation protection technician, and contractor personnel) commensurate with radiation safety responsibilities associated with each such position. Visitors to the Controlled Access Area (CAA) are escorted by trained personnel while in the CAA.

Radiological safety training includes information about radiation and radioactive materials, risks involved in receiving low-level radiation exposure in accordance with 10 CFR 19.12, Notices, Instruction, and Reports to Workers: Inspection and Investigation (CFR, 2009i) and the basic criteria and practices for radiation protection. Further description of the IIFP facility radiation protection training program is provide in the IIFP LA Chapter 4, Radiation Protection, Section 4.5.

Training sessions covering radiation protection are conducted on a regular basis to accommodate new employees or those attending continuing training. Topics covered in these sessions depend upon the job responsibilities and include the following - when applicable to the job responsibility:

- Notices, reports and instructions to workers,
- Practices designed to keep radiation exposures ALARA,
- Methods of controlling radiation exposures,
- Contamination control methods (including decontamination),
- Use of monitoring equipment,
- Emergency procedures and actions,
- Nature and sources of radiation,
- Biological effects of radiation,
- Use of personnel monitoring devices,
- Risk to pregnant females,
- Radiation protection practices,
- Protective clothing,
- Respiratory protection, and
- Personnel surveys.

Individuals attending these sessions must pass an initial examination covering the training contents to assure the understanding and effectiveness of the training. The effectiveness of the training programs is also evaluated by audits and assessments of production and maintenance personnel responsible for following the requirements related to the topics listed above.

Since contractor employees perform diverse tasks in the CAA, training for these employees is designed to address the type of work they perform. In addition to applicable radiation safety topics, training contents may include radiation work permits (RWP), special bioassay sampling, and special precautions for welding, cutting, and grinding in the CAA.

These training programs are conducted by instructors assigned by the Training Manager as having the necessary knowledge to address chemical safety and radiation protection. Records of the training programs are maintained.

Individuals requiring unescorted access to the CAA receive annual continuing training.

Production personnel are further instructed in the specific safety requirements of their work assignments by qualified personnel during on-the-job training. Employees must demonstrate understanding of work assignment requirements based on observations by qualified personnel before working without direct supervision. Changes to work procedures including safety requirements are reviewed with production personnel by their immediate supervisor or delegate.

11.3.7.3 Industrial Safety

General industrial safety training topics are included in the GET. More specific training in various aspects of industrial and chemical safety protection is conducted train new employees in specific job duties and to provide refresher training topics to workers depending on employee job responsibilities. The industrial safety training is an important part of establishing a strong safety culture and ensuring workers are aware of safety procedures, requirements and hazards involved in assigned duties.

The industrial safety program includes a training matrix that identifies employees that require initial training in a particular safety element and in what program element the employee is required to have the specific training. For example, individuals whose job duties involve operating a mobile fork truck would be identified as requiring the approved OSHA forklift training module in accordance with written procedures. The industrial safety training matrix also includes a required frequency by job duty for refresher training in each applicable element. The safety and health program elements include, but are not limited to, the following:

- Mobile equipment and vehicle safety;
- Forklift operation and licensing'
- Crane safety;
- Fall protection;
- Hoisting and rigging;
- Confined space permits and entry;
- Personnel protective equipment;
- Respirator usage, fitting and cleanliness;
- Job hazard analysis;
- Electrical safety, permits and lockout procedures;
- Hot work permits (welding and burning);
- Eye and head protection;
- Hand and foot protection; and
- Back awareness and protection.

11.3.7.4 Emergency Preparedness and Fire Brigade

Emergency preparedness personnel and the Emergency Response Organization (ERO) develop, maintain and implement the IIFP Emergency Plan (EP) and the implementing procedures (IPIPs). Initial training and refresher training is conducted, at the appropriate frequencies, in accordance with the IIFP EP and IPIPs and is based on the specific responsibilities of the ERO and emergency response personnel. Further description of training, including drills and exercises, related to emergency response personnel is provided in Sections 10.2 and 10.3 of the IIFP Emergency Plan.

The Fire Brigade is organized, operated, trained and equipped in accordance with NFPA 600. The Fire Brigade is comprised of facility employees that have their normal job responsibilities and serve in a dual role on the Fire Brigade. The Fire Brigade is considered an incipient fire brigade as classified under NFPA 600, and its members are not required to wear thermal protective clothing nor self-contained breathing apparatus (SCBA) during firefighting. The intent of the facility Fire Brigade is to be able to handle all minor fires and to be a first response effort to supplement the local fire department for major fires at the facility. The Fire Brigade members are trained and equipped to respond to fire emergencies and contain fire damage until offsite help from a neighboring fire department arrives. The plant Fire Brigade response includes the use of hand held portable and wheeled fire extinguishers as well as hoses to fight interior/exterior incipient fires and to fight larger exterior fires in a defensive mode (e.g., vehicle fires).

The fire brigade training program provides for initial training of all new fire brigade members, classroom refresher training and drills, annual practical training, and leadership training for fire brigade and incident commanders. Incident command, first-responder and fire fighting training all are conducted by qualified

instructors in accordance with procedures that prescribe the instructor qualifications and that are approved by the IIFP ESH Manager or designee.

11.3.7.5 Technical Training

Technical training is designed, developed and implemented to assist facility employees in gaining an understanding of applicable fundamentals, procedures, and practices related to IROFS. Also, technical training is used to develop skills necessary to perform assigned work related to IROFS. Technical training consists of four segments:

- Initial training,
- OJT and qualifications,
- Continuing (and refresher) training, and
- Special training.

Initial Training

Initial job training is designed to provide an understanding of the fundamentals, basic principles, and procedures involved in work related to IROFS that an employee is assigned. This training may consist of, but is not limited to, live lectures, taped and filmed lectures, self-guided and interactive study, demonstrations, laboratories and workshops, and on-the-job training.

Certain new employees or employees transferred from other sections within the facility may be partially or wholly qualified by reason of previous applicable training or experience. The extent of further training for these employees is determined by applicable regulations, performance in review sessions, comprehensive examinations, or other techniques designed to identify the employee's present level of ability.

Initial job training and qualification programs are developed for production, maintenance and technical classifications. Training for each program is grouped into logical blocks or modules and presented in such a manner that specific behavioral objectives are accomplished. Trainee progress is evaluated using written examinations, oral or practical tests. Depending upon the regulatory requirements or individual's needs and plant operating conditions, allowances are made to suit specific situations.

On-the-Job Training and Qualifications

OJT is a systematic method of providing the required job related skills and knowledge for a position. This training is conducted in an environment as close to the work environment as feasible. Applicable tasks and related procedures make up the OJT qualifications program for each technical area. Training is designed to supplement and complement training received through classroom and laboratory.

On-the-Job Training is an element of the technical training program. OJT is used in combination with classroom training for activities that are IROFS. Designated personnel competent in the program standards and conducting training shall conduct OJT using current performance-based training materials. Completion of OJT is demonstrated by actual task performance or performance of a simulation of the task with the trainee explaining task actions using the conditions encountered during the performance of the task, including references, tools, and equipment reflecting the actual task to the extent practical.

Continuing Training

Continuing (or refresher) training is any training not provided as initial qualification or basic training that maintains and improves job-related knowledge and skills such as the following:

- Facility systems and component changes;
- Policy and procedure changes;
- Lessons learned from operating experience program documents review to include industry and in-house operating experiences;
- Continuing training required by regulation (e.g., emergency plan training);
- General employee, special, administrative, vendor, and/or advanced training topics supporting tasks that are elective in nature;
- Training identified to resolve deficiencies (task-based) or to reinforce seldom used knowledge skills;
- Refresher training on initial training topics;
- Structured pre-job instruction, mock-up training, and walk through;
- Quality awareness;
- Requalification training; and
- Training designed to maintain proficiency.

Continuing training may consist of classroom and components performed on a frequency needed to maintain proficiency on the job. Once the objectives for continuing training have been established, the methods for conducting the training may vary. The method selected must provide clear evidence of objective accomplishment and consistency in delivery.

Special Training

Special training involves those subjects of a unique nature required for a particular area of work.

11.3.8 Evaluation of Training Effectiveness

Periodically the training program is systematically evaluated to measure the program's effectiveness in producing competent employees. The trainees are encouraged to provide feedback after completion of classroom training sessions to provide data for this evaluation for program improvements. These evaluations identify program strengths and weaknesses, determine whether the program content matches current job needs, and determine if corrective actions are needed to improve the program's effectiveness. The training functional organization is responsible for leading the training program evaluations and for implementing any corrective actions.

Evaluation objectives follow that are applicable to the training program or topical area being reviewed:

- Management and administration of training and qualification programs,
- Development and qualification of the training staff,
- Position training requirements,
- Determination of training program content, including its facility change control interface with the CM system,
- Design and development of training programs feedback, including lesson plans,
- Conduct of training,

- Trainee examinations and evaluations, and
- Training program assessments and evaluations.

Evaluation results are documented, with program strengths and weaknesses being highlighted. Identified weaknesses are reviewed, improvements are recommended, and changes are made to procedures, practices, or training materials as necessary.

Periodically, training and qualifications activities are monitored by designated facility and/or contracted training personnel. The QA Coordinator audits the facility training and qualification system. In addition, trainees and vendors may provide input concerning training program effectiveness. Methods utilized to obtain this information may include surveys, questionnaires; performance appraisals, staff evaluations, and overall training program effectiveness evaluation techniques. Frequently conducted classes are not evaluated each time. However, those are routinely evaluated at a frequency sufficient to determine program effectiveness. Evaluation information may be collected through:

- Verification of program objectives as related to job duties for which intended;
- Periodic working group program evaluations,
- Testing to determine trainee accomplishment of objectives;
- Trainee evaluation of the instruction;
- Supervisor's evaluation of the trainee's performance after training on-the-job; and
- Supervisor's evaluation of the instruction.

Unacceptable individual performance is transmitted to the appropriate line manager.

11.3.9 Personnel Qualification

The qualification requirements for key management positions are established (See the IIFP LA Chapter 2, Organization and Administration). Training and qualification requirements associated with QA personnel are provided. In addition, qualification and training requirements for production personnel are established and implemented in plant procedures.

11.3.10 Periodic Personnel Evaluations/Needs for Retraining

Personnel performing activities related to IROFS are evaluated periodically to determine whether they are capable of continuing their activities that are related to IROFS. The evaluation may be by written test, oral test, or on-the-job performance observation by the supervisor. The results of the evaluation are documented. When the results of the evaluation dictate, retraining or other appropriate actions are provided. Continuing training is also required due to plant modifications, procedure changes, and QAP changes that result in new or revised information.

11.4 Procedures Development and Implementation

All activities involving IROFS and QA level 1 and 2 items (See Section 11.8.4) are conducted in accordance with approved procedures. As noted throughout this document, procedures are used to control IROFS activities to ensure the activities are carried out in a safe manner and in accordance with regulatory requirements.

11.4.1 Type of Procedures

Generally, four types of plant procedures are used to control QA Level 1 and 2 activities: operating procedures, administrative procedures, maintenance procedures, and emergency procedures. Procedures may also be used to control other plant and administrative activities.

11.4.1.1 Operating Procedures

Operating procedures are used to directly control production. Operating procedures include, as applicable:

- Purpose of the activity;
- Regulations, polices, and guidelines governing the procedure; and
- Type of procedure;
- Steps for each operating process phase include:
  - Initial startup,
  - Normal production,
  - Temporary operations,
  - Emergency shutdown,
  - Emergency operations,
  - Normal shutdown,
  - Startup following an emergency or extended downtime,
  - Hazards and safety considerations, and
  - Production limits
- Measures to be taken if hazard contact or exposure occurs ;
- IROFS associated with the process and their functions; and
- The timeframe for which the procedure is valid.

Applicable safety limits and IROFS are clearly identified in the procedures. IIFP will incorporate methodology for identifying, developing, approving, implementing, and controlling operating procedures. Identifying needed procedures will include consideration of ISA results. The method will ensure that, as a minimum:

- Operating limits and IROFS are specified in the procedure.
- Procedures include required actions for off-normal conditions of production, as well as normal production.
- Needed safety checkpoints are identified at appropriate steps in the procedure.
- Procedures are validated through field tests.
- Procedures are approved by functional managers responsible and accountable for the operation.
- A mechanism is specified for revising and reissuing procedures in a controlled manner.
- The QA elements and CM program at the facility provide reasonable assurance that current procedures are available and used at all work locations.

11.4.1.2 Administrative Procedures

Administrative procedures deal with policy or programs and administrative systems, provide programmatic requirements, and do not normally involve manipulation of equipment. Administrative procedures are used to perform activities that support production, including management measures such as the following:

- Configuration management;
- Safety, radiation, chemical, and fire safety;
- Quality Assurance;
- Design control;
- Plant personnel training and qualification;
- Audits and assessments;
- Incident investigations;
- Record keeping and document control;
- Reporting; and
- Procurement

11.4.1.3 Maintenance Procedures

Maintenance, including testing, and calibration, of facility IROFS is performed in accordance with approved written procedures, documented instructions, checklists, or drawings that conform to applicable codes, standards, specifications, and other appropriate criteria. Key maintenance requirements for safety controls, such as calibration, functional testing, and replacement of specified components are derived from the analyses described in the ISA summary. Procedures are developed that are commensurate with the need as determined by the ISA review (for example, skills normally possessed by qualified maintenance personnel may not require detailed step-by-step delineation in a written procedure).

Functional testing is on a periodic basis to determine various facility parameters and to verify the continuing capability of IROFS to meet performance requirements. The functional testing is conducted in accordance with approved, written procedures. Periodic test procedures are utilized to perform such testing and are sufficiently detailed that qualified personnel can perform the required functions without direct supervision.

The selection and qualification of Maintenance personnel for IROFS work activities are documented and implemented through written procedures. Contractors working or performing activities that could affect IROFS are required to follow the same procedures as IIFP Maintenance personnel.

Maintenance procedures address:

- Preventive and corrective maintenance of IROFS;
- Surveillance (includes calibration, inspection, and other surveillance testing);
- Post-maintenance testing of IROFS; and
- Requirements for pre-maintenance activity involving reviews of the work to be performed and reviews of procedures.

The administrative control of maintenance is maintained as follows:

- A comprehensive maintenance program for the facility's IROFS is established to assure safe, reliable, and efficient operation.
- Personnel performing maintenance activities are qualified in accordance with applicable codes and standards and procedures.
- Maintenance is performed with written procedures that conform to applicable codes, standards, specifications, and other appropriate criteria.

- Maintenance is scheduled so as not to jeopardize facility operation or the safety of facility personnel.
- Maintenance histories are maintained on facility IROFS.
- The administrative control of facility modifications is maintained as in Section 11.1, Configuration Management.

Maintenance procedures are reviewed by the various safety disciplines, including fire, radiation, and industrial and chemical process safety. The procedures describe, as a minimum, the following:

- Controls on and specification of any replacement components or materials to be used, to ensure like-kind replacement;
- Post-maintenance testing to verify operability of the equipment;
- Tracking and records management of maintenance activities; and
- Safe work practices (e. g., lockout/tag-out, confined space entry, control of exclusion area, radiation or hot work permits, and fire, chemical, and environmental requirements).

11.4.1.4 Emergency Procedures

IIFP develops and maintains a documented controlled set of Emergency Plan Implementation Procedures (EPIPs) applicable to the IIFP facility. Emergency instructions pertinent to specific accident scenarios and other categorized non-routine operational events are developed and included in the EPIPs. These procedures clearly state the duties, responsibilities, action levels, and actions to be taken by responders. Administrative procedures are established to ensure that individuals and groups assigned responsibilities in an emergency have easy access to a current copy of each procedure that pertains to their functions. Responsibilities are provided for each emergency position.

In accordance with established IIFP procedural guidelines, departmental administrative procedures are established which assign responsibility for the development, review, approval, and update of the Emergency Plan and its supporting procedures. The Emergency Plan is reviewed periodically by the ESH functional organization for accuracy and updated as needed. A decrease in effectiveness review is completed for all proposed changes to the Emergency Plan. Changes to the plan that decrease the effectiveness is not be implemented without prior Nuclear Regulatory Commission (NRC) approval. Changes that do not decrease the effectiveness of the Emergency Plan may be implemented without NRC prior approval provided the changes are submitted to the NRC and appropriate organizations within three months of making the changes. Additionally, any proposed change that affects an off-site organization are provided to that organization for review and comment at least 60 days prior to the change being implemented, unless mutually agreed otherwise. Revised Emergency Plan and procedures are distributed to affected parties and are submitted to the NRC within three months of the revision.

11.4.2 Procedures Process

Procedures are developed or modified through a formal process incorporating the change controls described in Section 11.1. The procedure process utilizes nine basic elements to accomplish procedure development, review, approval, and control. These elements are Identification, Development, Verification, Review and Comment Resolution, Approval, Validation, Issuance, Change Control, and Periodic Review. These elements are discussed in detail in the following paragraphs.

11.4.2.1 Identification

Site managers have the responsibility for identifying which tasks are included in procedures within their areas of control. Procedures are required where actions are taken necessary to prevent or mitigate the consequences of accidents described in the ISA. As a minimum, a procedure is required for any task or activity that affects QA Level 1 and QA Level 2 SSCs.

Maintenance activities, not involving QA Level 1 or QA Level 2 SSCs, may be addressed by written procedures, documented work instructions, or drawings appropriate to the circumstances.

A procedure is normally not needed if the work is not complex or only involves a few actions (unless failure to properly conduct those actions could result in significant consequences), if the task requires those skills normally possessed by a qualified person (otherwise known as "skill-of-the-craft"), or if the consequences of error are minimal.

New or revised NRC certification requirements are evaluated to determine impact on existing implementing procedures or to identify the need for new implementing procedures.

11.4.2.2 Development

The procedure use category is determined. This determination documents the designation of a procedure as In Hand (Continuous Use), General Intent (Reference Use), or Information Use. The designation is based on the administrative or non-administrative use of the procedure, and the safety or financial consequences of failing to adhere to procedural requirements.

Procedure development, preparation, and quality are the user organization's responsibility. Input and review are required by affected parties. Other selected reviews are obtained, such as Safety and Quality, to ensure that safety and quality assurance requirements are identified and included where Quality Level 1 or Quality Level 2 SSCs are involved.

Interviews with procedure users and process walk-downs are utilized to ensure procedures are usable, reflect as-built conditions, production operations, and maintain management controls for safety and quality. During development, regulatory commitments, ISA, and QAP requirements are identified and incorporated in the procedure.

As the procedure is drafted, attributes that enhance procedural use are included, such as standard style organization and format. Additionally, essential elements are included that are generic to all procedures including chemical process and fire safety, warning notes, reminders or pertinent information regarding specific hazards or concerns, Materials Safety Data Sheet availability, special precautions, radiation and explosive hazards, and special personal protective equipment.

11.4.2.3 Verification

Verification is a process that ensures the technical accuracy of the procedure and that it can be performed as written. Non-administrative procedures are verified by the procedure owner/user during the procedure development/change process. There are two basic attributes of the verification process. The first attribute relates to the technical accuracy of the procedure. It ensures that all technical information including formulas, set points, and acceptance criteria are correctly identified in the procedure. The second attribute is administrative, in that it verifies the procedure format and style and that it is consistent with the

procedure-on-procedures. Verification consists of a walk-down of the procedure in the field or a table-top walk through.

11.4.2.4 Review and Comment Resolution

Draft new procedures and procedure changes are distributed for technical reviews and cross-discipline reviews, as needed. Functional area and cross-discipline reviews are performed by individuals not having direct responsibility for processing the new procedure or procedure change. Comments/questions generated during the review process are resolved with the originating organizations. If comments are so extensive that resolution of the comments changes the intent of the original draft, the revised draft procedure is verified a second time, and the validation checked. Reviews by plant personnel ensure that the production limits and controls involving IROFS as well as quality assurance, programmatic, and regulatory requirements, are specified in procedures.

11.4.2.5 Approval

Following the resolution of review comments, procedures are approved. Approval authority rests with the responsible manager. Managers ensure that necessary training or required reading is completed prior to procedure implementation.

11.4.2.6 Validation

The purpose of procedure validation is to ensure that technical errors or human factor issues were not inadvertently introduced during the procedure review process. Validation is performed by qualified personnel and may be accomplished by detailed evaluation of the procedure as part of a walk through exercise or as part of a walk through drill (particularly for emergency or off-normal procedures). If the particular system or process is not available for a walk through validation, talk through may be performed in the particular shop or training environment. Performance of procedure validation is documented.

11.4.2.7 Issuance and Distribution

Procedures are issued and controlled in accordance with the records management and document control program practices.

11.4.2.8 Change Control

Changes to procedures are processed as described below:

- The preparer documents the change as well as the reason for the change.
- An evaluation shall be performed in accordance with 10 CFR 70.72 as appropriate. If the evaluation reveals that a change to the license is needed to implement the proposed changes, the change will not be implemented until prior approval is received from the NRC.
- The procedure with proposed changes shall be reviewed by a designated reviewer.
- The functional manager shall be responsible for approving procedure changes, and for determining whether a cross-disciplinary review is necessary, and by which department(s).

The need for the following cross-disciplinary reviews shall be considered. For proposed changes having a potential impact on chemical or radiation safety, a review shall be performed for chemical and radiation

hazards. Proposed changes having a potential impact on IROFS are reviewed by facility safety engineering personnel and the QA Coordinator, or designee. Proposed changes that have potential impact on environmental controls are reviewed by the ESH functional organization. Records of completed cross-functional reviews are maintained for all changes to procedures involving IROFS.

Temporary changes to procedures are issued for production activities that are of a nonrecurring nature. Temporary changes to procedures are used when revision of a production or other permanent procedure is not practical. Temporary changes to procedures shall not involve a change to IROFS and shall not alter the intent of the original procedure. Examples of uses of temporary changes to procedures are:

- To direct production activities during special testing or maintenance,
- To provide guidance in unusual situations not within the scope of normal procedures, or
- To ensure orderly and uniform production for short periods of time when the facility, a system or a component is performing in a manner not addressed by existing procedures or has been modified in such a manner that portions of existing procedures do not apply.

The temporary changes to procedures are approved by two members of the facility management staff, at least one of whom is a shift superintendent, or designee. Temporary changes to procedures have a designated expiration date, and may be made permanent once the change is reviewed and approved through the normal procedure change and approval process.

11.4.2.9 Periodic Review

Periodic reviews are performed on procedures to assure their continued accuracy and usefulness. Specifically, reviews of operating procedures are conducted periodically. In addition, applicable procedures are reviewed after unusual incidents, such as an accident, unexpected transient, a significant error by production personnel, equipment malfunction, or after any modification to a system; and procedures are revised as needed. When conducting the periodic review, the procedure owner or subject matter expert performs a complete administrative and technical review ensuring information is complete and accurate and that the procedure is usable as written.

11.4.3 Use and Control of Procedures

In-Hand (continuous use) procedures are performed step-by-step without deviation unless deviation is allowed by the procedure. General Intent (Reference Use) procedures are followed as written, unless deviation is allowed by the procedure. Information Use procedures are followed to implement programmatic requirements.

Controlled copies of procedures are marked "Controlled Copy". Working copies are verified as the latest version. This may be managed by limited access to the most current revision of the document. Information Only copies of In-Hand (Continuous Use) or General Intent (Reference Use) procedures are marked "Information Only" to indicate they are not used to perform work.

If a step of a procedure involving QA Level 1 and QA Level 2 SSCs cannot be performed as written, work is stopped, the system is immediately placed in a safe condition, and corrective actions initiated in accordance with site procedure-change procedures.

11.4.4 Temporary Procedures

Temporary procedures may be issued only when permanent procedures do not exist (1) to direct operations during testing, maintenance, and modifications; (2) to provide guidance in unusual situations not within the scope of permanent procedures; and (3) to ensure orderly and uniform production for short periods when the plant, a system, or component of a system is performing in a manner not covered by existing permanent procedures, or has been modified or extended in such a manner that portions of existing procedures do not apply. These temporary procedures may be used for a period of time which should not exceed 90 days, or a period for which the temporary condition must exist, whichever is greater. Temporary procedures that need to exceed the 90 days are assessed to ensure it is appropriate to extend the use of the temporary procedure.

11.4.5 Records

Records generated during procedure use are identified in the governing procedure and controlled according to the plant records management and document control program practices. Further description of the records management program is presented below in Section 11.7.

11.5 Audits and Assessments

IIFP has a tiered approach to verifying compliance to procedures and performance to regulatory requirements. Audits are focused on verifying compliance with regulatory and procedural requirements and licensing commitments. Assessments are focused on effectiveness of activities and ensuring that IROFS, and any items that affect the function of IROFS, are reliable and are available to perform their intended safety functions. This approach includes performing assessments and audits on critical work activities associated with facility safety, environmental protection and other areas as identified via trends.

11.5.1 Audits

Audits of the QA Level 1 and QA Level 2 (See Section 11.8.4) work activities associated with IROFS and any items that affect the function of the IROFS are conducted in accordance with the QA Program.

These audits and their associated frequencies are conducted in accordance use written plans and checklists. Audits are performed under the direction of a lead auditor. Lead auditors and staff auditors are functionally and organizationally independent of the programs and activities examined. Where appropriate, audit teams are supplemented with on-site and/or off-site technical specialists.

Audit results are documented and reported as specified in plant procedures. Provisions are made for immediate reporting and corrective action where warranted. A plant corrective action program is administered to ensure proper control of corrective actions (See Section 11.6).

11.5.2 Assessments

Assessments are performed by management responsible for implementing the respective portions of the QAP to assess the adequacy of the part of the QAP for which they are responsible and to assure its effective implementation. Personnel from the area being assessed may perform the assessment, provided that they do not have direct responsibility for the specific area being assessed. Results of assessments are documented. Any observations from the program assessments are resolved by the responsible organization manager.

11.5.2.1 Management Assessments

Management assessments may be conducted by the line organizations responsible for the work activity. Site managers follow a management assessment process within their organization to assess the adequacy of and effectiveness of the implementation of the programs under their cognizance. The Quality functional organization will monitor the management assessment process.

Managers evaluate findings from audits, assessments from plant facilities in the areas of occupational safety and health, radiological protection, environmental compliance, fire safety, emergency preparedness and security, safety requirements, conduct of operations, and conduct of maintenance. Issues relating to training, quality assurance, maintenance, CM, etc., are also assessed during these management assessments.

11.5.2.2 Independent Assessments

Independent audits/assessments, where required by procedure, are conducted by individuals not involved in the area being assessed. These assessments are performed routinely by qualified staff personnel that are not directly responsible for production activities. Deficiencies identified during the assessment requiring corrective action are forwarded to the responsible manager of the applicable area or function for action in accordance with the Corrective Action Program. Future assessments shall include a review to evaluate if corrective actions have been effective.

11.5.3 Conduct of Audits and Assessments

Audits and assessments are performed to assure that facility activities are conducted in accordance with the written procedures and that the processes reviewed are effective and in compliance with established processes or work instructions..

Audits are conducted by the IIFP independent ESH, quality and technical organizations in accordance with procedures and checklists by qualified auditors. Audits verify the effectiveness of health, safety, and environmental programs and their implementation and determine the effectiveness of the assessment process.

Audits are performed in accordance with a written plan that identifies and schedules audits to be performed. Audit team members shall not have direct responsibility for the function and area being audited. Team members shall have technical expertise or experience in the area being audited and are indoctrinated in audit techniques. Audits are conducted on an annual basis.

The results of the audits and assessments are provided in a written report in a timely manner to the Plant Manager and the managers responsible for the activities audited or assessed. Any deficiencies noted in the audits and assessments are responded to promptly by the responsible managers or designees, entered into the Corrective Action Program, and tracked to completion and re-examined during future audits and assessments to ensure corrective action has been completed.

Records of the instructions and procedures, persons conducting the audits or assessments, and identified violations of license conditions and corrective actions taken are maintained.

11.5.4 Activities Subject to Audit and Assessments

Audits and assessments may be conducted in the areas of:

- Radiation safety,
- Chemical safety,
- Industrial safety including fire protection,
- Environmental protection,
- Emergency management,
- QA,
- Configuration management,
- Maintenance,
- Training and qualification,
- Procedures,
- Corrective Actions/Incident investigations, and
- Records management.

11.5.5 Scheduling of Audits and Assessments

A schedule is established that identifies audits and assessments to be performed and the responsible organization assigned to conduct the activity. The frequency of audits and assessments is based upon the status and safety importance of the activities being performed and upon work history. All major activities is audited or assessed on a periodic basis. The audit and assessment schedule is reviewed periodically and revised as necessary to ensure coverage commensurate with current and planned activities.

11.5.6 Procedures for Audits and Assessments

Internal and external audits and assessments are conducted using approved procedures that meet the QA program requirements. These procedures provide requirements for the following audit and assessment activities:

- Scheduling and planning of the audit and assessment,
- Training requirements of audit personnel,
- Development of audit plans and audit and assessment checklists as applicable,
- Performance of the audit and assessment,
- Reporting and tracking of findings to closure, and
- Closure of the audit and assessment.

The applicable procedures emphasize reporting and correction of findings to prevent recurrence.

Audits and assessments are conducted by:

- Using the approved audit and assessment checklists as applicable,
- Interviewing responsible personnel,
- Performing plant area walk-downs,
- Reviewing controlling plans and procedures,
- Observing work in progress, and

- Reviewing completed QA documentation.

Audit and assessment results are tracked in the Corrective Action Program. The data is periodically analyzed for potential trends and needed program improvements to prevent recurrence and/or for continuous program improvements. The resulting trend is evaluated and reported to applicable management. This report documents the effectiveness of management measures in controlling activities as well as deficiencies. Deficiencies identified in the trend report require corrective action. The QA organization also performs follow up reviews on identified deficiencies and verifies completion of corrective actions reported as a result of the trend analysis.

The audit and/or assessment team leader is required to develop the audit and /or assessment report documenting the findings, observations, and recommendations for program improvement. These reports provide management with documented verification of performance against established performance criteria for IROFS. These reports are developed, reviewed, approved, and issued following established formats and protocols detailed in the Corrective Actions procedure. Responsible managers are required to review the reports and provide any required responses due to reported findings.

Corrective actions following issuance of the audit and/or assessment report require compliance with the Corrective Actions procedure. The QA organization will verify the corrective actions were taken were effective and were completed in a timely manner. In addition, future assessments will include a review to evaluate if corrective actions have been effective.

11.5.7 Qualifications and Responsibilities for Audits and Assessments

The QA Coordinator coordinates the audits. The responsible lead auditor and QA Coordinator determine the scope of each audit. The QA Coordinator may initiate special audits or expand the scope of audits. The lead auditor directs the audit team in developing checklists, instructions, or plans and performing the audit. The audit shall be conducted in accordance with the checklists, but the scope may be expanded by the audit team during the audit. The audit team consists of one or more auditors.

Auditors and lead auditors are responsible for performing audits in accordance with the applicable QA procedures. Auditors and lead auditors hold certifications as required by the QAP. Before being certified under the IIFP QAP, auditors must complete training on the following topics:

- IIFP QA Program;
- Audit fundamentals, including audit scheduling, planning, performance, reporting, and follow-up action involved in conducting audits;
- Objectives and techniques of performing audits; and
- On-the-job training.

Certification of auditors and lead auditors is based on the QA Coordinator's evaluation of education, experience, professional qualifications, leadership, sound judgment, maturity, analytical ability, tenacity, and past performance and completion of QA training courses. A lead auditor must also have participated in a minimum of three QA audits or audit equivalent within a period of time not to exceed three years prior to the date of certification. Audit equivalents include assessments, pre-award evaluations, or comprehensive surveillances.

Personnel performing assessments do not require certification, but they are required to complete QA orientation training, as well as training on the assessment process. Personnel performing these assessments do not report to the production organization and have no direct responsibility for the function or area being assessed.

11.6 Incident Investigations and Corrective Action Process

The following sections describe the incident investigations and corrective action process.

11.6.1 Incident Investigations

The incident investigation process is a simple mechanism available for reporting deficiencies, abnormal events and potentially unsafe conditions or activities. Each event is considered in terms of its requirements for reporting in accordance with regulations and is evaluated to determine the level of investigation required. The process of incident identification, investigation, root-cause analysis, recording, reporting, and follow-up are addressed in and performed by written Incident Investigations and Corrective Action procedures. Radiological, hazardous-chemicals, and industrial safety requirements are addressed. Guidance for classifying occurrences shall be contained in the Incident Investigation procedures, including examples of threshold off-normal occurrences. The depth of the investigation will depend upon the severity of the classified incident in terms of the levels of uranium or chemicals released and/or the degree of potential for exposure of workers, the public, or the environment.

The Quality Assurance Coordinator shall ensure that a record is maintained of corrective actions to be implemented as a result of off-normal occurrence investigations in accordance with the Corrective Action procedures. These corrective actions shall include documenting lessons learned, and implementing worker training where indicated, and are tracked to completion by the QA Coordinator or designee.

Specifics of the Incident Investigation process are as follows:

- IIFP will establish a process to investigate abnormal events that may occur during operation of the facility and that involve QA Level 1 and QA Level 2 SSCs or activities, abnormal excursions to the environment that have potential to exceed regulatory limits, or abnormal industrial safety events that would require reporting under OSHA regulations. The investigation is to determine their specific or generic root cause(s) and generic implications, to recommend corrective actions, and to report to the NRC as required by 10 CFR 70.74 (CFR, 2009f) or to other regulatory agencies, accordingly. The investigation process includes a prompt risk-based evaluation and, depending on the complexity and severity of the event, the investigation may be conducted by one subject-matter-expert. The investigator(s) is independent from the line function(s) involved with the incident under investigation. Investigations begin within 48 hours of the abnormal event, or sooner, depending on safety significance of the event. The record of IROFS failures required by 10 CFR 70.62(a)(3) (CFR, 2009c) for IROFS is reviewed as part of the investigation. Record revisions necessitated by post-failure investigation conclusions are made accordingly.
- Where determined necessary by the ESH Manager, the COO/PM, or designee, appoints qualified internal or external investigators to serve on investigating teams when required. The team includes at least one process expert and at least one team member trained in root cause analysis.
- IIFP will monitor and document corrective actions through completion.
- IIFP will maintain auditable records and documentation related to abnormal events, investigations, and root cause analyses so that "lessons learned" may be applied to future production of the facility. For each abnormal event, the incident report includes a description,

contributing factors, a root cause analysis, findings, and recommendations. Relevant findings are reviewed with affected personnel. Details of the event sequence are compared with accident sequences already considered in the ISA, and the ISA Summary is modified to include evaluation of the risk associated with accidents of the type actually experienced.

IIFP will develop procedures for conducting an incident investigation, and the procedures will contain the following elements:

- A documented plan for investigating an abnormal event.
- A description of the functions, qualifications, and/or responsibilities of the manager who would lead the investigative team and those of the other team members; the scope of the team's authority and responsibilities; and assurance of cooperation of management.
- Assurance of the team's authority to obtain all the information considered necessary and its independence from responsibility for or to the functional area involved in the incident under investigation.
- Guidance for personnel conducting the investigation on how to apply a reasonable, systematic, structured approach to determine the specific or generic root cause(s) and generic implications of the problem.
- Requirements to make available original investigation reports to the NRC on request.
- A system for monitoring the completion of appropriate corrective actions.

11.6.2 Corrective Action Process

The QA Program identifies the responsibilities and provides authority for those individuals involved in quality activities to identify any condition adverse to quality, such as failures, malfunctions, deficiencies, deviations, defective materials and equipment, and non-conformances. These individuals identify and document conditions adverse to quality, analyze and determine how the conditions can be corrected or resolved, and take such steps as necessary to implement corrective actions in accordance with documented procedures.

The QAP requires regularly scheduled audits and assessments to ensure that needed corrective actions are identified. Employees have the authority and responsibility to initiate the corrective action process by reporting issues or concerns to their line management, or to the ESH or QA organization. The QAP contains procedures for identifying, reporting, resolving, documenting, and analyzing conditions adverse to quality. Reports of conditions adverse to quality are analyzed to identify trends in quality performance. Significant conditions adverse to quality and significant trends are reported to senior management in accordance with corrective action procedures.

Significant conditions adverse to quality, the cause of the conditions, and the corrective action taken to preclude repetition are documented and reported to management for review and assessment in accordance with corrective action procedures. The QA Coordinator verifies proper and timely implementation of corrective actions.

11.7 Records Management and Document Control

Records management and document control programs are established to ensure records and documents required by the QAP are appropriately managed and controlled. These programs provide administrative controls that establish standard methods and requirements for collecting, maintaining, and disposing of records. These programs also ensure that documents are controlled and distributed in accordance with

identified written requirements and authorizations. The administrative controls for the generation and revision of records and documents are contained in site implementing procedures. The principal elements of each of the records management and document control programs and a brief description of the manner in which the functions associated with each element shall be performed along with a list of the types of records that are retained for the duration of the NRC License at the site.

11.7.1 Records Management Program

The following elements and requirements of the records management program shall be applied to QA Level 1 and QA Level 2 SSCs and activities; or to ESH, financial, quality, emergency response or investigation related records as required by regulations or approved procedures. These elements may be also applied to commercial quality and other plant activities where determined by facility management or required by procedure. The records management program provides direction for the handling, transmittal, storage, and retrieval of records. Records media may include microfilm, electronic (magnetic or optical), or hard copy. Records are categorized and handled in accordance with their relative importance to safety and storage needs. The Record functional organization is responsible for the administration of the records management program. The managers and functional organizations that generate the records are responsible for ensuring compliance with the records management program. This program is implemented through procedures that provide guidance for the following program elements.

11.7.1.1 Legibility, Accuracy, and Completeness

Documents designated to become records are legible, accurate, complete, and contain an appropriate level of detail commensurate with the work being performed and the information required for that type of record.

11.7.1.2 Identification of Items and Activities

Records clearly and specifically identify the items or activities to which they apply.

11.7.1.3 Authentication

Records are authenticated or validated by the manager of the organization which originates the record, or his designee, as specified in the procedure which controls the generation and revision of these records.

11.7.1.4 Indexing and Filing

Methods are specified for indexing, filing, and locating records within the record system to ensure the records can be retrieved in a timely manner.

11.7.1.5 Retention and Disposition

Records retention times are specified in a retention schedule. The process for disposition of records that have reached the end of their retention lifetime is specified by procedures and conforms to applicable requirements.

11.7.1.6 Corrections

Corrections to records are approved by the organization which created the record unless other organizations are specifically designated. Changes are made by clearly indicating the correction, the date of the correction, and the identification of the individual making the correction.

11.7.1.7 Protection of Records

Controls are established for protection of records from deterioration, loss, damage, theft, tampering, and/or unauthorized access for the life of the record. Requirements include instructions on protection of records by the record originator until they are transferred to records management. Instructions for the protection of special record media such as radiographs, photographs, negatives, microform and magnetic media are provided to prevent damage from excessive light, stacking, electromagnetic fields, temperature, humidity, or any other condition adverse to the preservation of those records. Records which cannot be duplicated are stored in a fashion that minimizes deterioration.

11.7.1.8 Storage Requirements

Records are stored in authorized facilities or containers providing protection from fire hazards, natural disasters, adverse environment, insect infestation, mold, or rodents. Storage facilities are maintained to ensure continuous protection of the records. Requirements are for both permanent and temporary storage of records.

11.7.1.9 Receipt of Records

A record transmittal process is used to formally transmit records to records management. The process includes a receipt acknowledgment that notifies the sending organization that the records have been received and accepted.

11.7.1.10 Access to Records and Accountability for Removed Records

Requirements for controlling access to records and maintaining accountability for records are provided to ensure that only authorized personnel have access to records and to prevent loss, damage, or inadvertent destruction of records.

11.7.1.11 Records Requirements for Procured Goods or Services

Records management requirements for goods or services procured from outside suppliers are specified in the applicable procurement documents. These requirements cover:

- Supplier methods for collection, storage, and maintenance of records;
- Identification of required records and applicable retention periods;
- Records submittal plans or indexes;
- Availability, accessibility, and if applicable, disposition criteria for records retained by the supplier; and
- Accessibility of the supplier's records prior to the final transfer to the purchaser.

11.7.1.12 Types of Records

Records series which are included in the records management program, where applicable as described in Section 11.7.1, include, but are not limited to:

- Transportation and shipping records for nuclear materials;
- Radiation Protection records, including ALARA findings and occupational radiation exposure records;
- Training, qualification, and requalification records;
- Procurement documents/records;
- Design documents and changes involving design modifications made to safety systems and equipment;
- Certification documents;
- Reportable event records;
- Gaseous and liquid radioactive and hazardous waste records;
- ISA reviews and evaluations;
- Plant radiation surveys and environmental survey records;
- QA activity records required by the QA program;
- Regulatory agency reports and responses;
- Emergency Management assessments;
- Fire Safety evaluations;
- Audits and assessments records where identified by procedures.

Specific records are retained for a period of time specified by applicable NRC, federal or State regulations.

11.7.1.13 Usage and Control of Computer Codes and Data

Computer programs used in the records management program are controlled and maintained in accordance with procedures. These requirements and practices provide for virus protection as well as access control to the records management program database and ensure continuing usability of the codes as hardware and software technology change. Routine backups of the records management database are performed by application administrators. Precautions are taken to ensure that computer data that constitute a record are stored in a format that is readily retrievable even as hardware and software technology evolve. The storage format of computer data is reviewed as required to determine threats to future retrieval, and if necessary, the data are translated to an updated format and verified acceptable.

11.7.1.14 Assessment

The overall effectiveness of the records management program is evaluated through the audit program described in the QAP. Deficiencies identified are corrected in a timely manner in accordance with the manual.

11.7.2 Document Control Program

The following elements and requirements of the document control program shall be applied to QA Level 1 and QA Level 2 SSCs and activities; or to ESH, financial, quality, emergency response or investigation related documents as required by regulations or procedures. These elements may also be applied to

commercial quality and other plant activities where determined by plant management or approved procedures. The program provides direction for the handling, distribution, and transmittal of documents important to safety and quality that specify requirements or prescribe activities affecting quality, such as procedures, drawings, and calculations. This program is implemented through procedures that provide guidance on the following program elements.

11.7.2.1 Unique Identifier

A unique identification number is assigned or obtained by the generator for each document requiring controlled distribution. Document control concurs with the numbering scheme for each document type.

11.7.2.2 Approval and Release of Documents

For documents and changes to documents required by the QAP are established for approval and release of those documents for distribution.

Controlled documents are approved by the organization authorized to approve them as identified in the procedures which control their generation and revision. Changes to controlled documents are approved and released by the organization that performed the document's initial approval unless other organizations are specifically designated. After approval, the documents are forwarded to document control for control and distribution to the locations on the approved distribution list.

11.7.2.3 Master Copy

A master copy of all approved controlled documents is maintained by document control to ensure the document is available for controlled copy issuance.

11.7.2.4 Controlled Document Index and Distribution Lists

Creation and maintenance of a controlled document index and controlled distribution list(s) for each document or document type shall be required. The controlled document index is used to maintain a list of controlled documents and to track the current (latest) approved revision levels of those documents. The index is available to users to verify current document revision levels. The controlled document index and the distribution lists are maintained and updated by document control.

11.7.2.5 Copies of Controlled Documents

Each controlled copy is stamped, marked or otherwise identified. A method is established in procedures for duplicating and marking controlled documents so that duplicates are distinguishable from the controlled version. Copies of controlled documents that are not marked or otherwise identified in accordance with procedural requirements are considered information only.

11.7.2.6 Distribution

Controlled documents are distributed in accordance with controlled distribution lists to ensure that controlled documents are available in a timely manner at locations where work is being performed. Specific time requirements are established for controlled document distribution. Document control uses a

distribution acknowledgement as part of the Document change form to manage distribution of controlled documents control points.

11.7.2.7 Voided, Canceled, or Superseded Documents

When notified by the generator of a controlled document that the document has been voided, canceled, or superseded, document control removes the document from distribution and notifies copyholders of the changed status. The document generator must use a Document change request form to formalize the cancellation or obsolescence of a document.

11.7.2.8 Change Documents

Change documents are documents which are used to modify controlled documents. Controls are also applied to the change documents to provide revision approval and distribution controls equivalent to the original document until completion of installation, at which time the original document is revised. Documents showing the current configuration are not changed until the modifications are completed.

11.7.2.9 Revision Identification

The controlled document revision level is clearly identified on the document.

11.7.2.10 Document User Responsibilities

Responsibilities of the end user and copyholders are defined. Responsibilities include requirements for the use of controlled documents and working copies.

11.7.2.11 Usage and Control of Computer Codes and Data

Computer programs used in the document control program are controlled and maintained in accordance with procedures. These requirements provide for virus protection as well as access control to the document control program database and ensure continuing usability of the codes as hardware and software technology change. Routine backups of the document control database are performed by application administrators.

11.7.2.12 Assessment

The overall effectiveness of the document control program is evaluated through the audit program described the QAP. Deficiencies identified are corrected in a timely manner in accordance with the program description.

11.7.2.13 Archiving Documents

The record copy of all revisions of controlled documents is transmitted to records management/document control personnel in accordance with the requirements of the records management program.

11.8 Quality Assurance Program Elements

A brief of the QA Program elements follows. The program elements are discussed in detail in the IIFP LA Appendix A, QAP Description.

11.8.1 Organization

Line Managers/Leads have primary responsibility for ensuring safety of the employees and public and that IIFP products and services meet all necessary requirements. The QA Coordinator is responsible for implementing and overseeing the QAP and assuring it is in compliance with applicable regulations, codes and standards (See Figure 11-1, INIS/IIFP Organization during Design and Construction of the FEP/DUP Facility; and Figure 11-2, IIFP Plant Organization during Operations of the FEP/DUP Facility. Additionally, see Chapter 2.0, Organization and Administration of the LA).

11.8.2 Quality Assurance Program Basis

IIFP is committed to ensuring a safe facility operation and to providing the best quality products possible. It is IIFP policy that its activities will comply fully with all applicable regulations, codes and standards to which the work is subject.

INIS has developed a QAP that applies to the design, construction, operation, and decommissioning of the IIFP facility.

Application of the QAP is mandatory for IROFS in accordance with 10 CFR 70.4, “Definitions” (CFR, 2009a), 10 CFR 70.61, “Performance Requirements” (CFR, 2009b), and 10 CFR 70.64 (CFR, 2009d). The QAP, in conjunction with the other management measures, ensures IROFS are available and reliable to perform the required safety functions when needed.

The QAP specifies mandatory requirements for performing activities affecting quality and is set forth in procedures which are distributed on a controlled basis to organizations and individuals responsible for quality. Revisions to these procedures are also distributed on a controlled basis. Applicable portions of the QAP are documented, approved and implemented prior to undertaking an activity.

11.8.3 Applicability

The QAP is a management system established to ensure that IIFP products are safe and reliable and that those products and IIFP services meet or exceed customers' requirements, needs, and expectations.

The QAP applies to all products and services using a graded approach as described in the QA Program Description of the IIFP LA Appendix A (and in the summary Section 11.8.4 below). The establishment of the program shall include consideration of the technical aspects of the activities affecting quality. The QAP forth the minimum requirements for those items, activities, and services and is established, maintained, and executed as described in Appendix A of the LA.

The QAP for design, construction, and preoperational testing continues simultaneously with the QAP for the operational phase when construction activities are in progress during plant operation.

11.8.4 Graded Application

This section is a summary of the graded application of the IIFP QAP. Detailed description is provided in the IIFP LA as Appendix A, Quality Assurance Program Description.

Risk is the fundamental consideration in determining to what extent the requirements of the QAP apply. Certain activities, items, or processes may require extensive control measures while others may require only a limited degree of control. The control measures that are to be considered include procedural coverage, qualification and training, peer reviews, surveillances, audits, and assessments. The application and degree to which these control measures are employed for an activity, item, or process is established through the risk assessment decision process.

The risk assessment decision process shall take into account such factors as

- Risk significance;
- Relative importance to safety, safeguards, and security;
- Consequences of failure;
- Probability of failure;
- Applicable regulations, industry codes, and standards;
- Complexity or uniqueness of an item/activity and the environment in which it has to function;
- Quality history of the item in service or activity;
- Degree to which functional compliance can be demonstrated or assessed by test, inspection, or maintenance methods;
- Anticipated life span;
- Degree of standardization;
- Importance of data generated; and
- Reproducibility of results.

Facility components and processes are assigned a QA level if they are determined to be IROFS based on their safety significance. Each IROFS component will receive a classification of QA Level 1 or Level 2 that applies throughout the life of the facility and is based on the following definitions:

QA Level 1 Requirements The QA Level 1 Program shall conform to the criteria established in 10 CFR 70, Subpart H. The QA Level 1 QA program shall be applied to a single item relied on for safety (sole IROFS) preventing or mitigating a high consequence event. All QAP requirements are applied to QA Level-1 IROFS.

QA Level 2 Requirements The QA Level 2 program is applied where two or more IROFS are credited to prevent or mitigate a high consequence event, or any single IROFS (sole IROFS) preventing or mitigating an intermediate consequence event. QAP requirements are applied to QA Level-2 IROFS using a graded approach. The graded approach is implemented through approved written procedures taking into consideration the factors delineated above.

By appropriately balancing considerations of importance and process capability, an appropriate level of quality is achieved commensurate with the item's importance to safety. The results of the application of the graded approach to quality are incorporated into design requirement documents, specifications, procedures, instructions, drawings, inspection plans, test plans, procurement documents, and other documents that establish the requirements for items or activities.

QA Level 3 Requirements The QA Level 3 program is defined as standard commercial practice. A documented QA Level 3 program is not required. QA Level 3 components or processes do not require a Quality Level 3 designation on any documentation or system requirements. QA Level 3 governs all activities that are not designated as QA Level 1 or QA Level 2.

11.8.5 QA Program Implementation

The QAP, along with associated policies, procedures, and contractual documents, provides the means of communicating and documenting the program goals, objectives, requirements, and elements to all organizational levels.

The QAP is implemented through policies, procedures, instructions, specifications, drawings, procurement documents, contractual documents, and other documents. Procedures are established to ensure that these documents are consistent with the requirements of the QA Program Description, the ISA, and regulatory requirements. These documents also provide measures which ensure that activities within the scope of the QAP are planned and accomplished under suitably controlled conditions as necessary to accomplish the goals and objectives of the QAP.

Quality-related activities shall be controlled and conducted using documented procedures (including instructions, drawings, process diagrams, or other appropriate documents). These procedures may be the procedures within the QAP other manuals, or procedures developed by IIFP.

The procedures used shall provide for accomplishment of quality-related activities under suitably controlled conditions. Examples of conditions to address include use of appropriate equipment, any environmental restriction, and verification that necessary prerequisites for the process activities have been met.

The QAP and supporting procedures are reviewed periodically to ensure they are in compliance with applicable regulations, codes, and standards. New or revised regulations, codes, and standards as well as lessons learned and revised activities are reviewed for incorporation into the QAP and supporting manuals and procedures as necessary.

Personnel performing activities covered by the QAP shall perform work in accordance with approved procedures, and must demonstrate suitable proficiency in their assigned tasks. Training programs are established for quality assurance policies, requirements, procedures, and methods. Ongoing training is provided to ensure continuing proficiency as procedural requirements change. New employees are required to participate in a QA indoctrination or OJT process describing on authority, organization authority, policies, the QA manual, and procedures.

Additional training is conducted based on NRC specific regulations and guidance, procedures, auditing, and applicable codes and standards. Supplemental training is performed as required. OJT is performed by the employee's supervisor in area-specific procedures and requirements. Training records are maintained for each person performing job functions.

IIFP participates in the planning and scheduling for system turnover as construction is completed. Prior to system turnover, written procedures are developed for control of the transfer of systems, structures, components and associated documentation. The procedures include checklists, marked drawings, documentation lists, system status, and receipt control.

Major work activities contracted by IIFP are identified and controlled. The performance of contracted activities shall be formally evaluated by IIFP commensurate with the importance of the activities to safety.

11.8.6 Quality Improvement

It is a basic concept of quality improvement that all work activities can be planned, performed, measured, and improved. Managers at all levels are responsible for creating an atmosphere where improvement is continuous and an integral part of the work activities. In achieving that, managers should encourage the development and exploration of new ideas. Managers are expected to increase staff awareness of the importance of quality and emphasize enhanced product and process safety and reliability, including the identification of nonconforming-items and potential areas for improvement.

Processes have been established to detect and prevent quality problems and to ensure quality improvement.

Products, services, and processes that do not meet established requirements shall be identified, controlled in accordance with Section A.11.1 of the QAP "Control of Nonconforming Items," and corrected through the Corrective Action Process documented in Section A.12.1 of the QAP Description. The process of correction includes identifying the root cause of problems and preventing recurrence.

The QA Coordinator shall establish procedures to periodically perform a trend-analysis of non-conformances and corrective actions.

The combination of internal IIFP audits and management reviews serve as tools for identifying opportunities for improvement.

Wore process performance should be measured and evaluated to identify improvement opportunities.

11.8.7 Qualifications and Certification of Personnel

The principle objective of the IIFP training program system is to ensure job proficiency of facility personnel through effective training and qualification. The training program system is designed to meet commitments to comply with applicable established regulations and standards. Employees are provided with training to establish the knowledge foundation and on-the-job training to develop work performance skills. Continuing training is provided, as required, to maintain proficiency in these knowledge and skill components, and to provide further employee development.

Qualification is indicated by successful completion of prescribed training, demonstration of the ability to perform assigned tasks, and the maintenance of requirements established by regulation. A graded approach to systematic training is used that applies the level of detail needed relative to safety. This graded approach incorporates methods to accomplish the analysis, design, development, implementation, and evaluation of training (See Section 11.3, Training and Qualifications).

11.8.8 Work Control

The QAP establishes requirements and defines the procedure for controlling project work activities to ensure that they comply with the requirements of both the applicable contract and the QAP

IIFP products are planned, authorized, accomplished, and verified through a controlled process utilizing written instructions, procedures, or other appropriate means. The degree of complexity and detail in instructions and procedure is commensurate with the risk associated with the work being performed and specific customer requirements (See Section 11.4, Procedures Development and Implementation).

11.8.9 Design Control

These requirements and controls ensure that new design and design change activities are carried out in a planned, controlled, and orderly manner, and that design requirements such as design basis, regulatory requirements and appropriate quality standards are correctly translated into design output, procurement, and procedural documents. These controls also establish provisions for verifying or checking the technical adequacy of design documents including computer codes. They also provide for the control of design changes. The design control provisions contained in the QA Program Description are applicable to design activities taking place beginning on the date the DB contactor assumes the detailed design and engineering role and establishes the design organization and controls. Reconstitution of the any prior conceptual design is not required; however if a deviation to the design is discovered, engineering shall resolve the deviation and as-built the drawings if necessary.

11.8.10 Procurement Document Control

The procurement document control system ensures that applicable regulatory requirements, technical requirements, and QAP requirements are included or referenced in procurement documents for the procurement of items and services. This system also establishes provisions for the preparation, review, approval, and control of procurement documents, including changes.

11.8.11 Instructions, Procedures, and Drawings

Activities affecting the availability or reliability of IROFS are prescribed by and accomplished in accordance with documented specifications, requirements, procedures, instructions, and drawings of a type appropriate to the circumstances. These documents include or reference appropriate acceptance criteria for determining that prescribed activities have been satisfactorily accomplished. Standard guidelines for the format, content, review, and approval processes for documents are established (See Section 11.4).

Adherence to policies and procedures is mandatory. In the case of conflict or error involving a procedure, the activity in question shall be placed in a safe condition and the procedure shall be corrected or changed before proceeding to implement the procedure.

11.8.12 Document Control/Records Management

A document control and records management system is established for IROFS and related activities and services within the scope of the QAP. This system ensures that documents and records defining the

performance of quality-related activities are controlled so only current and correct information is available at the location where the activity is performed prior to commencing the work.

11.8.13 Control of Purchased Items

A system for the control of purchased items and services is established for IROFS and services within the scope of the QAP.

11.8.14 Identification and Control of Materials, Parts, and Components Inspection

A system is established for the identification and control of IROFS items within the scope of the QAP. This system establishes the requirements for the identification and control of such items and associated materials, parts, spare parts, components, and sub-assemblies.

11.8.15 Inspection

A system is established for inspection of IROFS. This system provides measures to ensure that maintenance, repair or modification work is completed satisfactorily.

Requirements for the certification of personnel who perform inspection, examination, surveillance and testing are identified in Section 2.2 of the QA Program Description.

11.8.16 Control of Measuring and Test Equipment

A system is established for the control of measuring and test equipment (M&TE) used for measurement, test, and calibration of IROFS items within the scope of the QAP. This system establishes measures that ensure that tools, gauges, instruments, reference and transfer standards, nondestructive test equipment, and other measuring and testing devices used in activities affecting quality are properly controlled, calibrated, and adjusted at specified intervals to maintain equipment performance within required limits.

This system also establishes measures to ensure that devices and standards used for measurement, tests, and calibration activities are of the proper type, range, accuracy, and tolerance to accomplish the function of determining conformance to specified requirements.

11.8.17 Control of Purchased Items

A system is established for the control of nonconforming material and process for IROFS and related activities and services within the scope of the QAP. The system establishes the requirements for identification, segregation, disposition, prevention of inadvertent installation or use, documentation, and notification to affected organizations for items which do not conform to specified requirements.

11.8.18 Corrective Action

A corrective action system is established for IROFS and related activities and services within the scope of the QAP. This system establishes measures which ensure that conditions adverse to quality are identified and corrected as soon as practical. The system also ensures that, in the case of significant conditions adverse to quality, the cause of the condition is determined, and corrective action is taken to preclude

recurrence. These actions are documented and reported to appropriate levels of management. This system also ensures that follow-up actions are taken to verify implementation of the corrective action.

11.8.19 Quality Assurance Records

A records management system is established for IROFS and related activities and services within the scope of the QAP. The records management system provides measures to control quality assurance records.

11.8.20 Audits

A management assessment of the QAP is performed at least six months prior to scheduled receipt of licensed material on the site. Items identified as needing completion or modification are entered into the Correction Actions program and corrective action completed before scheduled receipt of licensed material. IIFP management monitors the QAP prior to this initial management assessment through project review meetings and other assessments. This management assessment along with integrated schedules and program review meetings ensure that the QAP is in place and effective prior to receiving licensed material.

The IIFP COO/Plant Manager and the INIS President assesses the scope, status, adequacy and regulatory compliance of the QAP through regular meetings and correspondence with the INIS Regulatory Affairs and QA Director and the IIFP QA Coordinator. Additionally, the IIFP QA Coordinator and the INIS QA

Regulatory Affairs and QA Director inform the IIFP COO/Plant Manager and the INIS President of quality concerns that need management resolution.

An audit system is established for IROFS and activities and services within the scope of the QAP. This system establishes planned and periodic audits to verify the compliance and the effectiveness of the QAP in meeting quality requirements. Audit personnel have sufficient authority and organizational freedom to make the audit process meaningful and effective. Audits are executed in accordance with established procedures and are performed by personnel having no direct responsibilities in the areas being audited.

Internal audits of selected aspects of operational activities are performed with a frequency commensurate with their importance to safety and in such a manner as to assure that audits of activities within the scope of the QAP are completed within specified time periods.

11.9 References

CFR, 2009a. Code of Federal Regulations, 10 CFR 70.4, *Definitions*, 2009.

CFR, 2009b. Code of Federal Regulations, 10 CFR 70.61, *Performance Requirements*, 2009.

CFR, 2009c. Code of Federal Regulations, 10 CFR 70.62, *Safety Program and Integrated Safety Analysis*, 2009.

CFR, 2009d. Code of Federal Regulations, 10 CFR 70.64, *Requirements for New Facilities or New Processes at Existing Facilities*, 2009.

CFR, 2009e. Code of Federal Regulations, 10 CFR 70.72, *Facility Changes and Change Process*, 2009.

CFR, 2009f. Code of Federal Regulations, 10 CFR 70.74, *Additional Reporting Requirements*, 2009.

CFR, 2009g. Code of Federal Regulations, 10 CFR 70, Subpart H, *Domestic Licensing of Special Nuclear Material*, 2009.

CFR, 2009h. Code of Federal Regulations, 10 CFR 19, *Notices, Instructions, and Reports to Workers*, 2009.

CFR, 2009i. Code of Federal Regulations, 10 CFR 19.12, *Notices, Instructions, and Reports to Workers, Inspection and Investigations,* 2009.

CFR, 2009j. Code of Federal Regulations, 29 CFR 1910.1200, *Hazard Communication*, 2009.

ISO, 2000. International Organization for Standardization, ISO 9001-2000, *Quality Management System Standard,* 2000.

ASME, 2004. American Society for Mechanical Engineering, NQA-1, *Nuclear Quality Assurance*, Part I, 2004.

IIFP, 2009. International Isotopes Fluorine Products, *Quality Assurance Program Description*, 2009.