AREVA

November 11, 2009
REL:09:050

U. S. Nuclear Regulatory Commission
Director, Office of Nuclear Material
Safety and Safeguards
Attn: Document Control Desk
Washington, D.C. 20555

Gentlemen:

Subject: Revised Responses to NRC Requests for Additional Information (RAIs) on the AREVA NP Inc. Supercritical CO_2 System License Amendment (TAC L32689)

Ref.: 1. Letter, RE Link to NRC Document Control Desk, "Amended Responses to Request for Additional Information Regarding the Review of the AREVA NP Inc., Fuel Fabrication Facility Supercritical CO_2 License Amendment Application," License No. SNM-1227, Docket No. 70-1257 (TAC L32689) July 13, 2009

Ref.: 2. Letter, RL Rodriguez to RE Link, "Revisions to Responses to Request For Additional Information in Support of AREVA NP Inc's License Amendment Application for the Supercritical Carbon Dioxide Extraction Process at the Richland Fuel Fabrication Facility," (License No. SNM-1227; Docket No. 70-1257) October 6, 2009

Via Reference 1, AREVA NP Inc. (AREVA) provided a complete set of RAI responses relative to its pending license amendment for its new supercritical CO_2 uranium extraction process. Following telephone discussions between AREVA and NRC's Peter Habighorst and Rafael Rodriguez on August 20, 2009, the NRC, via Reference 2, requested certain revisions to AREVA's original RAI responses.

Attached to this letter is a complete response to the request made via Reference 2. The response and associated attachments contain proprietary/business sensitive information and AREVA requests that the NRC handle it as such.

A copy of the redacted version of the requested revisions to the RAI responses is also provided.

Please contact me on 509-375-8409 if you have questions or need additional assistance regarding this response.

Very truly yours,

R. E. Link, Manager
Environmental, Health, Safety & Licensing

/mah

HMSS01

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Enclosures

cc: Mr. Rafael Rodriguez,
U.S. Nuclear Regulatory Commission
Fuel Manufacturing Branch
Mail Stop EBB-2-C-40
Rockville, MD 20852-2738

STATE OF WASHINGTON)
: ss
COUNTY OF BENTON)

Robert E. Link, being duly sworn on oath, states as follows:

1. I am employed by AREVA NP Inc. (AREVA NP) as Manager, Environmental, Health, Safety, & Licensing in Richland, Washington. I am responsible for the overall administration of the safety programs at AREVA NP's Richland, Washington nuclear fuel fabrication facility, including regulatory licensing and permitting. This affidavit is based on my first hand, personal knowledge and is submitted in my capacity as Manager, Environmental, Health, Safety and Licensing.

2. I am familiar with the contents of the "Revised Responses to NRC's Request for Additional Information Regarding the Review of the AREVA NP Inc., Fuel Fabrication Facility Supercritical CO_2 License Amendment Application" package. This revised RAI response has been classified and designated as "Proprietary" by AREVA NP in accordance with the document control system and policies established by AREVA NP for the control and protection of proprietary and confidential information.

3. AREVA NP is engaged in the business of designing and manufacturing nuclear fuel assemblies for commercial nuclear reactors. Within the United States, there are two additional firms that design and manufacture nuclear fuel for commercial nuclear reactors and there are several other companies outside of the United States that engage in the same business as AREVA NP. Competition among these companies including AREVA NP is fierce and manufacturing costs of the nuclear fuel are critical to the maintenance of market share and to the growth of market share among utility customers.

4. The revised RAI response package contains commercial information of a confidential nature that is not available in public sources or available to the public. This information contained in the license amendment package is commercial and confidential because it:

A. Reveals distinguishing aspects of AREVA NP's manufacturing processes by relating sequences of operations and/or sub-operations to optimize the efficiency and performance of manufacturing operations which a competitor within the field of nuclear fuel manufacturing may adapt for their own processes, reducing the competitor's expenditure of resources to achieve the same efficiencies, thereby gaining a competitive advantage to the disadvantage of AREVA NP.

B. Reveals the use of process chemical additives for the enhancement of chemical processes which are believed to be unique in the industry both in terms of type and application, which if revealed to a competitor would provide for an unfair competitive advantage by reducing any expenditure by the competitor to develop and test the same concepts.

C. Reveals aspects of privately funded development of process controls and parameters derived by AREVA NP over the course of optimizing the performance of waste treatment and other processes.

D. Reveals technical rationale developed by AREVA NP relating to plant layout, structure, process flow and other technical information which a competitor could readily use without expenditure of funds and replicate in its facilities thereby gaining a competitive advantage to the disadvantage of AREVA NP.

5. AREVA NP Inc. will suffer considerable competitive harm if the contents of the license amendment package are made available to AREVA NP domestic and international competitors. Finally, this material cannot be reasonably segregated from other material which may not meet the criteria set forth in 10 CFR § 2.390.

Dated this 13th day of November, 2009.

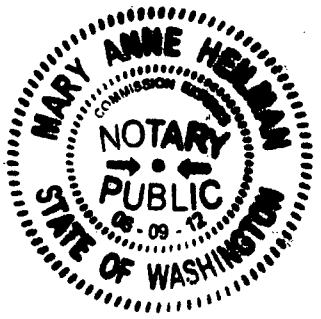
Robert E. Link
Manager, Environmental, Health, Safety, & Licensing

STATE OF WASHINGTON)
: ss
COUNTY OF BENTON)

On this 13th day of November, 2009, before me, the undersigned, a Notary Public in and for the State of Washington, duly commissioned and sworn, personally appeared Robert E. Link to me known to be the Manager, Environmental, Health, Safety & Licensing of AREVA NP Inc., the corporation that executed the foregoing instrument, and acknowledged the said instrument to be the free and voluntary act and deed of said corporation, for the uses and purposes therein mentioned, and on oath stated that he is authorized to execute the said instrument.

Witness my hand and official seal hereto affixed the day and year first above written.

Mary Anne Heilman
Notary Public in and for the State of Washington,
residing at Kennewick, Washington.
MY COMMISSION EXPIRES: June 9, 2012



ATTACHMENT I
REVISED RESPONSES TO NRC'S RAIs FOR THE AREVA NP, INC. SUPERCRITICAL CO_2 LICENSE AMENDMENT APPLICATION (TAC L32689)

NRC's Nuclear Criticality Safety Questions

A) Nuclear Criticality Safety

Questions 3, 4, 5, and 6

In responding to these questions, AREVA NP Inc. (AREVA) indicated that "design features" may be used to demonstrate that an accident sequence is "not credible" or "highly unlikely" without declaring the feature as an item relied on for safety (IROFS). These responses are inadequate because they conflict with the definition of "not credible" or "highly unlikely" in Section 6.0 of the U.S. Nuclear Regulatory Commission (NRC)-approved Integrated Safety Analysis (ISA) summary and the requirements in Title 10 of the *Code of Federal Regulations* (10 CFR), 70.61(e).

Requested Action

Revise your responses to these questions to declare an appropriate set of IROFS to prevent an inadvertent criticality. Identify the associated management measures that would apply to these IROFS.

Revise the ISA Summary for the supercritical carbon dioxide process to include the accident sequences, and an appropriate set of IROFS, that were dismissed as "not credible" because they relied on favorable geometry equipment. Identify the associated management measures that would apply to these IROFS.

NRC's Original Request for NCS question 3:

3. Accident sequence 186-5 is described as at least "highly unlikely" because a funnel break prevents backflow of solutions into the tri-butyl phosphate supply drum. Consistent with 10 CFR 70.65 (b)(6) and 70.61 (e), explain why the funnel break is not designated as an IROFS when funnel breaks in other parts of the facility are designated as IROFS (e.g., IROFS 6117). Justify that it is at least highly unlikely for the funnel break to be adversely changed or bypassed during installation, maintenance, or normal operations of the process.

AREVA's Original Response:

Clarification and implementation of the distinction between design features and IROFS is a work in progress at AREVA Richland. Some design features, including the subject IROFS 6117, were incorrectly designated as IROFS during the initial creation of the facility ISA. As time and manpower permits, such inconsistencies and errors are under review and being corrected during the ongoing ISA updating process. The referenced IROFS is to the Polyhall tank and during our five-year review is on the list of items to be removed from the IROFS category to Design Feature category.

The only failure mechanism identified by the ISA Team for the designated design feature (funnel break) is loss of configuration control, e.g., unauthorized replacement by a direct pipe connection. In the ISA Team evaluation of the design, no inherent paths to spontaneous degradation or failure (e.g., plugging) were identified. Further, this feature is judged not subject to being "degraded without a justifying safety review" *(NUREG-1520).* Once installation has been properly verified, it requires no plant-applied management measure (e.g., a PM/IRM) to ensure its continued availability, and it cannot be easily defeated by accidental action of operating personnel. The safety-related attribute, prevention of backflow, is based on physical laws: There is no credible path for counter-pressurization. The item is therefore designated a "design feature" and not an IROFS.

AREVA's Revised Response:

Certain equipment exists for which no identified failure mode leads to a high consequence accident, but that if improperly modified or replaced, could allow such an accident to occur. Funnel breaks used to prevent reverse flow into unfavorable geometry equipment fall into this category of equipment. Once installed, laws of physics will prevent the reverse flow. AREVA is modifying the ISA Summary for process system 186, Supercritical CO_2 Extraction to designate the subject funnel break as an IROFS. Additionally, the required pre-startup verification that the system is installed to ensure that the bounding assumptions and initial conditions assumed in the NCSA will also be designated as an IROFS. Appropriate management measures consistent with those listed in Table 8.1 of the ISA Summary will be established to assure the continued availability of the funnel break and the reliability of the pre-startup inspection by adequately qualified individuals working to approved procedures.

NRC's Original Request for NCS question 4:

4. Accident sequence 186-15 is described as at least "highly unlikely" because "the insulation is shielded from direct contact with spraying process fluid, tightly fills its shield walls, and is composed entirely of closed-cell foam." Consistent with 10 CFR 70.65 (b)(6) and 70.61 (e), explain why these design features are not designated as IROFS. Justify that it is at least highly unlikely for any of these design features to adversely change during installation, maintenance, normal operations of the process or process upsets.

AREVA's Original Response:

Since the original submittal, the system design has been modified and the internal stainless steel shield wall was deleted. This fact is judged to have no significant deleterious effect on the resistance to degradation of the foam insulation, and has the advantage of keeping the foam visible.

The only failure mechanism identified by the ISA Team for the designated design feature (closed-cell polyethylene foam) is loss of configuration control, e.g., unauthorized replacement by an absorptive insulating material. In the ISA Team evaluation of the design, no inherent paths to spontaneous degradation or failure (e.g., degradation of the foam from exposure to process chemicals, maintenance materials, or personnel action) were identified. Further, this feature is judged not subject to being "degraded without a justifying safety review" *(NUREG-1520).* Once installation has been properly verified, this feature requires no plant-applied

management measure (e.g., a PM/IRM) to ensure its continued availability, and it cannot be easily defeated by accidental action of operating personnel. The safety-related attribute, prevention of undetected accumulation of SNM, is based on physical laws: two bodies cannot occupy the same space at the same time. The item is therefore designated a "design feature" and not an IROFS.

More detailed information about the material used in construction of this feature, e.g., chemical inertness of the closed-cell foam, is available for inspection on site.

AREVA's Revised Response:

Certain equipment (e.g. columns) exist for which no identified failure mode leads to a high consequence accident, but that if improperly modified or replaced, could allow such an accident to occur. The nominal two-inch thick closed-cell polyethylene foam attached to the ceiling and vertical walls of the process enclosure for insulation is this type of material and is used for process rather than safety purposes. Any liquid sprays from the process vessels inside the insulated process enclosures that impinge on this insulation will run down the wall just as it would if the wall were made of sealed gypsum or concrete. AREVA is modifying the ISA Summary for process system 186, Supercritical CO_2 Extraction, to state the following:

> "Certain equipment, (e.g. columns) exist for which no failure mode leads to a high consequence accident, but that if improperly modified or replaced, could allow such an accident to occur. Such equipment in process system 186, Supercritical CO_2 Extraction, will be generically classified as items relied on for safety (IROFS) as defined within 10 CFR 70.4. These items are not all individually identified herein, but all will be maintained in their safe configuration using the configuration control management measure as implemented by AREVA's Management Measures program specified in Chapter 11 section 11.1 of SNM-1227.
>
> Identification of this type of equipment is listed in Nuclear Criticality Safety Specifications (NCSSs) as SRE-1 equipment. For the purpose of maintaining records of configuration control failures (should they ever occur), records will be maintained as described in Chapter 11 section 11.6 of SNM-1227.
>
> These structures, systems or components are considered passive, engineered controls for the purposes of meeting the performance requirements specified in 10 CFR 70.61 for high consequence accident sequences."

The generic Configuration Control IROFS and associated management measure are presented in the list of IROFS in the ISA Summary for process system 186 in the following format:

Generic Configuration Control IROFS

IDENTIFICATION	DESCRIPTION OF SAFETY FUNCTION	ACCIDENT SEQUENCE	MANAGEMENT MEASURES APPLIED
IROFS 0.20	Structures, systems, and components, such as favorable geometry columns, dikes, floors, and piping that require configuration control for criticality safety	Inappropriate configuration modification	A, B, C, D, G, E

NRC's Original Request for NCS question 5:

5. Accident sequence 186-16 is described as at least "highly unlikely" because "a hood surrounding the process columns provides adequate spacing," and there is "no reason or motive for transporting containers of uranium-bearing material" near the hood. Consistent with 10 CFR 70.65 (b)(6) and 70.61 (e):

   a. Explain why the hood is not designated as IROFS. Justify that it is at least "highly unlikely" for the hood to be adversely changed or removed during installation, maintenance, or normal operations of the process.

   b. Justify the statement that there is "no reason or motive for transporting containers of uranium-bearing material" near the hood. The ISA Summary indicates that uranium-bearing material is routinely transported and stored within the room, and it appears that the only pathway through the room is next to the hoods surrounding the process columns.

AREVA's Original Response:

The only failure mechanism identified by the ISA Team for the subject design feature (hood), as related to the subject Accident Sequence 186-16, is loss of configuration control, e.g., unauthorized removal of the hood or some portion thereof, combined with concurrent operation of the extraction equipment. In the ISA Team evaluation of the design, no inherent paths to spontaneous degradation or failure were identified. Further, this attribute is judged not subject to being "degraded without a justifying safety review" *(NUREG-1520)*. Once installation has been properly verified, it requires no plant-applied management measure (e.g., a PM/IRM) to ensure its continued availability, and it cannot be easily defeated by accidental action of operating personnel. The safety-related attribute, spacing, is based on physical laws: The physical barrier prevents manual transport of materials adjacent to the columns. The item is therefore designated a "design feature" of the system, and not an IROFS.

Many practices and programmatic requirements basic to operations at AREVA Richland prevent operation of any equipment while the surrounding hood is breached or is found to be otherwise defective. Standard practice for turnover from Operations to Maintenance requires that systems first be shut down and emptied of SNM by Operations personnel. Turnover back to Operations requires closure and inspection of the maintenance process to ensure that the equipment is adequately prepared for restart. Details of these programmatic practices and requirements (i.e., management measures) are available for inspection on site.

Although containers of uranium-bearing material are routinely stored within the room (as opposed to processing through the $SCCO_2$ System), the sole entrance/exit used for their transport is at an opposite corner of the room away from the hood. All storage locations for these containers are restricted to the area between the entrance/exit and the subject hood, and the ISA Team identified no reason or motive to transport SNM containers "through" the room. Since the original submittal, however, a design change has been implemented and the ISA Team now identifies a single transport path that skirts the hood itself, i.e. transport of ash containers from the northwest entrance to the dumbwaiter at the south end of the SCCO2 system. This path, however, is not judged to invalidate the concept that the hood will prevent these containers from being brought into proximity with the SCCO2 vessels. Floor Plan Drawing CSA-616,520 illustrates these facts, and further site inspection would also verify the described layout.

AREVA's Revised Response:

Certain equipment (e.g. the process enclosure/hood) exists for which no identified failure mode leads to a high consequence accident, but that if improperly modified or replaced, might increase the likelihood of an accident. The only failure mechanism identified by the ISA Team for the subject design feature (hood), as related to the subject Accident Sequence 186-16, is loss of configuration control, e.g., unauthorized removal of the hood or some portion thereof, combined with concurrent operation of the extraction equipment.

It is at least highly unlikely for the hood to be removed or significantly altered and for the process to simultaneously be in operation for the following reasons:

Such a removal or modification of the hood requires an Engineering Change Notice (ECN) which requires safety review and approval. This review prevents the prescribed spacing from being compromised unless a justifying safety analysis has been completed.

If for some reason the ECN process were to be bypassed, the panels for the process enclosure around the extractor vessels would have to be removed prior to modifying the enclosure's frame material, which is welded 316SS 3x3 and 2x2 square structural tubing. Such an activity requires a maintenance work permit and a pre-job briefing which includes those involved with the process and typically members of the safety staff.

If the maintenance work permit process were not followed, the required hot work permit which is required for welding, cutting and grinding in the area would also cause a safety review because the hood and or work platform would have to be cut into pieces in order for the required spacing provided between material in transit and the process vessels to be compromised.

Such a modification would require multiple shifts of work and it is very improbable that it would go unnoticed by operations supervision who would question why the activity is being performed without following any of the three previously mentioned procedures and permits.

If operations supervision failed to notice such an activity and assigned operators to run this process equipment, the process operators would have to start-up the ash preparation equipment and extraction vessels knowing that the panels that provide containment for radioactive contamination are missing.

As demonstrated above, such a condition would be the result of many unliklely human actions or errors. The deliberate disregard for the above listed procedures and safety requirements and failure for such a large number of people from different organizations to recognize these failures and to not question the work associated with this activity is at least highly unlikely. The above discussion will be added to the ISA summary for process system 186.

NRC's Original Request for NCS question 6:

6. Accident sequences 186-17, -18, and -19 are described as at least "highly unlikely" because liquids will flow into catch trays or onto the room floor where a favorable geometry will be maintained. Consistent with 10 CFR 70.65 (b)(6) and 70.61 (e), explain why these design features are not designated as IROFS, when the floor is listed as an IROFS (e.g., IROFS 6127) for other process areas. Justify that it is at least "highly unlikely" for any of these design features to adversely change during installation, maintenance, or normal operations of the process.

AREVA's Original Response:

Clarification and implementation of the distinction between design features and IROFS is a work in progress at AREVA Richland. Some design features, including the subject IROFS 6127, were incorrectly designated as IROFS during the initial creation of the facility ISA. As time and manpower permits, such inconsistencies and errors are under review and being corrected during the ongoing ISA updating process.

The subject design features (room floor and catch trays) ensure safe-slab geometry for any process fluids they might be called upon to contain. The total liquid volume that could potentially end up in a catch pan is small enough that the depth of the maximum spill of uranium-containing moderated solution will be less than 1.0 inch in any enclosure catch pan.

The only failure mechanism identified by the ISA Team for the subject design features (floor and catch trays) is loss of configuration control, e.g., unauthorized replacement of the catch trays with other items that do not posses safe-slab geometry, or unauthorized construction of an unfavorable geometry sump in the room. The flat-floored room is large enough to ensure that the maximum credible fluid loss from the system will maintain a safe-slab geometry. In the ISA Team evaluation of the design, no inherent paths to spontaneous degradation or failure of these features were identified. Further, these features are judged not subject to being "degraded without a justifying safety review" *(NUREG-1520)*. Once installation has been properly verified, they require no plant-applied management measure (e.g., a PM/IRM) to ensure their continued availability, and they cannot be easily defeated by accidental action of operating personnel. The

safety-related attribute, maximum fluid depth, is based on physical laws: Fluid will spread out to its own level on a flat surface, and will overflow the lip of a catch tray. The subject items are therefore designated "design features" and not IROFS.

Detailed information related to fluid capacities and equipment dimensions is available for inspection on site.

AREVA's Revised Response:

Certain equipment (e.g. floors and favorable depth catch basins) exists for which no intrinsic failure mode is identified that can lead to a high consequence accident, but that if improperly modified or replaced, might increase the likelihood of such an accident. The only failure mechanism identified by the ISA Team for the subject design feature (floor and catch basins), as related to the subject Accident Sequences 186-17, 18, and 19, is loss of configuration control, e.g., unauthorized removal of the floor, catch basin or some portion thereof, combined with replacement with a sump or unfavorable geometry catch basin and subsequent operation of the extraction equipment followed by a loss-of-containment event.

As indicated in the response to NCS question 4, the favorable geometry provided by the catch basins and surrounding floor will be designated as a generic configuration management IROFS with management meaures consistent with those listed in Table 8.1 of the ISA Summary.

NRC's Chemical Safety Questions

B) Chemical Safety

Questions 1, 2, 3, 5, 7, 8, and 9

In responding to these questions, AREVA described certain features or attributes that render the accident sequences not credible or "highly unlikely." AREVA concluded that IROFS were not required and these responses are inadequate because they conflict with the requirements in 10 CFR, 70.61(e).

Requested Action

Revise your responses to these questions to declare an appropriate set of IROFS that would render the accident sequences "highly unlikely." Identify the associated management measures that would apply to these IROFS.

NRC's Original Request for Chemical Safety question 1:

1. Sections 3.0, 6.0, and Table 1 of the license amendment application show pressurized process vessels and equipment as part of the extraction process. Most of them will operate at high pressures (up to 3,000 psig) and would appear to have some safety significance. Section 6.2 mentions that: "...a catastrophic release of the working fluid is precluded by primary and secondary containment which have management measures...management measures include periodically inspecting the process vessels in conformance with applicable pressure vessel codes and

standards." Management measures are applied to IROFS. However, the license amendment application does not identify any IROFS, safety programs, or other criteria for these process vessels and equipment. Consistent with 10 CFR 70.61(e) and 70.62, identify the IROFS and describe what safety programs will apply to these pressurized process vessels and equipment. Alternatively, justify why IROFS are not required.

AREVA's Original Response:

AREVA Richland applies management measures, as needed, to such safety-critical attributes, but also notes that the application of management measures to an item does not require that the item be designated an IROFS. Initial construction and verification of construction to code is considered a management measure verified, but not directly applied, by AREVA Richland. A similar comment may be applied to the state-mandated periodic pressure vessel inspection.

The subject items that are composed of ductile materials, i.e., the pressure vessels and ancillary devices such as connecting tubing and fittings, are not designated as IROFS, but the safety-critical attribute, ductility, exists within the boundary of these items, just as such attributes might exist within the boundary of an IROFS. The attribute of ductility is a design feature of these items, and its effectiveness as a defense against catastrophic failure is based on the metallurgical structure of ductile materials and the fact that their characteristic failure mode is one of gradual displacement under load, rather than the instantaneous displacement characteristic of brittle materials such as ceramics.

The only failure mechanism identified by the ISA Team for the designated attribute of ductility is loss of configuration control, e.g., unauthorized replacement by a brittle component. During the engineering evaluation of the materials and their operating environment, no inherent paths to spontaneous degradation or failure, e.g., stress corrosion or embrittlement, were identified. Further, this attribute is judged not subject to being "degraded without a justifying safety review" *(NUREG-1520)*. Once installation has been properly verified, this attribute requires no plant-applied management measure (e.g., a PM/IRM) to ensure its continued availability, and it cannot be easily defeated by accidental action of operating personnel. This attribute is based on physical laws: the metallurgical structure of the material. It is therefore designated a "design feature" and not an IROFS.

The "secondary containment" listed above refers to the process hood that surrounds the high-pressure equipment, which would serve to contain escaping gas (less than a catastrophic break) and ensure that it is exhausted outside the building. The HVAC system for the supercritical CO2 system is sized to contain the maximum credible system leak while maintaining negative pressure in the containment hoods. Calculations are available on site for inspection.

The process hood is also designated a design feature, because the only failure mechanism identified by the ISA Team for the hood is loss of configuration control, e.g., unauthorized removal of the hood or some portion thereof, combined with concurrent continuing operation of the extraction equipment. During the engineering evaluation of the design, no inherent paths to spontaneous degradation or failure of this item were identified. Further, the hood is not subject to being "degraded without a justifying safety review" *(NUREG-1520)*. Once installation has been properly verified, it requires no plant-applied management measure (e.g., a PM/IRM) to

ensure its continued availability, and it cannot be easily defeated by accidental action of operating personnel. The safety-related attribute, containment, is based on physical laws: Rapid gas transport through a solid barrier will not occur, and escaping gas will seek the path of least resistance, i.e., the exhaust system. The hood is therefore designated a "design feature" and not an IROFS.

Many practices and programmatic requirements basic to operations at AREVA Richland prevent operation of any equipment while the surrounding hood is breached or is found otherwise defective. Maintenance activities for instance might require temporary breach of the hood. Standard practice for turnover from Operations to Maintenance requires that systems first be shut down and emptied of SNM by Operations personnel. Turnover back to Operations requires closure and inspection of the maintenance process to ensure that the equipment is adequately prepared for restart. Details of these programmatic practices and requirements (i.e., management measures) are available for inspection on site.

AREVA's Revised Response:

This RAI request implies that if management measures are applied to an item, then it must be an IROFS. AREVA Richland applies management measures, as needed, to safety-critical attributes of equipment, but also notes that the application of management measures to an item does not require that the item be designated an IROFS. This is especially true with the configuration management management measure that applies to all licensed activities, not solely to IROFS.

Many practices and programmatic requirements basic to operations at AREVA Richland prevent operation of any equipment while the surrounding hood is breached or is found to be otherwise defective. Maintenance activities for instance might require temporary breach of the hood. Standard practice for turnover from Operations to Maintenance requires that systems first be shut down and emptied of SNM by Operations personnel. Turnover back to Operations requires closure and inspection of the maintenance process to ensure that the equipment is adequately prepared for restart. Details of these programmatic practices and requirements (i.e., management measures) are available for inspection on site.

NRC's Original Request for Chemical Safety question 2:

2. Section 8.2 of the license amendment application states that: "Catastrophic failure of pressure vessels and/or piping is prevented by design, construction, and periodic inspection in conformance with applicable pressure vessel codes and standards." It further states that: "Catastrophic release due to over-pressurization in the process system is prevented by…pump design…and…equipping the process vessels with rupture disks or pressure relief valves." During the December 2008 site visit, AREVA identified management measures (e.g., design control, inspections, conformance with the standards in the American Society of Mechanical Engineers Boiler and Pressure Vessel Code (ASME Code), Section VIII, Division 1) for reducing the initiating frequency to "highly unlikely" for many accident sequences involving pressure vessels and/or piping. Management measures are applied to IROFS. However, the license amendment application does not identify any IROFS for pressure vessels and/or piping. Consistent with 10 CFR 70.61(b), (c), (e) and 70.62:

a) Identify the IROFS, associated management measures, and any other safety information for the pressure vessels and/or piping. Alternatively, justify why IROFS are not required.

b) b) Since pressure relief is used to prevent catastrophic failures, which likely constitute at least intermediate events, identify which pressure relief devices are IROFS. Alternatively, justify why IROFS are not required.

AREVA's Original Response:

A typical quote from the accident sequence notes dealing with catastrophic failure of pressure vessels and/or piping is ***"Construction and*** periodic inspection to applicable codes is judged by the ISA Team to make the initiating event at least highly unlikely" (emphasis added). Initial construction is judged the crucial factor. A similar comment applies to welded piping construction, which is accepted as being more reliable than threaded pipe. AREVA Richland does not take the position that the state-mandated inspections are necessary to make the subject accidents "highly unlikely", but instead, that they "serve as features that enhance safety" *(10 CFR 70.64).* Also, the "notes" are not lists of IROFS nor of management measures, but instead serve as historical, supporting information and help to show the thought processes of the ISA Team.

The subject items are composed of ductile materials, i.e., the pressure vessels and ancillary devices such as connecting tubing and fittings. These are not designated as IROFS, but the described safety-critical attribute, ductility, exists within the boundary of these items, just as such attributes might exist within the boundary of an IROFS. The attribute of ductility is a design feature of these items, and its effectiveness as a defense against catastrophic failure is based on the metallurgical structure of ductile materials and the fact that their characteristic failure mode is one of gradual displacement under load, rather than the instantaneous displacement characteristic of brittle materials such as ceramics.

The only failure mechanism identified by the ISA Team for the designated attribute of ductility is loss of configuration control, e.g., unauthorized replacement by a brittle component. During the engineering evaluation of the materials and their operating environment, no inherent paths to spontaneous degradation or failure, e.g., stress corrosion or embrittlement, were identified. Further, this attribute is judged not subject to being "degraded without a justifying safety review" *(NUREG-1520).* Once installation has been properly verified, this attribute requires no plant-applied management measure (e.g., a PM/IRM) to ensure its continued availability, and it cannot be easily defeated by accidental action of operating personnel. This attribute is based on physical laws: the metallurgical structure of the material. It is therefore designated a "design feature" and not an IROFS.

Similar comments apply to "welded construction", which, like ductility, is an attribute of the installed system. It is listed here as an attribute that enhances the reliability of the piping system, an item intended to "serve as a feature that enhances safety" (10 CFR 70.64).

AREVA Richland applies management measures, as needed, to such safety-critical attributes, but also notes that the application of management measures to an item does not require that the item be designated an IROFS. Initial construction and verification of construction to code is considered a management measure verified, but not directly applied, by AREVA Richland. A

similar comment may be applied to the state-mandated periodic pressure vessel inspection.

At the time of submittal of the application for license amendment, pump design was considered the controlling design feature in this application. All of the subject pumps were driven by compressed air and were so constructed that Richland site compressed air, even under any credible upset condition, could not reach a pressure high enough to endanger the integrity of the pressure vessels via these pumps. The pumps were therefore designated as design features that made overpressurization of the vessels via pumping at least "highly unlikely". Now, however, a major design change to all of the pumps has rendered them capable of generating much higher pressures, assuming, among other faults, failure of the equipment that controls their input air pressure. Certain accident sequences, including Accident Sequence 8.2 (186-64), have therefore been revised, some new accident sequences have been created, and appropriate IROFS designated to preclude catastrophic failure of a pressure vessel or connecting line due to overpressurization by an air-driven pump. Changes to the accident sequences are shown highlighted in Attachment II.

With the exception of pressure relief devices specifically listed in the new and revised accident sequences dealing with the pump change described above, AREVA Richland does not take the position that the referenced pressure relief devices are necessary to make the subject accidents "highly unlikely", but instead, that they "serve as features that enhance safety" *(10 CFR 70.64)*. These items are therefore not designated as IROFS.

AREVA's Revised Response:

"Construction and periodic inspection to applicable codes is judged by the ISA Team to make the initiating event at least highly unlikely" This approach is consistent with the previously NRC approved ISA summary example 5 on page 6-3 for "meeting the highly unlikely criteria without using the risk indexing methods per Table 4-5." Consistent with this previously approved approach, AREVA will designate the following pressure vessels used in this process as IROFS:

The required formal state inspection program will also be designated as an IROFS. It is noted that with the ductile materials used to fabricate the pressure vessels, a catastrophic failure (a loss of containment due to a crack or hole larger than an open-ended pipe break) during service, without first resulting in a small leak is at least highly unlikely.

It is further noted that the ancillary devices such as connecting tubing and fittings are also constructed from ductile material. The attribute of ductility is an attribute of this equipment that has been reviewed by the ISA team including a mechanical engineer and an expert on high pressure systems similar to the SCCO2 process, and the only failure mechanism identified for the designated attribute of ductility is loss of configuration control, e.g. unauthorized replacement by a brittle component. Given this physical property, a loss of containment due to a hole larger than an open-ended pipe break is at least highly unlikely. A smaller hole does not result in a consequence of concern.

At the time of submittal of the application for the license amendment, pump design was considered the controlling design feature in this application. All of the subject pumps were driven by compressed air and were so constructed that Richland site compressed air, even under any credible upset condition, could not reach a pressure high enough to endanger the

integrity of the pressure vessels via these pumps. The pumps were therefore designated as design features that made over pressurization of the vessels via pumping at least "highly unlikely". Now, however, a major design change to all of the pumps has rendered them capable of generating much higher pressures, assuming, among other faults, failure of the equipment that controls their input air pressure. Certain accident sequences have therefore been revised, some new accident sequences have been created, and appropriate IROFS designated to preclude catastrophic failure of a pressure vessel or connecting line due to over-pressurization by an air-driven pump.

Changes to the applicable accident sequences and the IROFS associated with them are shown highlighted in Attachment II. The management measures established to ensure these IROFS are available and reliable when needed and are consistent with those listed in Table 8.1 of the ISA Summary.

With the exception of pressure relief devices specifically listed in the new and revised accident sequences dealing with the pump change described above, the referenced pressure relief devices "serve as features that enhance safety" *(10 CFR 70.64)* and are therefore not designated as IROFS.

NRC's Original Request for Chemical Safety question 3:

3. Sections 1.0 and 8.2 of the license amendment application state that: "Catastrophic releases [from the extractor vessels due to human error, mechanical degradation, or frequent openings] are prevented by passive design features." Examples given are: (1) the design ensures the lids cannot be manually opened while under significant internal pressure; and (2) large pressure relief valves that remain open until the lid is completely closed to prevent buildup of high pressures in the vessel under unsafe lid positions. AREVA stated during the December 2008 site visit that the extractor vessels would be designed and inspected in accordance with the ASME Code, Section VIII, Division 1. The design features of the extractor vessels appear to be serving a safety function. The management measures (e.g., design controls, inspections, conformance with ASME Code, Section VIII, Division 1) were identified for reducing the initiating frequency to "highly unlikely" for many accident sequences involving extractor vessels, yet no IROFS were identified either during the site visit or in the license amendment application. Consistent with 10 CFR 70.61(e), 70.62, and 70.65(b)(6):

   a) Identify the IROFS that the management measures apply to.

   b) Identify the IROFS and associated management measures for the following accident sequences: 186-84, 186-86, 186-87, and 186-88. These accident sequences appear to rely on design features to render the initiating events as "highly unlikely," thus serving a safety function. Alternatively, justify why IROFS are not required.

AREVA's Original Response:

This RAI appears to be concerned not only with the lids of the extractor vessels, but also with the general construction of the extractor vessels and the associated pipe and fittings.

A typical quote from the accident sequence notes dealing with catastrophic failure of pressure vessels and/or piping is ***"Construction and*** periodic inspection to applicable codes is judged by the ISA Team to make the initiating event at least highly unlikely" (emphasis added). Initial construction is judged the crucial factor. A similar comment applies to welded piping construction, which is accepted as being more reliable than threaded pipe. AREVA Richland does not take the position that the state-mandated inspections are necessary to make the subject accidents "highly unlikely", but instead, that they "serve as features that enhance safety" *(10 CFR 70.64).*

The subject items are composed of ductile materials, i.e., the pressure vessels and ancillary devices such as connecting tubing and fittings. These are not designated as IROFS, but the described safety-critical attribute, ductility, exists within the boundary of these items, just as such attributes might exist within the boundary of an IROFS. The attribute of ductility is a design feature of these items, and its effectiveness as a defense against catastrophic failure is based on the metallurgical structure of ductile materials and the fact that their characteristic failure mode is one of gradual displacement under load, rather than the instantaneous displacement characteristic of brittle materials such as ceramics.

The only failure mechanism identified by the ISA Team for the designated attribute of ductility is loss of configuration control, e.g., unauthorized replacement by a brittle component. During the engineering evaluation of the materials and their operating environment, no inherent paths to spontaneous degradation or failure, e.g., stress corrosion or embrittlement, were identified. Further, this attribute is judged not subject to being "degraded without a justifying safety review" *(NUREG-1520).* Once installation has been properly verified, this attribute requires no plant-applied management measure (e.g., a PM/IRM) to ensure its continued availability, and it cannot be easily defeated by accidental action of operating personnel. This attribute is based on physical laws: the metallurgical structure of the material. It is therefore designated a "design feature" and not an IROFS.

Similar comments apply to "welded construction", which, like ductility, is an attribute of the installed system. It is listed here as an attribute that enhances the reliability of the piping system, an item intended to "serve as features that enhance safety" (10 CFR 70.64).

AREVA Richland applies management measures, as needed, to such safety-critical attributes, but also notes that the application of management measures to an item does not require that the item be designated an IROFS. Initial construction and verification of construction to code is considered a management measure verified, but not directly applied, by AREVA Richland. A similar comment may be applied to the state-mandated periodic pressure vessel inspection.

Mechanical design of the extractor vessel lids ensures that they cannot be manually opened while under significant internal pressure, and includes vent paths that remain open until the lid is completely closed. These vents prevent buildup of high pressures in the extractor vessels unless the lids are sufficiently closed to withstand the design pressures.

The only failure mechanism identified by the ISA Team for the extractor vessel lids is loss of configuration control, e.g., unauthorized replacement by a non-conforming component. In the ISA Team evaluation of the design, materials, and operating environment, no inherent paths to spontaneous degradation or failure, e.g., mechanical wear resulting from long use, were identified. Further, these features are judged not subject to being "degraded without a justifying

safety review" *(NUREG-1520)*. Once installation has been properly verified, they require no plant-applied management measure (e.g., a PM/IRM) to ensure continued availability, and they cannot be easily defeated by accidental action of operating personnel. The safety-significant aspects of the design are based on physical laws, e.g., the mechanical strength of the material. They are therefore designated "design features" and not IROFS.

Details of the mechanical design, and supporting calculations, are available for inspection on site.

AREVA's Revised Response:

Chemical Safety RAI 3 (a) implies that if management measures are applied to an item, then it must be an IROFS. AREVA Richland applies management measures, as needed, to safety-critical attributes of equipment, but also notes that the application of management measures to an item does not require that the item be designated an IROFS. This is especially true with the configuration management management measure that applies to all licensed activities, not solely to IROFS.

Chemical Safety RAI 3 (b) appears to be concerned not only with the lids of the extractor vessels, but also with the general construction of the extractor vessels and the associated pipe and fittings. As stated in the revised response to Chemical Safety RAI 2, the extraction vessels will be designated as IROFS along with the associated state inspections.

Changes to the applicable accident sequences and the IROFS associated with them are shown highlighted in Attachment II. The management measures established to ensure these IROFS are available and reliable when needed are consistent with those listed in Table 8.1 of the ISA Summary.

NRC's Original Request for Chemical Safety question 5:

5. Accident sequence 186-94 in the ISA Summary describes a failure of the TBP/CO_2 Holding Tank. The ISA Team rendered the initiating event as not credible, or at least "highly unlikely," due to construction and periodic inspection in accordance with the ASME Code, Section VIII, Division 1. This requires initial and subsequent inspections by inspectors qualified by the ASME. During the December 2008 site visit, AREVA stated that an inspector from the State of Washington would fulfill this role, and periodic inspections would occur biannually. AREVA also stated visual inspection by the operators for wear would be part of AREVA's operating procedures. These elements appear to serve a safety function. However, the ISA Team concluded that IROFS were not required. An ASME Form U1A ("Manufacturer's Data Report For Pressure Vessels") was also reviewed during the site visit for one of the pressure vessels, and it did not indicate any allowance for corrosion, thus highlighting the need for inspections. Consistent with 10 CFR 70.61(e), 70.62, and 70.65(b)(6), identify the IROFS and associated management measures for this accident sequence. Alternatively, justify why IROFS are not required.

AREVA's Original Response:

A typical quote from the accident sequence notes dealing with catastrophic failure of pressure vessels and/or piping is ***"Construction and*** periodic inspection to applicable codes is judged by the ISA Team to make the initiating event at least highly unlikely" (emphasis added). Initial construction is judged the crucial factor. A similar comment applies to welded piping construction, which is accepted as being more reliable than threaded pipe. AREVA Richland does not take the position that the state-mandated inspections are necessary to make the subject accidents "highly unlikely", but instead, that they "serve as features that enhance safety" *(10 CFR 70.64).*

The subject items are composed of ductile materials, i.e., the pressure vessels and ancillary devices such as connecting tubing and fittings. These are not designated as IROFS, but the described safety-critical attribute, ductility, exists within the boundary of these items, just as such attributes might exist within the boundary of an IROFS. The attribute of ductility is a design feature of these items, and its effectiveness as a defense against catastrophic failure is based on the metallurgical structure of ductile materials and the fact that their characteristic failure mode is one of gradual displacement under load, rather than the instantaneous displacement characteristic of brittle materials such as ceramics.

The only failure mechanism identified by the ISA Team for the designated attribute of ductility is loss of configuration control, e.g., unauthorized replacement by a brittle component. During the engineering evaluation of the materials and their operating environment, no inherent paths to spontaneous degradation or failure, e.g., stress corrosion or embrittlement, were identified. Further, this attribute is judged not subject to being "degraded without a justifying safety review" *(NUREG-1520).* Once installation has been properly verified, this attribute requires no plant-applied management measure (e.g., a PM/IRM) to ensure its continued availability, and it cannot be easily defeated by accidental action of operating personnel. This attribute is based on physical laws: the metallurgical structure of the material. It is therefore designated a "design feature" and not an IROFS.

AREVA Richland applies management measures, as needed, to such safety-critical attributes, but also notes that the application of management measures construction to code is considered a management measure verified, but not directly applied, by AREVA Richland. A similar comment may be applied to the state-mandated periodic pressure vessel inspection.

Materials of construction are judged compatible with the working fluids and significant corrosion is not anticipated over the life of the facility; therefore, a corrosion allowance is judged superfluous to an item not designated an IROFS. Initial construction and verification of Supporting documentation is available for inspection on site. Visual inspection for wear is not required for the subject vessel, as the ISA Team identified no mechanism for mechanical wear. The only pressure vessels in the subject system that might be subject to mechanical wear are the extractor vessels which are discussed under question 3 above.

AREVA's Revised Response:

As stated in the revised response to Chemical Safety RAI 2, the TBP/CO2 Holding Tank will be designated an IROFS, along with the associated state inspections.

Changes to the applicable accident sequences and the IROFS associated with them are shown highlighted in Attachment II. The management measures established to ensure these IROFS are available and reliable when needed are consistent with those listed in Table 8.1 of the ISA Summary.

The NRC reviewer correctly noted that "visual inspection by the operator for wear..." appear to serve a safety function. These types of inspections are aspects of a safety-culture with a formal conduct-of-operations attribute. However, failure to perform these inspections will not result in a high or intermediate consequence event and therefore the inspections are not designated as IROFS.

NRC's Original Request for Chemical Safety question 7:

7. Accident sequence 186-102 in the ISA Summary describes the mechanical failure of the Tri-butyl Phosphate (TBP) Acidification Column (V-80). The ISA Team rendered the initiating event as not credible, or at least "highly unlikely," due to construction and periodic inspection in accordance with the ASME Code, Section VIII, Division 1. These elements appear to serve a safety function. However, the ISA Team concluded that IROFS were not required. Consistent with 10 CFR 70.61(e), 70.62, and 70.65(b)(6):

c) Identify the IROFS and associated management measures for this accident sequence. Alternatively, justify why IROFS are not required.

d) Sheet 4 of the process flow sheet shows that the TBP Acidification Column (V-80) has a rupture disk (RD-801). This disk seems to perform a safety function for this accident sequence (i.e., relieve overpressure so that a catastrophic vessel failure cannot occur). Clarify if this rupture disk is an IROFS. Alternatively, justify why this rupture disk should not be designated as an IROFS.

AREVA's Original Response:

AREVA Richland does not take the position that the referenced rupture disk is necessary to make the subject accidents "highly unlikely", but instead, that it "serves as a feature that enhances safety" *(10 CFR 70.64)*. This device is therefore not designated as an IROFS.

A typical quote from the accident sequence notes dealing with catastrophic failure of pressure vessels and/or piping is ***"Construction and*** periodic inspection to applicable codes is judged by the ISA Team to make the initiating event at least highly unlikely" (emphasis added). Initial construction is judged the crucial factor. A similar comment applies to welded piping construction, which is accepted as being more reliable than threaded pipe. AREVA Richland does not take the position that the state-mandated inspections are necessary to make the subject accidents "highly unlikely", but instead, that they "serve as features that enhance safety" *(10 CFR 70.64)*. Also, the "notes" are not lists of IROFS nor of management measures, but instead serve as historical, supporting information and help to show the thought processes of the ISA Team.

The subject items are composed of ductile materials, i.e., the pressure vessels and ancillary devices such as connecting tubing and fittings. These are not designated as IROFS, but the

described safety-critical attribute, ductility, exists within the boundary of these items, just as such attributes might exist within the boundary of an IROFS. The attribute of ductility is a design feature of these items, and its effectiveness as a defense against catastrophic failure is based on the metallurgical structure of ductile materials and the fact that their characteristic failure mode is one of gradual displacement under load, rather than the instantaneous displacement characteristic of brittle materials such as ceramics.

The only failure mechanism identified by the ISA Team for the designated attribute of ductility is loss of configuration control, e.g., unauthorized replacement by a brittle component. During the engineering evaluation of the materials and their operating environment, no inherent paths to spontaneous degradation or failure, e.g., stress corrosion or embrittlement, were identified. Further, this attribute is judged not subject to being "degraded without a justifying safety review" *(NUREG-1520).* Once installation has been properly verified, this attribute requires no plant-applied management measure (e.g., a PM/IRM) to ensure its continued availability, and it cannot be easily defeated by accidental action of operating personnel. This attribute is based on physical laws: the metallurgical structure of the material. It is therefore designated a "design feature" and not an IROFS.

AREVA Richland applies management measures, as needed, to such safety-critical attributes, but also notes that the application of management measures to an item does not require that the item be designated an IROFS. Initial construction and verification of construction to code is considered a management measure verified, but not directly applied, by AREVA Richland. A similar comment may be applied to the state-mandated periodic pressure vessel inspection.

AREVA's Revised Response:

AREVA Richland's revised responses to questions 3 and 5 are applicable to this question.

Changes to the applicable accident sequences and the IROFS associated with them are shown highlighted in Attachment II. The management measures established to ensure these IROFS are available and reliable when needed are consistent with those listed in Table 8.1 of the ISA Summary.

NRC's Original Request for Chemical Safety question 8:

8. Accident sequence 186-119 in the ISA Summary describes the mechanical failure of Scrub Column (V90). The ISA Team rendered the initiating event as not credible, or at least "highly unlikely," due to construction and periodic inspection in accordance with the ASME Code, Section VIII, Division 1. These elements appear to serve a safety function. However, the ISA Team concluded that IROFS were not required. Consistent with 10 CFR 70.61(e), 70.62, and 70.65(b)(6):

e) Identify the IROFS and associated management measures for this accident sequence. Alternatively, justify why IROFS are not required.

f) Sheet 4 of the process flow sheet shows that the Scrub Column (V-90) has a rupture disk (RD-901). This disk seems to perform a safety function for this accident sequence (i.e., relieve overpressure so that a catastrophic vessel failure cannot occur). Clarify if

this rupture disk is an IROFS. Alternatively, justify why this rupture disk should not be designated as an IROFS.

AREVA's Original Response:

AREVA Richland does not take the position that the referenced rupture disk is necessary to make the subject accident "highly unlikely", but instead, that it "serves as a feature that enhances safety" *(10 CFR 70.64).* This device is therefore not designated as an IROFS.

A typical quote from the accident sequence notes dealing with catastrophic failure of pressure vessels and/or piping is ***"Construction and*** periodic inspection to applicable codes is judged by the ISA Team to make the initiating event at least highly unlikely" (emphasis added). Initial construction is judged the crucial factor. A similar comment applies to welded piping construction, which is accepted as being more reliable than threaded pipe. AREVA Richland does not take the position that the state-mandated inspections are necessary to make the subject accidents "highly unlikely", but instead, that they "serve as features that enhance safety" *(10 CFR 70.64).*

The subject items are composed of ductile materials, i.e., the pressure vessels and ancillary devices such as connecting tubing and fittings. These are not designated as IROFS, but the described safety-critical attribute, ductility, exists within the boundary of these items, just as such attributes might exist within the boundary of an IROFS. The attribute of ductility is a design feature of these items, and its effectiveness as a defense against catastrophic failure is based on the metallurgical structure of ductile materials and the fact that their characteristic failure mode is one of gradual displacement under load, rather than the instantaneous displacement characteristic of brittle materials such as ceramics.

The only failure mechanism identified by the ISA Team for the designated attribute of ductility is loss of configuration control, e.g., unauthorized replacement by a brittle component. During the engineering evaluation of the materials and their operating environment, no inherent paths to spontaneous degradation or failure, e.g., stress corrosion or embrittlement, were identified. Further, this attribute is judged not subject to being "degraded without a justifying safety review" *(NUREG-1520).* Once installation has been properly verified, this attribute requires no plant-applied management measure (e.g., a PM/IRM) to ensure its continued availability, and it cannot be easily defeated by accidental action of operating personnel. This attribute is based on physical laws: the metallurgical structure of the material. It is therefore designated a "design feature" and not an IROFS.

AREVA's Revised Response:

AREVA Richland's revised responses to questions 3 and 5 are applicable to this question.

Changes to the applicable accident sequences and the IROFS associated with them are shown highlighted in Attachment II. The management measures established to ensure these IROFS are available and reliable when needed are consistent with those listed in Table 8.1 of the ISA Summary.

NRC's Original Request for Chemical Safety question 9:

9. Accident sequence 186-127 describes the mechanical failure of the UNH Stripper Column (V100). The ISA Team rendered the initiating event as not credible, or at least "highly unlikely," due to construction and periodic inspection in accordance with the ASME Code, Section VIII, Division 1. These elements appear to serve a safety function. However, the ISA Team concluded that IROFS were not required. Consistent with 10 CFR 70.61(e), 70.62, and 70.65(b)(6):

g) Identify the IROFS and associated management measures for this accident sequence. Alternatively, justify why IROFS are not required.

h) Sheet 4 of the process flow sheet shows that the UNH Stripper Column (V100) has a rupture disk (RD-1001). This disk seems to perform a safety function for this accident sequence (i.e., relieve overpressure so that a catastrophic vessel failure cannot occur). Clarify if this rupture disk is an IROFS. Alternatively, justify why this rupture disk should not be designated as an IROFS.

AREVA's Original Response:

AREVA Richland does not take the position that the referenced rupture disk is necessary to make the subject accident "highly unlikely", but instead, that it "serves as a feature that enhances safety" *(10 CFR 70.64).* This device is therefore not designated as an IROFS.

A typical quote from the accident sequence notes dealing with catastrophic failure of pressure vessels and/or piping is ***"Construction and*** periodic inspection to applicable codes is judged by the ISA Team to make the initiating event at least highly unlikely" (emphasis added). Initial construction is judged the crucial factor. A similar comment applies to welded piping construction, which is accepted as being more reliable than threaded pipe. AREVA Richland does not take the position that the state-mandated inspections are necessary to make the subject accidents "highly unlikely", but instead, that they "serve as features that enhance safety" *(10 CFR 70.64).* Also, the "notes" are not lists of IROFS nor of management measures, but instead serve as historical, supporting information and help to show the thought processes of the ISA Team.

The subject items are composed of ductile materials, i.e., the pressure vessels and ancillary devices such as connecting tubing and fittings. These are not designated as IROFS, but the described safety-critical attribute, ductility, exists within the boundary of these items, just as such attributes might exist within the boundary of an IROFS. The attribute of ductility is a design feature of these items, and its effectiveness as a defense against catastrophic failure is based on the metallurgical structure of ductile materials and the fact that their characteristic failure mode is one of gradual displacement under load, rather than the instantaneous displacement characteristic of brittle materials such as ceramics.

The only failure mechanism identified by the ISA Team for the designated attribute of ductility is loss of configuration control, e.g., unauthorized replacement by a brittle component. During the engineering evaluation of the materials and their operating environment, no inherent paths to spontaneous degradation or failure, e.g., stress corrosion or embrittlement, were identified. Further, this attribute is judged not subject to being "degraded without a justifying safety review"

(NUREG-1520). Once installation has been properly verified, this attribute requires no plant-applied management measure (e.g., a PM/IRM) to ensure its continued availability, and it cannot be easily defeated by accidental action of operating personnel. This attribute is based on physical laws: the metallurgical structure of the material. It is therefore designated a "design feature" and not an IROFS.

AREVA's Revised Response:

AREVA Richland's revised responses to questions 3 and 5 are applicable to this question.

Changes to the applicable accident sequences and the IROFS associated with them are shown highlighted in Attachment II. The management measures established to ensure these IROFS are available and reliable when needed are consistent with those listed in Table 8.1 of the ISA Summary.

NRC's Revised Request for Chemical Safety question 10:

Question 10

In responding to this question on July 13, 2009, AREVA described the inspection activities conducted on the extractor vessels, or other vessels, equipment and piping used in the proposed process. This response appears to imply that the process vessels in the system (excluding the extractor vessels) would be inspected only after identifying any deterioration in the physical condition of the seal caps of the extractor vessels or the ash baskets. Even if there is no degradation in the seal caps or the ash baskets, this response is inadequate because it does not consider any possible degradation that could occur in the process vessels.

In addition, the response did not identify which inspection activities, conducted by AREVA, would support IROFS.

Requested Action

Revise this response to clarify the process vessels in the system would be inspected regardless of any deterioration in the physical condition of the seal caps of the extractor vessels or the ash baskets. In addition, identify which inspection activities conducted by AREVA would support IROFS. In identifying these inspections, AREVA should consider any IROFS that have been declared in responding to the questions mentioned in this letter.

AREVA's Original Response:

The extractor vessel caps will be visually inspected each time the caps are removed from the vessel for wear and deterioration, however these inspections are not required to prevent high or intermediate consequences. Special emphasis will be given to the seals which seal the cap to the vessel wall and the inside of the ash baskets. Any deterioration in the physical condition of the caps, which are fabricated from the same material (316L SS) as the extractor vessels and separations columns, will be an indication of potential deterioration of the process vessels and will initiate further inspection of the vessels themselves. In addition, the ash baskets will be periodically inspected periodically for wear and corrosion. Because the baskets are also fabricated from the same material (316L SS) as the extractor vessels and separations columns

and are subjected to the same conditions as the vessels, any deterioration in the physical condition of the baskets will be an indication of the potential problems with the process vessels. If deterioration of the baskets is noted then further inspections of the process vessels will be initiated.

AREVA's Revised Response:

AREVA will establish a management measure to perform an external NDE test (ultra sonic) on each pressure vessel that is individually designated as an IROFS prior to system start up to obtain baseline test results. A retest will be completed about a year after startup of the process system to assess degradation rates with subsequent testing frequencies for this management measure to be established following a review of the baseline and one-year test results and consultation with an NDE/materials expert.

Attachment II
Requested Revisions to Accident Sequence
Summary for Process System # 186