AREVA

February 4, 2010
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U. S. Nuclear Regulatory Commission
Director, Office of Nuclear Material
Safety and Safeguards
Attn: Document Control Desk
Washington, D.C. 20555-0001

Gentlemen:

Subject: Responses to NRC's Request for Additional Information (RAI) Related to the AREVA NP Inc. Supercritical CO2 System License Amendment (TAC L32689)

Reference 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

Reference 2: Letter, R. L. Rodriguez, NRC Project Manager to R.E. Link, "Request For Additional Information Pertaining To Analysis of Overpressurization Scenarios, and Replacement Of A Configuration Control Item Relied Upon For Safety In The Supercritical Carbon Dioxide License Amendment Application; License No. SNM-1227, Docket No. 70-1257 (TAC L32689)"; January 29, 2010

In Reference 1, AREVA NP Inc. provided responses to NRC's RAI questions regarding a license amendment application for a uranium recovery process using supercritical CO_2.

Via Reference 2, the NRC documented additional conference calls between AREVA and the NRC on December 15, 2009, and January 8, 2010 AREVA and requested additional information pertaining to AREVA's Supercritical CO_2 License Amendment Application.

Attached to this letter is a response to this request..

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

Very truly yours,

Calvin D. Manning for

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

/mah

Enclosures

NMSS01

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Attachment I

NRC Request

1) The submittal makes reference to a configuration control item relied on for safety (IROFS) that AREVA is crediting for meeting the performance requirements in Title 10 of the Code of Federal Regulations (10CFR), Section 70.61. This "IROFS" is proposed by AREVA for several criticality and chemical accident sequences. The description and functions performed by this "IROFS" contribute to the reliability and functionality of other IROFS in the accident sequences, thus meeting the definition of a management measure in 10 CFR 70.4. Therefore, the NRC staff concludes that this configuration control "IROFS" cannot be used to demonstrate regulatory compliance.

AREVA shall re-evaluate those accident sequences where this configuration control IROFS is used and propose a different IROFS, where required, to demonstrate regulatory compliance. These results shall be communicated to the NRC in writing.

AREVA Response:

The AREVA amendment application did not designate as IROFS some design features that render certain accident sequences as "not credible". To the best of our knowledge, this is consistent with the practices of at least three other licensees. In response to a previous NRC RAI that expressed concern that these design features had not been declared as IROFS, AREVA declared these items as IROFS and also added IROFS 0.21. AREVA added this IROFS to meet AREVA's internal policy to not have any "sole IROFS". This policy is consistent with the regulatory guidance provided in NUREG 1520. The accident sequences listed below credited IROFS 0.21 in a previous RAI response.

In response to this most recent NRC request, AREVA will no longer designate the activities previously described as IROFS 0.21 as an IROFS and has modifed the impacted accident sequences as indicated below:

<u>Accident Sequence 186-5</u>, Metering pump seal failure leads to backflow from Tank V-30 to the unfavorable geometry TBP supply drum.

IROFS 6939 with a PFOD = -4 is currently listed as preventing this accident sequence. IROFS 6939 is described as follows: "Backflow of fluid is prevented by an atmospheric break in the subject line (design feature: physical laws prevent reverse flow through the atmospheric break)".

The IROFS that will be used to replace IROFS 0.21 in meeting the performance criteria is IROFS 6944 "Mass control: An atmospheric vent at the top of Tank V-30 prevents backflow from Tank V-30 to an unfavorable geometry by directing liquid overflow to the process enclosure floor." This IROFS will have a PFOD = -3.

<u>Accident sequence186-15,</u> Uranium from leaking process fluid gradually accumulates in the insulation of the column enclosure.

IROFS 6945 was previously listed as preventing this accident sequence along with IROFS 0.21. The IROFS that will be used to replace IROFS 0.21 in meeting the performance criteria is IROFS 6956, Geometry/mass control: Piping and vessel integrity will prevent significant leaks. This IROFS will

have a PFOD = -3. The initiating event for this sequence is failure of this IROFS resulting in a significant leak of sufficient size and duration to allow the accumulation of 63 kg U in UN solution, and is assigned a frequency of -1.

IROFS 6945 with a PFOD = -4 will continue to be used in this accident sequence. This IROFS is described as follows: "Geometry control: Accumulation of fluid and/or solids within the material is prevented by characteristics inherent to the insulation, which is composed of closed-cell foam and is chemically inert with respect to the process fluids (a design feature)."

Accident Sequence 186-16, Loss of UOx spacing and interaction requirements when a drum or other uranium-bearing material is transported near the process columns.

IROFS 0.20 was previously listed as preventing this accident sequence along with IROFS 0.21. The IROFS that will be used to replace IROFS 0.21 in meeting the performance criteria is IROFS 6957, Geometry control: An administrative control prevents movement of SNM containers in the immediate vicinity of the SCCO2 process equipment whenever there is a significant amount of SNM in the process equipment, unless the hood is intact. This IROFS will have a PFOD = -2.

IROFS 0.20 with a PFOD = -4 will be replaced with IROFS 6940. This IROFS is described as follows: "Geometry control: The hood surrounding the subject process equipment ensures any leaking fluid will drain into a favorable geometry catch tray (safe slab) on the floor of the hood, and maintains adequate spacing between process vessels and containers in transport." This IROFS has a PFOD = -4

Accident Sequence 186-17, A significant amount of UNH from the process fluid leaks into the column hood and accumulates into an unfavorable geometry.

IROFS 0.20 was previously listed as preventing this accident sequence along with IROFS 0.21. The IROFS that will be used to replace IROFS 0.21 in meeting the performance criteria is IROFS 6977, Geometry control: Criticality drain C186DR07, by directing liquid overflow to the room floor, prevents retention of UN solution in the process hood beyond a favorable geometry (depth). These IROFS have a PFOD = -3.

IROFS 0.20, "Geometry control: One or more physical attributes of the installed system (design features) prevent the occurrence of nuclear criticality via the subject pathway", has been replaced with IROFS 6940, "This IROFS is described as follows: "Geometry control: The hood surrounding the subject process equipment ensures any leaking fluid will drain into a favorable geometry catch tray (safe slab) on the floor of the hood, and maintains adequate spacing between process vessels and containers in transport." This IROFS has a PFOD = -4

Accident sequence186-18, A significant amount of UNH leaks from the raffinate or UNH transfer pumps and accumulates into an unfavorable geometry.

The IROFS used for this accident sequence are identical to those used in accident sequence 186-17.

Accident sequence186-19, Process liquid sprays or leaks into open containers of UOx.

The IROFS that will be used to replace IROFS 0.21 in meeting the performance criteria is IROFS 6956 "Geometry/mass control: Piping and vessel integrity will prevent significant leaks. This IROFS

will have a PFOD = -3. The initiating event is failure of this IROFS resulting in a significant leak of sufficient size and duration to allow the accumulation 63 kg U in UN solution, and is assigned a frequency of -1.

The other IROFS used to meet the performance criteria will be IROFS 6940. This IROFS is described as follows: "Geometry control: The hood surrounding the subject process equipment ensures any leaking fluid will drain into a favorable geometry catch tray (safe slab) on the floor of the hood, and maintains adequate spacing between process vessels and containers in transport." This IROFS has a PFOD = -4

Accident Sequence 186-84, The lid of an extractor vessel is closed just enough to take significant pressure but not enough to withstand full pressurization. When the vessel is fully pressurized, the vessel lid is blown off and process fluid is released to the room at a high rate, causing significant personnel exposure to CO2, nitric acid, TBP, and uranyl nitrate.

IROFS 6941 with a PFOD = -4 was previously used with IROFS 0.21 to prevent this accident sequence. The IROFS that will be used to replace IROFS 0.21 in meeting the performance criteria will be IROFS 6943 "An interlock prevents significant personnel exposure to process fluids. This interlock, based on lid-closed sensors, prevents pressurization of the associated pair of extractors by blocking all flows into the pair if the lid of either of the extractors is not fully closed." This IROFS has a PFOD =-3.

IROFS 6941 will continue to be used to prevent this accident sequence. This IROFS is described as: "Catastrophic failure of the extractor vessel lid due to insufficient closure is prevented by a design feature: The lid is designed with vent holes that prevent significant pressurization unless it is completely closed."

Accident Sequence 186-86, Operator opens the extractor lid under pressure.

IROFS 6942 with a PFOD = -4 was previously used with IROFS 0.21 to prevent this accident sequence. The IROFS that will be used to replace IROFS 0.21 in meeting the performance criteria will be IROFS 6950, "An administrative control prevents significant personnel exposure to process fluids: The operator will ensure that internal pressure is nominally zero before attempting to open the vessel." This IROFS has a PFOD = -2. The operator will either use a pressure indicator or a pressure gage to make this determination. The indicator or pressure gage will be within the IROFS boundary of IROFS 6950 and will have the appropriate management measures to assure that it is available and reliable when needed.

IROFS 6942 will continue to be used to prevent this accident sequence. This IROFS is described as: "Opening the extractor vessel lid under significant internal pressure is prevented by a design feature: The vessel and lid are designed with specialty threads which prevent the operator from opening the lid unless the internal pressure is adequately low."

Note: a pressure sufficiently high to result in a high consequence event due to an inadvertent lid removal is sufficiently high to make it physically impossible for a human to remove the lid.

NRC Request

The submittal makes reference to several new sequences involving over pressurization and subsequent catastrophic failure of process pressure vessels which constitute high consequence events per 10 CFR 70.61. AREVA identified IROFS involving the low pressure circuit of the system. During the December 15, 2009, conference call, AREVA stated that there were no credible mechanisms in the high pressure circuit of the process (i.e. inside the pressurized vessels) that could result in a high or intermediate consequence event. The November 11, 2009, submittal from AREVA does not provide supporting information related to this conclusion. During this conference call, the NRC staff informed AREVA that this is an unusual and indirect approach, and would not be considered reasonable and generally accepted, good engineering practices (RAGAGEP) for protecting pressure vessels from failure. For example, as stated during the conference call, Section VIII of the American Society of Mechanical Engineers (ASME) Boiler and Pressure Vessel Code generally considers the pressure relief devices on the high pressure circuit (i.e. the pressurized vessels) to have a safety designation related to the protection against overpressurization and catastrophic failure. Thus, for the supercritical CO2 extraction process, the ASME code and the use of RAGAGEP would likely assign a safety designation to the relief devices on the pressurized vessels. However, in the AREVA submittal, none of these relief devices have a safety designation (i.e. declared IROFS) for any overpressurization scenarios: some pressurized vessels have uncredited defenses that include pressure relief devices on the high pressure circuit.

Consequently, the NRC staff concludes that AREVA's current approach does not demonstrate compliance with 10 CFR 70.61. The NRC staff concludes that AREVA has the option of identifying additional IROFS for these scenarios (e.g. by designating one or more of the uncredited defenses in the pressurized vessels as IROFS), or by providing an analysis that supports AREVA's conclusion that the current approach of controls on the low pressure circuit can render overpressurizatioin and catastrophic failure events in the process as "highly unlikely". The NRC notes that, if AREVA chooses to submit an analysis to demonstrate the adequacy of the current safety strategy, it must be a high quality submittal addressing all credible overpressurization scenarios because the current strategy is contrary to Section VIII of the ASME Code and does not follow RAGAGEP. AREVA should also be aware that additional questions could result from the review of such an analysis by the NRC staff.

Consistent with 10 CFR 70.61 (e) and 70.64 (a)(5), AREVA shall either identify additional IROFS for these overpressurization scenarios or provide a copy of a high quality analysis that demonstrates the current proposed controls meet the regulatory requirements.

AREVA Response:

AREVA disagrees with the NRC's characterization that the Supercritical CO_2 extraction process design does not meet reasonable and generally accepted, good engineering practices (RAGAGEP) for protecting pressure vessels from failure and the implication that the design does not meet Section VIII of the American Society of Mechanical Engineers (ASME) Boiler and Pressure Vessel Code.

AREVA made it clear in each of the referenced telephone calls between AREVA and the NRC that each of the three process columns and the six extraction vessels meet the requirements of Section VIII of the American Society of Mechanical Engineers (ASME) Boiler and Pressure Vessel Code and that each is equipped with a pressure relief device (i.e. rupture disk). The presence of these devices is clearly shown

on the drawing provided with the license amendment application. These pressure relief devices were acknowledged by AREVA as providing a safety function. AREVA's position was that although these devices perform a safety function, they were not required to demonstrate that catastrophic failure of these vessels is highly unlikely.

AREVA also discussed each of the potential scenarios that could result in some degree of overpressurization and that these sources did not result in high or intermediate consequences.

AREVA further believes that the license application and supplemental information provided to the NRC include all the information required by 10CFR 70.65, and that consistent with 10 CFR 70.61 (e) and 70.64 (a)(5), AREVA has provided a list of all the IROFS required to make credible high and intermediate consequence events highly unlikely and unlikely respectively.

Notwithstanding AREVA's good faith efforts to meet the applicable regulatory requirements and address the additional concerns expressed by the NRC's reviewers, it has become apparent that it is in AREVA's best interest to designate the existing pressure relief devices on each of the six extraction vessels and the three process columns as an IROFS. Therefore, in each location where the IROFS 6938 rupture disk RD-10 (located on the low pressure system) had previously been used, AREVA will substitute the rupture disks on each of the six extraction vessels and the three process columns. These replacement IROFS have an assigned PFOD = -4, which is the same as the PFOD previously assigned to IROFS 6938 (RD-10).