June 27, 2002

Mr. Peter Hastings, Licensing Manager
Duke Cogema Stone & Webster
P.O. Box 31847
Mail Code: FC-12A
Charlotte, NC 28231-1847

SUBJECT: EVALUATION OF DUKE COGEMA STONE & WEBSTER'S APRIL 23, 2002 LETTER

Dear Mr. Hastings:

The staff reviewed the information provided in your April 23, 2002, letter and provides its evaluation of that information in the enclosure to this letter. The information provided in your letter has been aligned to the open items in the staff's draft Safety Evaluation Report dated April 30, 2002. The staff expects that Duke Cogema Stone & Webster (DCS) will provide additional information for items listed as "Open Items" in Enclosure 2 of the letter.

Sincerely,

/RA/

Andrew Persinko, Sr. Nuclear Process Engineer
Special Projects Section
Division of Fuel Cycle Safety
and Safeguards
Office of Nuclear Material Safety
and Safeguards

Docket: 70-3098

Enclosure: NRC Evaluation of DCS's 4/23/02 Ltr

cc: Mr. James Johnson, DOE
Mr. Henry Porter, SC Dept. of H&EC
Mr. John T. Conway, DNFSB
Mr. Louis Zeller, BREDL
Ms Glenn, Carroll, GANE

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#17 in Enclosure 2

FS-3 Propagation of heat through pneumatic transfer systems

In its April 23, 2002, letter, Duke Cogema Stone & Webster (DCS) requested clarification of this issue. During the October 15, 2001, meeting, DCS and staff discussed how fires are prevented from propagating between fire areas through interconnected systems such as the pneumatic tubes and sampling systems. DCS indicated that the pneumatic transfer tubes are non-combustible, and lack continuous combustibles, therefore, it was unlikely that the fire could spread though the tubes. However, the applicant indicated the propagation of hot gases through the tubes could pose a fire hazard downstream of the fire area and that it was not fully evaluated. The applicant is evaluating the propagation of hot gases through pneumatic transfer tubes. If this hazard poses a fire risk in the downstream fire area, then principal structures, systems, and components (PSSCs) such as sliding valves will be identified to isolate the pneumatic tubes. Therefore, the propagation of hot gases through pneumatic transfer tubes has not been adequately resolved and is considered an open issue. The applicant committed to provide methodologies and input assumptions for determining fire hot gas propagation during construction approval.

#23, #29 in Enclosure 2

CS-10 A suitable design basis for habitability in the Emergency Control Room has not been identified (DSER Section 8.1.2.6.1).

In clarification 27 in Enclosure 1 of DCS's April 23, 2002, letter, the applicant committed to provide design basis information for asphyxiating gases. The response also identifies monitoring in the Emergency Control Room as an "IROFS function." As identified in the Construction Authorization Request (CAR), PSSCs are designed to meet the temporary emergency exposure limits (TEELs) for events identified in the hazards analysis.

The staff reviewed the information in DCS's April 23, 2002, letter. DCS identified one event that requires operator action outside of the control room but indicated that the progression of this event is slow, thus allowing the operator action to be performed. The response implies that the applicant is continuing its review of event sequences that have the potential to exceed the performance requirements. The staff expects that the applicant will further describe this event, including more details regarding the operator actions. Additionally, the staff expects that DCS will inform the staff of any other events that require operator action outside of the control room when DCS completes its review.

Regarding the TEELs, it is not clear if DCS considers the TEELs to be design bases. Further, as noted in the draft Safety Evaluation Report (SER), the staff anticipates the design bases might include limits, other than TEELs, that are suitable for longer exposure periods to chemicals. If the applicant intends to use short-term exposure limits, then sufficient justification should be provided for the use of such limits.

Thus, this item remains open.

Enclosure

#33 in Enclosure 2

AP-1 With respect to the electrolyzer, the applicant has not provided sufficient justification for protecting the electrolyzer against the over-temperature event in the hazards analysis. This applies to the dissolution and silver recovery units (DSER Section 11.2.1.2)

In clarification 3 in Enclosure 1 of DCS's April 23, 2002, letter, the applicant reorganized material from the CAR. In the response, the applicant did not provide additional design basis information. Additional, non-design basis information is provided to clarify the safety strategies The response states temperature sensors will be present to preclude an over-temperature event in the electrolyzer. The location and effectiveness of the sensors will be evaluated in the Integrated Safety Analysis (ISA). The applicant further states that detecting the temperature rise at the heat source mitigates any potential over-heating of the electrolyzer that may result from diminished cooling (such as from clogging by the plutonium dioxide powder). Powder morphology, flow, and electrical parameters are not controlled safety parameters due to the ability to detect and prevent over-heating with the identified temperature sensors.

The staff reviewed the information in DCS's April 23, 2002, response. For the loss of confinement-over-temperature event, the PSSC for prevention is identified as the Process Safety I&C system, with the safety function of shutting down process equipment prior to exceeding temperature safety limits. The applicant has added new information indicating the temperature sensors are provided at the source of heating to ensure process is shutdown, by cutting power to the electrolyzer, prior to exceeding safety limits. However, this new information is not identified as part of the design basis.

As noted in the draft SER, the staff review indicates a number of parameters in the CAR and applicant responses (such as voltage/electrical, silver ion concentration(s), and flammable vapor limits) that could be used to avoid fire and over-temperature events and, thus, might be part of the safety design basis for the electrolyzer. For example, electrical parameters are frequently monitored and cooling water flow maintained as part of industrial safety systems for electrolytic processes, and the applicant, in the response to Request for Additional Information (RAI) 50, mentioned that the voltage will be limited.

The additional information from the applicant's April 23, 2002, letter does not provide assurance that the temperature sensor(s) will be measured at the location of the expected highest temperature(s) and that the electrolyzer system will naturally cool to a safe condition once the power has been terminated (i.e., no thermal inertia or a reaction ramp - exotherm - has not been initiated).

The staff also believes the applicant needs to verify that any lessons-learned from experience at facilities in France and chemical process industry practice with electrolyzers have been adequately considered and addressed by the design bases and control strategy. Consequently, the staff concludes the applicant has not provided sufficient justification for protecting the electrolyzer against the over-temperature event in the applicant's hazard and accident analysis. Thus, this item remains open.

#34 in Enclosure 2

AP-2 With respect to the electrolyzer, the applicant's hazard and accident analysis did ADAMS;ML_ADAMS^HQNTAD01;021790068;1001**not consider fires and/or explosions caused by ignition of flammable gases generated by chemical reactions and or electrolysis, such as from an overvoltage condition. This applies to the dissolution and silver recovery units (DSER Sections 11.2.1.2 and 11.2.1.10).**

In clarification 3 in Enclosure 1 of DCS's April 23, 2002, letter, the applicant reorganized material from the CAR. In Enclosure 1 of the April 23, 2002, letter, the applicant did not provide additional design basis information. Additional, non-design basis information is provided to clarify the safety strategies. The response states temperature sensors are present to preclude an over-temperature event in the electrolyzer. The location and effectiveness of the sensors will be evaluated in the ISA. The applicant further states that detecting the temperature rise at the heat source mitigates any potential over-heating of the electrolyzer that may result from diminished cooling (such as from clogging by the plutonium dioxide powder). Powder morphology, flow, and electrical parameters are not controlled safety parameters due to the ability to detect and prevent over-heating with the identified temperature sensors.

The staff reviewed the information in DCS's April 23, 2002, letter. For the Explosion - Aqueous Polishing (AP) Vessel Over Pressurization event, the PSSC for prevention is identified as Chemical Safety Controls, with the safety function of ensuring control of the chemical makeup of the reagents and ensuring segregation and separation of vessels and components from incompatible chemicals. The applicant provided the following additional information: "Ensure normality of nitric acid in catholyte is above a value that assures hydrogen production from hydrolysis remains 25 percent below the Lower Explosive Limit (LEL) (i.e., less than 1 percent volume in air)." The new information is not identified as part of the design basis.

As stated in the draft SER, the applicant's hazard and accident analysis did not consider fires and/or explosions caused by ignition of flammable gases generated by chemical reactions and/or electrolysis. The staff notes the discussion about the use of scavenging and emergency air systems to preclude the possibility of explosions, based upon the rate of hydrogen generated by radiolysis. In the response to RAI 122, the applicant provided supplemental information on the scavenging air flow for "... radiolysis risk mitigation based on the renewal of the atmosphere of the free volume in vessels containing plutonium." A maximum hydrogen concentration of 1 percent is discussed for radiolysis but no design bases are identified. In Enclosure 1 of the subject letter, a separate event group is identified for "radiolysis-induced explosion." For the event of concern ("Explosion - AP Vessel Over-Pressurization"), the additional information does not address the staff's concerns; additional PSSCs and design basis are not identified (e.g., administrative controls for chemical analyses/acid normality, a hydrogen limit, and/or the process instrumentation and control (I&C) system [e.g., for a voltage limit]), the safety function and additional information appear to be contradictory (chemical feed makeup and segregation versus process control), and the additional information does not follow normal chemical trends (e.g., maintaining an acid normality above a minimum value normally increases - not decreases - hydrogen during electrolysis; excess hydrogen generation will occur at higher voltages anyway).

Considering the above, the applicant has not shown that flammable gas generation and ignition cannot produce an event exceeding the performance requirements of 10 CFR Part 70. Thus, the staff restates the need for a flammable gas (e.g., hydrogen) design basis explicitly for this unit that incorporates potential unknowns from chemical reactions and electrolysis. The applicant has not provided a safety design basis for the gas spaces in the electrolyzer and the ullage spaces in the dissolution unit. Based on the applicant's hazard and accident analysis, the applicant should provide additional design basis information for flammable gases and vapors around the electrolyzers and associated systems or provide justification that it is not necessary.

In summary, the staff concludes that additional information is still needed for: (1) the design basis limit for hydrogen and other flammable gases; and (2) clarifying the apparent discrepancy regarding chemical safety controls. Thus, this item remains open.

#35 in Enclosure 2

AP-3 The applicant's hazard and accident analysis did not include events involving titanium, such as titanium fires. Accident events should be evaluated and PSSCs identified as necessary. This applies to the dissolution and silver recovery units (DSER Sections 11.2.1.2 and 11.2.1.10).

In clarification 3 in Enclosure 1 of DCS's April 23, 2002, letter, the applicant reorganized material from the CAR. In Enclosure 1 of the April 23, 2002, letter, the applicant did not provide additional design basis information. Additional, non-design basis information is provided to clarify the safety strategies. The response states temperature sensors are present to preclude an over-temperature event in the electrolyzer. The location and effectiveness of the sensors will be evaluated in the ISA. The applicant further states that detecting the temperature rise at the heat source mitigates any potential over-heating of the electrolyzer that may result from diminished cooling (such as from clogging by the plutonium dioxide powder). Powder morphology, flow, and electrical parameters are not controlled safety parameters due to the ability to detect and prevent over-heating with the identified temperature sensors.

In clarifications 4 and 5 in Enclosure 1 of the April 23, 2002, letter, the applicant identifies the safety strategy for fires in AP gloveboxes (which contain the electrolyzers) as mitigation; the C3 system is identified as the PSSC for the site worker and the public. For the facility worker, "Training and Procedures" is identified as the PSSC (the staff notes that training and procedures are management measures, not PSSCs, that assure that the operator action PSSC is available and reliable). For titanium fires, the applicant states they are only credible during special maintenance activities. The applicant also commits to assuring that process equipment is devoid of bulk quantities of special nuclear materials which could result in exceeding the performance requirements of 10 CFR Part 70. The applicant also notes that the form of titanium at the facility (identified as a solid bulk form) precludes the possibility of titanium fires. The applicant mentions that massive titanium shapes will only ignite under extreme conditions, such as an oxygen atmosphere. The staff notes that parameters are not defined for "solid bulk form" and "massive titanium shapes," and for bulk quantities of special nuclear materials.
The staff reviewed the information in DCS's April 23, 2002, letter. For the fire event (AP/MP C3 Glovebox Areas), the PSSC for mitigation for the site worker and public is the C3

confinement system, and the safety function is remaining "... operable during design basis fire and effectively filter any release." The additional information provided by the applicant is, "All radiological consequences to the site worker, public, and environment from a fire involving the electrolyzer are mitigated by this principal SSC." The PSSC for mitigation for the worker is "Training and Procedures," and the safety function is, "Ensure that facility workers take proper actions to limit dose." The additional information is, "Maintenance activities increasing fire risk (e.g., welding) to be performed when vessels are devoid of bulk quantities of materials."

A titanium fire would also result in significant over-temperatures, which are grouped under a separate event in Enclosure 1 of the April 23, 2002, letter. For the loss of confinement over-temperature event, the PSSC for prevention is identified as the Process Safety I&C system, with the safety function of shutting down process equipment prior to exceeding temperature safety limits. The applicant has added new information indicating the temperature sensors are provided at the source of heating to ensure process is shutdown, by cutting power to the electrolyzer, prior to exceeding safety limits. This new information is not identified as part of the design basis. (See AP-1 above for discussion of temperature sensor location and power to the electrolyzer).

The staff review notes that the electrolyzer uses titanium and has a heat exchanger-like design. There are literature reports of heat exchangers containing titanium tubes igniting during welding and other operations. There have also been incidents during maintenance and inspection activities on titanium metal materials (not powders) initiated by battery powered equipment. Thus, the staff concludes that titanium fires are credible. The staff notes the applicant has committed to assuring that process equipment is devoid of bulk quantities of nuclear materials prior to performing special maintenance activities which could result in exceeding the performance requirements of 10 CFR Part 70, but it is unclear if this is a design basis. The staff notes the consequences of a potential titanium fire during maintenance activities might not be effectively mitigated by the proposed PSSCs (the C3 confinement and the fire safety features; fire extinguishing agents like carbon dioxide, nitrogen, and water react with burning titanium and are not suitable). The staff needs calculations or additional design bases (for example, industry guidelines on the use of titanium) to address the concerns of potential fires during maintenance activities.

The staff review also notes that routine operation of the electrolyzer involves large electrical currents comparable to or exceeding typical welding currents that might occur during maintenance activities. Although the electrolyzer includes an isolation system for electrical current, it is not identified as a PSSC for fire events. The titanium in the electrolyzer is exposed to concentrated nitric acid and may become more reactive. The Material Data Safety Sheet (MSDS) for titanium also lists incompatibility with nitric acid. In addition, impurities, such as transition metal compounds, will likely be introduced into the dissolver as part of normal operations. Thus, iron oxides will likely be present and, with sufficient sparking, may initiate fire-like reactions with the titanium. Hydrogen generation - from radiolysis and electrolysis - will occur; titanium can easily form hydrides. If a titanium fire is initiated, the applicant has not shown that its proposed approach of mitigation via the C3 system and fire safety features will meet the performance requirements of 10 CFR Part 70.

The staff finds that the applicant needs to further address titanium metal fire hazards in the safety assessment, considering both maintenance and operations. The applicant's hazard and

accident analysis did not include events involving titanium, such as titanium fires. Accident events should be evaluated and PSSCs identified, if necessary. This may involve means to monitor local metal temperatures, detect metal fires, avoid over-temperature, avoid sparks, and/or actively quench the metal and components. Thus, this item remains open.

#36(1) in Enclosure 2

AP-4 The design basis value of the corrosion function of the fluid transport system PSSC should address instrumentation and/or monitoring of lower alloy components (stainless steel) that could be exposed to aggressive species (silver II) in the dissolution and silver recovery units (DSER Sections 11.2.1.2 and 11.2.1.10).

In clarification 6 in Enclosure 1 of DCS's April 23, 2002, letter, the applicant recognizes the potential hazards associated with corrosion induced by silver(II). The applicant states the consequence analysis from the CAR determined that event sequences resulting in leaks do not result in exceeding the performance requirements of 10 CFR Part 70. The applicant concludes that a design basis for leaks due to silver(II) corrosion of stainless steel equipment is not necessary. The applicant notes that corrosion may challenge the geometry for criticality safety of the process equipment and is still evaluating the necessity of controls and design bases for preventing a criticality. The applicant identifies the use of peroxide as a design feature to reduce the likelihood of silver(II) induced corrosion.

The staff reviewed the information in DCS's April 23, 2002, letter. There are two aspects of the staff's concern: (1) the design bases of the corrosion program and (2) the consequences of leaks.

With respect to (1), as noted in the draft SER and by the applicant's clarification, lower alloys can be inadvertently exposed to aggressive conditions; for example, stainless steel would likely experience uneven pitting corrosion that could lead to premature leaks and failures if it is routinely exposed to low concentrations of silver(II) ions. The applicant has proposed a generic corrosion control program as a PSSC. This appears to be based upon general corrosion. The pitting corrosion that could occur from silver(II) ions might not be detected prior to failure by the proposed PSSC of a general corrosion control program, and, thus, the potential exists for the corrosion leak to release plutonium compounds (i.e., a loss of confinement). The applicant should identify the design basis value of the corrosion safety function of the fluid transport system PSSC.

With respect to (2), in Table 5.5-10 from Section 5.5 of the CAR, the applicant has identified a control strategy for leaks of AP process vessels and pipes in process cells. This control strategy uses the process cell and its associated ventilation system as the PSSC for loss of confinement events. The applicant intends to contain fluid leaks within the cell and any airborne contamination would be treated with high efficiency particulate air (HEPA) filtration prior to exhaust. The PSSC of Process Cell Entry Controls prevents the entry of personnel into process cells during normal operations and ensures that workers do not receive a dose in excess of limits while performing maintenance. The actual fluid leaks would not be prevented. As discussed in the draft SER, the staff review has identified a potential event involving an acute chemical exposure to facility and site workers from hazardous chemicals produced from

licensed materials that leak from AP process vessels during such a loss of confinement event. Such a leak could occur due to erosion/corrosion of the vessels and piping. The leak would consist of radioactive nitrate solutions which, once released from the vessels and pipes, would expose a large liquid surface area that allows a nitric acid and NOx release into the cell's atmosphere. This material would not be removed by the HEPA filters on the exhaust system and would be released to the atmosphere. For 100-200 gallons of radioactive nitrate solutions, TEEL-3 limits would be exceeded for several hundred meters. Some of the solutions might be at temperatures above ambient which could result in TEEL-3 limits being exceeded for larger distances. Thus, the item remains open (this is identified as draft SER finding AP-13).

#37/#47 (Waste Acceptance Criteria (WACs), Savannah River Site (SRS) acceptance), #38/#48 (design basis of liquid waste unit, maximum inventory) in Enclosure 2

AP-5 Confirm that the wastes generated will conform to the SRS WACs and that SRS will accept these wastes, based on the program redirection (DSER Section 11.2.1.12); identify any PSSCs and design bases for the waste unit, such as maximum inventories (DSER Section 11.2.1.12).

In clarification 21 in Enclosure 1 of DCS's April 23, 2002, letter, the applicant provided a response that replaced its previous response to RAI 135. In the clarification, DCS commits to clarify the design for this unit at a later date. The applicant refers to Section 10.5.2 of the CAR for the design bases for waste management. The staff review notes that Section 10.5.2 contains a list of documents that "... provide guidance for the design of waste and operational systems for fuel fabrication facilities." In the clarification, DCS commits that the facility will meet the Waste Acceptance Criteria (WAC) and that DCS and SRS will enter into an agreement assuring the acceptance of mixed oxide (MOX) fuel fabrication facility (MFFF) wastes. As part of the commitment to clarify the design of the unit, DCS will clarify the basis for the selection of the maximum inventory of radioactivity and liquids, and the actions taken if the inventory limit is reached.

The staff reviewed the information in DCS's April 23, 2002, letter. While DCS has committed to meeting the WAC and to provide maximum inventories in the waste unit, the issue of PSSCs and design bases for the waste unit has not been adequately addressed. In addition to maximum inventory, other potential design bases associated with waste processing in the waste unit that are needed to meet the performance requirements should be provided. Thus, this item remains open.

Item 38 in Enclosure 2 in DCS's April 23, 2002, letter, states the applicant will provide clarification regarding design bases and PSSCs related to the Liquid Waste Reception Unit and maximum inventory of radioactivity and liquids and is listed as open.

#39 in Enclosure 2

AP-7 Parameters have not been identified for the plutonium feed to the facility. PSSCs and design bases should be identified for this feed material or a justification provided that it is not necessary (DSER Section 11.2.1.1).

In clarification 23 in Enclosure 1 of DCS's April 23, 2002, letter, DCS cites CAR Chapter 6 and Section 9.1.3.1 (Table 9-3) as the design bases for the plutonium feed. In Enclosure 2 of the subject letter, it is identified as Item 39 and listed as addressed in the DCS letter.

The staff reviewed the information in DCS's April 23, 2002, letter. As noted in Section 11.2.1.1 of the draft SER, plutonium feed parameters may affect the design and safe operation of the facility. The applicant's letter only addresses radiological parameters; chemical and morphology parameters are not addressed. As regards the radiological parameters, Table 9-3 lists three columns (essentially corresponding to 0, 40, and 70 years of decay), and the applicant should identify which values are identified as design bases. The staff notes that chemical impurities (e.g., listed in draft SER Table 11.2-1) influence facility design and the inclusion of alternate feedstock material (essentially less pure plutonium) is resulting in design changes and the handling of additional chemicals (e.g., chlorine) and potentially hazardous operations (e.g., additional electrolysis). The staff anticipates there may be similar design impacts from physical parameters, such as morphology and matrix. The applicant should state whether chemical impurity and morphology values are design bases for specific PSSCs in the facility or justify why they are not design bases. Thus, this item remains open.

#43, #44, #45 in Enclosure 2

AP-8 A design basis and PSSCs are needed for flammable gases and vapors in the Offgas unit (DSER Section 11.2.1.11).

In clarification 18, the applicant commits to providing additional design basis information on the Red Oil phenomena and to clarify the design basis for the Offgas system. In clarifications 19 and 20, the applicant commits to clarify the design basis for the Offgas system.

In Enclosure 2 of the subject letter, Items 43, 44, and 45 are identified for this issue and listed as open.

In Enclosure 3 of the subject letter, the applicant states the design basis level for hydrogen in the offgas system is 1 percent (25 percent of the LFL in air). The applicant also states that, for those systems that have the potential to exceed a 4 percent concentration (in seven days, based upon calculations), emergency scavenging air is provided to limit the hydrogen concentration to 1 percent (25 percent of the LFL).

The staff reviewed the information in DCS's April 23, 2002, letter. The staff accepts the design basis level of 1 percent (25 percent of the LFL in air) for hydrogen in the Offgas unit. The staff has concerns about the accuracy of the calculations used to determine which systems receive emergency scavenging air. A level of 4 percent hydrogen (100 percent of the LFL in air) provides no margin and does not consider uncertainties in the calculations. Consequently, the staff does not accept the 4 percent limit. The applicant should provide sufficient justification why the 4 percent limit provides adequate assurances of safety or use a lower, more

conservative limit that addresses the inherent uncertainties in the calculations. Thus, this item remains open.

#50 in Enclosure 2

MP-1 PSSC and design basis information associated with the pyrophoric nature of some UO_2 powders (DSER Section 11.3.1.2.1).

In clarification 22, the applicant reiterated its February 11, 2002 letter. This response was evaluated as part of the draft SER. The applicant states burnback could occur during offnormal conditions if the inert atmosphere has been replaced by air (the applicant has not currently identified a safety function for the inert atmosphere). The applicant indicates burnback has been taken into account in the thermal analysis of the MFFF during offnormal conditions, and cites the RAI 49 response. No PSSCs or design bases are identified by the applicant to address burnback concerns. Additionally, thermal analyses are not presented in the responses.

The staff reviewed the information in DCS's April 23, 2002, letter. The staff concludes that a potential pyrophoric reaction or burnback of uranium dioxide cannot be dismissed because it has occurred several times during fine UO_2 powder processing in existing fuel fabrication facilities. This burnback could potentially impact several units in the MP area that handle fine UO_2 powder by itself or blended with plutonium dioxide. Such a burnback event could result in the release of large quantities of uranium oxides (a chemical toxicity concern), the release of plutonium powders from the commingled blend, and/or initiate other large loss of confinement events, such as major fires, that could release the radioactive materials. Thus, this item remains open.

51 in Enclosure 2

MP-2 PSSC and design basis information associated with the pyrophoric nature of some PuO_2 powders (DSER Section 11.3.1.2.3). (RAI 49)

In clarification 22, the applicant reiterated its February 11, 2002 response. This response was evaluated as part of the draft SER. The staff found that PuO_2 is often present as a substoichiometric oxide (i.e., PuO2-x) and prone to absorb moisture unless it has been calcined and held at a temperature of circa 900 degrees C for two hours to stabilize (ceramicize) the material. Unstabilized plutonium dioxides may exhibit pyrophoric reactions in air, due to its substoichiometry or the radiolysis of absorbed water, which could lead to a loss of confinement and release or initiate other events, such as fires. Furthermore, at the February 13, 2002, public meeting, the applicant stated that a review was underway to determine if unstabilized PuO_2 would be received by the facility. The staff review of the calcining section of the AP process (see Section 11.2x) did not identify any PSSCs or design bases for ensuring that stabilized PuO_2 powder would be produced. The staff concludes that the applicant's proposed approach does not provide adequate assurances of preventing potential pyrophoric events with substoichiometric PuO_2. Thus, this item remains open.

#52, #60 in Enclosure 2

MP-4 PSSC and design basis information associated with the sintering furnace regarding potential explosions in the room due to a hydrogen leak (DSER Section 11.3.1.2.4).

In clarifications 28 and 29, the applicant refers to its February 11, 2002, letter for identification of PSSCs and design bases for the sintering furnace area. The applicant further states that numerous IROFS controls act to shut down the furnace prior to seal failure; these controls consist of pressure, temperature, cooling flow, oxygen and hydrogen monitoring and controls. The draft SER included the consideration of the applicant's letter of February 11, 2002.

In clarification 31 of Enclosure 1 in the April 23, 2002, letter, the applicant committed to providing additional information on the design bases for the sintering furnace, including a standard for sensor placements and PSSC designations for detectors and interlocks. In Enclosure 2, this is identified as Item 52 and listed as open.

As noted in the draft SER, the staff requested clarification and additional information on the controls around the sintering furnaces, including the hydrogen detectors, as this appears to involve a complex mixture of hydrogen detectors, oxygen sensors, and pressure controls. In the draft SER, the staff identified PSSC and design basis information associated with the sintering furnace as an open item. The staff remains concerned that additional PSSCs and design bases may be needed for the sintering furnace area. In particular, the hydrogen-argon flow to the furnace is not terminated based upon any sensor or control system action within the furnace area, half of the operating mixture range is in the flammable region, the sintering furnace temperature is above the auto-ignition limit of hydrogen in air, the rationale for using a potentially flammable hydrogen-argon mixture is not justified, the interaction between local and control room alarms are not delineated, and design basis values are not identified for the glovebox sensors. Thus, this item remains open.

#52 in Enclosure 2

FLS-1 Hydrogen explosion in the glovebox outside of the sintering furnace airlock due to insufficient purging of the airlock

As stated in Appendix A, Item FLS - 1, of the MFFF draft SER, the accident scenario of a hydrogen explosion in the glovebox outside the sintering furnace airlock due to insufficient purging in the airlock needs to be developed. (DSER Section 11.9.1.1)

DCS stated in its letter dated April 23, 2002, that failure of the nitrogen supply would not potentially lead to explosive conditions in the inlet or outlet gloveboxes, because, under normal conditions, the inlet and outlet gloveboxes have a nitrogen purge that would remove oxygen or hydrogen before explosive levels were reached. DCS noted that the process safety control system has been identified as a PSSC to stop the operation of the sintering furnace airlocks during a "global" loss of nitrogen supply gas, and therefore preclude a hydrogen explosion outside the sintering furnace.

The staff believes that this response does not adequately address the issue and that additional clarification is necessary. If the nitrogen system is not a PSSC, as DCS has stated, then the

confinement function of the sintering furnace inlet and outlet airlocks to prevent a fire or explosion becomes more important. The staff notes that the sintering furnace airlocks provide a confinement function when closed that serves to reduce or eliminate the possibility that oxygen or hydrogen could accumulate in the inlet and outlet airlocks. The staff also notes that the confinement function may require a certain physical operation to return to the confinement position and be "locked closed" when ordered by the process control system. The staff further notes that the confinement function presupposes a certain level of allowed leakage. Therefore, DCS should: (1) provide the design basis for this system, to include pertinent operating parameters, such as time to respond, time to close, volume, flow rates, any important sealing characteristics, allowed leakage rates, etc; (2) provide the rationale for how the accident scenario can be prevented if the process safety control system is the only system identified as a PSSC. In providing that rationale, DCS should describe the role of the airlocks and their ability to perform a confinement safety function, given that they have not been designated as PSSCs; and (3) describe the indicators that will be used by the process control system to detect a "global" loss of nitrogen supply gas, and why they are reliable indicators. Included in this discussion of indicator reliability, DCS should describe why a local loss of nitrogen supply is not an initiating event. Due to these questions, this item remains open.

#61 in Enclosure 2
FLS-2 Nitrogen blanket on the hydroxylamine and hydrazine tanks

As stated in Appendix A, Item FLS - 2, of the MFFF SER, DCS stated that the purpose of the nitrogen blanket on the hydroxylamine nitrate (HAN) and hydrazine tanks are to displace and prevent air from entering these tanks, thereby eliminating flammability concerns. The staff has continuing concerns that this is an apparent safety function and that no PSSCs have been identified for this system. (DSER Section 11.9.1.1)

DCS stated in its letter dated April 23, 2002, Item 26, that (1) DCS will provide additional information regarding the HAN/hydrazine hazards in the AP area, and (2) that nitrogen blanketing is not a principal SSC for the HAN/hydrazine tanks in the reagents processing building (BRP), and (3) that events in BRP do not involve licensed materials, and are bounded by the postulated external explosion event, and do not involve operators performing IROFS functions. DCS also stated in its April 23, 2002 response that the nitrogen blanketing on the hydrazine tanks is not a PSSC. DCS stated that the purpose of nitrogen blanketing on the aqueous hydrazine tanks is to exclude oxygen that may react with the hydrazine, decreasing the quantity available for the process. DCS stated that hydrazine is supplied at a 35 percent concentration, is used in the reagent building (less in the AP process), and is not a flash or fire point per ASTM Method D92. The staff notes that Item 26 of the DCS letter states the concentration of hydrazine supplied and used in the reagent building but does not discuss the potential level of hydrazine fumes that may build up in the gas space of a hydrazine tanks and any PSSCs, if necessary, to control those levels.

Therefore, the staff concludes that the information submitted to date by DCS (including the April 23, 2002 letter) does not resolve this issue. This item will remain open until: (1) DCS resolves issue number CS-5 on hazardous chemical releases and their possible impacts on operator safety functions (see DSER), and (2) DCS describes why the likelihood of a fire or explosion, and/or the consequences of a fire or explosion, and a related event leading to a release, in the

hydrazine tanks is acceptably low or provides PSSCs designed to reduce the likelihood or consequences of an accident to acceptable levels and how they meet the applicable performance requirements (staff also notes that the April 23, 2002 letter only addresses hydrazine). Therefore, items on HAN and hydrazine remain open.