DUKE COGEMA
STONE & WEBSTER

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U.S. Nuclear Regulatory Commission
Washington, D.C. 20555

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DCS-NRC-000157

Subject: Docket Number 070-03098
Duke Cogema Stone & Webster
Mixed Oxide (MOX) Fuel Fabrication Facility
Response to Request for Additional Information – Chemical Safety Open Items CS-09, AP-02, AP-08, and AP-09

References: 1) R. C. Pierson (NRC), *Draft Safety Evaluation Report on Construction of Proposed Mixed Oxide Fuel Fabrication Facility, Revision 1*, Dated 30 April 2003

As part of the review of Duke Cogema Stone & Webster's (DCS') Mixed Oxide Fuel Fabrication Facility (MFFF) Construction Authorization Request (CAR) documented in the Draft Safety Evaluation Report (Reference 1), NRC Staff identified open items related to Chemical Safety. In addition to items identified in Reference 1 above, NRC clarified their requests in a July 2003 public meeting. To facilitate resolution to the request for additional information, DCS has enclosed additional information regarding Open Items CS-09, AP-02, AP-08, and AP-09

If I can provide any additional information, please feel free to contact me at (704) 373-7820.

Sincerely,

Peter S. Hastings, P.E. for
Manager, Licensing and Safety Analysis

Enclosure 1: Chemical Safety DSER Open Item Responses

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Enclosure 1
Chemical Safety DSER Open Item Responses

Open Item CS-09, AP-02, AP-08 and AP-09 - Lower Flammability Limit:

A follow up teleconference to the Open Items AP-2 and CS-09, AP-08, and AP-09 from letter DSC-NRC-00142, dated 05 June 2003, was held on Wednesday, 11 June 2003. As a result of this teleconference, the NRC clarified its position regarding what constitutes an adequate margin between noncombustible and combustible conditions.

> **The NRC stated that 25% of the lower flammable limit (LFL) is used as a design basis safety margin by the DOE Hanford and Savannah River Sites. The NRC cited references [1] and [2] from these sites and NFPA 69-1997 to support this position. The NRC asked DCS to provide additional information to justify the use of different values for the design bases.**

Response:

DCS proposes to use the guidance provided in NFPA 69-1997 as the design basis for control of flammable mixture concentrations within the AP process vessels. NFPA 69 provides various options to accomplish this including the following:

- The combustible concentration shall be maintained at or below 60% of the LFL when automatic instrumentation with safety interlocks is provided, or

- The combustible concentration shall be maintained at or below 25% percent of the LFL

Within equipment in the solvent extraction, solvent recovery, and waste units, DCS proposes the following for control of the flammable hydrocarbon concentration:

- Design Basis: The combustible concentration shall be maintained at or below 60% of the LFL when automatic instrumentation with safety interlocks is provided.

- Principle SSCs/Safety Function:
  - Process Safety Control Subsystem - ensure that external sources of heat are limited so as to ensure that 60% of the LFL is not exceeded. This PSSC will be implemented by monitoring the process temperature and terminating the heat source prior to exceeding the temperature limit (e.g., 50 °C for HPT).
  - Chemical Safety Controls - ensure that the process temperature, corresponding to the 60% LFL limit, which may result from exothermic chemical reactions, is not exceeded. This will be implemented by controlling the concentrations and/or flowrates of reagents.

It should be noted that either of the above design options can be selected during final design and confirmed in the ISA without significant changes to the design.

Within equipment in the oxalic precipitation and the oxalic mother liquor units, DCS proposes the following for control of the flammable hydrocarbon concentration:

- Design Basis: The combustible concentration shall be maintained at or below 25% of the LFL.
- Principle SSCs/ Safety Function:
    - Process Safety Control Subsystem – Prevent diluent from entering into equipment at elevated temperatures such that flammable concentrations of hydrocarbons do not occur. This will be implemented by online redundant measurements (density or conductivity for example).

It should be noted that either of the above design options can be selected during final design and confirmed in the ISA without significant changes to the design.

Within equipment at elevated temperatures (evaporator) in the acid recovery unit, DCS proposes the following for control of the flammable hydrocarbon concentration:

- Design Basis: The combustible concentration shall be maintained at or below 25% of the LFL.
- Principle SSCs/ Safety Function:
    - Process Safety Control Subsystem – Prevent diluent from entering into equipment at elevated temperatures such that flammable concentrations of hydrocarbons do not occur. This will be implemented by online redundant measurements (density or conductivity for example).

It should be noted that either of the above design options can be selected during final design and confirmed in the ISA without significant changes to the design.

Within equipment not at elevated temperatures in the acid recovery unit, DCS proposes the following for control of the flammable hydrocarbon concentration:

- Design Basis: The combustible concentration shall be maintained at or below 60% of the LFL when automatic instrumentation with safety interlocks is provided.
- Principle SSCs/Safety Function:
    - Process Safety Control Subsystem - ensure that external sources of heat are limited so as to ensure that 60% of the LFL is not exceeded. This PSSC will be implemented by monitoring the process temperature and terminating the heat source prior to exceeding the temperature limit.
    - Chemical Safety Controls - ensure that the process temperature, corresponding to the 60% LFL limit, which may result from exothermic chemical reactions, is not exceeded. This will be implemented by controlling the concentrations and/or flowrates of reagents.

It should be noted that either of the above design options can be selected during final design and confirmed in the ISA without significant changes to the design.

For control of the hydrogen concentration associated with radiolysis, DCS proposes the following:

- Design Basis: The combustible concentration shall be maintained at or below 25% percent of the LFL.
- Principle SSCs/Safety Function:
  - KWG exhaust gas ventilation system – provide exhaust path for the removal of the diluted hydrogen gas in process vessels.
  - Instrument Air System - provide sufficient scavenging air to dilute the hydrogen generated during radiolysis such that flammable concentrations of hydrogen do not occur.

For control of the H2 concentration associated with electrolysis within the dissolution processes, DCS proposes the following:

- Design Basis: The combustible concentration shall be maintained at or below 25% percent of the LFL.
- Principle SSCs/Safety Function:
  - Process Safety Control Subsystem – limit the generation of hydrogen by ensuring that the normality of the nitric acid is sufficiently high to ensure that the off-gas is not flammable.

References

[1] Jain, V., R. Pabaian, D. Daruwalla, J. Weldy and D. Pickett; "Review of BNFL Inc. Design Safety Features Deliverable: Hydrogen Control in High-Level Waste Storage Tanks," CNWRA 99-001, Rev. 1 April, 1999

[2] Hobbs, D. T., *"Possible Explosive Compounds in the Savannah River Site Waste Tank Farm Facilities (U)"*, Savannah River Technology Center, WSRC-TR-91-444, Revision 3, February 15, 2000