11.0 PLANT SYSTEMS
11.10 HEAVY LIFT CRANES

11.10.1 Conduct of Review

This chapter of the revised DSER contains the staff's review of the heavy lift cranes described by the applicant in the revised CAR. The objective of this review is to determine whether heavy lift crane principal structures, systems and components (PSSCs) and their design bases identified by the applicant provide reasonable assurance of protection against natural phenomena and the consequences of potential accidents. The staff evaluated the information provided by the applicant for heavy lift cranes by reviewing Chapter 11.0 and other sections of the revised CAR, supplementary information provided by the applicant, and relevant documents available at the applicant's offices but not submitted by the applicant. The review of the heavy lift cranes' design bases and strategies was closely coordinated with the review of fire protection in Section 7.0 of this revised DSER, the review of chemical safety in Section 8.0 of this revised DSER, the review of accident sequences described in the Safety Assessment of the Design Bases (see Chapter 5 of this revised safety evaluation), and the review of other plant systems.

The review for this construction approval focused on the design basis of heavy lift cranes, their components, and other related information. For heavy lift cranes, the staff reviewed information provided by the applicant for the safety function, system description, and safety analysis. The review also encompassed proposed design basis considerations such as redundancy, independence, reliability, and quality. The staff used Section 11.4.8 in NUREG-1718 as guidance in performing the review of heavy lift cranes.

In the revised DSER discussions that follow, the system descriptions are provided, as well as function, major components, control concepts, and system interfaces.

11.10.1.1 System Description

Duke, Cogema, Stone & Webster (DCS) has not identified cranes, heavy-lift or otherwise, as PSSCs in the Mixed Oxide (MOX) Fuel Fabrication Facility (MFFF or the facility) revised CAR. However, material handling equipment and controls have been identified as PSSCs. IROFS will be identified by DCS in its Integrated Safety Analysis (ISA) summary to be submitted as part of its application for a special nuclear material (SNM) possession and use license.

For the facility, heavy lift cranes are designated as those cranes designed to lift greater than 816 kg [1,800 lbs], as defined in NUREG-0612, "Control of Heavy Loads at Nuclear Power Plants." This load definition limits, to a very few, the number of cranes or lifting devices designated as "heavy lift cranes." Other cranes or lifting devices may be identified as the design matures. The currently identified applications of heavy lift cranes in the facility are bridge cranes in the fresh fuel cask shipping truck bay, the assembly loading area, and the fresh fuel cask handling area, a bridge crane stacker for waste drum handling in room B-254, a bridge crane for handling empty PuO_2 shipping package pallets in room B-163, and a maintenance crane in the emergency diesel generator building.

The facility general design philosophy is stated as preventing lifts above PSSCs. When not possible to avoid lifts above other PSSCs, such as in moving or stacking MOX fresh fuel casks in the truck bay, IROFS will be identified by DCS in its ISA summary to be submitted as part of its application for an SNM possession and use license. In general, heavy lift cranes are not designated as PSSCs because equipment being lifted would be qualified for drops from the maximum lift height of the cranes. For example, the qualification of the MOX fresh fuel package is to maintain confinement integrity of the package for a drop from a height of 30 feet (9.1 m) onto a solid surface. DCS states that the maximum lift height for any piece of equipment in the facility is 16 feet (4.9 m). However, it is possible for cranes to impact PSSCs without a load drop. In this case, the PSSCs identified in the revised CAR are the material handling controls as discussed in the revised DSER review for Section 11.7. The term material handling controls includes controls on material handling equipment and administrative controls. Examples of these controls include safe travel paths, procedures and training to limit crane operations or to properly prepare loads or nearby equipment prior to crane use, and a radiation protection program to ensure workers are protected during maintenance activities. Specific material handling controls will be identified in the ISA summary.

11.10.1.1.1 Function

The function of the facility heavy lift cranes is to lift and move critical loads in a manner consistent with the loads' qualification, to limit inadvertent movement, and to retain loads under all design basis conditions, such as earthquake and loss of power events. Critical loads are loads of a type that, if dropped and the contents released, could result in unacceptable radiological dose consequences to the worker, the public, or the environment. Other non-critical loads may also be moved by this equipment at any time. The heavy lift cranes' functions include controlling movement of the cranes and loads during operation and maintenance so they will not impact other PSSCs.

11.10.1.1.2 Major Components

The major components of the heavy lift cranes are the crane structures, drive motors for positioning and hoisting, the operator's cab or local operating station, and the lights and control systems for the cranes. Crane equipment consists of slings, lifting frames, and other below-the-hook lifting devices. Cranes may also be equipped with auxiliary hoists to perform routine lifting of smaller loads. The capacity of each crane is such that it should meet or exceed the lifted load; the lifted load includes the equipment to be moved plus the weight of the slings and other lifting devices plus applicable design margins specified in the crane design codes and standards.

11.10.1.1.3 Control Concepts

Most of the facility heavy lift cranes will be operated locally by crane operators who are in visual contact with the crane and the load. The crane control stations are local and the controls are conventional and are required in the industry codes and standards, such as American Society of Mechanical Engineers (ASME) B30.2, "Overhead and Gantry Cranes," 1996. The stacker crane in Room B-254 will be designed to operate automatically, with provisions for manual

control as necessary. Similarly, the crane in the assembly loading area will function in automatic mode for some of its operations.

11.10.1.2 System Interfaces

The heavy lift cranes interface with the building structure, the rails on which the cranes run, the girders that span the work area, the electric drives for the bridge, trolley, and hoist, local operating stations, and the lights and control systems for the cranes. The crane may be controlled by radio communication with the operator. In these cases, the interactions between the crane controls and the building security, process monitoring, and control systems will be considered.

11.10.1.3 Design Bases of PSSCs

None of the current cranes or hoists have been identified as PSSCs in Section 11.10 of the revised CAR. There are only two PSSCs over which heavy loads may be lifted: a) the building floor, which has been evaluated for dynamic loads, including drop loads, and b) the emergency generator during maintenance operations. Any non-heavy loads over PSSCs will be done in accordance with Material Handling Controls, which are a PSSC. The applicant states in Section 11.10.7 of the revised CAR that the drop of any load handled by a heavy lift crane would not result in consequences exceeding those stated in the 10 CFR 70.61 performance requirements.

Section 5.0 of the revised CAR discusses load handling events. A load handling hazard is postulated to occur from the presence of lifting or hoisting equipment used in normal or maintenance activities. Examples of load handling events include: a dropped lifted load; a lifted load impacting other equipment during the lift, or; the load handling equipment impacting other nearby items. An event of this type could damage handled loads, thereby dispersing nuclear material or chemicals, damaging nearby equipment resulting in a loss of confinement or loss of subcritical conditions, or damaging IROFS. Such load handling events are evaluated in Chapter 5.0 of this revised DSER.

11.10.2 EVALUATION FINDINGS

In Section 11.10 of the revised CAR, the applicant did not designate heavy lift cranes as PSSCs. Based on the staff's review of the revised CAR and supporting information provided by the applicant relevant to the heavy lift cranes, the staff concurs that heavy lift cranes need not be designated as PSSCs.

11.10.3 REFERENCES

11.10.3.1 American Society of Mechanical Engineers (ASME). B30.2, "Top Running Bridge, Single or Multiple Girder, Top Running Trolley Hoist Overhead and Gantry Cranes." ASME: 1996.

11.10.3.2 _____. ASME B30.9, "Slings.," ASME 1996.

11.10.3.3 _____. ASME B30.16, "Overhead Hoists (Underhung)." ASME: 1998.

11.10.3.4 Crane Manufacturers Association of American (CMAA). 70, “Specifications for Top Running Bridge and Gantry Type Multiple Girder Electric Overhead Traveling Cranes.” CMAA: 1994.

11.10.3.5 ANSI N14.6,, “Radioactive Materials -- Special Lifting Devices for Shipping Containers Weighing 10,000 lbs or More.” ANSI: 1993.

11.10.3.6 Department of Energy (US)(DOE). DOE-STD-3013, “Stabilization, Packaging, and Storage of Plutonium-Bearing Materials,” September 2000.

11.10.3.7 Ihde, R, Duke Cogema Stone & Webster, letter to Document Control Desk, U.S. Nuclear Regulatory Commission, RE. Mixed Oxide Fuel Fabrication Facility—Construction Authorization Request, October 31, 2002.

11.10.3.8 Nuclear Regulatory Commission (US)(NRC). NUREG-1718, “Standard Review Plan for the Review of an Application for a Mixed Oxide (MOX) Fuel Fabrication Facility.” NRC: Washington, D.C. August 2000.