



UNITED STATES  
**NUCLEAR REGULATORY COMMISSION**  
REGION I  
475 ALLENDALE ROAD  
KING OF PRUSSIA, PENNSYLVANIA 19406-1415

August 27, 2003

Docket No. 03036239  
Control No. 132825

License No. 37-30804-02

MEMORANDUM TO: Docket File

FROM: John D. Kinneman, Chief **/RA/**  
Nuclear Material Safety Branch 2

SUBJECT: CFC Logistics, Inc., License Review

Attached is a description of the review conducted on the license application from CFC Logistics, Inc. for an underwater irradiator in Milford Township, PA.

Attachment: As Stated

ML032390038

# **CFC Logistics, Inc., License Review**

Docket No. 03036239  
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## **1.0 Introduction**

In an application dated February 19, 2003, (ML030630036) CFC Logistics, Inc. requested approval of an underwater irradiator (trade name GENESIS I) to be located in Milford Township (near Quakertown), PA. As described in the application, the GENESIS irradiator consists of a water-filled shielding pool constructed of two steel layers with a concrete filled six-inch space between them. The inner steel layer in contact with the pool water is one-quarter inch stainless steel; the outer layer is one-quarter inch carbon steel coated on the outside with a corrosion inhibitor and welded to "I" beams which are also welded to the inner layer. The void between the two is filled with concrete after the tank is placed in the ground. Up to 1 million curies of cobalt-60 in individual sealed sources are to be contained in source holders placed in a heavy, stainless steel, water tight plenum at the bottom of the pool. During use, the plenum is filled with air to minimize attenuation of the gamma radiation by water. The pool is provided with a water treatment system and air is constantly circulated through the plenum. Radiation detectors are provided on both systems to detect leaking sources. The irradiator is designed so that product containers (called "bells" by CFC) can be lowered for irradiation and rest for an appropriate amount of time first on one side of the plenum and then on the other. The bells range in weight from 5000 to 7000 pounds, depending on the product being irradiated. When over the pool, movement of each bell is computer controlled and an operator must be present.

## **2.0 Licensing Review**

### **2.1 Standard Review**

The application was reviewed against the requirements in 10 CFR 20, 10 CFR 30, 10 CFR 36 and the guidance in NUREG-1556, Volume 6, Final Report, Program-Specific Guidance About 10 CFR Part 36 Irradiator Licenses. Questions and deficiencies were resolved through discussions and correspondence with CFC, Grey\*Star, the supplier of the irradiator and C.H. Landis, the fabricator of the irradiator components. (See ML031210348 and ML030980096 regarding the heat generated by the pencils in the plenum; ML031900700 regarding the temperature of the pool water; ML032020137 and ML03203033 regarding specific design features of the irradiator; and, ML032100758, ML032330104 and ML032330107 regarding the hoists and lifting of source casks). The lead for review of the application was with Region I's Division of Nuclear Material Safety, Nuclear Material Safety Branch No. 2. Staff from the Performance Evaluation Branch, Division of Reactor Safety, Region I provided engineering support by reviewing and inspecting component fabrication at the fabrication shop, on site construction including the placement of the tank and overall

## CFC Logistics, Inc., License Review

engineering of the tank. Staff from the Systems Branch, Division of Reactor Safety, Region I, reviewed and inspected the hoists, trolley structure and system controls. Staff from both Branches provided support for the analyses described in Section 4 of this document.

### 2.2 Special Panel

Due to the novelty of the design and the relatively small number of irradiators that are licensed by the Region, a special panel was convened to assess the thoroughness of the review. On June 12, 2003, the Deputy Director, Division of Nuclear Material Safety, the Chief, Systems Branch, Division of Reactor Safety and the State Agreements Officer, a Health Physicist, met with the Chief, Nuclear Materials Safety Branch No. 2, the principal license reviewer and an engineer from the Performance Evaluation Branch, Division of Reactor Safety who provided support for the review to assess the review of this application and the application itself. Each of the attendees had visited the site, discussed the design with representatives of the vendor and reviewed the application, applicable regulations and NRC guidance. The group concluded that the review had been comprehensive and conducted in accordance with NRC guidance. While the group agreed that a license could be issued, due to the fact that this is a new design, the group suggested that the licensee should be requested to provide specific additional information in the following areas:

- Maintenance and inspection, especially of the “bells” and the trolley and hoist systems.

- Actions to be taken in various kinds of emergency.

- Make specified changes to their security procedures.

These were discussed with the applicant and they provided the requested information which was found to be satisfactory. (ML031960588)

### 2.3 Security Aspects

The security provisions incorporated into the application were discussed with the Office of Nuclear Security and Incident Response (NSIR). NSIR has a detailed plan for implementing the irradiator Compensatory Measures (CM) when the license is issued.

### 2.4 Public Meetings

On July 16, 2003 Region I managers and staff attended a public meeting at the invitation of the Milford Township Board of Supervisors and answered questions from local residents concerning regulation of the facility and NRC processes and procedures. On August 21, 2003 Region I managers and staff and representatives of various Headquarters offices held a public meeting in Quakertown, PA, made a presentation

concerning the NRC's review of the CFC application and answered questions from local residents.

### **3.0 Inspection**

The appropriate parts of MC2815, Construction and Preoperational Inspection of Panoramic, Wet-Source-Storage Gamma Irradiators were implemented at the CFC site. The inspection results are documented in Inspection Report No. 03036239/2003001 (ML032390328) and have been considered during the review of the application.

The applicant has completed construction and "cold" facility testing. Inspection results indicate that the facility has been constructed as designed and operates as expected. The applicant has sufficient trained personnel to operate the facility safely.

### **4.0 Additional Considerations**

Due to the novel design of the CFC facility, the NRC staff examined several additional aspects of the facility which are outside the standard considerations for licensing contained in 10 CFR 36 and NUREG-1556, Volume 6. These include seismic concerns, heavy loads and load drop scenarios. These scenarios are documented in Inspection Report No. 03036239/2003001 (ML032390328).

#### **4.1 Hoist Design and Heavy Load Handling**

Review of the design of the hoists, associated support system and control system indicated they are properly designed and are adequate for the intended loads. The procedures for operating the system are appropriate and provide sufficient direction to the operators. The margin of safety for each of the components supporting the loads was examined and found to be appropriate.

#### **4.2 Load Drop**

The licensee provided information on the effects of a component failure resulting in a load drop (ML032030333). Review of that information and the facility design indicate that a failure resulting in a load drop is very unlikely. In addition, if such a failure occurred it is very unlikely to result in a radiation hazard. If the failure occurs while the load (a bell) is actually in the pool, the guides will contain the bell and assure that it does not damage the pool or the sources. If the drop occurs while the load is over the pool, and strikes an edge of the pool or the beam over the plenum, these structures are sufficiently strong that it is extremely unlikely that the pool will receive more than surficial damage. A high degree of protection from damage caused by a falling bell is afforded the sources by the tight clearances presented by the guide structures, the hydraulic damping of the pool water and the design strength of the plenum.

#### 4.3 Seismic Evaluation

10 CFR 36 applies certain design considerations for shielding walls at panoramic irradiators located in seismic areas. Although these considerations do not apply to pool irradiators such as the one constructed by CFC, the staff evaluated seismic hazards for the CFC facility.

The staff consulted the U.S. Geological Survey (USGS) National Earthquake Information Center website as well as the Limerick Generating Station Final Safety Analysis Report. Those sources indicated that the Quakertown area is physically located between the Piedmont Lowland section of the Piedmont physiographic province and the Reading Prong section of the New England physiographic province. USGS data indicate that over a 50 year period in the Quakertown area, there is a 2% occurrence probability of a seismic event with peak ground acceleration (PGA) of 0.16g (0.16 times the acceleration of gravity). Based on this information, the Quakertown area does not meet the criteria for a seismic area under Part 36.

Moreover, a review of historic seismic events within 200 miles of the Quakertown area indicates that the highest intensity event recorded was a level VII on the Modified Mercalli Intensity Scale (MMIS). The USGS describes the effect of such an event as "Damage negligible in buildings of good design; slight to moderate in well-built ordinary structures; considerable damage in poorly built or badly designed structures; some chimneys broken." The staff's inspection effort confirmed that the pool design and final structure is a robust one and, accordingly, that an event of this intensity is likely to result in negligible damage to the pool. Damage could occur to the support structure for the product delivery system as a result of ground acceleration, but the integrity of the pool and the sources within the pool are expected to be unaffected.

#### 5.0 Conclusion

Review of the application and the inspection results indicate that the facility has been designed and constructed in accordance with the appropriate requirements and guidance.

Based on the above described review, the NRC staff has concluded that the applicant has satisfied the general requirements in 10 CFR 30.33, the special requirements in 10 CFR 36, the guidance in NUREG-1556, Volume 6 and that there is reasonable assurance that the facility proposed by the applicant can be operated safely and in compliance with the requirements in 10 CFR 20.