

## WHAT IT TOOK TO GET AN NRC LICENSE FOR CENTRALIZED INCINERATION

Raymond DiSalvo, William Zielenbach  
Battelle Memorial Institute  
Columbus Division  
505 King Avenue  
Columbus, Ohio 43201-2693

### ABSTRACT

In 1982, Battelle joined five other commercial generators of low level radioactive waste in conducting a study of the technical and economic feasibility and the licensability of a central facility for incinerating LLW. The project generated a license application to the USNRC and supporting documentation related to the safety and environmental impacts of the facility. After thorough review, the NRC has issued a Finding of No Significant Impact and the associated license authorization, which is the first of its kind for an incineration facility.

### INTRODUCTION

Battelle has owned, maintained and operated facilities for conducting research using special nuclear (SNM) and byproduct materials since 1956. The facilities are located at West Jefferson, Ohio, about 17 miles west of Columbus. In late 1982 Battelle joined five other commercial generators of LLW to demonstrate the licensability of a central incineration facility which would satisfy all applicable regulations while accomplishing cost-effectiveness for its users. Battelle planned to construct a central Volume Reduction Demonstration Facility (VRDF) utilizing a controlled-air incinerator. Site operations were to include receipt, volume reduction, storage, and shipment of LLW supplied under terms of negotiated contracts with utilities, universities, and institutions (hospitals, etc.). Radioactive, non-transuranic (TRU) waste from Battelle's nuclear and medical research operations was also to be treated in the facility. The supporting documentation regarding cost, safety, and environmental impact were developed (1).

In August, 1983, Battelle made its initial request for an amendment to its Materials License No. SNM-7 to authorize LLW incineration operations at its West Jefferson site. This paper describes the process by which Battelle received the first authorization issued by the NRC to construct and operate a central incineration facility for low-level radioactive waste.

### FACILITY DESCRIPTION

The proposed Volume Reduction Demonstration Facility consists of two adjoining buildings which share a common wall. The incinerator, control room, offices, and locker rooms are in the three story Process Building. Adjacent to the long side is the Waste Storage Building, which is for receiving, monitoring, storing, and shipping waste. The facility was to be located outside an existing double-fenced, secured area, but was to receive the radiological and health physics services available at the secure nuclear site.

The proposed incinerator is a two-stage, controlled-air pyrolysis type with a dry exhaust cleanup system. It operates by continuous feed with a throughput capacity of 150 kg/hr. Process controls

are provided for controlling temperatures and air flows during normal, off-normal, and emergency conditions. The air cleaning system consists of a hot gas filter (fiberglass bags or candles), mixing chamber for cooling exhaust air, mesh filters, and final roughing and HEPA filters. Incinerator pressures are maintained subatmospheric by induced draft fans discharging to a 40 m high stack. Waste is charged and ash is removed through air-scavenged locks and drum connectors. Ash is discharged into drums under the incinerator, under the hot gas filter, and under the mesh filters. Used filter materials can be fed into the incinerator for volume reduction.

### INTERACTIONS WITH NRC

Several documents existed when Battelle undertook the VRDF project in late 1982 which served as important bases for the license request. Battelle had a recently renewed license for SNM and byproduct material operations. The document (2) supporting this renewal describes applicable specifications and controls (technical specifications, administrative policies and procedures, reviews, audits, training, safety, quality assurance, security, etc.). In February, 1981, the NRC had prepared an Environmental Impact Assessment of Battelle's West Jefferson operations (3). The document was used as the basis for describing the site and surrounding environment. The incinerator proposed for use at Battelle was a larger version of a prototype incinerator developed by Kernforschungsanstalt Juelich GmbH (KFA) and Kraftanlagen (KA) AG, Heidelberg, which is represented in the US by ATCOR Engineered Systems, Inc. Topical reports by these organizations supported the license request (4,5). NRC's comments (6) on ATCOR's topical were most helpful.

In parallel, Battelle contacted NRC about the requirements for licensing; these were outlined in a letter to Battelle from NRC's Division of Fuel Cycle and Material Safety (7). This information specified requirements for safety information (an outline was provided) and for an environmental impact report. A copy of the then proposed 10CFR61 (8) was provided as well.

Informal discussions with NRC in early 1983 determined a schedule and the needed elements of the submittal for license amendment. These were

basically revisions of BCL-1081 (2) with additions. The application itself contained general conditions and administrative procedures to assure health and safety controls, administrative lines of responsibility, and descriptive information about the facility.

The application was accompanied by two supporting documents: a report on safety information and an environmental assessment (Appendices G and H to BCL-1081, respectively, (2)). Tables I and II present in abbreviated form the contents of the two appendices.

Table III presents a chronology of the licensing effort. As is evident from this chronology, licensing is a protracted but thorough process. About 3 years elapsed from initial submittal (August, 1983) to the Finding of No Significant Impact (July, 1986).

NRC's initial request for further information consisted of 6 minor questions on application procedural matters, 16 on safety information, and 2 on the environmental assessment. Of these, the most concern appeared to be over emission control, fire protection, and dose estimates. The following information was supplied in response to safety matters:

- Emissions data related to incinerator feed composition from German experiments (demonstrated removal efficiency of 99.97% for air cleaning system)
- Clarification on reuse of LLW drums for ash filling
- Description of precautions for storage of waste prior to processing
- Expanded criteria for waste packaging and acceptance criteria (flexible and non-flexible criteria) and methods to ensure compliance
- In reference to design criteria, use of the term "important to safety" in place of "safety related"
- Clarification of confinement to maintaining ALARA levels well below compliance levels in operating areas during normal operations
- Additional detail on fire protection systems and compliance with NFPA Code
- Clarification of description of filtered vents for local incinerator vents (drum filling locations)
- Expanded description of final filters, their construction, and their operation
- Definition of maximum time periods for on-site retention of wastes
- Expanded detail on continuous air monitors and determination of set points for radiation detectors
- Description of stack sample system to minimize deposition and condensation losses
- Combination of additional exposure from incinerator with those from existing, normal operations

- Exposures under accident conditions with a reassessed (lower) wind speed for unfavorable weather conditions
- Estimates of the amount of decommissioning waste
- Clarification of quality assurance responsibilities between Battelle and ATCOR.

These were supplied as replacement pages for the original submission.

Both questions on the environmental impact assessment concerned the location of existing on-site perimeter particulate air sampling stations relative to the proposed facility. The response indicated that one station would have to be moved. Copies of the annual environmental reports for 1981 and 1982 were also requested.

In early 1985, based on subsequent internal Battelle review, Battelle made a smaller submission of additional supplemental information. This included more discussion of proposed final HEPA filter materials and construction; description of the continuous, real-time monitors for B and Y particulates in the stack; details of I-125 sampling in flow-through, charcoal filters; estimates of I-125 exposures (inhalation and ingestion); and descriptions of special handling requirements for medical waste, such as generator retention periods for decay and specific facility limits (10 m Ci/yr) for incineration.

During early 1985, owing to competing, heavy demands on NRC staff time, action on the Battelle request was delayed at NRC. At that time "no major stumbling blocks" were foreseen by NRC, although no assurances could be made as to raising new issues. NRC's major concern at that time was the high-temperature (approximately 260 C) performance of the final HEPA filters. By mid-1985, the application was given to another NRC staff reviewer for a new independent review. He raised another 8 points, 7 of which were new, and the other concerned the final HEPA filters. This last was satisfied by proposing to use either filters of German manufacture which have been used successfully in German installations or to use American made filters of equivalent specifications. It was agreed that confirmatory, pre-operational testing of filters as well as other components would be conducted prior to any operations with radioactive material. This round of questions also provided Battelle with the chance to include descriptions of technology improvements made by KA; these included a redesigned HGF to ease filter replacement, replacement of the steel mesh, rotary drum filters with baghouse filters, and the emergency exhaust bypass for the HGF for use in the event of sudden filter plugging.

For the other seven comments, the following responses were supplied as Revision 3 to the initial request:

- Air flow priorities for operation of the incinerator for burner, recirculation, pyrolysis, and combustion air
- Details on control of dilution air added in the mixing chamber to cool incinerator exhaust gases
- Revision of accident analyses to provide bounding analyses for minor accidents

TABLE I

Table of Contents for Report on  
Safety Related Information

1.0 PRINCIPAL DESIGN CRITERIA	3.4.4 Redundant Components
1.1 Purpose of Incineration Program	3.4.5 Nuclear Instrumentation
1.1.1 Incinerator Functions	3.5 Control Room
1.1.2 Incinerator Feed	3.6 Feed and Product Analyses
1.1.3 Incinerator Products	3.6.1 Feed Radioactivity Analyses
1.1.4 Compliance with Regulatory Requirements	3.6.2 Product Radioactivity Analyses
1.2 Structural and Mechanical Design Criteria	3.6.3 Feed Materials/Emissions Compositions
1.2.1 Quality Assurance	3.6.4 Comparison of Discharge Regulations
1.2.2 Protection Against Abnormal Forces	4.0 RADIOACTIVE MATERIALS CONFINEMENT
1.2.3 Protection Against Fires and Explosions	4.1 Ventilation
1.2.4 Sharing of Structures, Confinement Systems and Related Components	4.1.1 Off-Gas Treatment
1.2.5 Proximity of Facilities	4.1.2 Air Supply and Discharge Systems
1.2.6 Testing and Maintenance	4.2 Product Handling and Storage
1.2.7 Emergency Plans	4.3 Effluent Sampling and Analysis
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1.2.9 Structural Criteria	5.1 Radiation Protection Design Features
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1.3.5 Radiation Protection	5.2.1 Contained Sources
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1.3.8 Industrial and Chemical Safety	6.0 ACCIDENT ANALYSIS
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TABLE II

Table of Contents for Report on  
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1.0 PROPOSED ACTIVITIES	6.0 EFFLUENT AND ENVIRONMENTAL MEASUREMENTS AND MONITORING PROGRAMS
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4.2.1 Effects of Radiation	6.2.3 Meteorological Monitoring
4.2.2 Effects of Chemical Discharge	6.2.4 Biota Monitoring
4.2.3 Effects of Sanitary and Other Waste Discharge	
5.0 ENVIRONMENTAL EFFECTS OF ACCIDENTS	

- Detailed P & IDs for all incinerator system components (in German with translation and symbol table) indicating all sensors and their functions
- An enhanced building schematic indicating incinerator systems and building ventilation flows
- Confinement system with compensating vessel. This vessel is water filled and serves as part of incinerator confinement during normal operation but allows pressure relief in the event of an off-normal, above atmospheric pressure condition. This has not been called to function yet in the German experience in four facilities
- Comparison of effluent quality with U.S. and German (TA Luft) (12) regulations. It was shown that this incinerator system meets German regulations which are as strict or stricter than U.S. regulations.

In June, 1986, the NRC issued its environmental assessment for the VRDF (10). This 63 page document was based on Battelle's input and NRC's own calculations and reassessments. It included review of many safety aspects and provided an accident analysis. The review assessed:

- The site environment
- The facility's equipment, operation, and transportation requirements
- The characteristics of incoming waste and end-products
- Radioactivity confinement and effluent control
- The environmental effects of normal operation and related transportation
- The environmental and occupational monitoring programs
- Consequences of potential accidents
- Waste management alternatives.

A summary and conclusion regarding environmental effects were presented, as were NRC staff findings. The findings indicate license conditions that will be imposed particularly for monitoring of effluents (frequency of sampling, analysis, and reporting). The last point of the findings stated that NRC staff found that environmental impact of construction and operation would be insignificant. Based on the information submitted and the confirmatory analyses performed, a Finding of No Significant Impact was warranted. The



TABLE III  
Licensing Chronology

August, 1983	Battelle submitted license amendment request to NRC
September, 1983	NRC published <u>Federal Register</u> notice (9)*
November, 1983	NRC issued request for additional information (24 items)
December, 1983	Battelle requested NRC to defer consideration until further notice
July, 1984	Battelle reactivated request for NRC amendment and resumed development of licensing information
September, 1984	Battelle submitted responses to regulatory questions (Rev. 1)
November, 1984	NRC advised Battelle of final date for submitting any additional information
January, 1985	Battelle submitted additional clarifications (Rev. 2)
June, 1985	NRC requested additional information and clarifications (8 items) based on further review
July, 1985	NRC staff visited Battelle, viewed proposed site, and met with Ohio EPA
September, 1985	Visit by Battelle staff to KA in Heidelberg to review operating data
October, 1985	NRC staff member toured similar operating incinerators in West Germany and received additional background material
December, 1985	Battelle supplied responses to information request of June (Rev. 3)
June, 1986	NRC issued Environmental Assessment (10)*
July, 1986	NRC published <u>Federal Register</u> notice of Finding of No Significant Impact (11)*
March, 1987	NRC issued license.

\* Reference numbers.

announcement of issuance of the environmental assessment and of the Finding subsequently appeared in the Federal Register (11). The signed license document itself was not issued until early 1987. NRC staff asserted the delay was caused by their distraction to resolve other regulatory matters unrelated to Battelle's application.

#### Interaction with the Public and State and Local Governments

In 1982 and 1983, Battelle engaged in public awareness activities in connection with the proposed demonstration incinerator (13). These activities included a news release, printed in the Columbus Dispatch, that described the incinerator program. The news release prompted primary media stories that appeared in several local papers and on television that dealt with community concerns and Battelle's efforts to provide information to ease these concerns. In addition, Battelle briefed the Ohio House Representative for Franklin County and the West Jefferson Mayor and councilmen on the proposed incinerator program. Community meetings were held to promote community awareness. These included public meetings with the Darby Estates Civic Association, the West Jefferson Community and Businessmen's Association, and the London (Madison County) Rotary Club.

The Ohio Environmental Protection Agency has jurisdiction over the non-radioactive emissions in Ohio and must grant a permit to install new sources of pollution. Battelle filed the Permit to Install (PTI) with the State in June, 1983, but later requested suspension of consideration without prejudice until NRC licensing and funding for construction and operation were assured.

#### CONCLUSION

Battelle found that relations with the NRC throughout this process were harmonious, though progress was slow. NRC's comments and requirements were relevant, concisely stated and understandable, and contributed toward advancing to a common goal. Battelle believes that the past performance of site operations, the offers to do pre-operational confirmatory testing, the provision of German operating experience as related to German and U.S. environmental regulations, and the early involvement of public interest groups were most helpful in achieving the final Finding and issuance of the authorization.

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  13. Public Awareness Activities Summary with Attached News Release by Battelle Columbus Laboratories, (November 18, 1982).