

January 4, 2002

MEMORANDUM TO: Robert A. Gramm, Chief  
Section 1  
Project Directorate IV  
Division of Licensing Project Management  
Office of Nuclear Reactor Regulation

FROM: Kathy Halvey Gibson, Chief/**RA**/  
Emergency Preparedness and  
Health Physics Section  
Reactor Safeguards, Radiation Safety,  
and Emergency Preparedness Branch  
Division of Inspection Program Management  
Office of Nuclear Reactor Regulation

SUBJECT: SAFETY EVALUATION FOR A REQUEST TO DISPOSE OF  
CONTAMINATED DEMOLITION DEBRIS FROM THE BIG ROCK POINT  
NUCLEAR PLANT PURSUANT TO 10 CFR 20.2002

The Emergency Preparedness and Health Physics Section has completed its review of the Consumers Energy Company's (the licensee) request, pursuant to 10 CFR 20.2002, dated March 14, 2001, as supplemented on May 18, and June 20, 2001, to dispose of 42.25 million pounds of demolition debris in a State of Michigan licensed Type II landfill. The calculated annual radiological dose to a member of the public or worker from the disposal of this material is less than 1 mrem.

Based on our review, we find that the licensee has provided adequate justification to support its request. The attachment to this memorandum provides our evaluation of the licensee's application.

This completes our review under TAC No. MB1463.

Docket No. 55-155

Attachment: Safety Evaluation

CONTACT: Stephen Klementowicz, NRR/DIPM/IRSB/EP/HP  
(301) 415-1084

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SAFETY EVALUATION BY THE EMERGENCY PREPAREDNESS

AND HEALTH PHYSICS SECTION

OFFICE OF NUCLEAR REACTOR REGULATION

BIG ROCK POINT NUCLEAR PLANT

DOCKET NO. 55-155

**1.0 Introduction**

By letter dated March 14, 2001, as supplemented on May 18, and June 20, 2001, Consumers Energy Company (the licensee), submitted a request, pursuant to 10 CFR 20.2002, to dispose of 42.25 million pounds of predominately concrete debris in a State of Michigan licensed Type II landfill.

The Big Rock Point Nuclear Plant was permanently shutdown on August 29, 1997, for decommissioning. As part of the decommissioning process, the licensee plans to dismantle the individual structures after they have been decontaminated and radiologically surveyed. The licensee estimates that there will be total of 84.5 million pounds of predominately concrete debris from the entire decommissioning project. Approximately one half of this material is non-impacted (i.e., has never had the potential for neutron activation or exposed to licensed radioactive material). The other half has a potential to contain residual licensed radioactive material and/or neutron activation products in a limited quantity, and is the subject of this evaluation pursuant to 10 CFR 20.2002.

**2.0 Evaluation**

The licensee, as required by 10 CFR 20.2002, performed a comprehensive physical and radiological evaluation of the demolition debris material.

The demolition debris will originate from the demolition and removal of structures and paved surfaces at the plant site, which includes flooring materials, concrete, rebar, roofing materials, structural steel, soils associated with digging up foundations and concrete and/or asphalt pavement or other similar solid materials.

The physical form of the material will be that of bulk material with various screen sizes ranging from particles the size of sand up to occasional monoliths with a volume of several cubic feet. The licensee, for the calculations, assumed the material to be a homogenous mixture with a density of 150 pounds per cubic foot. The material will be dry solid waste containing no absorbents or chelating agents. The material will meet all State of Michigan disposal criteria and is subject to inspection by State Inspectors.

The licensee estimates that the mass of both contaminated and non-contaminated material will total approximately 84.5 million pounds. With an assumed density of 150 pounds per cubic foot, the estimated volume of material disposed at the State of Michigan licensed landfill will be approximately 563,000 cubic feet. This value represents approximately two percent of the annual volume of waste disposed at the landfill that is expected to receive the material.

The disposal of the material is expected to be completed within one year. The material will not be isolated or dedicated to a single burial cell at the landfill. Rather, it will be co-mingled with other landfill materials. The material will be covered with an interim 6-inch layer of soil each day, in accordance with landfill requirements.

The licensee's radiological evaluation of the buildings, structures, and other materials to be disposed, included over 200 core borings in locations expected to have the highest contamination potential. Each core material was analyzed on-site by gamma spectrometry and direct radiation survey to determine what radio nuclides are present and how far the contaminants have penetrated into the concrete. In addition, portions of 14 core samples were analyzed by an off-site laboratory (General Engineering Laboratories) at detection levels consistent with environmental monitoring using alpha and gamma spectrometry and liquid scintillation monitoring to analyze for the presence of the following radionuclides:

Ac-227	Ac-228	Ag-108m	Ag-110m	Am-241	C-14
Cd-109	Ce-144	Cm-242	Cm-243/244	Co-60	Cs-134
Cs-135	Cs-137	Eu-152	Eu-154	Fe-55	H-3
I-129	K-40	Mn-54	Ni-59	Ni-63	Nb-94
Pb-214	Pm-147	Pu-241	Pu-238	Pu-239/240	Ru-106
Sb-125	Sr-90	Tc-99	U-233/234	U-235/236	U-238
Zn-65					

The results of the laboratory analysis identified only Co-60, Cs-137, and H-3. In addition, K-40, Pb-214, U-233/234, and U-238 were identified, but at levels that were indistinguishable from naturally occurring background levels measured in plant concrete samples that were not contaminated by licensed radioactive materials.

Based on the radiological characterization of the buildings and structures to be demolished, the licensee calculated the approximate amount of licensed radioactive material that would be generated. For the 42.25 million pounds of debris, the total amount of radioactivity by radionuclide is as follows:

<u>Radionuclide</u>	<u>Total Activity (mCi)</u>
Co-60	16.0
Cs-137	3.3
H-3	152
<b>Total</b>	<b>171</b>

The value of 171 mCi represents the realistic amount of licensed radioactive material that is expected to be contained in the 42.25 million pounds of debris. However, the licensee performed a more conservative bounding calculation which used a principal gamma emitter concentration of 5 pCi/gm for licensed radioactive material contained in the debris. Adjusting

the total gamma activity upward to a bounding principal gamma emitter concentration value of 5 pCi/gm results in the following values:

<u>Radionuclide</u>	<u>Total Activity (mCi)</u>
Co-60	80.0
Cs-137	16.5
H-3	760
<b>Total</b>	<b>856</b>

For this 10 CFR 20.2002 application, the licensee used the bounding value of 5 pCi/gm principal gamma emitter concentration as a limit to ensure that radiological dose to workers and members of the public is kept As Low As Reasonably Achievable (ALARA). To ensure that the 5 pCi/gm principal gamma emitter limit is not exceeded, radiological surveys will be performed on structural surfaces prior to demolition to verify that radioactive surface contamination does not exceed 5000 dpm/100 cm<sup>2</sup> averaged over areas appropriate for the detection system used and all demolition debris will be monitored by a bulk assay radiation detection system with an alarm setpoint established at or below the 5 pCi/gm principal gamma emitter limit prior to disposal.

The licensee performed radiological calculations which used the 5 pCi/gm principal gamma emitter concentration limit as the concentration of licensed radioactive material in the 42.25 million pounds of demolition debris being transported and disposed of in a State of Michigan licensed Type II landfill. To perform these calculations, the licensee used readily available commercial dose assessment codes (MicroShield, Version 5.03, from Grove Engineering and RESRAD, Version 6.0, from the U.S. Department of Energy) that are acceptable to the NRC.

Dose assessments were performed for the types of individuals which have the potential to receive the maximum dose: Transport worker, Landfill worker, and Landfill resident / Farmer.

<u>Individual</u>	<u>Annual Dose (mrem)</u>
Transport Worker	0.366
Landfill Worker	0.290
Landfill Resident / Farmer	0.009

In addition to the NRC staff's evaluation of the licensee's data and radiological assessment the staff also performed independent dose assessment calculations. This evaluation used the RASCAL code and the licensee's radionuclide survey data, which confirmed the acceptability of the licensee's calculations. The staff's calculated doses were in agreement with the licensee's calculations.

### **3.0 Conclusion**

The NRC staff finds the licensee's application to dispose of approximately 42.25 million pounds of demolition debris in a State of Michigan licensed Type II landfill will result in a calculated potential annual dose to a worker or a member of the public of less than 1 mrem. This calculated dose is well within the 10 CFR Part 20 annual dose limit of 100 mrem and less than the annual dose limit of 25 mrem for decommissioning which will allow for license termination and unrestricted use of the land. Additionally, the material will meet all State of Michigan disposal criteria and is subject to inspection by State Inspectors.

The NRC staff finds the licensee's application, pursuant to 10 CFR 20.2002, will not have a significant impact on workers, the public, or the environment and is acceptable.