01/14/83

UNITED STATES OF AMERICA
NUCLEAR REGULATORY COMMISSION

BEFORE THE ATOMIC SAFETY AND LICENSING BOARD

In the Matter of	)	
	)	
CONSUMERS POWER COMPANY	)	Docket Nos. 50-329 OM & OL
	)	50-330 OM & OL
(Midland Plant, Units 1 and 2)	)	

NRC STAFF RESPONSE TO INTERROGATORY SUBMITTED BY INTERVENOR BARBARA STAMIRIS ON SEPTEMBER 13, 1982

I. INTRODUCTION

On September 13, 1982, Intervenor Barbara Stamiris filed "Stamiris Divsovery to NRC Based on New Information in FES." By letter dated October 6, 1982, the Staff informed the Board that it would voluntarily respond to the submittal. The Staff's response follows. Affidavits in support of the response will be filed at a later date.

II. INTERROGATORY

Contention 1 b.

In the FES, (p5-51) the NRC states, "Since 1960, 68 nuclear reactors have been or are in the process of being decommissioned. Although no large commercial reactor has undergone decommissioning to date, the broad base of experience gained from smaller facilities is generally relevant to the decommissioning of any type of nuclear facility."

Interrogatory 1

Name the reactors from this group of 68 which have been or are being decommissioned by the prompt removal/dismantlement method and provide

DS07

their: a) date of completion; b) cost of completion; c) megawatt capacity (or other description of size), d) date of decommissioning; e) cost of decommissioning; f) decommissioning cost as percentage of construction cost, converted into like, completion year dollar values. (Please explain this inflation-conversion calculation.)

Response

Of the 68 reactors indicated in Contention 1 b, the enclosed report, "U.S. Licensed Reactor Decommissioning Experience," indicates those reactors that have been decommissioned by the dismantlement method. See Tables III, IV, V. That report indicates that, as of the time of the report's completion, 43 licensed reactors had been decommissioned by the dismantlement method, including 26 research reactors, 16 critical facilities,[1/] and one demonstration power reactor (the Elk River reactor). Table 5.1 of NUREG/CR-1756, "Technology, Safety and Costs of Decommissioning Reference Nuclear Research and Test Reactors," prepared by Battelle Pacific Northwest Laboratory (PNL) for the USNRC, March 1982 provides additional decommissioning information for the 26 dismantled research reactors, and section 4.3 of NUREG/CR-0672, "Technology, Safety, and Costs of Decommissioning Reference Boiling Water Reactors," prepared by Battelle-PNL for the USNRC, June 1980, provides additional decommissioning information on Elk River. Both of the above documents

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1/ A critical facility is a reactor capable of sustaining a chain reaction operating at extremely low power (a few watts) and designed to determine a critical mass, neutron flux distribution, and other characteristics of a flexible arrangement of nuclear fuel, construction materials, coolant, and other reactor components.

will be placed in the local public document room in Midland, Michigan, and are available in the public document room in Washington, D.C. The information provided in those documents includes the name of the reactors, the years which they oeprated, their megawatt capacity, and the date at which the license was terminated (i.e., date of decommissioning) which is the information requested by Items a, c, and d of Interrogaotry No. 1.

The information requested by Items b and e, namely the amount it cost to construct and to decommission the above facilities, was not specifically required of licensees by the NRC, and hence is not available from the licensee docket files at the NRC. (Similarly Item f which depends on Items b and e is not available). (Some information on decommissioning costs is available for these facilites in the general literature, as, for example, the cost to decommission Elk River (see response to Question 9, NRC Staff Further Responses to Interrogatories Submitted by Barbara Stamiris on August 30, 1982).

Although the NRC does not have such information, this is not considered to be a problem in estimating (or in evaluating estimates of) decommissioning costs for large commercial power reactors like Midland nor is it in conflict with the statement made on page 5-51 of the Midland FES that "the broad base of experience gained from smaller facilities is generally relevant to any type of nuclear facility." As can be seen from the attached information, 37 of the 43 dismantled reactors have power levels of 0.1 Mwt or less (of these, 33 have power levels of 0.001 Mwt or less) while the remainder have power levels between 1 and 60 Mwt. NUREG/CR-0672, Section 4.3, contains a review of decommissioning experience accumulated to date and indicates, in referring to these smaller facilities that, "Because of the many differences in the decommissioned facilities, extrapolation of the costs for decommissioning these facilities to large commerical reactors is considered to be generally unreliable." Section 4.3 also indicates that "the primary value of past decommissioning experience is in identification of the methods and technologies of decommissioning." In Section 4.3.3, NUREG/CR-0672 describes some of the lessons learned from past decommissionings including the fact that "Past decommissionings have decomstrated some of the aspects of the practicality and acceptability of the various decommissioning approaches. The necessary technology not only exists, but has been safely and successfully applied numerous times to a wide variety of nuclear installations." As can be seen in Appendix G of NUREG/CR-0672, information on techniques and methods from earlier decommissionings, gathered from various sources, is used in considering what techniques are applicable to larger facilities, as for example in the areas of decontamination, physical cleaning, removal of structural material, and equipment disassembly. Thus, as discussed in NUREG/CR-0672, direct extrapolation or comparison of costs of decommissioning the small facilities is not useful in evaluating costs of decommissioning for the larger commercial facilities, but rather the usefulness of the earlier decommissionings (and the basis for the statement on page 5-51 of the Midland FES, as quoted above) is in their demonstration of available and successful decommissioning methods and techniques to accomplish specific tasks.

Another factor to be considered is that it is difficult and perhaps misleading to make simple comparisons between different costs for different plants without taking into account the many site-specific and facility-specific considerations (such as plant design and operating conditions, local taxes and labor costs, and licensing requirements, etc.) involved in costs of decommissioning specific facilities. For example, in addition to the large differences in size and design between the small reactors and larger commerical reators discussed above, Section 4.3.1.9 of NUREG/CR-0672 points out that at Elk River during the decommissioning, a full test development program, with associated costs, was carried out on equipment cutting techniques as part of the fact that Elk River was a demonstration project under U.S. Government contract. These types of developmental programs would not necessarily need to be carried out at commerical reactor decommissionings. These factors indicate that direct comparison of the costs to decommission the 43 dismantled research and demonstration reactors with those of commercial power reactors is difficult and probably not meaningful.

It should also be noted that the information requested in Interrogatory 1 b, Item f, is not a specifically defined or fixed relationship. The studies on decommissioning performed by Battelle Pacific Northwest Laboratories (NUREG/CR-0672 and NUREG/CR-0130, "Technology, Safety and Costs of Decommissioning a Reference Pressurized Water Reactor," June 1978) on commercial power reactors, have not identified a specific relationship between construction costs and decommissioning costs. As can be seen in NUREG/CR-0672, decommissioning costs depend on various specific factors such as costs of staff labor to accomplish decommissioning tasks, cost to dispose of waste, special tools and equipment, miscellaneous supplies, etc. (see NUREG/CR-0672, Section 10). Cost of construction (and commissioning) includes several items which have little or no effect on decommissioning costs such as licensing, quality assurance procedures during construction, site preparations, instrumentation, control and electrical systems, the cost of interest on the money used during construction, etc. This discussion does not attempt to define or provide costs of these and other items, but to point out the differing nature of many of the construction and decommissioning cost items and, thus why there was no identification of a defined relationship between them in the Battelle-PNL reports. In evaluating the decommissioning activities and costs, it turns out that for commercial reactors, as has been indicated in NUREG-0586, "Generic Environmental Impact Statement on Decommissioning Nuclear Facilities," USNRC, January 1981, that present worth costs of decommissioning are estimated to be between 5 to 10% of current dollar commissioning costs. This discussion in the GEIS is intended to serve as a general illustration. It is recognized that cost ratios for smaller facilities are probably not in the same ratio. For example, at Elk River, in addition to the need to consider developmental costs incurred during decommissioning as discussed above, it would also be necessary to consider other factors such as; (1) differing licensing requirements (and associated construction and commissioning costs) in place when Elk River as built in the late 1950's and early 1960's compared to those which current reactors must meet, (2) the fact that Elk River was a demonstration project funded by a government agency (the United States

Atomic Energy Commission (USAEC)), and (3) the fact that Elk River was constructed in 4 years compared to over 10 for Midland (and the associated costs to borrow money over that period for the utility, as compared to the fact that for Elk River the USAEC would probably not have had to borrow money and therefore not had to pay interest during construction). This discussion does not attempt to evaluate the effect of these items on the construction-to-decommissioning cost ratio but rather to point out the need to consider specific details of each situation prior to making comparisons. Based on the differences between Elk River and the commercial reactors, it would not be unexpected to observe different cost ratios for the smaller facilities, such as Elk River, compared to the large commercial reactors.

Respectfully submitted,

Michael N. Wilcove
Counsel for NRC Staff

Dated at Bethesda, Maryland
this 14th day of January 1983

UNITED STATES OF AMERICA
NUCLEAR REGULATORY COMMISSION

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CERTIFICATE OF SERVICE

I hereby certify that copies of "NRC STAFF RESPONSE TO INTERROGATORY SUBMITTED BY INTERVENOR BARBARA STAMIRIS ON SEPTEMBER 13, 1982" in the above-captioned proceeding have been served on the following by deposit in the United States mail, first class, or, as indicated by an asterisk through deposit in the Nuclear Regulatory Commission's internal mail system, this 14th day of January 1983:

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Attachment

U. S. LICENSED REACTOR

DECOMMISSIONING EXPERIENCE

Peter B. Erickson

Division of Operating Reactors

U. S. Nuclear Regulatory Commission

ANS Topical Meeting September 16-20, 1979

INTRODUCTION

To date, 64 reactors licensed under 10 CFR Part 50 have been decommissioned. In addition, four demonstration nuclear power plants have been decommissioned. These demonstration plants were government owned but operated by utilities under special government authorization. The 64 licensed reactors consist of five power reactors, six test reactors, one nuclear ship and 52 research reactors and critical facilities. Of the decommissioned research reactors and critical facilities, 42 have been dismantled and the remaining ten are either in the process of being dismantled or plans for early dismantlement are being developed. Tables I through V list each decommissioned reactor, the reactor type, the power level, the location and date the license was terminated or the present status if a license is still in effect.

SAFE STORAGE

Licensees with facilities in safe storage are required to control access to radiation areas, perform periodic radiation surveys both inside and outside of the facility, inspect the facility and report findings of surveys and inspections to the NRC. NRC Regulatory Guide 1.86 "Termination of Operating Licenses for Nuclear Reactors" describes acceptable ways for maintaining a facility in a safe status.

Access control at a decommissioned facility in safe storage has usually involved upgrading or minor modification of existing fences, radiation signs, containment buildings, steel doors, and concrete shielding structures and the use of security personnel from adjacent company facilities. Where security personnel are not available from adjacent facilities, such as Saxton and SEFOR, intrusion alarm systems, which are continuously monitored, have been installed to detect unauthorized entry. When continuously manned security coverage is not maintained, the NRC has required that access to high radiation areas be made very difficult. We have accepted the use of combinations of heavy shielding blocks and welded entry portals for the high radiation areas in combination with the intrusion alarms. Since all fuel, liquids and easily movable radiation sources have been removed from the site, access control is used primarily for protecting an intruder from serious overexposure.

Annual reports received by the NRC for facilities in safe storage state that there has been no evidence of release of radioactivity to the environment or any unauthorized entry into high radiation areas. The Office of Inspection and Enforcement of the NRC audits the containment of radioactivity with independent radiation surveys and measurements both inside and outside of the facilities.

The NRC has uncovered no material migrating to clean areas in a facility or outside the controlled areas. Some facilities do, however, show some evidence of rusting of carbon steel structures such as water tanks and carbon steel containment buildings. To date, this deterioration has not affected the integrity of the retention of radioactive material which is largely confined to the activated pressure vessel, pressure vessel internals and the primary system. Also, since the primary systems have all been drained and are essentially at atmospheric pressure a release of radioactive liquid is not likely to occur. The licensee is responsible for maintenance of the facility in a manner to assure that structures are adequate for access control and retention of radioactivity.

All five power reactors, six test reactors and the Nuclear Ship Savannah (N. S. Savannah) have been placed in safe storage with future dismantling delayed. Discussions with licensees for these facilities indicates that while no definite date for dismantlement has been selected, most intend to remove residual radioactivity within approximately 50 years after reactor shutdown. Two facilities in safe storage, Plum Brook and the N. S. Savannah are discussed to illustrate the range of differences in facility conditions.

Plum Brook Facility

The Plum Brook Facility in Sandusky, Ohio is owned by NASA and consists of the 60 MWt Plum Brook Test Reactor and the 100 KWt Plum Brook Mockup Reactor. Both reactors have been shutdown since January 1973 and all fuel has been removed from the site.

The Plum Brook Test Reactor is a heterogeneous light water cooled and moderated reactor that used MTR type fuel. Since 1973 the reactor has been maintained in safe storage. In addition to removing all fuel from the site, all resins were removed, the reactor vessel and all piping systems were drained, and areas with high radiation were shielded and sealed. Fuel storage canals have been cleaned and drained and hot drain systems and sumps have been flushed and kept dry.

Access control has primarily involved the use of existing doors, fences, shielding, intrusion alarms and security personnel. For instance, doors to the containment building, subpile room and hot cells are locked and the keys administratively controlled. Radiation surveys and sampling is performed quarterly to verify retention of radioactive material in controlled areas. The integrity of physical barriers is verified by routine security guard checks and monthly inspections.

In 1977 NASA considered a plan for entombing the Plum Brook Test Reactor with monitoring for a limited period of time to assure that entombment structures were adequately retaining the radioactivity. This plan was not pursued, however, in view of the possibility that the license would remain in effect and some monitoring would be required as long as any radioactive material, above levels acceptable for release to unrestricted access, remained on site.

The Mockup Reactor is a pool type reactor that duplicated the Plum Brook Test Reactor in core characteristics but operated at a maximum power level of only 100 KWt. The Mockup Reactor was used for verifying nuclear characteristics of in-core experiments before they were placed in the test reactor. In addition to removing the fuel, all water has been drained from the reactor pool. The radiation level near the remaining Mockup Reactor core components is approximately 100 mr/hr. Access to pool area is controlled by locked doors and radiation signs.

NASA is now developing plans for dismantlement of both reactors at the facility. Buildings and structures will be retained to the extent allowable but all radioactive material will be removed from the site. The major residual activity is in the reactor vessel and reactor vessel internals of the 60 MW test reactor. NASA estimates that this inventory consists primarily of 156,000 curies of tritium in the beryllium reflector segments, 2,640 curies of cobalt-60 in the reactor vessel and internals and 7,340 curies of Iron-55 in the reactor vessel and internals. The reflector segments and other reactor internals will be detached, removed and disposed of prior to remotely cutting up the reactor vessel. Dismantling of the 100 KW Mockup Reactor will involve disposal of much smaller amounts of induced activity in the reactor internals and the reactor concrete pool walls.

N. S. Savannah

The N. S. Savannah is the first and only nuclear powered cargo and passenger ship in the United States. The 80 MWt Savannah reactor has been shutdown since August 1970. All fuel, radioactive resins, primary and secondary system water and loose radioactive material has been removed and the ship is in safe storage at the U. S. Army Depot Berth in North Charleston, South Carolina. All radiation areas are controlled through the use of the shielding barriers of the reactor containment structure and locked hatches in other parts of the ship. Also, the U. S. Army provides access control with their existing guard force. The U. S. Maritime Administration, the licensee, continues to maintain cathodic protection for the ship's hull. Authorization has been given to move the Savannah to the James River Reserve Fleet to be retained there in safe storage until the reactor vessel radiation levels have decayed to reduce exposures for eventual dismantling.

The N. S. Savannah may, however, be refurbished and put on display at the Naval and Maritime Museum at Patriots Point, Charleston, South Carolina. The Patriots Point Development Authority has proposed to lease the ship from the Maritime Administration for that purpose. The Patriots Point Authority was established and funded by the State of South Carolina and now has the U. S. S. Yorktown, an aircraft carrier, on display at their Maritime Museum.

Prior to transfer of the Savannah to the Maritime Museum, all highly radioactive areas such as the pressure vessel and surrounding containment vessel would of course have to be secured adequately to prevent unauthorized entrance. Also, further decontamination of other areas may be required. The Maritime Administration would retain ownership of the vessel with radiation control and monitoring accomplished by the State Public Health Service. The NRC will evaluate the adequacy of any proposed license changes to allow the use of the Savannah for this

Maritime Museum. The Savannah will remain at its berth in North Charleston until a decision is made on moving it to the Maritime Museum or the James River Reserve Fleet.

DISMANTLING

Experience in dismantling has involved 42 research reactors and critical facilities and the Elk River Demonstration Power Plant. The major effort in dismantlement to date has involved the Elk River Reactor and larger research reactors in which considerable quantities of activated and contaminated concrete, steel and soil have had to be removed. Regulatory Guide 1.86 has been used for guidance on surface contamination with activation and soil contamination limits evaluated on a case basis. The licensee has been required to show through analysis that radiation exposures to any member of the public would be a small fraction of 10 CFR 20.105 limits (500 mr/yr) for activated materials and soil contamination. We have, also, required that activated material be removed such that the radiation level three feet from the surface of the activated material would be less than 50 microrem/hr. The licensee has also been required to demonstrate with cost benefit analysis that the residual radioactivity was as low as reasonably achievable.

ENTOMBMENT

Three Demonstration Nuclear Power Plants have been entombed (Table V). These are government owned reactors which were operated by private utilities. Radiation surveys and sampling is accomplished by local agencies for the U. S. Department of Energy (DOE). There has been no evidence of deterioration of the entombment structures or release of radioactivity from these entombed facilities per discussions with DOE personnel. Two of the entombed facilities were used for other purposes following entombment. The Piqua Containment Building is still used by the City of Piqua, Ohio as a warehouse and the Bonus Facility in Puerto Rico was used as a museum following entombment. At Hallam, all above ground structures were removed prior to entombment.

REGULATIONS AND GUIDES ON DECOMMISSIONING

We are now involved in reviewing our regulations and guidance on reactor decommissioning in light of our experience and studies that we have funded.

A study by Battelle PNL "Technology, Safety and Costs of Decommissioning a Reference Pressurized Water Reactor Power Station" (NUREG-CR 0130) was published in June 1978 and a similar study by Battelle for boiling water reactors (NUREG-CR 0672) is near completion. In addition Battelle is performing an environmental study for the NRC on decommissioning (NUREG-0586). An Oak Ridge study "Potential Radiation Dose to Man from Recycle of Metals Reclaimed from a Decommissioned Nuclear Power Plant" NUREG-CR 0134) was published in December 1978.

We anticipate that the result of our reviews will be to develop more specific rules and guidance for each decommissioning alternative and more specific facility radiation release criteria.

CONCLUSION

We believe that the experience to date has demonstrated that there are very viable options for decommissioning both smaller nuclear reactors and today's larger commercial facilities. A single decommissioning route is not appropriate for all facilities. Methods and time of decommissioning must be tailored to accommodate the specific site characteristics including future use of the site, cost and potential exposure to workers without, of course, any compromise to the health and safety of the public.

TABLE 1

DECOMMISSIONED POWER, TEST AND NUCLEAR SHIP REACTORS IN SAFE STORAGE/MOTHBALLED WITH CONTINUED LICENSE

DOCKET NO. REACTOR	THERMAL POWER	LOCATION	PRESENT STATUS
50-16 Fermi 1 Fast Breeder Power Reactor	200 MW	Monroe Co. Mich.	Possession Only Lic.
50-18 GE VBWR BWR Power Reactor	50 MW	Alameda Co. Calif.	Possession Only Lic.
50-114 CVTR Presssure Tube, Heavywater, Power Reactor	65 MW	Parr S.C.	Byproduct Lic. (St.)
50-130 Pathfinder Nuclear Superheat, Power Reactor	190 MW	Sioux Falls S. Dak.	Byproduct Lic. (NRC)
50-171 Peach Bottom 1 HTGR Power Reactor	115 MW	York Co. Pa.	Possession Only Lic.
50-22 Westinghouse Test Reactor	60 MW	Waltz Mill Pa.	Possession Only Lic.
50-30 NASA Plum Brook Test Reactor	60 MW	Sandusky Ohio	Dismantling Authorized
50-146 Saxton PWR Test Reactor	28 MW	Saxton Pa.	Possession Only Lic.
50-183 GE EVESR Exp. Superheat Test Reactor	17 MW	Alameda Co. Calif.	Possession Only Lic.
50-200 B&W BAWTR Test Reactor (Pool Type)	6 MW	Lynchburg Va.	Byproduct Lic. (NRC)
50-231 SEFOR Sodium Cooled Test Reactor	20 MW	Strickler Ark.	Byproduct Lic. (St.)
50-238 NS Savannah PWR	80 MW	Charleston S.C.	Possession Only Lic.

Updated 3/10/82

TABLE II

DECOMMISSIONED RESEARCH REACTORS AND CRITICAL FACILITIES IN SAFE STORAGE WITH CONTINUED POSSESSION ONLY LICENSE

DOCKET NO. REACTOR	THERMAL POWER	LOCATION	PRESENT STATUS
50-6 Battelle Memorial Institute Pool Type Research Reactor	2 MW	Columbus Ohio	Dismantling Plans Being Developed
50-47 Watertown Arsenal U. S. Army Pool Type Research Reactor	5 MW	Watertown Mass.	Dismantling Plans Being Developed
50-94 Rockwell Inter. Corp. L-77 Research Reactor	10 W	Canoga Park Calif.	License Terminated 2/11/82
50-106 Oregon State Univ. AGN-201 Research Reactor	0.1 W	Corvallis Oregon	License Terminated 11/10/81
50-111 North Carolina State Pool Type Research Reactor	10 KW	Raleigh N.C.	Dismantling Authorized
50-129 West Virginia Univ. AGN-211P Research Reactor	75 W	Morgantown W. Va.	Dismantling Authorized
50-141 Stanford Univ. Pool Type Research Reactor	10 KW	Stanford Calif.	Dismantling Authorized
50-147 Rockwell Int. Corp. FCEL Split Table Critical Facility	200 W	Canoga Park Calif.	License Terminated 10/1/80
50-185 NASA MOCKUP Pool Type Research Reactor	100 KW	Sandusky Ohio	Dismantling Authorized
50-394 Calif. Polytechnic State Univ. AGN-201 Research Reactor	0.1 W	San Luis Obispo Calif.	Dismantling Authorized
50-99 Lynchburg Pool Reactor, B&W, Pool Type Research Reactor	1.0 MW	Lynchburg Va.	~~Dismantling Authorized~~ License terminated 7-20-82

Updated 3/10/82

TABLE III

DISMANTLED RESEARCH REACTORS (LICENSE TERMINATED)

DOCKET NO. REACTOR	THERMAL POWER	LOCATION	DATE LIC. TERMINATED
50-1 Illinois Inst. of Technology (Water Boiler Research)	100 KW	Chicago Ill.	04-28-72
50-4 USN Research Lab (Pool Type)	1 MW	Washington D.C.	03-18-71
50-8 N.C. State (Aqueous Homogeneous)	100 W	Raleigh N.C.	09-07-66
50-17 Industrial Reactor Labs. (Pool Type)	5 MW	Plainsboro N.J.	11-04-77
50-43 U.S. Naval Post-graduate School (AGN-201)	0.1 W	Montery Calif.	10-11-72
50-50 North American Aviation (L-47 homogeneous)	5 W	Canoga Park Calif.	06-30-58
50-58 Oklahoma State University (AGN-201)	0.1 W	Stillwater Okla.	03-19-74
50-60 U. S. Navy Hospital (AGN-201M)	5 W	Bethesda Md.	06-24-65
50-64 University of Akron (AGN-201)	0.1 W	Akron Ohio	10-09-67
50-84 University of Calif. (AGN-201)	0.1 W	Berkeley Calif.	08-23-66
50-98 University of Delaware (AGN-201)	0.1 W	Newark Del.	02-26-79
50-101 Gulf United Nuclear (Pawling Lattice Test Rig)	100 W	Pawling N.Y.	06-25-74

TABLE III (CONT'D)

DISMANTLED RESEARCH REACTORS (LICENSED TERMINATED)

DOCKET NO. REACTOR	THERMAL POWER	LOCATION	DATE LIC. TERMINATED
50-114 William March Rice University (AGN-211)	15 W	Houston Texas	09-26-67
50-122 University of Wyoming (L-77)	10 W	Laramie Wyoming	12-05-75
50-135 Walter Reed Medical Center (L-54, Homogeneous Solution)	50 KW	Washington D.C.	07-26-72
50-167 Lockheed (Pool Type)	10 W	Dawson Co. Georgia	09-01-60
50-172 Lockheed (Radiation Effects Reactor)	3 MW	Dawson Co. Georgia	08-31-71
50-202 University of Nevada (L-77)	10 W	Reno Nevada	02-24-75
50-212 General Dynamics Fast Critical Assembly	500 W	San Diego Calif.	03-05-65
50-216 Polytechnic Inst. N.Y. (AGN-201M)	0.1 W	Bronx N.Y.	12-21-77
50-227 General Atomic Co. (TRIGA Mark III)	1.5 MW	San Diego Calif.	12-10-75
50-235 Gulf General Atomic (APFA)	500 W	San Diego Calif.	10-22-69
50-240 Gulf General Atomic (HTGR)	100 W	San Diego Calif.	04-02-73
50-253 Gulf Oil Corp. (APFA III)	500 W	San Diego Calif.	08-10-73
50-310 NUMEC and Commonwealth of Pa. (Pool)	1 MW	Quehanna Pa.	12-02-66

TABLE IV

DISMANTLED CRITICAL FACILITIES (LICENSE TERMINATED)

DOCKET NO. REACTOR	MAX. POWER	LOCATION	DATE LIC. TERMINATED
50-13 Babcock & Wilcox (Split Table)	1 KW	Lynchburg Virginia	06-01-73
50-14 Battelle Memorial Platics Moderated Critical Assembly	200 W	W. Jefferson Ohio	05-11-70
50-23 Nuclear Development Corp. of America (Crit. Ex.)	100 W	Pawling N.Y.	06-22-61
50-24 General Electric (BWR Crit. Ex.)	200 W	Alameda Co. Calif.	12-01-69
50-34 Westinghouse Electric Corp. (PWR Crit. Ex.)	1 KW	Waltz Mill Pa.	12-08-69
50-37 Gen. Dynamics (CIRGA Zirconium Hydride Mod.)	25 W	San Diego Calif.	03-15-60
50-75 NASA (ZPR-1, Solution Type Crit. Fac.)	100 W	Cleveland Ohio	10-13-73
50-87 Westinghouse Electric Corp. (Crit. Ex. Station)	100 W	Waltz Mill Pa.	01-26-72
50-108 Allis Chalmers (Crit. Ex. Fac.)	100 W	Greendale Wis.	01-20-67
50-153 Westinghouse Electric Corp. (CVTR MOCKUP, Heavy Water)	3 KW	Waltz Mill Pa.	04-24-63
50-154 Martin Marietta Corp. (Liquid Fluidized Bed Crit. Ex.)	10 W	Middle River Md.	02-07-66
50-191 Babcock & Wilcox (Plutonium Recycle Crit. Ex.)	-	Lynchburg Virginia	06-01-73

TABLE IV (CONT'D)

DISMANTLED CRITICAL FACILITIES (LICENSE TERMINATED)

DOCKET NO. REACTOR	MAX. POWER	LOCATION	DATE LIC. TERMINATED
50-197 NASA (ZPR-2 Solution Type Crit. Fac.)	100 W	Cleveland Ohio	10-13-73
50-203 GE (Mixed Spectrum Crit. Assembly)	400 W	Alameda Co. Calif.	03-11-68
50-234 Gulf Oil Corp. (Thermionic Crit. Fac.)	200 W	San Diego Calif.	08-10-73
50-246 General Dynamics Corp. ACRE	10 KW	San Diego Calif.	12-30-66
50-290 Gulf United Nuclear (Water Mod. Proof Test Fac.)	100 W	Pawling N.Y.	06-25-74

TABLE V

DECOMMISSIONED DEMONSTRATION NUCLEAR POWER PLANTS

DOCKET NO. REACTOR	THERMAL POWER	LOCATION	PRESENT STATUS
115-1 Elk River BWR	58.2 MW	Elk River Minn.	Dismantled Federal Control Terminated
115-2 Piqua Organic Cooled	45.5 MW	Piqua Ohio	Entombed DOE Monitoring
115-3 Hallam Sodium Cooled	256 MW	Hallam Nebr.	Entombed Doe Monitoring
115-4 Bonus BWR Nuclear Superheat	50 MW	Rincon Puerto Rico	Entombed DOE Monitoring