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ADDENDUM TO SAXTON CORE III LICENSE APPLICATION

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by

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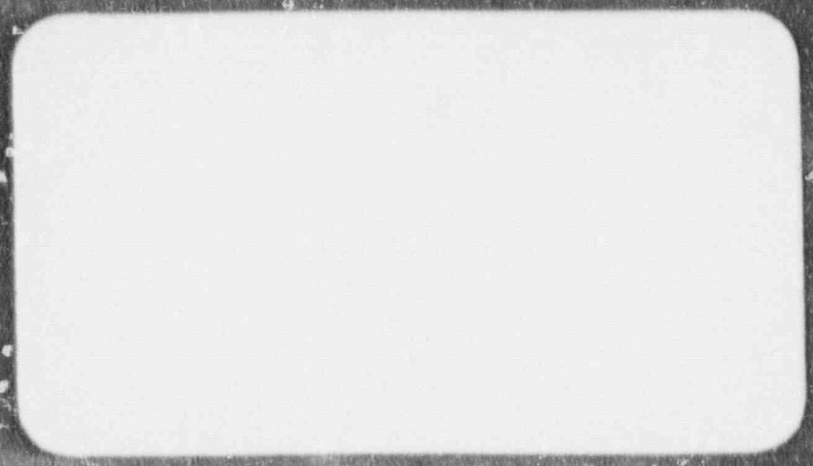

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ADDENDUM TO SAXTON CORE III LICENSE APPLICATION

Introduction

This addendum to the Saxton Core III Safeguards Report contains proprietary information on load follow fuel rod design which amplifies the description of these rods in the main body of the report. The types of experimental fuel rods and the ranges of rod design values are given here.

The calculational basis for nuclear and thermal-hydraulic designs is discussed in full in the safeguards report and is not repeated here. Mechanical design, with the exception of a detailed listing of fuel rod variables, is covered in the main report; only a brief description of assembly design is repeated here. An evaluation of thermal-hydraulic and mechanical performance of these test rods which confirms that all test rods satisfy the applicable design criteria is summarized in this report. The six rods (of the 120 load follow rods) which contain pressure control devices are designed such that internal pressure may exceed primary system pressure at the end-of-life. These rods were analyzed to assure that the clad stress and strain design criteria are satisfied.

Test Objective and Mode of Operation

The objective of the load follow experiment is to determine the effect of fuel rod linear power level, fuel density, fuel-clad gap and internal pressure on fission gas release, fuel swelling, and clad strain behavior under power cycling conditions. The study includes combinations of rod design variables representative of both current and developmental fuel designs.

Throughout Core III operation the assemblies will be subjected to several power cycles each day. The lower limit of the cycling range may be re-

stricted by Saxton plant capabilities, but is expected to be in the vicinity of 40% of full power. The upper limit of the cycle will be limited to 100% of full power, as defined in the safeguards report. In addition, mid-way through Core III life the positions of these two assemblies will be interchanged to simulate power level increases associated with fuel management techniques which [illegible]ire movement of fuel assemblies from low power core regions to high pow[illegible]re regions.

Load Follow Assembly Design

The load follow assemblies are similar in design to previous Saxton assemblies. The arrangement of fuel rods and other fuel bundle components of the assemblies is shown in cross section in Figure 1. Three tie rods hold the removable top nozzle in place. Two tie rods are Inconel-filled stainless steel tubes and the third tie rod is a stainless steel tube with a stainless steel filler rod. Five water-filled tubes are used to increase the water-fuel ratio in the center of the assembly and thus increase the power level of the adjacent fuel rods.

Fuel Rod Design

A number of combinations of the variables listed in Table I are included in the 120 fuel rods comprising the two load follow assemblies. The majority of the rods are Zircaloy-4 clad. The several stainless steel rods are included to study fission gas release and fuel swelling with minimized sensitivity to clad-pellet gap conductance. Six pressurized rods contain pressure control chambers located in the top plenum space to limit the range of internal gas pressure from beginning to end of core life. The chambers consist of stainless steel below with brazed thin diaphragm end closures designed to rupture at internal pressures not to e[illegible]ed 2800 psi. The rods with pressure control chambers will operate [illegible] peak linear powers in the range 14.5 to 19.9 kw/ft.

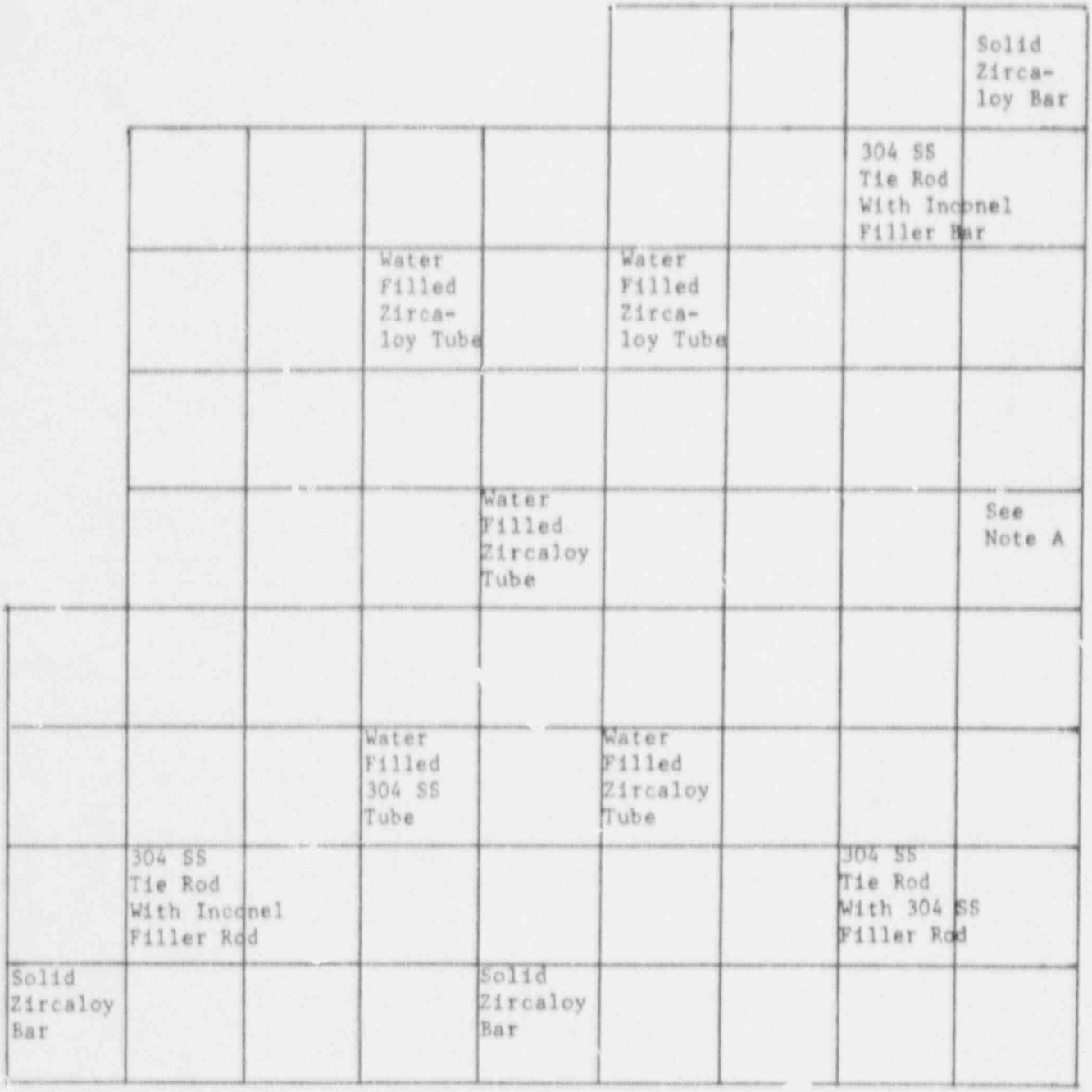

Figure 1: Schematic Diagram of Load Follow Assembly Cross Section Showing General Arrangement (All positions not otherwise noted are occupied by fuel rods.)

NOTE A: In fuel assembly 503-18-3 this position occupied by a Zircaloy tube test specimen assembly at beginning of Core III. In fuel assembly 503-18-1 this position occupied by a flux monitor thimble at beginning of Core III. Positions of tube test assembly and flux monitor thimble are reversed in second half of Core III lifetime.

TABLE 1

LOAD FOLLOW TEST ROD DESIGN VARIABLES

A. Fuel

Composition - UO_2

Density - 89.5% T.D. - 42 rods
92% T.D. - 42 rods

94.5% T.D. - 30 rods

Mixed 89.5% T.D. and 95% T.D. - 6 rods

Enrichment - 9.5% U-235 - 34 rods
12.5% U-235 - 86 rods

B. Cladding

Zircaloy-4 - .3445" I.D. x .3910" O.D.

6 rods in recrystallization annealed condition

96 rods in stress-relief annealed condition

Type 304 Stainless Steel - .361" I.D. x .391" O.D. - 18 rods

C. Fuel Clad Diametral Gap

5.5, 7.5, 9.5 mils for Zircaloy clad rods
3-10 mils for stainless steel clad rods

D. Fuel Rod Internal Atmosphere

air at 15 psia
helium at 200, 350, 500 psia

Fuel Rod Performance

All of the Load Follow test rods were designed to avoid fuel melting. The highest temperature (4600°F at beginning-of-life, approximately 500°F below the melting point) will occur in a Zircaloy-clad rod at peak design power of 19.9 kw/ft with 89.5% T.D. fuel, an initial pressure of 15 psia air. With continued irradiation, fuel thermal expansion, and clad creep down tend to increase the fuel-clad gap conductance and therefore decrease the fuel temperature. Other design combinations were evaluated for initial internal gas pressures up to 500 psia, fuel density up to 94.5% T.D. and fuel-clad gap up to 9.5 mils. Because of the higher fuel-clad gap conductance resulting from the higher pressure and because of the higher thermal conductivity of the higher density fuel, peak fuel temperatures were predicted to be less than in the case stated above.

The highest internal gas pressure conditions will exist in Zircaloy-clad rods containing pressure control chambers; in several of these rods pressure will exceed coolant pressure. However, even in the event that the pressure chambers fail to rupture as designed, the clad stress will still be considerably below yield stress and total clad strain will still be less than 1%.

For the Zircaloy clad rods which do not contain pressure control devices, the lead rod end-of-life internal pressure will be less than the 2250 psia primary system pressure. The lead rod design parameters are 89.5% fuel density, 500 psia initial internal pressure, and 9.5 mil initial fuel-clad diametral gap. At the design peak burnup of 21,000 MWD/MTU, fission gas release is expected to have a minor effect on the total internal pressure. Higher fuel density and smaller fuel-clad gaps are more moderate design combinations leading to increased fuel-clad gap conductance, lower fuel temperatures, lower fission gas release and lower end-of-life pressure. In none of these temperature and pressure limiting combinations does the total clad strain exceed the design limit of 1% in the Zircaloy clad fuel rods.

The questions of fuel temperature and internal pressure are also considered for the 18 stainless steel-clad fuel rods in these two assemblies. The combinations of gap, fuel density and linear power have been chosen to avoid fuel melting and end-of-life internal pressures exceeding coolant pressure in the stainless steel rods. The higher strength of the stainless steel cladding assures that clad strain at end-of-life will be less than 1%.

David DeKok
113 Conoy Street
Harrisburg, Pa. 17104
Jan. 1, 1991

FREEDOM OF INFORMATION
ACT REQUEST
FOIA-91-17
Rec'd 1-8-91

Mr. Donnie H. Grimsley
Director
Division of Freedom of Information
and Publications Services
Office of Administration and Resources Management
Nuclear Regulatory Commission
Washington, D.C. 20555

Re: Freedom of Information request

Dear Mr. Grimsley:

Pursuant to the Freedom of Information Act, I would like copies of the following documents:

--All documents pertaining to the Ad Hoc Committee for Cooperation Between the AEC and the Electric Power Industry, which was in existence from 1949 to 1951. Edward W. Morehouse, vice president of General Public Utilities, was one of three members of this committee. If any of these documents are already in the local public document room in Harrisburg, please provide me with their titles and fiche numbers.

--All documents (with the exception of those provided in a previous FOIA) between 1951 and 1966, inclusive, pertaining to Atomic Power Development Associates, an industry consortium organized in 1951 by Walker Cisler of Detroit Edison and of which General Public Utilities was a member. GPU vice president Edward W. Morehouse was a member of the APDA board and chairman of the Economics Committee. APDA's purpose was to do engineering and economic studies of nuclear energy, and its engineers (loaned from GPU and others) developed plans for the Enrico Fermi breeder reactor.

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If any of these documents are already in the local public document room in Harrisburg, please provide me with their titles and fiche numbers. The PDR staff has informed me, however, that no APDA documents are in the public document room.

--All documents from Jan. 1, 1955, to Dec. 31, 1958, pertaining to the Manila Nuclear Power Project of General Public Utilities. The project was a study of whether it was feasible to build a nuclear reactor for Manila Electric Co. in the Philippines, then a subsidiary of GPU, and Atomic Energy Commission personnel were extensively consulted on the project, according to one document I have. If any of these documents are already in the public document room in Harrisburg, please provide me with their titles and fiche numbers.

--All documents not already in the public document room that pertain to the Saxton Nuclear Experimental Corporation reactor operated by Westinghouse and General Public Utilities at Saxton, Pa. The time period is Jan. 1, 1957 through Dec. 31, 1967. I have a print-out of PDR documents on Saxton, and only a handful are dated prior to 1969. Planning for Saxton began in 1957 or 1958.

--All corporate documents--for example, corporate board minutes--of General Public Utilities, Jersey Central Power & Light Co., and Metropolitan Edison Co. that are in the possession of the Nuclear Regulatory Commission, including those obtained for use in any of the investigations of the Three Mile Island nuclear accident. If any of these are already in the local public document room in Harrisburg, please provide me with their titles and fiche numbers.

--Any documents in NRC files that were obtained from the Pennsylvania State Police for use in any of the investigations of the TMI nuclear accident. This would include the State Police helicopter pilot log and the State Police dispatcher log, both of which were requested from the state by Deputy Director James M. Allen in a June 28, 1979 letter to Lt. Gov. William Scranton of Pennsylvania. If any of these documents are already in the local public documents room in Harrisburg, please provide me with their titles and fiche numbers.

The state police refuse to release any of their documents, on any topic, and are not subject to FOIA or the state's limited Open Records Act. If the NRC has any of these documents, it is my only realistic source for them.

Pursuant to the Freedom of Information Act, I also request both representative of the news media status and a public interest waiver of all search and copying fees. A public interest waiver of search and copying fees has been provided by Hugh L. Thompson Jr., deputy executive director for nuclear materials safety, safeguards and operations support in connection with previous FOIA requests for this research project.

I will now provide the information requested of fee waiver applicants in 10 CFR 9.41(b)(c) & (d).

(1) Describe the purpose for which the requester intends to use the requested information.

The documents will be used in preparation of a definitive history of General Public Utilities (GPU), the Three Mile Island nuclear accident and its impact on the world.

(2) Explain the extent to which the requester will extract and analyze the substantive content of the agency record.

I will provide a great deal of analysis to the information in the documents I obtain from the NRC. I will match it with information I obtain from other sources, like personal interviews, and use all that information to write a comprehensive, truthful and objective book that will (1) tell the history of the commercial nuclear industry, especially the involvement of GPU, before TMI; (2) tell what happened during the TMI accident in 1979; (3) tell what happened during the 10 years after TMI (such as the clean-up at TMI, the financial problems of the nuclear industry, etc.); and (4) will look at the future of nuclear power in light of concerns over global warming.

(3) Describe the nature of the specific activity or research in which the agency records will be used and the specific qualifications the requester possesses to utilize information for the intended use in such a way that it will contribute to public understanding.

I plan to use the NRC records to write a definitive history for the general public of the Three Mile Island nuclear accident of 1979 and its impact on the world. The book will describe the events leading to the accident, the accident itself, and what happened at TMI and to the nuclear industry in the 10 years that followed, and what the future might hold for nuclear power in light of concerns over global warming.

I have considerable experience in making complex scientific or technical stories accessible and interesting to the general public. My first book, *Unseen Danger: A Tragedy of People, Government and the Centralia Mine Fire* (University of Pennsylvania Press 1986) required me to make a complex geological problem understandable to people who were not, in most cases, geologists or scientists. The reviews my book received testify to my success in carrying that out.

I covered the nuclear energy beat for The Patriot-News in Harrisburg for about two years (until GPU Nuclear succeeded last February in having me removed from the beat because I am writing this book--an arbitration ruling in my grievance is pending) and acquired a working knowledge of nuclear terminology and procedures. If there was something I did not understand about something I had read, I would call an expert who could help me. I would do the same if there was something I did not understand in the documents I seek in this FOIA request.

(4) Describe the likely impact on the public's understanding of the subject as compared to the level of understanding existing prior to disclosure.

No comprehensive, definitive history has been written of the TMI accident that includes all the important events that preceded it as well

as what happened to GPU and the rest of the nuclear industry in the years that followed.

My book will be more than just a simple retelling of the TMI accident. I will place the accident in the context of the rise and (perhaps) fall of the commercial nuclear industry in the U.S. and the world.

I intend for my book to be the one people pick up at the library in years to come when they want to know the who-what-why-when-where and how much of one of the more significant technical, business and historic events of the late 20th century. It will distill the important information from the tens of thousands of government documents pertaining to TMI, technical papers written by scientists, and the many other sources of information into one good book.

(5) Describe the size and nature of the public to whose understanding a contributions will be made.

This book is being written for the general reading public--the average man or woman who does not work for the NRC or the Department of Energy or the nuclear industry and who typically would only receive information about TMI from a book acquired at a library or bookstore. I would estimate this to be quite a large, diverse group.

(6) Describe the intended means of dissemination to the public.

A book.

(7) Indicate if public access to information will be provided free of charge or provided for an access fee or publication fee.

Readers will be able to borrow the book free of charge at public libraries.

(8) Describe any commercial or private interest the requester or any other party has in the agency records sought.

I have no commercial or private interest in the NRC documents sought in this request. They will be used exclusively for research for my book and will not be sold.

(d)(1) How the subject of the requested agency records concerns the operations or activities of the Government.

It has been the duty of the NRC, and the Atomic Energy Commission before it, to regulate the U.S. nuclear industry, a duty that includes investigation of nuclear accidents.

(d)(2) How the disclosure of the information is likely to contribute to an understanding of Government operations or activities.

The documents will be used in a book about General Public Utilities, the TMI accident, and its impact on the world. Readers of the book will come to understand the role of the NRC, and the AEC before it, in supervising the U.S. nuclear industry, and of the AEC in promoting the U.S. nuclear industry.

(d)(3) If disclosure of the requested information is likely to contribute to public understanding.

To the best of my knowledge, no definitive history has been written about the TMI accident, and none of the books that have been written fully describe the history of GPU's involvement in nuclear energy.

(d)(4) If disclosure is likely to contribute significantly to public understanding of Government operations or activities.

The documents will contribute significantly to a general public understanding of the role of the AEC in regulating and promoting

nuclear power and of the NRC in regulating it. Relatively little has been written by non-government sources about the early history of commercial nuclear energy, and to the best of my knowledge, nothing has been written for the general public about GPU's early involvement with nuclear energy. Thus, the requested documents will make a significant contribution to public understanding. The corporate documents will contribute to public understanding in the same manner. As for the state police documents, they show the range of areas investigated by the NRC after the nation's worst commercial nuclear accident.

(d)(5) If, and the extent to which, the requester has a commercial interest that would be furthered by the disclosure of the requested agency records.

I anticipate receiving royalties on the book, perhaps in four or five years. However, there is no guarantee I will make any profit on the book. It is often said that most authors would make more money by spending the same amount of time working in a fast food restaurant. My first book, Unseen Danger, received favorable reviews, including one in The New York Times, was purchased for many libraries, and earned me enough to buy a nice topcoat, which I still have but which is starting to show its age. I hope this book will do better, but one never knows.

(d)(6) If the magnitude of the identified commercial interest of the requester is sufficiently large, in comparison with the public interest in disclosure, that disclosure is primarily in the commercial interest of the requester.

As I have stated, the documents will be used in a definitive history of the TMI accident and its impact on the world. I anticipate receiving royalties, but I believe the public interest in disclosure of the documents clearly outweighs any minimal commercial benefit to myself.

The public has an especially significant interest in this issue because of the global warming problem. Nuclear power production

emits only a tiny fraction of the carbon dioxide emitted by a conventional power plant burning fossil fuels. TMI and the nuclear safety issue remains a roadblock in the public mind to greater use of nuclear power, however, and unless the public is given all the facts, about issues great and small, it cannot make an informed decision.

Thank you for your consideration.

Sincerely,

David DeKok

Rec'd 1-25-91

David DeKok
113 Conoy Street
Harrisburg, Pa. 17104
Jan. 8, 1991

Mr. Donnie H. Grimsley
Director
Division of Freedom of Information
and Publication Services
Office of Administration and Resources Management
Nuclear Regulatory Commission
Washington, DC 20555

Re: Amended FOIA request

Dear Mr. Grimsley:

I wish to make a slight amendment to one of the categories of documents I asked for in my FOIA request of Jan. 1, 1991.

In the paragraph that asked for "All documents not already in the public document room that pertain to the Saxton Nuclear Experimental Corp. reactor operated by Westinghouse and General Public Utilities at Saxton, Pa.," please delete the time period for the requested documents, Jan. 1, 195[illegible], through Dec. 31, 1967.

I now wish to obtain copies of all Saxton-related documents dated Jan. 1, 1957 through Jan. 1, 1991, that are not in the public document room.

Sincerely,

David DeKok

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