

ap Ser. 2/13/59

MF 1520

Summary notes 2/1/63

Vol 1

MHS-3-Hazards of Power Reactors

TITLE

MH&S-3-Hazards of Power Reactors

	Date	To	From	Class	Pgs. No.	To	From	Class
1	1-13-59	AEC 943/4						
		Reactor Projects Safety Reports						
			skw	u				
2	1-22-59	Reactor Hazards Briefing of the President						
			skw	u				
3	2-16-59	AEC 1016						
		Hazards Review of Reactors						
		Public Participation in Hazards						
		Review of Reactors						
		Parallel Procedures	skw	ouc				
4	11-23-59	AEC 943/5						
			vee	u				
5	5-9-60	AEC 943/6						
		Air Force						
		Safety Surveys of USAF						
		Reactors	vee	u				

MH&S-3-Hazards of Power Reactors

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1	8-18-60	Teller, Edward		skw	u			
2	11-15-60	Army Reactor Safety Rules						
		filed in MH&S-3-Hazards of						
		Military Reactors						
3	12-27-60	AEC 943/7		skw	u			
		Pool-Type Reactors						
4	2-28-61	AEC 943/8		skw	u			
		Reactor Safety Criteria						
5	8-15-61	Haworth, Commissioner Olson, Commissioner Ad Hoc Cmtee to Study Responsibility for Safety of Commission-Owned Reactors		see				
6	12-16-61	AEC 943/9		see	c			
		Confinement of Production Reactors						
7	5-23-62	Operation of Nuclear Ships		see				

MH&S 3 Hazards frm. Power Reactors

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1	1-10-63	AEC 943/10	Reactor Safety Research Program						
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2	3-2-63	AEC 943/11							
				vee					
3	11/20/63	AEC 943/12							
				rk					
4	11/20/63	AEC 943/13							
				rk					
5	1/19/63	Containment Systems Experiment							
				rk					
6	11-29-63	AEC 943/14							
				skr					
7	1-3-64	Boyle, W.A.							
				skr					
8	1-15-64	AEC 943/15							
				skr					
9	2-20-64	Nuclear Safety Research and Devel. Program							
				skr					
10	3-17-64	AEC 943/16							
				vee					

70A05-3 Hazards of Power Reactors
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Res. & Status Br. - GTR

UNITED STATES GOVERNMENT

Memorandum

TO : File DATE: May 13, 1964

FROM : W. B. McCool, Secretary

SUBJECT: REACTOR CAPTAINS

SECY:McQ

*Original Serial
W. B. McCool*

1. At Information Meeting 376 on May 8, 1964, Commissioner Ramey requested that he be furnished complete background information on "reactor captains". The information should include functions, responsibilities, history, pro and con considerations, etc.

2. It is our understanding that the Director of Operational Safety will furnish the information pertaining to AEC-owned reactors and the Deputy Director of Regulation will supply similar information pertaining to AEC-licensed operations.

- cc:
- Chairman
 - Commissioner Ramey
 - Commissioner Tape
 - General Manager
 - Deputy General Manager
 - Acting Asst. General Manager
 - Asst. Gen. Mgr. for R&D
 - Asst. Gen. Mgr. for Operations
 - Director, Operational Safety
 - Director of Regulation
 - Deputy Director of Regulation
 - General Counsel

*copy filed:
70A05-3 Hazards of
Nuclear Reactors*

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5-13-64

DATE:

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~~CONFIDENTIAL~~

~~POWER OF NUCLEAR ENERGY REACTORS (NFER)~~

TO: G.F.QUINN

FROM: GEN. ELECTRIC

SUMMARY: SAFETY IN OPERATIONS AT HANFORD Including loading of "N" reactor, irregularity of load "H" Reactor and the recent activity in the Columbia River

FILED: CONTRACT 9-GENERAL ELECTRIC

INDEXER: et

REMARKS:

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DOE NSI DECLASSIFICATION REVIEW E.O. 12958
BY: MARY DEFFENBAUGH DOE/NA-623
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U. S. ATOMIC ENERGY COMMISSION
CORRESPONDENCE REFERENCE FORM

5-25-62

DATE:

INDEX: MHS-3-Hazards from Power Reactors

TO: Commissioners

FROM: Duncan Clark, Director, Div. of Public Information

SUMMARY: STORY ON REACTOR SAFETY IN THE NATION MAGAZINE. Memo to the Commissioners with an attached article from the current issue of The Nation magazine which, in general, is a favorable story on the safety of nuclear power plants, although it is critical of the AEC in some respects.

FILED:

INDEXER: I&P-6-Articles

REMARKS: date of memo: 3-24-64

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DOE NSI DECLASSIFICATION REVIEW E.O. 12958
BY: MARY DEFFENBAUGH DOE/NN-523

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U. S. ATOMIC ENERGY COMMISSION

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8-24-64

711 44-2 - [unclear]) [unclear]

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AEC 943/16

March 17, 1964

COPY NO. 51

ATOMIC ENERGY COMMISSION

COOPERATION WITH THE ATOMIC INDUSTRIAL FORUM ON AEC
NUCLEAR SAFETY RESEARCH AND DEVELOPMENT PROGRAM

Note by the Secretary

The General Manager has requested that the attached memorandum from the Director, Division of Reactor Development, be circulated for the information of the Commission.

W. B. McCool

Secretary

AEC
943
16

DISTRIBUTION

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3-21-64

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UNITED STATES
ATOMIC ENERGY COMMISSION
WASHINGTON, D. C.

MEMORANDUM

TO : A. R. Luedcke March 12, 1964
General Manager
THRU : S. G. English, AGMRD
FROM : Frank K. Pittman, Director
Division of Reactor Development

SUBJECT: COOPERATION WITH THE ATOMIC INDUSTRIAL FORUM ON AEC
NUCLEAR SAFETY RESEARCH AND DEVELOPMENT PROGRAM

SYMBOL : RD:DNE:HGH

In my memorandum to you of November 19, 1963, (circulated as AEC 943/14), I noted that the Commission and the Board of Directors of the Atomic Industrial Forum had agreed to provide industrial input into our nuclear safety research and development program on a closer and more intensive basis. To implement this program, it was decided that industry would be solicited by the AIF in an effort to obtain an expression of interest in assigning industrial representatives to some of the AEC Nuclear Safety Programs so that direct communication and input from industry could be obtained.

The AIF has completed its survey of industry and approximately 25 firms have indicated an interest in participating in the Nuclear Safety Program. We have selected representatives from eight of these firms for the first round of what we plan will be a continuing program of industrial participation. The firms selected for the initial participation are:

<u>FIRMS</u>	<u>AEC PROGRAM</u>
General Electric	LOFT and SPERT, NRES
Westinghouse	LOFT, NRES
Stone and Webster	SPERT, NRES
Pacific Gas & Electric	Containment Systems Experiment, HAN
Consolidated Edison	Containment Systems Experiment, HAN
Bechtel	Containment Systems Experiment, HAN
EBASCO	Nuclear Safety Pilot Plant, ORNL
Battelle	Nuclear Safety Pilot Plant, ORNL

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In the second round of this program, starting next year, we would expect to invite participation by other industrial organizations that have already responded to the AEC offer, plus others that may indicate a desire to participate at a later date.

Letters have been sent to eight selected firms inviting them to meet with us to develop the details of the programs, including schedules for assignments. It is expected that each participant will spend part-time at the assigned location and the balance at his home office. As indicated in AEC 943/14, the participating companies will bear all salary costs with the Commission, through its integrated contractors, assuming travel and per diem costs.

M.H.S. 3-14-64 J. James Beck trans



UNITED STATES
ATOMIC ENERGY COMMISSION
WASHINGTON, D.C. 20545

March 4, 1964

MEMORANDUM FOR DR. FRANK PITTMAN, DIRECTOR
DIVISION OF REACTOR DEVELOPMENT

SUBJECT: LIAISON WITH DL&R ON NUCLEAR SAFETY
RESEARCH AND DEVELOPMENT PROGRAM

Thank you for sending me your memorandum of February 20 with an attached copy of a memo dated February 4 from Dr. Vander Weyden to Dr. Beck on the above subject.

I believe that assigning over-all liaison responsibility to one individual in each organization would be a step forward in coordinating the interests of the two groups. However, I believe there probably are additional matters which require attention in establishing a system of coordination of your respective interests in nuclear safety research and development.

I believe all of the Commissioners would be interested in the progress of the development of this type of relationship.

(728)
James T. Ramey
Commissioner

cc: Chairman Seaborg
Commissioner Palfrey
Commissioner Tape
General Luedcke
Dr. Beck
Secretary

3-4-64

John F. Kennedy

W.H. 9-3-1964
Frank R. Miller

FEB 10 1964

MEMORANDUM FOR CONSIDERATION

(Signed) Dwight D. Eisenhower
Director, Federal Reserve Board

SUBJECT: LEASING WITH RESERVE ON FEDERAL RESERVE DEPOSIT AND INVESTMENT ACCOUNT

In view of Mr. Miller's comments to the file dated January 11, 1964, your interest in the above subject was noted. It also was believed such action to be desirable and had not the desired response.

FRANK R. MILLER, Director
Division of Monetary Development

Approved:
Raymond G. Taylor, Deputy Director
Date: March 2, 1964

- cc: Chairman, Council
- Comptroller, Treasury
- Comptroller, Fed
- Comptroller, Finance
- W. E. Miller, Secretary (R)

4 files in vol. 2 - Reg. 7 - for discussion

10.11.64 by
D.M. 1.000
initials by
Signatures from President

1000

February 4, 1964

Clifford K. Beck
Deputy Director of Regulation

A. J. Vander-Hayden, Deputy Director
Division of Reactor Development

**NUCLEAR SAFETY PROMINANCE AND DEVELOPMENT ACTIVITIES - LIAISON BETWEEN
DIA AND DRD**

RD:DMR:RUS

As you are aware, this division conducts an extensive program in nuclear safety research, development, testing, data collection, and analysis. Much of the work done under this program can be expected to be of significant interest and value to the regulatory organization, particularly to the Division of Licensing and Regulation. Conversely, in the review of license applications and the regular contact with organizations building and operating licensed reactors, members of the regulatory staff develop ideas which can be of interest and value to us in the orientation, content, and direction of our nuclear safety work.

To date, the interchange of ideas and information between the regulatory organization and our nuclear safety organization has been considerable, and has been accomplished on a rather informal basis, and we would propose to continue in this manner. However, the amount and diversity of activities now involved in the nuclear safety program make it appear desirable that an individual in your organization be assigned over-all responsibility for liaison with our nuclear safety group. I believe the assignment of over-all liaison responsibility to one individual would secure the maintenance and promotion of mutually beneficial interchanges between our organizations and a more complete coverage of the wide spectrum of nuclear safety activities being conducted.

If you share these views, I would appreciate hearing from you regarding the appointment of a liaison representative. Should you wish to discuss this further, Dr. Lieberman or I would be happy to do so.

*M. H. S. Hazards from
Reaction*

JAN 21 1964

Dr. David F. Hall
Chairman, Advisory Committee on
Nuclear Safeguards to the
U.S. Atomic Energy Commission
Washington, D. C.

Dear Dr. Hall:

Reference is made to your letter of December 13, 1963, concerning a review of the AEC spent fuel shipment work program by the AEC. The Commission appreciates the interest in this important program and the specific comments of the Spent Fuel Subcommittee.

The AEC staff is now in the process of reviewing the Subcommittee's research and testing program related to safety design criteria for spent fuel shipment shipping modes to define additional studies that should be carried out in this area.

The recommendations of the Spent Fuel Subcommittee will be fully considered in this review. We will advise you of specific plans for a study on the feasibility of use of shielding materials other than lead.

You may be interested to know that the Franklin Institute, in cooperation with the AEC, will perform a mechanical analysis and small scale fire testing program which will serve as a basis for a full-scale fire test for a 15-ton lead cask, such as spent fuel shipping container. Consideration is being given to using the small fire test facilities for the full-scale test.

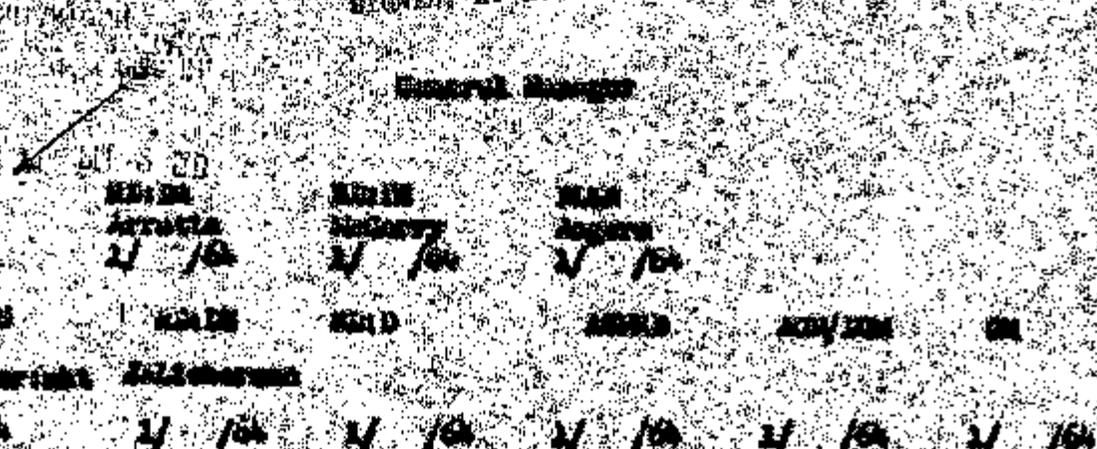
Sincerely yours,

SIGNED: A. R. HEDGECOCK

General Manager

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1-2/64

M.H.S. - 3 Adams 7 Power Reactor

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AEC 943/15

January 15, 1964

COPY NO. 53

ATOMIC ENERGY COMMISSION

AEC REACTOR SAFETY RESEARCH AND DEVELOPMENT PROGRAM

Note by the Secretary

The attached letter to Dr. David B. Hall, Chairman, ACRS, is circulated for the information of the Commission.

W. B. McCool
Secretary

AEC
943
15

DISTRIBUTION

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Dr. David B. Hall - ACRS

1-15-64

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UNITED STATES
ATOMIC ENERGY COMMISSION
WASHINGTON, D. C.

January 14, 1964

Dr. David B. Hall
Chairman, Advisory Committee on
Reactor Safeguards to the
U. S. Atomic Energy Commission
Washington 25, D. C.

Dear Dr. Hall:

This is in response to your letter of November 19, 1963,* transmitting the Committee's more recent comments on the AEC reactor safety research and development program.

I would like to express my appreciation for the Committee's continuing interest in the safety program and for the time and effort committee members have given to the review of this program. The Committee's comments have been received with great interest by our staff and are most helpful in focusing our R&D effort on the most significant problems. This letter summarizes how our current program attacks the primary problem of reactor safety, i.e., potential release and control of fission products to the environment, and responds to several related matters which were mentioned in your letter.

Since the laboratory scale work to date indicates that large fractions of fission products can be expected to be released upon the oxidation and melting of reactor fuels, our efforts in the area of fission product release are placing greater emphasis on the identification of the physical and chemical form of the released species and on the study of their behavior after leaving the fuel. Both the Nuclear Safety Pilot Plant and the Containment Systems Experiment will be devoted largely to the study of fission product behavior and transport and their control.

The primary purpose of the Nuclear Safety Pilot Plant (NSPP) is to study fission product behavior (transport, agglomeration, susceptibility to "countermeasures", etc.) within a containment shell. The NSPP is not, of course, intended to reproduce or simulate a complete core meltdown in a real reactor pressure vessel. The NSPP will attempt to produce sets of radioactive forms that cover a wide enough range of test conditions to permit bracketing the transport characteristics of radioactivity that would be released by actual reactor meltdowns. The actual representation of real fission product releases will be gained from the LOFT project and from other Division of Reactor Development research programs. Due to its ability to vary the rate and amount of fuel melting, temperature and atmosphere of the melt, type of fuel cladding melted, containment pressure, and other initial conditions, the NSPP will be able to study a wide range of simulated accident conditions and thus give an insight into the natural attenuation

*Secretariat Note: Circulated as AEC 943/12.

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factors that can be expected after real accidents. The NSPP will also be able to investigate the effectiveness of such engineered safeguards as water sprays and recirculation filter systems in reducing the fission product concentration within the containment shell. Currently, the NSPP is undergoing shakedown tests and it is expected that the experimental program will start in early 1964.

The Containment Systems Experiments (CSE) recently initiated at Hanford Laboratories will study the effectiveness of containment and other engineered safeguards under conditions simulating a maximum credible accident (loss-of-coolant) for water reactors. The experimental facility will consist of a model containment shell (25 ft. in diameter and 75 ft. high) housing a pressure vessel (2500 psi, 650°F), equipment for simulating various containment systems, extensive instrumentation, etc. By providing the flexibility to simulate and integrate all the major facets of such an accident (such as the rate of coolant loss, duration of release of activity, pressure rise and decay in containment, type of radioactive release, etc.), a comprehensive investigation defining the significance of the various accident characteristics on the transport of radioactivity can be carried out. Concurrently, the program will examine the effect of the loss-of-coolant accident on various types of containment systems and components (such as simple shells, multiple-wall shells, pressure suppression by water pools, sprays, etc.), and determine the effectiveness of these systems in retaining fission products which might be released in a reactor accident. Studies will be conducted of the inherent characteristics of containment that contribute to the retention of released radioactivity and various means of enhancing the effectiveness of the containment. It is expected that initially the experiments will use primarily simulated fission products; however, tests with real fission products are contemplated to demonstrate the applicability of CSE results to actual accident phenomena. The current schedule calls for the completion of fabrication and start of the experimental program by April 1965.

To enhance the scope of our research program we have already initiated experiments on fission product release from uranium carbide fuels and have plans for starting similar work with plutonium fuels. We are also evaluating the need for and the best means of testing that will better define the physical and chemical form of activity released under the conditions of real, self-induced core meltdown such as that resulting from the loss-of-coolant accident in water systems. This may require in-pile meltdown experiments on a larger scale than are presently being undertaken in the ORR and TREAT reactors. The results of such tests would be in support of and integrated with the data from such facilities as NSPP, CSE, and LOFT, to directly relate their investigations to actual accident conditions.

Many of the programs discussed thus far indicate the search we are making to understand the basic mechanisms governing nuclear safety. The engineering test portion of our program, which includes LOFT, embodies the philosophy that we need to know what actually happens in large nuclear accidents. Although the LOFT may not contribute directly to fundamental understanding of the various phenomena taking place, pre-analysis of the LOFT results will be undertaken to determine the applicability of existing research data to accident analyses and confirm our

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ability to use such data. It will, however, attempt to assess, for the first time in an integrated reactor system, the fission product release from:

1. The fuel elements to the reactor vessel,
2. The reactor vessel to the containment, and
3. The containment to the external environment.

Measurement of these successive transitions, which are the same as listed in your letter, is among the primary objectives of LOFT. In fact, we were pleased at the time of Dr. Frank Gifford's testimony before the JCAE on April 17, 1963, to note the identity of purpose in his statement and our project objectives. Dr. Gifford stated, "Just because the iodine release is so important, it is obviously very necessary to study all aspects of potential reactor accidents that may affect volatile fission product release. These include the core behavior during meltdowns; the amounts of various fission products released as a function of temperature and fuel composition; the amount and duration of containment pressurization; the height of release; the nature and efficiency of halogen removal systems, including washdown and plateout within the containment." The items in this excerpt of his testimony are what we propose to evaluate on an engineering scale in LOFT. It appears highly desirable to describe and discuss with you further this part of the program and I understand arrangements are being made to accomplish this with the Safety Subcommittee in the near future.

As has been previously indicated to the Committee, during the past year we have also initiated a program for the study of the likelihood, nature, extent, and prevention of failures in primary piping systems for pressurized and boiling water reactors. It is felt that a better understanding of this important aspect of a maximum credible accident for such systems could lead to improved reactor safety analysis and understanding of the likelihood and magnitude of any core meltdown and subsequent release and transport of radioactivity. This program is currently reviewing design criteria, materials specifications, service conditions, etc., for piping system. This survey effort will summarize the state of the art in piping design as well as modes and histories of failure and delineate the experimental program required to gain an understanding of the general problem of pipe rupture. It is anticipated that the experimental program will get under way in FY 65.

Directly related to the nuclear safety research effort is a comprehensive program of investigations on the effects of irradiation and environment on the properties of reactor structural materials, being conducted by the Fuels and Materials Development Branch of the Division of Reactor Development. This program, involving work at a number of sites, is aimed at developing a fundamental understanding of the nature of radiation damage. Included in the program are structural metals in current use in operating reactors as well as those considered for advanced reactor designs. Among the specific objectives of this program are: the development of a consistent method for measurement of exposure; study of the effect of neutron irradiation on materials subjected to multi-axial stress distribution; in-pile measurement of the fatigue properties of selected reactor vessel

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steels; the effect of irradiation on the fracture toughness of mild steels; the effect of radiation on the time-, temperature-, and stress-dependent properties of selected high temperature alloys and refractory metals; and the development of non-destructive testing instrumentation to measure nil ductility transition temperature change during the operating life of a reactor pressure vessel. I understand that arrangements have been made for the Committee to receive the quarterly progress reports prepared on this work.

In regard to the Committee's comments on the SPERT tests, the investigation of the mechanisms responsible for the destructive pressure pulse observed during the plate core destructive test is continuing. No such violent pressures were observed during the oxide core destructive test conducted last November; arrangements have been made to present the preliminary results of the latter test to the Committee during its January meeting.

I concur with the Committee's view on the need for a long-term, comprehensive research program on fast reactor safety. Fast reactor safety studies will be expanded starting in the next fiscal year. TREAT studies on the mode of fuel element failure are continuing and an investigation of sodium expulsion effects has recently been initiated. The Reactor Physics Branch of the Division of Reactor Development is conducting an extensive cross section measurement program to provide data from which Doppler coefficients can be reliably calculated. A program of Pu-239, U-235 alpha measurements is being conducted by ORNL, RPI, and General Atomics, up to energies of about 1 Mev. Integral measurements of the Doppler effect up to 1000°C. in various fast reactor spectra for fissile and other materials will be initiated soon. Also, you will recall that both the FARET and SEPOR projects will be, to a great extent, aimed at fast reactor safety studies.

Again, I wish to express my appreciation for the Committee's interest in the reactor safety research and development program and look forward to continuing communications with the Committee for our mutual benefit.

Sincerely yours,

/s/ Dwight A. Ink

Assistant General Manager

DATE:

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~~MH&S 3 Hazards of Power Reactors~~
~~MH&S 3 Hazards of Power Reactors~~

TO:

FROM:

SUMMARY: AEC 132/63 - PROBLEMS RELATING TO THE ADMINISTRATION OF REACTOR PROJECTS SUBJECT TO 10 CFR 115 - The paper presents only the GM views re the above. Paper recommends that AEC interest in NS Savannah be transferred to the Maritime Adm. as soon as practicable & the reactor be licensed.

FILED: O&M 2 Inspection, Div. of

INDEXER: date of paper: 1-7-64

REMARKS:

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BY: MARY DEFFENBAUGH DOE/NM-523

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U. S. ATOMIC ENERGY COMMISSION
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77-11-3 - Hyde from
Pam R. Miller

JAN 3 1964

MEMORANDUM FOR THE CHIEF OF BUREAU
COMMUNICATIONS SECTION
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COMMUNICATIONS SECTION
COMMUNICATIONS SECTION

SUBJECT: NEWSPAPER ARTICLE ON THE SAFETY OF NUCLEAR REACTORS

Attached for your information is another in the series of informative newspaper articles on atomic energy prepared and distributed by this Division. The present article, the sixth in the series, is on the safety of nuclear power reactors. As in the case of the preceding five articles, it will be distributed to leading daily and Sunday newspapers throughout the United States and to the two Canadian wire services. Attached to the article is a table of U.S. nuclear power reactors.

The article and the table have been approved by the General Manager and permission has been obtained from Dr. Hans Thoenes for inclusion of his remarks in the text of the article.

The article and table will be distributed by this office and by all field information offices for use on and after an early Sunday in January. We hope to be able to duplicate the article and table next week so as to distribute them soon enough to give editors a two-week lead time to prepare for their publication.

Signed
Duncan Clark
Duncan Clark, Director
Division of Public Information

Attachment

cc: A. R. Landis, CH

R. L. Price, Dir., RRU
W. E. McCall, ASST ←
R. X. Donovan, OCL

FI FI FI

WFO:ms:ms

12-30-63

1-344

NEW SAFE IS A NUCLEAR REACTOR

Washington, December 29 -- Fifteen civilian nuclear power reactors now have been built and placed in operation throughout the United States.

Operated in most cases by private or public utilities, the plants have an installed electrical generating capacity of more than one million kilowatts, or enough to meet the daily household power requirements of over one million American families.

Additional nuclear power plants now under construction and due for completion in 1964 and in 1965 will add nearly one million more kilowatts to the Nation's nuclear power capacity.

By 1970, the installed capacity of nuclear power plants in the U.S. is expected to rise to nearly six million electrical kilowatts for use by American homes, schools, churches, businesses and industries.

The total will rise to approximately forty million kilowatts of capacity by 1960 and in the year 1,000 half of all electrical power produced in the United States is expected to come from the atom.

(Here to follow: Now a list of present and planned reactors, including their output in kw, please see table which accompanies this article.)

Already civilian nuclear power is on the threshold of being commercially competitive with that derived from the fossil fuels -- coal, oil and gas -- in high-cost fuel areas, declares Dr. Glenn T. Seaborg, Director of the Atomic Energy Commission.

"In fact," says Dr. Seaborg, "in those high-cost fuel areas of the United States, such as California and New England, utilities have already decided to proceed with the immediate construction of new, large nuclear power plants because they consider them to be essential."

There is no difference, of course, between electricity produced by nuclear power and that made by some conventional means, but as more and more large reactors are built or proposed for use all over the country, serious questions arise.

Are nuclear power reactors safe?

How safe?

How can we be sure?

When public apprehensions over such reactors exist, it is linked for the most part to anxiety of the destructive power of the atom in World War II.

"It is unfortunate that the potentialities of nuclear fission were first introduced to mankind in the form of a bomb," says Dr. James J. Thompson, director of the Massachusetts Institute of Technology nuclear research reactor and a member of the AEC Advisory Committee on Reactor Safeguards.

"If gasoline had first been introduced in the form of jettied gasoline tanks spreading havoc and destruction in war, I am sure that the development of the automobile would have been delayed for many years.

"The talk would have been of exploding gasoline tanks at every corner, of children being burned or death and of other, disastrous fires as a result of using gasoline-powered cars.

"As it is natural, perhaps, that there are such fears regarding the peaceful applications of nuclear power."

Matters vs. Bombs

One of the first things many people ask when they think about reactors is whether they can explode or fire on atomic bomb when set off as a weapon.

The truth is that they cannot.

There are two reasons for this.

The first concerns the kind of nuclear material used in an atomic bomb versus that used in civilian power reactors.

The general concern the interior design and mechanism of a bomb as compared to the interior of a power reactor.

In an atomic bomb, the nuclear material is almost pure, highly-fissionable material.

In a civilian power reactor the nuclear fuel is always in the form of a chemical compound or alloy that is totally unsuitable for use in a bomb.

In a bomb, the interior mechanism is designed so that the highly-fissionable material can be brought instantly together and compressed into a very dense mass when the bomb is triggered. These two factors, produce a fantastically rapid nuclear chain reaction by which the bomb's tremendous explosive force is generated.

In a nuclear power reactor, exactly opposite conditions are required.

The fuel used and the design needed for power production are such that it is impossible to concentrate and hold in place the highly-fissionable material in the reactor core so that a bomb-like explosion can take place.

One comparison which may be made to illustrate the latter point is that between loose and tightly-packed gunpowder. Every hunter knows that

If he takes the powder from a gun shell and sprinkles it loosely over the ground, the powder will simply burn when ignited. On the other hand, when tightly compressed in a shell and contained in a gun barrel, the compressed powder develops a highly explosive force upon being ignited.

Actually, the reaction of a bomb is a different task carried out in a completely different way and by different methods than those used in nuclear reactors.

To find what happens and associated with power reactors a brief explanation of some nuclear physics is necessary. Fortunately, the basic principles involved are not difficult for a layman to understand.

An atomic reactor is an atomic furnace in which the heat generated by the splitting, or fissioning, of the nuclei, or centers, of the atoms of uranium or other nuclear fuel is controlled and harnessed as it can be used to do useful work.

In the reaction process, subatomic particles called neutrons split the fuel nuclei, producing large amounts of heat and at a rate with which to split other nuclei, etc., in the successive nuclear chain reaction pattern.

But the reaction process also produces something else.

These are the fragments which result from the splitting of the nuclei of the atomic fuel.

Most of these fragments are radioactive. They are known as fission products and may be thought of as the "ashes" of the nuclear fission process.

The collective fission products include a variety of substances which continue, for varying lengths of time, to emit beta and gamma rays.

Uncontrolled, these rays can be harmful to people.

Thus, the first and most important aspect of reactor safety is to see to it that these collective fission products do not escape into the environment under conditions that could be hazardous to the health and safety of the public.

Designing Reactor Safety

Reactor safety begins with careful attention to the design of the reactor itself, its control system and all other component parts to see as far as possible that no accident which could result in the release of fission products is likely to occur.

Take the case of control rods as an example. Most atomic reactors are operated by control rods, which contain substances that absorb neutrons -- the sub-atomic particles used to split the nuclei of fuel atoms so as to produce energy.

When control rods are inserted into the reactor, the reactor is shut down, or "scrammed." Conversely, when the rods are withdrawn, the neutrons are allowed to become active again and the chain reaction is started up. The rods also are used to bring or lower the power level of the reactor.

The major approach followed in accident-prevention design is to insure -- through the control rod drive mechanism's response to reactor scram

signals -- that the reactor can be shut down without fail when such action is required.

The drive mechanism is designed so that the control rods are lowered automatically when signals indicate something might go wrong. One set of signals, for instance, would warn the reactor at any instant that a predetermined power level was being exceeded. Other signals would cut off power if the power level should rise too rapidly or if excess reactor temperature or pressure were indicated.

Four reactors, incidentally, often are provided with auxiliary methods of shut-down. Back-up systems also are provided for other important reactor components.

One instrument alone, for example, is never depended upon to monitor the reactor power level. Usually, three or more independent instruments are employed for this purpose. Any one of them could shut the reactor down if pre-set power levels were exceeded. Other systems, such as the cooling system or instrument air supply system and valves in the containment system, similarly are backed up by auxiliary, automatically-activated systems which can take over if the primary system should fail to work.

Another practice of conservative and careful reactor design is to employ safety margins well above basic minimum safety margins so as to further reduce the possibility of accidents. Designs of the reactor pressure vessel, certain support and components and important electric circuitry are examples where this practice is followed.

Finally, great care is taken in the choice of reactor materials. These must be selected to withstand high temperatures and pressures, high radiation effects and correct corrective actions. They must also be free of impurities which would interfere with the nuclear reaction.

As much for building a reactor. What about its operation?

Controlling Fission Products

In normal operation of civilian power reactors, the radioactive fission products whose release must be guarded against are retained within the reactor in several ways.

The first barrier to their escape is the inherent ability of the coolant fuel to retain most of the radioactivity from the fission products that build up within the fuel as the reactor continues to operate.

Next comes a sheathing, or cladding, of stainless steel, aluminum or other material which is placed around the fuel. This cladding has two functions: (1) to protect the fuel from corrosion by the water or other coolant which is used to carry the reactor heat away from the fuel to a steam generator or turbine as it can be put to work; and (2) to help keep the fission products confined within their birthplace in the fuel.

The next barrier is the reactor vessel, sometimes called the pressure vessel, which surrounds and contains both the reactor fuel, core

and coolant and is intended to withstand all processes likely to be developed inside the reactor.

Surrounding the reactor vessel is a thick layer of lead or concrete which is known as the reactor shielding. The shielding prevents reactor personnel from radiation from within the reactor.

But suppose the reactor does not operate normally? What happens if there is an accident?

Designers of power reactors are required to analyze the various kinds of accidents that conceivably could happen to their reactors -- including a so-called "maximum credible accident" -- and then to engineer their plants so as to safeguard against them.

Most of today's civilian power reactors -- and the large civilian power plants planned for the near future -- use as fuel the water to remove heat from the reactor core.

The maximum credible accident assigned to water-cooled reactors is loss of the core cooling water through a major break in the coolant piping connected to, but outside of, the reactor pressure vessel.

Such an accident is regarded as extremely unlikely.

But if it should happen, the reactor fuel could overheat and melt and the fuel cladding could melt. The cooling water, as released through the break, could flash to steam. Large quantities of radioactive fission products would be released from the melted fuel and be carried by escaping steam and water through the break in the piping.

To contain this escaping steam, engineers normally employ water-cooled power reactors with glass, steel or other coverings called containment shells or use other methods for suppressing the pressure of the steam and containing the fission products that might escape from the core.

The containment shell, generally a dome-shaped cylinder or sphere of welded steel, frequently reinforced with concrete, covers not only the reactor pressure vessel, but all the pipes, pumps, valves and other parts of the reactor system that form the path for circulation of the reactor coolant.

In some cases alternative containment systems have been proposed by industry for certain reactors that could be considered for possible location in or near heavily-populated urban areas. Instead of a single containment shell, the steel shells could be used. Between them would be a vacuumed layer of porous concrete designed to trap and store any escaping fission products. The outer steel shell would be covered by another layer of thick concrete.

Another type of containment based on a "pressure suppression system" is in use on some water-cooled civilian power reactors. In this system, the coolant returns to a partially water-filled, completely air-tight pressure vessel. Any surge of steam created by a reactor accident would be led into this tank where water would condense the steam, thus effectively suppressing the pressure.

In other civilian power reactors operating at lower pressures, such as those that liquid sodium, gas or other non-water coolant is used, the containment may be a "pressure-bearing" building. In such buildings, the atmosphere is kept at lower pressure than that outside the structure so that any leaks in case of an accident would be "sucked" into the building instead of outward into the atmosphere.

Checking on Reactor Safety

Now we go to now that all civilian power reactors are designed, built and operated with all these safety provisions kept up-to-date in mind.

Now we go back to who sees that everything that should be done actually is done so that reactors are as safe as it is possible to have them.

This is the job of the Regulatory Staff of the Atomic Energy Commission, which is charged by Congress with responsibility for review of safety matters before any power reactor can be built or operated in this country.

A utility which hopes to build a power reactor must apply to the Atomic Energy Commission for a construction permit. The application then is reviewed by the AEC's Division of Licensing and Regulation in a study covering the safety aspects of the project, including the type of reactor to be built, its design, construction and proposed operation.

Also included in the study is a review of a safety analysis report which the company must submit. The report identifies conditions which

theoretically might occur in the remote and desolate but the necessary
precautions to guard against them.

Any major reactor project is then referred to the AEC's independent
Advisory Committee on Reactor Safeguards, a statutory committee estab-
lished by Congress.

After the AEC's study, the project is reviewed at a public hearing
before an AEC hearing committee or an Atomic Safety and Licensing Board.
Report testimony is taken and witnesses may be cross-examined. Members
of the public may also part in this hearing.

If the decision of the AEC hearing committee or the Atomic Safety
and Licensing Board is favorable, a construction permit may be granted
for the reactor after review of the proposed project by the AEC's inspec-
tors. Later, another full review, including a public hearing, may
be held before an AEC license to operate the plant is granted.

During construction of the plant a program of rigorous activities
of AEC inspectors is maintained to see that the highest quality materials
and workmanship. Another independent review committee hearing of the
reactor's design and systems under conditions equal to and usually
more severe than those likely to be encountered in actual plant operation.

Operators for the reactor must take intensive training in its opera-
tion and pass comprehensive written and oral examinations before receiving
AEC licenses which permit them to run the plant. License written pro-
cedures are prepared for all operation practices and strict adherence to
the procedures is required. The reactors then are visited periodically
by the AEC's Division of Inspections to make sure that they are being
operated in compliance with the AEC operating license and written

operating specifications.

No change having any major safety significance may be made in operation of a nuclear power reactor -- nor a change to a higher power level or modification of an important safety system -- without advance approval of the AEC.

Reactor Deliberately Destroyed

Because of a desire to improve the understanding of what might happen in a reactor accident and to develop information for more safer reactor design, the Atomic Energy Commission has deliberately destroyed reactors at its National Reactor Testing Station in Idaho.

A Commission reactor model TRR-1, used for research on the stability and safety of boiling water reactors, was destroyed as part of a test on July 22, 1964, in the first such test. Since then over 2,000 tests under unusual operating conditions approaching accident conditions have been conducted in four reactors at the station. The tests were carried out under a program known as TRR-2 -- for Special Power Research Reactor Tests.

TRR-1 was placed in service in 1955 as the first of three four reactors. One of its cores was deliberately destroyed in a series of tests which began on October 24, 1962, and ended on November 5, 1963. Scientists who watched the event from a control room half a mile away have gained valuable information from analyzing photographs, radiation measurements and other data from the experiment.

In November 19, 1963, a different type of core was subjected to increased energy levels in the MTR-1 reactor without major damage to either the core or the reactor itself. Preliminary results show that with this type of core, which used fuel typical of that used in civilian power reactors, it is extremely difficult to generate a hazardous, runaway nuclear accident.

In addition to these studies, the AEC's nuclear safety and research development program includes studies of chemical and physical effects associated with fuel accidents, continuing studies on reactor containment, and studies of the behavior of radioactive materials in the environment. All have contributed significantly to nuclear reactor safety.

The new Executive Order on safety covered reactors, incidentally, is accorded all other phases of the atomic energy program including the processing of radioactive waste and materials, their fabrication, transportation and use, and the collection, storage and disposal of radioactive waste materials.

As a result, the Commission and the contracting companies which carry out much of its work have been given the status of top national safety assets.

In June of 1963, for example, the Commission was the National Safety Council's highest safety award for the third time.

Previous National Safety Council award-winning years for the AEC were 1955 and 1960.

Also in June of 1953, the Commission was the President's Council for Safety among Federal employees. The most serious accident production among Commission employees in 1953. It was previously set by the AEC in 1952, 1953 and 1954.

U.S. Atomic Safety Board

Including the 14 power reactors mentioned in the beginning of this article, nearly 200 nuclear reactors are now operating or under construction in the United States.

They include all types of reactors, including those used for the production of material for weapons and approximately 50 research and training reactors located at or near American colleges and universities.

U.S. nuclear operating history dates back more than 20 years to the first controlled nuclear chain reaction achieved under the name of "Chicago Pile 1" at the University of Chicago, in December, 1942.

What has been the safety record of U.S. reactors to date?

Altogether, over 10 accidents involving nuclear chain reactions have occurred in experimental reactors and "critical assemblies" at remote Commission sites. Critical assemblies, as distinguished from power, production and research and training reactors, are extremely low-powered nuclear facilities capable of sustaining a chain reaction and used for test purposes.

Here is a summary of fatal accidents that have occurred in reactors and critical assemblies since the Nation's atomic energy program began.

Three men were killed in a reactor accident at the AEC's National Reactor Testing Station in Idaho on January 3, 1941.

The men were working atop the B-1, a small prototype reactor the Army was developing for use at remote military installations. The reactor had been shut down for maintenance work. It is believed that one or more of the men dug out the control control rod too far.

The result was an uncontrolled nuclear reaction that caused an instantaneous explosion of steam from water within the reactor. The men died immediately from blast effects. The third died about two hours later from a heart attack.

All of the men received high exposures to radiation and high levels of radioactivity were measured in the reactor building after the accident. Only low-levels of activity were measured outside the building, however, despite the fact that the reactor, an experimental one in an isolated area, was not enclosed in a containment structure as in the case with civilian power reactors.

The fatal accidents have occurred at various possibilities. Most of these accidents involved nuclear weapons work rather than power reactor research and development.

The first took place at the AEC's Los Alamos Scientific Laboratory, Los Alamos, New Mexico, on August 21, 1945. Two men were exposed to high-levels of radiation during operation of a fast plutonium critical assembly being used for research purposes. One of them died.

A second and similar accident occurred on the Alamo on May 21, 1946. Eight workers were exposed to high levels of radiation on this occasion and one died.

Today this kind of organization is done by means of a contract so that in the case of an accident or radiation in the event of an accident.

A check book issued by an individual check number, but not properly identifiable as a contract or contract number, occurred on the Alamo in 1946. The worker was fatally exposed to high radiation when plutonium suspended in an aerosol in a laboratory was inadvertently started up a check number.

There have been no U.S. nuclear civilian reactor accidents which have caused loss of life or endangered public health and safety.

"The safety records achieved by the AEC and the contractors are commendable, justifying great pride and satisfaction," declared Dr. Hinton.

"The firm and established plans which safety has always held in all nuclear activities is primarily responsible for our habit of winning top national and Presidential safety awards."

"Usually," said Dr. Hinton, "the main safety industry is the firm in which the regulation of safety in the industry can act in accordance with the development of the industry.

"The development of the industry, for example, certainly provided the development of air safety regulations...

"In the case of nuclear energy, however, safety was one of the chief considerations from the very start. In general, accidents which have occurred have been of a relatively small technical nature."

For this, then, is a nuclear power reactor?

The absolute guarantee of the safety of a reactor can never be given any more than safety can be guaranteed in the operation of any commercial plant, including those generating power by conventional means.

The AEC believes, however, that, with safety apparatus in mind in every phase of reactor activity from design to actual operation, nuclear power reactors may be safely operated under all normal conditions and that even in the unlikely event of an accident, public health and safety would not be endangered.

It believes the safety record of U.S. reactors to date is evidence that this is so.

Attachment:
Nuclear Tests

TABLE OF NUCLEAR POWER REACTORS

Note: In a table showing nuclear power reactors now operating in the U.S., those under construction and expected to go into operation by the end of 1973, and those plants proposed by major utility companies for completion by 1978.

Power Reactors Now Operating

Reactor	Plant Operator	Plant Location	Electrical Net Kilowatts
Indian Point*	Consolidated Edison Company	Yonkers, N.Y.	275,000
Reactor	Commonwealth Edison Company	Merida, Ill.	200,000
Yankee	Eastern Atomic Electric Company	Rose, Mass.	175,000
Millis	Commonwealth Edison Power District of Illinois	Millis, Ill.	75,000
Shippingport	Essex Light Company	Shippingport, Pa.	60,000
Sanford Bay	Pacific Gas & Electric Company	Sanford Bay, California	45,000
Big Rock Point	Commonwealth Edison Company	Big Rock Point, Michigan	47,500
Big River*	Rural Cooperative Power Association	Big River, Minnesota	40,000
Caroline-Virginia*	Caroline-Virginia Nuclear Power Assn. States, Inc.	Port, S. Car.	17,000
Pigeon	City of Pigeon	Pigeon, Ohio	11,400
SW - San Jose Nuclear Experiment	Rockwell International & Southern California Nuclear Company	San Jose, California	6,000
Fort St. Vrain	Nuclear Nuclear Experiment Corp.	Fort St. Vrain, Colorado	7,500

Power Reactors Not Operating (continued)

Reactor	Plant Operator	Plant Location	Electrical Net Capacity
Pease	Pease Electric Develop- ment Company	Lapeere Beach, Michigan	60,000
Experimental Breeder Reactor No. 2	Argonne National Laboratory	Idaho Falls, Idaho	10,000
Total presently installed nuclear power capacity			1,000,000 KW

Power Reactors Under Construction -- Operating by 1958

Fort St. Vrain	Northern States Power Company	St. Louis, Mo.	70,000
Beaumont	Public Elec. Util. Authority	Fort Worth, Texas	10,000
Frank Section	Pennsylvania Electric Company	Frankfort, Pennsylvania	10,000
Total nuclear electrical capacity due in 1958			110,000 KW

Power Reactors Under Construction -- Operating by 1962

Experimental Gas Cooled Reactor	AEC and TVA	Oak Ridge, Tennessee	20,000
McGowan	Edwards Power Company	Edwards, Missouri	20,000
Nav Production Reactor #2	AEC and Washington Public Power Supply System	Richland, Washington	200,000
Total nuclear electrical capacity due by 1962			240,000 KW
Total nuclear electrical power capacity expected by end of 1962			1,900,000 KW

Large Plants Proposed for Completion by 1970

Utility	Proposed Location	Completion Year	Electrical MW Available
Pacific Gas & Electric Company	Del Norte Bay, Calif.	1966	315,000
Southern California Edison & San Diego Gas & Electric Co.	Camp Pendleton Naval Reservation, Camp Pendleton, Calif.	1966	375,000
Consolidated Edison Atomic Power Co.	Walden Neck, Conn.	1967	465,000
City of Los Angeles, Water & Power Dept.	Los Angeles, Calif.	1967	400,000
Wagon Wheel Power Company	Orange, N.Y.	1968	300,000
New York Central Power and Light	Orange County, N.Y.	1968	315,000
Consolidated Edison Co. of New York	Long Island City, N.Y.	1970	1,000,000
Additional nuclear electrical capacity proposed by 1970			1,425,000 MW
Total electrical power capacity -- actual and planned -- from nuclear sources by end of 1970			3,675,000 MW

1. Includes some small-sized power plants.

2. Power from the AEC's Big Rock Station located at Richland, Washington, will be piped into an electrical generating station due to be completed at the site late in 1965 by the Washington Public Power Supply System. The 200,000 kilowatts of electricity to be produced at the station through use of steam power from the BWR will be distributed by private and public utilities.



UNITED STATES
ATOMIC ENERGY COMMISSION
WASHINGTON, D.C. 20545

*Mrs. A. J. Hagander
Power Reactor*

MEMORANDUM FOR CHAIRMAN SEABORG ←
COMMISSIONER PALFREY
COMMISSIONER RAMEY
COMMISSIONER TAPE
COMMISSIONER WILSON

THROUGH GENERAL MANAGER

SUBJECT: REACTOR SAFETY RESEARCH PROGRAM AND SPENT FUEL
SHIPMENT CASK PROGRAM

At Regulatory Information Meeting 109 on December 2 you requested publication of the November 19 letters from the ACRS on the Reactor Safety Research Program and the Spent Fuel Shipment Cask Program. Arrangements are being made to have these letters published in the spring issue of the quarterly review Nuclear Safety.

R. E. Hollingsworth
Deputy General Manager

cc: W. B. McCool, Secretary (2) ✓
H. L. Price, Director of Regulation

12-18-63

DE 338,117
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M N 13 - Hazardous from
Public Relations

DEC 6 1963

Dear Senator Jordan:

In reply to your letter of November 18, 1963, concerning reports of the discontinuance of certain AEC projects at Idaho Falls and their transfer to Hanford, Washington, I wish to assure you that no such action has been taken nor is such action contemplated at this time.

It is possible that the inquiries you have received have been prompted by our recent announcement, a copy of which is enclosed, of the construction of the Containment Systems Experiment at Hanford Works. In any event, this case illustrates our normal procedure which involves evaluation of all pertinent factors in selecting locations for various projects. Selection of Hanford as the site for the aforementioned experiment was based upon evaluation of all feasible AEC-owned sites, including the National Reactor Test Station (NRTS) near Idaho Falls. Hanford was selected because the cost and time of fabrication will be substantially less at that location, through use of an existing building and other economies, and because personnel having specialized experience applicable to operation of the facility are already available on the staff of the Hanford operating contractor. It should be noted that the information expected to be obtained from the Containment Systems Experiment will complement that being obtained from other nuclear safety studies being carried out and planned at other locations, among which the NRTS is the principal one.

In considering construction of certain new facilities, the AEC designates a provisional site for purposes of preparing preliminary design studies and cost estimates required for planning and budgeting purposes. Subsequent detailed evaluation of all the factors relating to each possible site may lead to final selection of one other than that designated provisionally. Although care is taken to assure that the provisional nature of the original site designation is understood, it is conceivable that persons not directly involved might misinterpret the AEC's action in the final

12-6-63

selection. While no provisional site designation was made for the Containment Systems Experiment, there are, at present, a number of other proposed projects for which the NRTS has been designated as the provisional site for planning purposes, but for which final site selection has not yet been made.

I wish to stress that both the Containment Systems Experiment and the other projects discussed in the preceding paragraph represent new activities and their location elsewhere than the NRTS should thus not affect the conduct of existing activities at that installation. On the other hand, existing activities at AEC sites may be decreased as changes in its program occur. In order to continue the availability to AEC programs of the considerable technical experience developed at such sites, the AEC gives due consideration to that factor in assigning new activities to the various locations. Similarly, an effort is made to avoid abnormal fluctuations in the level of activities at each site.

I trust that the foregoing will serve to allay the concern regarding any discontinuance of projects at the NRTS which prompted the inquiries to which your letter referred.

Sincerely yours,

(Signed) Wm. T. Rorer

Chairman

Honorable Len B. Jordan
United States Senate

Enclosure:
AEC Press Release No. 7-238, November 19, 1963

cc: Chairman (2)
GM (2)
AGSRD (2)
CONG. LIA. (1)



UNITED STATES
ATOMIC ENERGY COMMISSION
WASHINGTON, D.C. 20545

No. F-238
Tel. Hazelwood 7-7831
Ext. 3446

FOR IMMEDIATE RELEASE
(Tuesday, November 19, 1963)

NUCLEAR REACTOR SAFETY STUDIES TO BE CONDUCTED
AT HANFORD WORKS IN WASHINGTON

Dr. Glenn T. Seaborg, Chairman of the Atomic Energy Commission, announced today that a Containment Systems Experiment (CSE) will be built at the AEC's Hanford Works near Richland, Washington. The experiment will be an integral part of the AEC's research program specifically related to the safety of civilian nuclear power reactors.

A cylindrical containment shell about 25 feet in diameter and 75 feet high will be placed in an existing building at the site. The containment shell will house a model of the reactor pressure vessel, facilities for simulating several types of containment systems and extensive instrumentation and control systems. The experiment will be of such a size that the results can be related to full-scale power reactor systems.

A number of tests will be conducted in the containment shell. The tests will provide additional design information on containment and various other engineering safeguards related to the light water-cooled pressurized and boiling water reactors of current interest to power utilities.

The program will also examine the effect of simulated loss-of-coolant accidents of varying intensities on different types of containment systems and components, and determine the effectiveness of these systems in retaining fission products which might be released in an actual reactor accident. Studies will be made of inherent characteristics of containment that contribute to the retention of any released radioactivity, as well as of the effectiveness of engineering safeguards that can be incorporated in the design and deliberately activated after an accident. Auxiliary studies of containment leakage and comparisons of methods of measuring leakage will also be made.

(more)

Development of a detailed experimental program and subsequent operation of the experiment will be undertaken by the General Electric Company, the AEC's prime operating contractor at the Hanford Works. Detailed design of the experiment will be done by Vitro Engineering Co., the AEC's architect-engineering contractor at Hanford. Construction is expected to begin early in 1964 with completion scheduled for early 1965.

(NOTE TO EDITORS AND CORRESPONDENTS: This announcement is being distributed simultaneously in Richland, Washington, by the Commission's Richland Operations Office.)

11/19/63

~~OFFICIAL USE ONLY~~

MH+5-3
Hazardous Waste Unit
Reference Section

UNITED STATES GOVERNMENT

Memorandum

TO : File

DATE: December 5, 1963

FROM : W. B. McCool, *W. B. McCool*
Secretary

SUBJECT: AEC 943/12 - REVIEW OF REACTOR SAFETY RESEARCH PROGRAM AND
AEC 943/13 - SPENT FUEL SHIPMENT CASK PROGRAM

SECY:McQ

At Regulatory Information Meeting 109 on December 2, 1963,
the Commissioners requested joint recommendations on:

1. Reactor Safety Research Program, and
2. Spent Fuel Shipment Cask Program,

vis-a-vis the Advisory Committee on Reactor Safeguards November 19
letters on these matters circulated as AEC 943/12 and AEC 943/13
respectively.

cc:

- Chairman
- General Manager
- Deputy General Manager
- Asst. General Manager
- Asst. Gen. Mgr. for R&D
- Asst. Gen. Mgr. for Operations
- Asst. Gen. Mgr. for P&F
- Director, Operational Safety
- Director, Reactor Development
- Director of Regulation
- Deputy Director of Regulation
- Director, Licensing & Regulation
- Director, Radiation Protection Standards
- General Counsel

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12-5-63

72 10 11 3 *Hayden Form P*
Reactor

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AEC 943/14

November 29, 1963

COPY NO. 51

ATOMIC ENERGY COMMISSION

COOPERATION WITH THE ATOMIC INDUSTRIAL FORUM ON AEC
NUCLEAR SAFETY RESEARCH AND DEVELOPMENT PROGRAM

Note by the Secretary

The General Manager has requested that the attached memorandum from the Director, Division of Reactor Development, with enclosures be circulated for the information of the Commission.

W. B. McCool
Secretary

AEC
9-13
14

DISTRIBUTION

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UNITED STATES GOVERNMENT

Memorandum

TO : A. R. Luedcke, General Manager
THRU: S. G. English, ACMRD *MR*

DATE: November 19, 1963

FROM : Frank K. Pittman, Director *aguf*
Division of Reactor Development

SUBJECT: COOPERATION WITH THE ATOMIC INDUSTRIAL FORUM ON AEC NUCLEAR
SAFETY RESEARCH AND DEVELOPMENT PROGRAM

RD:DH:JAL

At the meeting between the Commission and the Board of Directors of the Atomic Industrial Forum on September 9, 1963, the desirability of obtaining industrial input into our nuclear safety research and development program on a closer, more intensive basis was agreed to by the Commission and the Board of Directors of the Forum. As a result of subsequent discussions between members of the Reactor Development staff and Forum representatives, the following has been done.

The Forum has solicited members of industry by copies of the attached letter. They are also proposing to issue within the next few days a press release on this subject, a draft copy of which is attached. The main purpose of this activity at present is to get from the Forum their recommendations regarding industrial representatives to participate in our safety program. The final selection and assignment of these industrial representatives will be the prerogative and responsibility of the AEC.

We intend to inform the JCAE staff of the above activities informally by telephone.

Attachments:

1. AIF letter to industry
2. Draft AIF press release

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ATTACHMENT I

Dear _____:

The Forum Committee on Reactor Safety has reached a stage in one phase of its activities where it must seek the more active participation of Forum members if it is to continue its effective representation of industry's interests. This relates to an AEC invitation to take a more active role in the day-to-day planning and operations of its nuclear safety program. In its invitation, the AEC has clearly provided to the industry an opportunity to step up to a problem which the industry has repeatedly identified as one of the most serious facing the further development of commercial nuclear power - the siting of reactors. Such participation would help the industry and also help the AEC.

Outlined below is an explanation of what is needed and what benefits should accrue to those members who find it possible to participate.

By way of background, you should know that during the past year the Committee has worked closely and effectively with the Nuclear Safety Group of the AEC's Division of Reactor Development in formulating an experimental nuclear safety program designed to be responsive to the complex and unresolved problems relating to the siting of nuclear power reactors. In March, for example, the Committee sent to the AEC an annotated list of recommended "short-term" and "continuing" reactor safety projects. In August, after an intervening meeting with the AEC staff, the Committee supplemented its earlier recommendations with an outline of recommended short-term tests on containment integrity and on the performance and reliability of associated engineering safeguards. The latter recommendations were also the subject of

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discussion in a September 9 meeting of the Forum Board of Directors with the AEC Commissioners. [As a member of the Forum Committee, Mr. _____ of your organization, is familiar with this work and can provide you with additional details.]

The AEC nuclear safety program currently under way and planned appears in concept to be aimed at a number of important questions relating to reactor siting. The program, for example, includes among others the following projects:

SPERT tests

SPERT I destruction tests will get under way shortly. Power transients with SPERT III and IV using UO₂ cores are being planned.

STEP

Title I engineering and design studies are under way on a Loss of Flow Test Facility (LOFT). Blowdown-meltdown tests from nuclear operation are scheduled for late 1967. A core melt proposed for SPERT II is under review. Other projects may be included at a later date in this Safety Test Engineering Program.

Nuclear Safety
Pilot Plant

Cold tests will begin within a month. Experiments involving fission product release and the performance of a model containment facility and associated equipment are scheduled for early 1964.

Containment
Test Facility

This facility will be designed for a series of short-term engineering tests on the performance of a medium-size containment facility. Detailed design and construction work is to begin shortly.

Both the AEC and the Forum Committee agree that the above facilities and projects, and possibly others, can and should lend themselves to many of the engineering tests that have been recommended by the Committee. In reality, however, the extent to which these projects will be responsive to specific Committee recommendations will depend on detailed plans, calculations, and study which go beyond the scope of assistance that can be expected of a committee.

For this reason we have explored with the AEC staff various ways of providing the type of detailed industrial consultation that will achieve maximum benefit for both AEC and industry.

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With this letter we are soliciting the cooperation of your company, as well as the cooperation of a number of others engaged in the design and construction or manufacture or operation of nuclear power reactors to contribute up to essentially the full-time services of a qualified technical staff member(s) to work with the AEC nuclear safety program.

The total number of industrial representatives needed has not been definitely determined. Some projects will undoubtedly require the assistance of several industrial representatives, whereas the assistance of one may suffice for others. It does seem clear, however, that regardless of the nature of the project, industrial assistance will be most critically needed during these periods when detailed design of the facility is under way and when detailed plans are being made for the particular series of experiments or engineering tests. On the basis of this assumption, it is anticipated that industrial help may prove most useful on a concentrated but perhaps sporadic schedule. For example, a man (or the whole industrial group) might be required to spend as much as several weeks, or even longer, at Oak Ridge or Idaho Falls, or some other location, after which time he might return to his company for two or three months. The important thing is that he spends sufficient time working with the project to make the kind of contribution expected of him and the industry.

Initially, the program will require a total of four to six qualified persons. The AEC has described its needs in the following way:

"The purpose would be to provide industrial technical recommendations to a number of important AEC reactor safety projects underway and planned, particularly SPERT, STEP, Nuclear Safety Pilot Plant, and Containment Test Facility. The primary objective will be to reflect

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industry experience and know-how gained from nuclear power plant design and operation in fixing those design parameters of reactor safety experiments that are most likely to have a major influence on test results.

"We are particularly interested in individuals knowledgeable or experienced in fission product release phenomenology and/or reactor kinetics and/or engineering tests. Further, such individuals should be at a technical and management level in their respective organizations to assure them of complete and ready access to their organization's collective thinking on important nuclear safety concepts, as well as on supporting technical details. Such individuals will be able to make a maximum contribution to the program only if they are qualified themselves to make technical recommendations on the detailed planning of specific experimental and test programs and if they are in a position to bring to the problem the technical resources of their respective organizations.

"Industry representatives would also be expected to effect a two-way liaison between the AEC projects in which they are participating and related work under way in their own organizations."

The AEC will specify the number of persons to be selected for assignment to each program area. The Forum Committee will, after consultation with the individuals concerned and their companies, make recommendations to the AEC for the assignment of particular individuals. The companies, whose employees are selected by the AEC for participation in this program, will be asked to enter into an agreement with the AEC operating contractor who is responsible for the particular program area. It is expected that the agreement will contain

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provisions dealing with patents and other matters which AEC operating contractors normally use in arrangements with consultants. Tenure of service will be 12 months and each commitment will be subject to renewal upon the agreement of the company and the AEC contractor.

Each representative's company or organization will be expected to pay his salary. The AEC is exploring methods to provide limited reimbursement for out-of-pocket costs, including travel expenses.

The Forum Committee looks upon the AEC proposals as an opportunity to introduce useful industrial thinking and know-how into a program which is vital to the further development of commercially competitive nuclear power. The Forum also believes that the proposal provides a mechanism for keeping industry informed on the detailed progress of the AEC program. The industrial representatives will be expected to report periodically to the Committee on Reactor Safety.

The advantages of such an arrangement to the sponsoring company lie in the assurance of being currently and fully informed on the technological details of those programs in which its representative is participating. It can also reasonably expect, via such an arrangement, to have an important and continuing influence on the scope and content of AEC reactor safety projects. AEC considers this to be of major importance.

This is an exploratory letter which invites your comments and expressions of interest. To facilitate your response, we are enclosing a separate information sheet on which you may check the extent of your interest.

Thank you.

Sincerely,

/s/ Louis H. Roddis, Jr.

Louis H. Roddis, Jr.
President

Encl.

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Information Sheet

on

Contributing Services of Consultant to AEC Nuclear Safety Program

Please complete and return this sheet at your earliest convenience to Edwin A. Wiggin, Secretary of the Forum Committee on Reactor Safety, Atomic Industrial Forum, 850 Third Avenue, New York, N. Y. 10022. A business reply envelope is enclosed for your convenience.

- - - - -

1. Interested _____
2. We wish to offer the services of Mr. _____ of our staff to work as a consultant to the AEC Nuclear Safety Program.
3. His (their) qualifications may be summarized as follows:
4. We prefer that our representative(s) be assigned to the following project area:
SPERT _____
Nuclear Safety Pilot Plant _____
LOFT _____
Containment Test Facility _____
5. We are not now in a position to volunteer the services of a representative, but we would be interested in taking advantage of this opportunity at a later date _____.
6. We have no interest in this proposal _____.

Name: _____

Company: _____

ATTACHMENT II

ATOMIC INDUSTRIAL FORUM
850 Third Avenue
New York 22, N. Y.

Draft of Proposed News Release

INDUSTRY INVITED TO PARTICIPATE IN AEC REACTOR SAFETY PROGRAM

The Atomic Industrial Forum announced today that it is inviting expressions of interest from the nuclear industry for more active participation in programs relating to nuclear reactor safety. The invitation stems from the desire of the Atomic Energy Commission to receive on a closer, more intensive basis the input of industrial thinking and know-how into its nuclear safety experimental and engineering test program. Projects identified by the AEC that would be expected to benefit from industrial participation and assistance are: (1) SPERT tests in Idaho involving the study of nuclear power transients and excursions; (2) LOFT tests in Idaho which include plans for observing and minimizing the consequences of a reactor core meltdown following an intentional loss of coolant; (3) Nuclear Safety Pilot Plant tests at Oak Ridge which starting early next year will include studies on the performance of a model containment facility and associated equipment in confining and reducing the concentration of released fission products; and (4) Containment Systems Experiments which will include short-term engineering tests on a medium-size containment facility to be built in the near future at one of the AEC's sites.

The number of industrial representatives needed has not been definitely determined. Some projects are expected to require several representatives whereas others may require only one. AEC has said that it is "particularly interested in individuals knowledgeable or experienced in fission product

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release phenomenology and/or reactor kinetics and/or engineering tests. Industrial representatives should also be at a technical and management level in their respective organizations to assure them of complete and ready access to their organization's collective thinking on important nuclear safety concepts, as well as on supporting technical details."

The Forum's action results from a close working relationship during the past year between the Forum's Committee on Reactor Safety and the AEC's Nuclear Safety Group. During this period, the Forum Committee has made a number of recommendations to the AEC on how the AEC program could be modified and supplemented in the interest of providing early answers to a number of important questions relating to the siting of power reactors.

Forum President Louis H. Roddis, Jr., has sent letters of inquiry to a number of firms engaged in the design, construction and operation of power reactors asking them to indicate their interest in participating in this AEC program. Other interested firms and private organizations are asked to contact the Forum's Technical Project Manager Edwin A. Wiggin. The information developed from this program as well as the information from the AEC's other safety projects will be made available to the entire nuclear industry.

*MH 13 - Hazardous from
Power Reactors*

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AEC 943/13

November 20, 1963

COPY NO. 49

ATOMIC ENERGY COMMISSION

SPENT FUEL SHIPMENT CASK PROGRAM

Note by the Secretary

The attached letter, together with the enclosure, from the Chairman, Advisory Committee on Reactor Safeguards, is circulated for the information of the Commission. The correspondence, as appropriate, has been referred to the Director of Regulation and to the General Manager.

AEC
943/13

W. B. McCool

Secretary

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11-20-63

November 19, 1963

Honorable Glenn T. Seaborg
Chairman
U. S. Atomic Energy Commission
Washington, D. C.

Subject: SPENT FUEL SHIPMENT CASK PROGRAM

Dear Dr. Seaborg:

At the request of the Division of Licensing and Regulation, the Advisory Committee on Reactor Safeguards has followed the problems in development of large spent fuel shipment casks. The Committee has also discussed the status of research concerning shipment casks as part of its review of the Division of Reactor Development Safety Research Program.

Committee comments, concerning the development of these casks are contained in the attached letter to the General Manager.

Sincerely yours,

/s/ D. B. Hall

D. B. Hall
Chairman

Attachment:

Letter to the AEC General Manager, dated November 19, 1963,
Subject: Spent Fuel Shipment Cask Program.

November 19, 1963

A. R. Luedcke
General Manager
U. S. Atomic Energy Commission
Washington, D. C.

Subject: REVIEW OF SPENT FUEL SHIPMENT CASK PROGRAM

Dear General Luedcke:

At the request of the Division of Licensing and Regulation, the Advisory Committee on Reactor Safeguards has been following the problems in development of large spent fuel casks. A briefing by members of the DL&R Staff on the status of this work was given to members of the ACRS Subcommittee on June 5, 1963, and further review of the research status was given at a meeting of the Division of Reactor Development Staff and the ACRS Subcommittee on Reactor Safety Research on October 16, 1963.

Substantially all of the spent fuel shipping casks currently in use, being designed, or fabricated use lead as the principal shielding material. Potential loss of shielding by melting in case of fire or by penetration is a drawback in the use of lead. Consequences of the loss of shielding in a fire might be severe.

A large increase in the number and size of casks built and shipped is expected. In view of the anticipated increase in cask shipments, and the problem of following and protecting them during transit, the Committee recommends that the research program on spent fuel casks include study of shielding materials other than lead.

Sincerely yours,

/s/ D. B. Hall

D. B. Hall
Chairman

CC: H. L. Price, Director of Regulation

7/21/63 - Hazardous from
Power Reactor

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AEC 943/12

November 20, 1963

COPY NO. 49

ATOMIC ENERGY COMMISSION

REVIEW OF REACTOR SAFETY RESEARCH PROGRAM

Note by the Secretary

1. The attached letter, together with the enclosure, from the Chairman, Advisory Committee on Reactor Safeguards, is circulated for the information of the Commission. The correspondence, as appropriate, has been referred to the Director of Regulation and to the General Manager.

2. The referenced ACRS letters of August 1, 1963, December 31, 1962, and August 30, 1962, were circulated, respectively, as AEC 943/11, AEC 943/10, and AEC 149/18.

W. B. McCool
Secretary

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AEC
943/12

11-20-63

November 19, 1963

Honorable Glenn T. Seaborg
Chairman
U. S. Atomic Energy Commission
Washington, D. C.

Subject: REVIEW OF REACTOR SAFETY RESEARCH PROGRAM

Dear Dr. Seaborg:

The Advisory Committee on Reactor Safeguards has reviewed all major portions of the reactor safety research program being sponsored by the Division of Reactor Development. Comments concerning various aspects of this program have been transmitted to you in letters dated August 1, 1963, December 31, 1962 and August 30, 1962.

Additional comments, representing the Committee's thoughts on the conduct of the overall program, are contained in the attached letter to the General Manager.

Sincerely yours,

/s/ D. B. Hall

D. B. Hall
Chairman

Attachment:

Letter to AEC General Manager, dated November 19, 1963,
Subject: Review of Reactor Safety Research Program.

November 19, 1963

A. R. Luedcke
General Manager
U. S. Atomic Energy Commission
Washington, D. C.

Subject: REVIEW OF REACTOR SAFETY RESEARCH PROGRAM

Dear General Luedcke:

In its letter of August 1, 1963, the Advisory Committee on Reactor Safeguards stated an intent to comment further on the Reactor Safety Research Program. Some additional comments, which are now transmitted, represent views of the Committee on the area of research that requires the greatest emphasis, with some discussion of the bases for these views.

The Committee believes that it is of primary importance to determine to what extent engineered safeguards can be relied on in relaxing reactor site restrictions.

In the light of present knowledge, it seems unlikely that general principles will render incredible the possibility that high power nuclear reactors can have large power excursions, or that they can have substantial core meltdown. Therefore, it must be expected that the safety analysis for locating and designing nuclear reactors will continue to assume such accidents to be possible, even if only remotely so.

Reactor accidents leading to temperatures and pressures representative of nuclear weapons can be considered incredible on physical grounds. Also, reducing the direct radiation effects of nuclear excursions to tolerable levels seems to pose no insuperable design problems. Primary attention will have to be given to potential release of fission products to the environment.

In such a release, fission products would usually have to pass through several stages of protection before being a public hazard. These are indicated by the successive transitions:

1. Release from the fuel element to the reactor vessel;
2. Release from the reactor vessel to the containment or confinement; and
3. Release from the containment or confinement to the external environment.

The Committee considers the fundamental goals of an adequate safety research program with respect to fission product release to be establishing the significance and reliability of each of these barriers and determining the extent to which they attenuate such release.

Research conducted so far has led to an adequate estimate of the fractional release of fission products from molten uranium and uranium oxide fuel. This work should be extended to other fuels showing promise.

Establishing upper limits for release fractions from the vessel to the containment or confinement, and from the containment or confinement to the atmosphere, seems more difficult. As stated in the Committee letter of August 1, 1963, environmental conditions will influence the results. An important research area needed to obtain good estimates of plate-out or deposition is the identification of the chemical and physical form of the fission products released during possible accidents. If the form of the fission product release is known, deposition temperatures, chemical reaction rates, agglomeration rates, and settling rates can be estimated. The conditions of current experimental release studies are often not those expected during accidents. The program should concentrate on fuels, atmospheres, and experimental conditions of relevance to reactor accidents. The safety research program should be strengthened in this area.

Large scale tests such as LOFT are not expected to contribute significantly to basic understanding of the phenomena mentioned above. They will show only what happens in the specific cases tested. When sufficient basic research has been performed on the physical and chemical processes important to plate-out and deposition, prediction of the result of a large scale experiment becomes feasible. At this point,

proof tests such as LOFT may make a contribution. It is doubtful that experiments done with the Nuclear Safety Pilot Plant will by themselves provide the upper limits relevant to large scale core meltdowns in real reactor vessels.

As indicated in our letter of August 1, 1963, the determination of decontamination factors for air cleaning systems and similar devices under actual conditions of release to the atmosphere is an important research area.

Some of the other major studies that will elucidate the probability and severity of accidents and hence the chances of fission product release are the following:

1. Research on the probability of gross rupture of primary pressure vessels and other pressurized components is needed. Information is needed on methods to protect the containment or confinement from possible missiles.

2. Further studies of the brittle-ductile transition of steels are needed. The effects of radiation, radiation rates, radiation under stress, and welding variables on the brittle-ductile transition phenomenon need further exploring. The results need to be analyzed both in terms of fracture stress and energy absorption. More information on the change of energy absorption and crack propagation with irradiation rate would be useful.

3. The SPERT-I destructive test on November 5, 1962, showed evidence of an unexpected threshold phenomenon that increased the destructiveness of a nuclear excursion. The nature of this phenomenon should be clarified. The existence of other threshold phenomena should be watched for in subsequent SPERT-type destructive tests on water cooled systems.

Recent renewed emphasis on the long range role of large fast breeder reactors points up the need for a well developed, long term, comprehensive research program on the safety of such reactors. A strong research program started now should develop information very useful to the first generation of very large fast reactors. Some of the matters carrying special safety implication are as follows: The Doppler coefficient; reactivity effects due to coolant voids and fuel movement;

November 19, 1963

the mode of fuel element failures, including foaming and slumping; unstable boiling of sodium during a transient; the stability and safety in the presence of positive coefficients.

The Committee wishes to reiterate its view that the Reactor Safety Research Program promises to be of great significance toward establishing how far engineered safeguards may be relied on in easing reactor site problems.

Sincerely yours,

/s/ D. B. Hall

D. B. Hall
Chairman

AEC**UNITED STATES
ATOMIC ENERGY COMMISSION
WASHINGTON, D.C. 20545***MA-5-3-Hazardous Power Reactors
B-425*

No. IN-460
Tel. HAZELWOOD 7-7831
Ext. 3446

FOR IMMEDIATE RELEASE
(Tuesday, November 19, 1963)

Remarks by Joseph A. Lieberman
Assistant Director for Nuclear Safety
Division of Reactor Development
U.S. Atomic Energy Commission
Prepared for Delivery at the
Atomic Industrial Forum Annual Conference
New York, New York, November 19, 1963

**NUCLEAR SAFETY RESEARCH AND DEVELOPMENT PROGRAM
RELATED TO CIVILIAN POWER REACTORS**

Two years ago at the AIF meeting in Chicago I described the research and development nuclear safety activities under the cognizance of the AEC's Division of Reactor Development. At that time the Nuclear Safety group had been only recently organized and, although some of its projects had been going on for several years, it was natural that the part of that discussion that dealt with future plans was more in the form of ideas and aspirations. Today, in at least summary form, I would like to describe how and to what extent these ideas and aspirations have progressed to plans and accomplishments, and how our future activities shape up.

To begin with, although I do not believe it is necessary to emphasize to this group the overriding importance of safety considerations in the design, construction and operation of reactors, I think it is important to note particularly events of the past year regarding reactor siting, to recognize the problems of public understanding of nuclear safety, and whenever possible to take a positive, even aggressive, attitude in meeting these problems. The industry's record with respect to safety is first-rate and is, I firmly believe, a reflection of the importance and effort attached to safety matters by the AEC and the nuclear industry. It is certainly more than just plain fortuitous.

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I should like to discuss another philosophical point, if you will, before going on. This has to do, in a fundamental sense, with information exchange -- exchange between the people developing the information and the people using it. Ken Davis, our session chairman, had some fairly strong words to say on this subject six weeks or so ago in San Francisco. He said, among other things, "that developments are of no value until applied commercially." He made it clear he wasn't talking about pure research, rather, the type which might be termed applied research which is usually closely associated with engineering development work. Another way, perhaps, of making this point is to say that information is of little value unless and until it is used or applied. I believe this is very much apropos our nuclear safety program.

The accomplishments of our nuclear safety activities through 1961 need no bolstering or embellishment from me. Not too long after I took over my present job, one industry representative told me that if the whole SPERT program did no more than demonstrate, as it did, the powerful influence of the Doppler effect in terminating the transient tests of the SAVANNAH core, it was well worth it. There are other examples, too. The whole effluent control and waste management program could be cited in that we have been able to show that nuclear wastes can be handled safely.

Nevertheless, there were criticisms, constructive, I might add, and realizations too, that some parts of the safety program were getting to be insufficiently related to the real problems and needs of the nuclear industry. To the extent such a state of affairs did exist or was believed to exist, it was due, in considerable measure, on the one hand, to a lack of knowledge of the kind and extent of information being developed and, on the other hand, to a lack of knowledge of the kind of information that was desired. Such feed-back mechanisms as did exist were not particularly effective.

From my viewpoint, in the past two years significant strides have been made in improving this nuclear safety information feed-back situation. Reactivation of the Forum Committee on Reactor Safety under the chairmanship of Ken Davis, and the subsequent meetings between the committee and the program people, and individual committee members and ourselves, have been mutually beneficial. Recommendations regarding the program from the Forum Committee have materially assisted in program definition and direction. They have also led to a recognition that as the safety research and development program progresses from a program definition

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stage to one of project, experiment and test design, more specific information feed-back mechanisms are essential. This was noted and recognized in the meeting between the Forum Board of Directors and the Commission several weeks ago. Accordingly, plans are being developed for establishing a mechanism whereby the safety project people get the benefit of a closer, more continuous industry input and industry gets the benefit of more timely information more closely associated with their needs. Shortly, I hope, a number of you will be asked to become participants in the AEC safety programs and I will let Ken Davis describe what we have in mind. I am sure the stated concern and interest of industry in this area will be reflected in your response to such an invitation.

Similarly, within the past two years the ACRS has established a Subcommittee on Safety Research and Development. This group was originally under the chairmanship of John Howe, and during the past year has been under the able leadership of Herb Kouts. Our meetings and discussions with this group have likewise been of significant benefit to the program and, I hope, useful to the ACRS.

Along these lines I should also mention the safety program study recently initiated by our Program Evaluation group within the Division of Reactor Development. This too, I believe, will contribute to assurance of rational program definition and direction.

All of this has resulted in a better total safety program, but it is clear that further advances can, and indeed, must be made.

Now, having made these general statements and self-serving declarations, some specifics are in order. I will, however, only highlight, in the form of a list, program and project plans and accomplishments. Other speakers who are intimately involved in various parts of the program will likely go into somewhat more detail.

The list is in no particular order of priority or importance. It simply shows how some of our ideas and aspirations have been translated into specific plans and accomplishments.

1. The SPERT program has largely been reoriented to the transient testing of oxide cores typical of those presently used in water cooled nuclear power plants. With the exception of some stability tests in SPERT IV, which may last into fiscal year 1965, most of the plate type core tests in SPERT will be phased out toward the end of the current fiscal year.

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In particular, SPERT II may be used for an oxide core melt-down experiment, and the test of an oxide core in SPERT III from high initial powers will be started early in the next fiscal year.

2. The increasing emphasis on integral, engineering scale tests is perhaps exemplified by the conduct of the SPERT I destructive tests, the first with the highly enriched plate type metal core a year ago and the second with an oxide core a little over a week ago. In a general way, the results of the recent test show that it is very difficult to destroy an oxide core, even when you go out of your way to force destruction. This, I believe, is a significant contribution to our knowledge of accident potentialities in oxide cores.

3. Our capability to investigate, on a more realistic scale, the behavior of accident-born fission products and counter-measures to control them, has been substantially enhanced with the conception and installation of the Nuclear Safety Pilot Plant at ORNL. The cold check-out of the facility is being completed now and the test program should start early in 1964.

4. A major engineering-scale investigation of the loss-of-coolant accident in water cooled reactors was conceived and is designated the LOFT program. Kaiser Engineers with Babcock and Wilcox working with Phillips Petroleum are busily engaged in the Title I design of that facility. A railroad dolly mounted 50MWT pressurized water reactor is the major component of this proposed test. Assuming favorable action by the Congress on our FY 1964 appropriation request, construction by the M. W. Kellogg Company is scheduled to start at the NRTS in the spring. The final test, which would take place after a series of blowdown, containment, and other tests, is presently scheduled for 1967.

5. A Nuclear Safety Information Center has been established and put into operation at ORNL under the direction of Bill Cottrell. The Center will collate, analyze, and synthesize nuclear safety information on the broadest possible basis. It is, in a very real sense, an effort to apply research and development data which has been generated over the past years. It will undertake specific projects on its own and will also respond to inquiries in the safety area from essentially all comers. Its first major undertaking is a comprehensive analysis of behavior and control of radioactive iodine. This project was undertaken because of its importance with respect to reactor location.

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6. A Containment Systems Experiments project has been developed and only recently assigned to Hanford. We are attaching great importance to test data and information to be obtained from this work, also particularly with respect to reactor location. Existing facilities at Hanford will be utilized in this work. Briefly, the main feature of the project will be an outer steel shell of some 30,000 cu. ft. designed for 75 psig and a 150 cu. ft. pressurized source designed to 2500 psig. A wide range of containment schemes and parameters and so-called "engineered safeguards" will be studied and tested, as well as the transport of fission products over a wide range of system conditions. Project design and engineering work has been started and it is hoped that significant testing will start in about 15 months.

7. Another important project related to containment has been developed, assigned to the General Electric Company, and the initial phase of this work is now under way. It deals with the phenomena associated with pipe rupture in pressurized reactor coolant piping. Such failures have been generally postulated as the initial event which subsequently leads to core meltdown and fission product release in water reactors. We believe that better understanding of, and better quantitative information on initiating mechanisms for pipe failure, how defects grow to cracks, how cracks grow to failures, maximum size of rupture, probability of failure -- will not only lead to a more rational technical basis for assessing this facet of the nuclear safety problem, but also to preventive design measures, materials and fabrication inspection, and other engineering steps to prevent such accidents.

8. The contributions from actual experience to our understanding and knowledge of design, construction and operating factors that specifically relate to safety are obviously important from at least two standpoints. First, from experience we should be getting better bases on which to evaluate the degree to which our safety objectives have been accomplished. Second, our experience should lead to ways to do a better job of engineering with respect to safety. It was this kind of thinking that led us to initiate, in a small, but we believe significant way, a systematic compilation and analysis of reactor operating experience under John Garrick at Holmes and Narver.

There are other manifestations of progress in the overall safety program that I believe will be brought out and elaborated on by the other speakers in this session. I would simply summarize this part of my remarks by claiming significant improvement, output and progress in the safety program -- but also acknowledging that we have quite a way yet to go.

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This leads to some brief comments on future safety program plans related to other than water systems.

Safety studies applicable to gas cooled reactor systems have largely been conducted in conjunction with the design of specific plant prototypes. General safety studies of the type performed with the SPERT reactors on water systems have not been undertaken to date. However, plans are under way to expand the safety effort on gas cooled reactors consistent with the Commission's interest in large gas cooled reactors directed to the U^{235} /Thorium fuel cycles. Small scale laboratory studies of uranium carbide fuel properties under accident conditions (including fission product release behavior) have been under way for some time. Consideration is being given, however, to the conduct of integral core type experiments, to study nuclear excursion behavior and the associated reactivity coefficients of a small gas cooled reactor core of advanced design. The feasibility of using existing reactors for such tests is being explored at the present time. Analytical studies and perhaps small scale out-of-pile experiments will also be initiated to study the effects of a depressurization accident for gas cooled systems. Such an accident is generally considered to be the major one for gas cooled reactors.

Fast reactor safety studies will also be expanded within the next year to anticipate, insofar as possible, safety problems which may arise in the development of large ceramic fueled fast breeder reactors. TREAT studies of the phenomena associated with fuel meltdown and reassembly will include experiments with ceramic type fuels, oxides and carbides, in addition to the work already under way on metallic fuels. TREAT experiments will include the use of a sodium loop to more adequately simulate conditions existing in a fast reactor during power operation.

The recent international meeting on fast reactor safety, breeding, and economics, which was held at Argonne early in October, indicated considerable preoccupation with the possible existence of a positive sodium void coefficient in large, dilute ceramic fueled fast reactors. Considerable effort will be expended in the FARET and other fast reactor programs to obtain a better understanding of the true value and meaning of the sodium void and Doppler coefficients for large fast reactors to determine the margin of safety they possess. Our studies will continue on the understanding and behavior of accident effects in fast reactors -- neglecting the known margins of safety -- just to determine the true magnitude of reactor accident consequences. The meltdown

(more)

and reassembly accident will receive further attention, using small scale TNT experiments, and the details of heat transfer, void production, and pressure generation in sodium coolant will also be explored at the same time. Planning for the over-all expansion of fast reactor safety studies is now under way.

Now, a few closing remarks on program definition and direction. In my earlier remarks I noted what I believe to be the benefits and advantages accruing from recent increased communication between the program people, the ACRS, and the AIF. While there has been a fair degree of consistency and agreement in the ideas and thoughts expressed, there has also been a recognizable difference in viewpoint and not necessarily a unanimity of opinion. These differences, incidentally, are randomly distributed. Even within the individual groups themselves, such as the AIF, we find differing opinions, i.e., as to what constitutes the most desirable course of action in safety research and test planning.

An example, obviously over-simplified for purpose of our present discussion, goes something like this. The reactor constructor says if you can demonstrate, prove, or otherwise convince yourself, and whoever else is involved, that your containment scheme does and will continue to perform according to design specifications, i.e., to contain the consequences of a maximum accident, then you have solved your over-all safety and siting problem. Therefore, this is the direction we should take -- demonstrate containment. The reactor designer says if you can demonstrate, prove, etc., that there will be no meltdown in the event of an accident, then you are home clear. You may mess up the plant some but with no fission products to be transported you have your problem licked. Still another, I'll call him our fission product behavior man, says if you can show how almost any conceivable amount of iodine which may be evolved from an accident can be naturally attenuated by a factor of at least 100, then it is only logical that this effect should receive primary attention with experimental effort since it has a direct bearing on the siting problem. You therefore should study iodine behavior.

All of these views are meritorious and logical and, I believe, have more than a thread of consistency running through them. In a well-balanced research and development program I believe all three of these views must be pursued. I do not believe we would be making the kind of contribution we should make if we were to go out and run a test to find out what happens and then not be able to say very much of

(more)

why or how it happened. We can't afford that kind of statistical approach to our problem. Conversely, I would repeat Ken Davis's statement that I quoted at the beginning. The information is not of much value unless it is used in a practical way.

The point I should like to emphasize is that we are making every effort to achieve a balanced program that will provide maximum output of useful information. To do this, I believe over the next few years the further emphasis we have placed on engineering scale tests, on investigations where the accident conditions are reproduced or simulated as closely as possible, is in order. Fundamental research studies, to obtain a thorough understanding of the accident phenomena observed through the engineering scale tests, must also be pursued.

AECUNITED STATES
ATOMIC ENERGY COMMISSION
WASHINGTON, D.C. 20545*M.A.S. 3. Hazard for Glenn Seaborg*No. F-238
Tel. HAZELWOOD 7-7831
Ext. 3446FOR IMMEDIATE RELEASE
(Tuesday, November 19, 1963)NUCLEAR REACTOR SAFETY STUDIES TO BE CONDUCTED
AT HANFORD WORKS IN WASHINGTON

Dr. Glenn T. Seaborg, Chairman of the Atomic Energy Commission, announced today that a Containment Systems Experiment (CSE) will be built at the AEC's Hanford Works near Richland, Washington. The experiment will be an integral part of the AEC's research program specifically related to the safety of civilian nuclear power reactors.

A cylindrical containment shell about 25 feet in diameter and 75 feet high will be placed in an existing building at the site. The containment shell will house a model of the reactor pressure vessel, facilities for simulating several types of containment systems and extensive instrumentation and control systems. The experiment will be of such a size that the results can be related to full-scale power reactor systems.

A number of tests will be conducted in the containment shell. The tests will provide additional design information on containment and various other engineering safeguards related to the light water-cooled pressurized and boiling water reactors of current interest to power utilities.

The program will also examine the effect of simulated loss-of-coolant accidents of varying intensities on different types of containment systems and components, and determine the effectiveness of these systems in retaining fission products which might be released in an actual reactor accident. Studies will be made of inherent characteristics of containment that contribute to the retention of any released radioactivity, as well as of the effectiveness of engineering safeguards that can be incorporated in the design and deliberately activated after an accident. Auxiliary studies of containment leakage and comparisons of methods of measuring leakage will also be made.

(more)

11-19-63

Development of a detailed experimental program and subsequent operation of the experiment will be undertaken by the General Electric Company, the AEC's prime operating contractor at the Hanford Works. Detailed design of the experiment will be done by Vitro Engineering Co., the AEC's architect-engineering contractor at Hanford. Construction is expected to begin early in 1964 with completion scheduled for early 1965.

(NOTE TO EDITORS AND CORRESPONDENTS: This announcement is being distributed simultaneously in Richland, Washington, by the Commission's Richland Operations Office.)

11/19/63

MH+dB - Hazard from Power Reactors

October 4, 1963

**MEMORANDUM FOR CHAIRMAN BOARD OF GOVERNORS
COMMISSIONER PALYNY
COMMISSIONER KERRY
COMMISSIONER TATE
COMMISSIONER WELLS**

THROUGH GENERAL MANAGER

SUBJECT: HEARINGS ON NUCLEAR SAFETY

We have just received word informally that the JCR will probably schedule hearings within a few weeks on the general subject of nuclear safety. I believe the purpose is to counter some of the increasing adverse publicity and discussion which have been generated by persons not knowledgeable or current with facts in this area. Both the regulatory and non-regulatory staffs will be involved in preparations for the hearings.

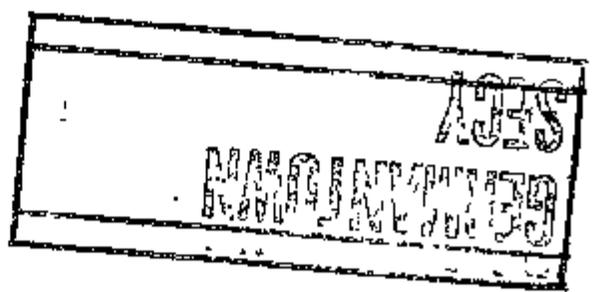
(Signed) Dwight A. Ink

**Dwight A. Ink
Assistant General Manager**

cc: Director of Regulation

cc: W. B. McGeel, Secretary (2) ✓

DAI:kvf



10-17-63

*O+m-78CAE

M. S. Z. Johnson, Jr. Atomic Reactors

UNCLASSIFIED

AEC 943/11

August 2, 1963

COPY NO. 11

ATOMIC ENERGY COMMISSION

ACRS REVIEW OF REACTOR SAFETY RESEARCH PROGRAM

Note by the Secretary

1. The attached letter from the Chairman, Advisory Committee on Reactor Safeguards, together with the enclosure, is circulated for the information of the Commission. The correspondence, as appropriate, has been referred to the General Manager and to the Director of Regulation for any action indicated.

2. The referenced ACRS letters of August 30, 1962, and of December 31, 1962, were circulated, respectively, as AEC 149/18 and AEC 943/10.

W. B. McCool

Secretary

DISTRIBUTION

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AEC
943
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8-2-63

Alvins 4-11 Com 7 ACRS

August 1, 1963

Honorable Glenn T. Seaborg
Chairman
U. S. Atomic Energy Commission
Washington, D. C.

SUBJECT: REVIEW OF REACTOR SAFETY RESEARCH PROGRAM

Dear Dr. Seaborg:

The Advisory Committee on Reactor Safeguards has continued its review of the program in reactor safety research sponsored by the Division of Reactor Development. Comments by the Committee concerning portions of this program were forwarded to you in letters dated August 30, 1962, and December 31, 1962.

Additional comments, dealing with that portion of the program related to fission product release from fuel elements and subsequent retention in containment barriers, are contained in the attached letter to the General Manager.

Sincerely yours,

/s/ D. B. Hall

D. B. Hall
Chairman

Attachment:
Ltr. to Gen. Mgr. dtd 8/1/63.

August 1, 1963

A. R. Luedecke
General Manager
U. S. Atomic Energy Commission
Washington, D. C.

SUBJECT: REVIEW OF REACTOR SAFETY RESEARCH PROGRAM

Dear General Luedecke:

The Advisory Committee on Reactor Safeguards has been reviewing the safety research program of the Atomic Energy Commission for several months. This review, undertaken at the request of the Division of Reactor Development, has been very timely because it has come during a period when engineered safeguards are increasingly used to justify sites that would otherwise be unacceptable. At the outset, the Committee wishes to thank the Division of Reactor Development for the opportunity to hear of the progress being made in reactor safety research and to comment on it. In a previous letter to you, dated December 31, 1962, some views of the Committee on the Spert and STEP projects were transmitted. In this letter additional comments are offered only on those portions of the program designed to provide further information on the release of fission products from fuel elements and the place and extent of their removal in passing through successive spaces and barriers.

The Committee would like to stress that dependence on engineered safeguards to reduce the effects of credible reactor accidents must be supported by confidence that the safeguards would act as expected. There must be assurance that the conditions to which the devices would be exposed are correctly foreseen. The effectiveness of the devices under these conditions must be established.

The safety research program devotes much of its attention to questions about the nature and magnitude of fission product releases by various mechanisms. Most of the research concerns the release of fission products by fuel that has been melted by afterheat. In most instances, the fission product heating is simulated by other means: plasma torches, electrical heating, induction heating. Several kinds of fuel are being investigated. Those being studied and proposed for study include the principal reactor fuels for the converter reactors.

August 1, 1963

In the spirit of the statement made above, that confidence in performance as planned is essential, the Committee would like to comment on aspects of these fission product release studies. Most of the comments simply reiterate views on which the research has been based, and these are stated again here only for completeness.

The two basic questions to be answered by fission product release studies are: (1) how much of what fission product of significance is released, and (2) in what form are the fission products released? There are no simple answers to these questions, because the answers depend on a variety of environmental conditions. These include: (1) the chemical composition of the fuel (e.g., uranium metal, uranium oxide, uranium carbide, alloying constituents), (2) the physical nature of the fuel (for instance, sintered oxide or vibratory compacted oxide), (3) the degree of burnup, (4) the temperature history of the melt, (5) the kind of cladding, (6) the kind of atmosphere in which the melt takes place (air, steam, air-steam mixture, noble gas). Amplification of the basic questions in the light of the environmental effects leads to such questions as: What fraction of the release of volatile fission products, particularly halogens, is in elemental form? What is the particle size distribution of released nonvolatiles? What is the expected degree of adsorption of volatiles on these particles? What chemical compounds are formed? What is the size distribution of the particles with which there are associated? The answers as functions of the environmental conditions must be known if the behavior of the engineered safeguards is to be assured.

In addition, the Committee would like to draw attention to the presence of large amounts of plutonium and other transuranic species near the end of reactor core life. The possible release of these, the effect of their release, and their effect on fission product release should be studied.

Throughout, care must be taken to assure that the history of significant fission products is followed. In circumstances where halogens are released in easily removable form, the effectiveness of the engineered safeguards will probably depend on other fission products.

It appears that some increase in the Atomic Energy Commission's safety research program will be needed if satisfactory answers to the above questions on fission product release are to be available for interpreting the consequences of integral experiments such as LOFT.

August 1, 1963

The release of fission products from fast reactor fuels should also receive growing attention. The fission product distribution curve differs somewhat with fission neutron energy. Fission product yields from plutonium fission are somewhat different from those from U^{235} fission. The fuels themselves will differ from those used in thermal converter reactors.

Before leaving the subject of fission product release research, the Committee would like to comment on the proposed studies of fission product release by methods other than simple fuel melting. The releases associated with nuclear excursions or chemical reactions (such as those between water and metals) will differ from the ones discussed above. The series of Spert destructive tests will shed some early light on the nature of such releases as well as on other questions. But the basic physical understanding of the releases will depend on research such as is projected for the Power Burst Facility. The Committee wishes to emphasize the need for the PBF, and to support its early construction and use.

The retention of released fission products on the inner walls and internals of the reactor vessel will reduce the magnitude of the release by an amount that is so far unpredictable. This reduction factor will depend on complicated circumstances: the geometry and composition of the surfaces, the form of the fission products (gaseous, elemental, particulate), the temperatures of surfaces, the size of the reactor vessel or pipe rupture, and the atmosphere in the reactor vessel. It will be necessary to identify the cause of the reduction, to establish the dependability of results. The Nuclear Safety Pilot Plant should help to answer a number of the questions influencing the expected retention of fission products in the reactor vessel, but it may be that the complication of structural members and fuel element surfaces will only lead to a lower limit on the advantage to be gained from vessel retention. The need for careful control in these experiments is stressed. It is noted that a plasma torch will be used to melt the fuel. This torch will be located in a separate chamber outside the simulated reactor vessel. Attention has been given to assuring that the release into the simulated vessel resembles that from an after-heat meltdown: this must be assured. The variable nature of the release as influenced by features of the melting, discussed earlier, should be taken into account. The course of the deposition in the vessel should become well enough understood on purely physical and chemical grounds to permit mathematical justification of vessel retention factors that might be assumed in reactor plants.

August 1, 1963

Beyond the escape from the vessel, released fission products to be a major hazard must still escape whatever containment or confinement is provided. The tests of retention by containment or confinement, and the effectiveness of air cleanup devices under actual conditions, are planned for the LOFT facility. Related test facilities have also been proposed: the Pressure Suppression Facility, and more recently, Spert-II.

It is difficult to specify the features important in finding the degree of retention in the containment or confinement building except by reiterating the need to justify whatever retention factors may be claimed in the future. This justification must rest on a foundation of physical and chemical understanding. The same sources of complication as pertain to vessel retention factors will also apply here.

In view of the recent finding of almost total release of several significant fission products, transport effects assume very great importance. The various engineered safeguards that have been proposed to reduce further the extent of final release should be tested under conditions under which they must be expected to perform. These engineered safeguards include spray washdown systems in the vessel and in the reactor building, building air recirculation systems, and final air cleanup systems. The variability of possible fission product releases will affect the performance of all of these. The temperature and steam content of the atmosphere will affect the performance of recirculating and final air cleanup systems. The possibility of saturation of air cleanup systems should be investigated. The rate of re-evaporation of halogens washed down by spray systems should be known.

The pressure suppression scheme that has been designed for some reactors bears further testing over a somewhat larger range of variables. In relation to the fission product retention problem, however, it would be useful to establish experimentally to what degree this scheme can be relied on for reduction of fission product escape.

The proposed Pressure Suppression Facility seems to be the one device that has been proposed for systematic study of the effectiveness of engineered safeguards such as building spray systems, air recirculation cleanup systems, and pressure suppression. The Committee wishes to encourage further development of this proposal, with emphasis on the

August 1, 1963

goal of physical justification of the reduction factors to be assigned such engineered safeguards.

The Committee views the LOFT experiments as being in the nature of necessary full system tests. These would establish whether the more specific research on the individual and successive aspects of the core meltdown and fission product release have made it possible to predict accurately the complete sequence of events, and whether any effects of importance have been overlooked. As corollaries to this view, the Committee believes that the research that is to be correlated on a full system basis must be at an adequate stage for this test when it is performed, and that the LOFT experiment must be well instrumented to establish quantitatively the physical and chemical nature of the release from the fuel, the vessel, and the building, and the environmental features influencing the release. It is doubtful that a single LOFT meltdown will be adequate to provide the confidence in predictability of the magnitude and kind of fission product releases after core meltdown.

The proposed use of Spert-II to provide some information prior to the LOFT experiments would be of questionable value. Because the basic experiments needed for interpretation would almost surely not be finished in the two years before a Spert-II meltdown can be done, this test could not be considered as a systems test of the nature of LOFT. Without the physical understanding of the more elementary processes, any results achieved could not be depended on as guides to predicting fission product releases following meltdown of other reactors. It seems that at best a Spert-II meltdown might give some further guidance to the conduct of the later LOFT tests.

The Committee has been favorably impressed by the emphasis that the Division of Reactor Development gives to research on nuclear reactor safety. This research should be of real value in helping to ease the problems of reactor siting and the assured performance of engineered safeguards.

The Committee will forward further comments on research aimed at reducing or clarifying the possibility of serious accidents when the review of these portions of the research program has been finished.

It is clear that some facets of reactor safety are more important than others, and the degree of urgency in attaining useful results varies.

To: A. R. Luedecke

-6-

August 1, 1963

In the near future, the Committee will forward to you their views on the coverage of these facets, on the general scope of the program, and the relative emphasis that should be placed on various aspects of the program. This critique will be based on our opinion of the relative importance of safety problems being faced in the siting, design and construction of large power and test reactors.

Sincerely yours,

/s/ D. B. Hall

D. B. Hall
Chairman

MH 5-3 - Hazards of Power Reactors
OFFICIAL USE ONLY

Reference Section

UNITED STATES GOVERNMENT

Memorandum

TO : Curtis A. Nelson, Director
Division of Inspection

DATE: July 31, 1963

FROM : W. B. McCool, Secretary

*to be signed
W. B. McCool*

SUBJECT: DIVISION OF INSPECTION REPORTS

SBCY:JFG

1. You will recall at Meeting 1954 on July 29, 1963, during consideration of the Division of Inspection Report concerning A Study of the AEC-Owned Reactor Safety Review System (July 19, 1963), the Commission requested paragraph 5 on page 15 of the Report be revised to reflect clearly that in cases of differing views between the General Manager and Director of Regulation with respect to the approval of a safety analysis report, the matter will be referred to the Commission for resolution. Other appropriate cases will also be submitted to the Commission.

2. Commissioner Ramey requested also that the Division of Inspection look into the question as to whether the Commission is being afforded an adequate opportunity to discharge its safety responsibilities with regard to reactors in the possession of the Department of Defense.

3. During consideration of AEC 132/61 - Quarterly Report by the Division of Inspection, you said a report on the appraisal of technical performance by AEC contractors will be submitted to the General Manager at an early date with a view toward enhancing contractor performance.

- cc:
- Chairman
- Commissioner Ramey
- General Manager
- Deputy General Manager
- Asst. General Manager
- Director of Regulation
- Deputy Director of Regulation

*Copies filed:
Com. 2 - Inspection
MH 5-3 - Hazards of
Military Reactors*

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7-31-63



UNITED STATES
 ATOMIC ENERGY COMMISSION
 WASHINGTON 25, D.C.

*Encl. A-3 - Reg. Handbook
 from Power Reactors*

July 29, 1963

MEMORANDUM FOR CHAIRMAN SEABORG
 COMMISSIONER WILSON
 COMMISSIONER PALFREY
 COMMISSIONER RAMEY
 COMMISSIONER TAPE

SUBJECT: CONSTRUCTION PERMITS - INFORMATION NEEDED, TECHNICAL SPECIFICATIONS, FINDINGS AND CONCLUSIONS.
 RECONVENING ATOMIC SAFETY AND LICENSING BOARDS.

At Regulatory Meeting 180 on May 16, the Commission requested a report on the feasibility and desirability of amending the regulations governing power and test reactors, particularly sections 50.34 to 50.36 inclusive, in order to amplify and specify more precisely the evidence required and the findings and conclusions to be made at the construction permit stage. At an earlier meeting (Regulatory Meeting 172), the Commission requested a report on the desirability and feasibility of defining more precisely in regulations the information to be furnished by an applicant prior to the issuance of a provisional construction permit or authorization, and the information to be reserved for a research and development program.

These two requests are closely related. During recent years we have been developing a comprehensive check list of information which an applicant should furnish. This has resulted in a draft guide prepared by the Division of Licensing and Regulation last summer, copy attached. The guide attempts to describe the total information needed to obtain a reactor license. The guide, however, does not break out the minimum information needed at the construction permit stage and it does not explain why the items listed are needed. Both of these gaps need to be covered.

Following the Supreme Court's decision in the PRDC case, we attempted to develop amendments dealing with provisional construction permits in those cases involving the necessity for a substantial research and development effort on important questions of safety. This resulted in amendments to Part 50 describing generally the criteria for a provisional construction permit for cases of this type.

In addition to the desirability of spelling out the criteria regarding R&D programs more precisely, there is a need to determine and define the information needed for the great majority of construction permits which do not require R&D work relevant to important safety questions. Previous efforts to do this have been unsuccessful because of a philosophical

*Copies filed:
 01/11/7 - Atomic Safety + Lic. Board
 PFC - 1 - Reg. Policy
 1/26/63 - Reg. Board + At. Faculties*

7-29-63

dilemma. On the one hand, we have to recognize that projects are never far advanced at this stage. On the other, safety evaluators inevitably desire the maximum amount of information before rendering a judgment on the acceptability of a project. This is generally true even in those cases that are substantially like previous cases.

I believe, however, that we have now had enough experience to resolve this difficulty. If we can develop a guide or regulatory amendments dealing with the problem of information needed at the construction permit stage, I think it then will not be too difficult to develop appropriate technical specifications and to define more precisely the necessary findings and conclusions to be made on the basis of that information.

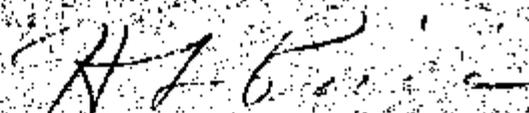
Dr. Beck has prepared the attached memorandum which I believe fairly outlines the nature of the problem. Whether we need a separate regulation for construction permits, amendments to existing regulations, or a combination of regulations and guides is a matter of form which can be decided later.

In the meantime, I have asked Dr. Beck to take the lead in working with the Division of Licensing and Regulation and the General Counsel's Office in developing appropriate rules or guides on this subject for Commission consideration. This is likely to require a substantial amount of time and effort. I am hopeful that a report with specific recommendations or alternative recommendations can be ready for discussion with the Commission during November.

At Regulatory Meeting 172, the Commission also requested a report on the desirability and feasibility of reconvening the same board, which presides in the provisional construction permit hearing relating to a case, for later evaluation of the results of the R&D programs involved in the case. Where substantial R&D programs relevant to important safety questions are involved, this would be a desirable procedure, and in many cases where further service of a board is needed, it probably will be feasible to reconvene the same board. We talked to the Atomic Safety and Licensing Board Panel along these lines at our meeting on July 23 and obtained the general impression that this would be in accordance with their views.

In the more important cases, we might reconvene the board for a hearing. In other cases, we might reconvene the board without a hearing. In many cases, particularly where important R&D is not involved, I think we will find that further participation by the board is unnecessary. In any event, I think that whenever a board is reconvened an effort should be made to convene the same board which heard the case at the construction permit stage. Specific criteria to implement a policy along these lines

for further use of Atomic Safety and Licensing Boards will follow logically from the results of Dr. Beck's study and report during the next few months.



H. L. Price
Director of Regulation

Enclosures:

1. Draft Guide
2. Memo from Dr. Beck to
H. L. Price, 6/24/63

cc: Secretary ✓
General Counsel
Director of Regulation

U. S. ATOMIC ENERGY COMMISSION
CORRESPONDENCE REFERENCE FORM

DATE:

INDEX: MH&S 3 Hazards of Power Reactors

~~INDEX: MH&S 3 Hazards of Power Reactors~~

~~INDEX: MH&S 3 Hazards of Power Reactors~~

TO:

FROM:

SUMMARY: Memo for the Commissioners from Inspection re Division of Inspection Reports - (1) Problems Relating to the Administration of Reactor Projects Subject to 10 CFR 115; and (2) A Study of the AEC-Owned Reactor Safety Review System.

FILED: O&M 2 Inspection

INDEXER: date of memo: 7-19-63

REMARKS:

THIS PAGE ONLY

7-19-63

W.H.D. 3 Hazards from Power Reactors



No. 885-63

IMMEDIATE RELEASE

JUNE 20, 1963

Oxford 76161

THRESHER COURT OF INQUIRY REPORTS

A flooding casualty in the engine room is believed to be the "most probable" cause of the sinking of the nuclear submarine USS THRESHER, lost April 10, 1963, 220 miles east of Cape Cod with 129 persons aboard.

The Navy believes it most likely that a piping system failure had occurred in one of the THRESHER's salt water systems, probably in the engine room. The enormous pressure of sea water surrounding the submarine subjected her interior to a violent spray of water and progressive flooding. In all probability water affected electrical circuits and caused loss of power. THRESHER slowed and began to sink. Within moments she had exceeded her collapse depth and totally flooded. She came to rest on the ocean floor, 8,400 feet beneath the surface.

This opinion of the Court of Inquiry was made public today by Secretary of the Navy Fred Korth.

The Court, headed by Vice Admiral Bernard L. Austin, USN, heard testimony from 120 witnesses, both military and civilian, during the eight weeks it was in session at the Naval Shipyard, Portsmouth, New Hampshire. It recorded 1700 pages of testimony and gathered for the record some 255 charts, drawings, letters, photographs, directives, debris and other exhibits bearing on the sinking.

The Record of Proceedings of the Court was delivered last week to the convening authority, Admiral H. Page Smith, USN, Commander-in-Chief, U.S. Atlantic Fleet, who transmitted it, with his comments, to the Secretary of the Navy. Copies of the bulky 12-volume record are now being studied in the Navy Department by engineers, designers and experts in nuclear submarine operations.

The Court declared that, in its opinion, "the basic design of the THRESHER class submarine is good, and its implementation has resulted in the development of a high-performance submarine."

The bulk of the Court's recommendations stated the need for careful review of the design, construction and inspection of vital submarine systems, such as sea water and air systems, and a review of operating procedures to improve damage control capability under casualty conditions such as flooding.

Certain lessons have already been taken. For example, the Navy's Bureau of Ships is applying a newly developed inspection technique to assure the integrity of high pressure piping systems on all naval ships. Based upon ultrasonic principles, the new method is being employed initially on nuclear submarines. Personnel training and ultrasonic inspection equipment familiarization are necessary and some rescheduling of submarine construction dates and overhaul intervals will be required.

(More)

Cy field. In. H. H. The. ...

6-20-63

... and by the Court was ... closed ...
... report is classified "Secret" to prevent disclosure of ...
... of the Navy's nuclear submarine force. Secretary Keith has ...
... the release of the following portions of the record which do not con-
tain secret information:

... its opinions, the Court stated that "the evidence does not estab-
... of those embarked in THRESHER were caused by the intent,
... or inefficiency of any person or persons in the naval ser-
vice of connection therewith."

The Court also reported there was no evidence of sabotage or hostile
action in connection with the loss of THRESHER. In addition, the Court found
that there was no indication of increased radioactivity in the search area.
Debris recovered was also found to be free of radioactive material.

The record states that it is impossible, with the information now avail-
able, to obtain a more precise determination of what actually happened.

The Court said, however, offer a "reasonable rationalization of probable
events" which, when pieced together with known facts, provide the following
chronology of the death of the THRESHER:

The THRESHER, under command of Lieutenant Commander John W. Harvey, USN,
departed Portsmouth Naval Shipyard on the morning of April 9, 1963, to con-
duct scheduled sea trials following an overhaul period which extended from
July 16, 1962, to April 11, 1963. THRESHER was a unit of Submarine Develop-
ment Group TWO and was operating under the orders of Commander, Submarine
Force, U.S. Atlantic Fleet (Administration) Portsmouth, for the sea trials.
One hundred twenty-nine persons were aboard THRESHER for the purpose of
conducting official duties. Included in this number were three officers and
15 civilian employees of the Portsmouth Naval Shipyard; one officer from the
staff of the Deputy Commander, Submarine Force, Atlantic Fleet; four civi-
lian contractor's representatives, and 12 officers and 96 enlisted men of
the ship's company.

USS SKILARK, commanded by Lieutenant Commander Stanley Hecker, USN,
was designated to act as escort to THRESHER during sea trials and effected
a rendezvous with the submarine at 9:49 A.M. on April 9 in the vicinity of
Latitude 42-56 North, Longitude 70-26 West. Upon completion of a scheduled
shallow dive, the two ships proceeded independently during the night to a
second rendezvous in the vicinity of Latitude 41-46 North, Longitude 65-03
West. During this transit, THRESHER proceeded both submerged and surfaced
and conducted various test evolutions, including full power propulsion.

At 7:15 A.M. on April 10, the two ships were at the rendezvous point,
separated by a distance of 3,400 yards. The sea was calm with a slight
swell. Wind was from the north-northeast at seven knots. Visibility was
about 10 miles. No other ships are known to have been in the vicinity.

Two minutes later, at 7:17 A.M., THRESHER reported by underwater tele-
phone that she was starting a deep dive. SKILARK maintained her approxi-
mate position while THRESHER reported course and depth changes as she

... and beneath the surface. To persons aboard SKYLARK, the dive appeared to be progressing satisfactorily until about 9:13 A.M., when THRESHER reported "Experiencing minor difficulties. Dive positive up angle. Am attempting to blow. Will keep you informed."

Listeners aboard SKYLARK next heard sounds of compressed air rushing into the submarine's ballast tanks as THRESHER sought to regain the surface.

Three minutes later, at about 9:16 A.M., SKYLARK heard a garbled transmission which was believed to contain the words "...test depth."

Upon receiving THRESHER's message that she was experiencing minor difficulty, her escort ship SKYLARK advised THRESHER that the area was clear. She announced her own course and requested range and bearings from the submarine. At about 9:15 A.M., SKYLARK asked THRESHER "Are you in control?" and repeated this query. At 9:21 A.M., SKYLARK established her position by Loran as latitude 41-45 North, Longitude 64-59 West. She continued her attempts to communicate with THRESHER by underwater telephone, sonar and radio. Then, at 10:00 A.M., SKYLARK commenced dropping a series of hand grenades as a signal to THRESHER that she should surface. SKYLARK then sent a message to Commander Submarine Development Group TWO reporting that she had lost contact with the submarine.

The Court of Inquiry concluded that the SKYLARK's message "did not convey to operational commanders the full extent of the information available." Lieutenant Commander Hecker was named a party to the investigation but, in the opinion of the Court, SKYLARK's actions "could not conceivably have contributed in any way to the loss of THRESHER..."

"The tragic loss of THRESHER has caused the Navy to review in minute detail the design, construction, operation and overhaul of our nuclear submarines," Secretary Korth said. "We have found nothing to cast doubt on the basic soundness of the program, but in every analysis of a major catastrophe at sea, lessons are learned. The Record of Proceedings of the Court of Inquiry headed by Vice Admiral Austin is receiving most careful and detailed scrutiny. It will undoubtedly serve to lessen the hazards inherent in operating beneath the sea."

END

MH-3 Hazards of Power Reactors

FEB 14 1963

Dr. David B. Hall
Chairman, Advisory Committee on
Reactor Safeguards to the
U.S. Atomic Energy Commission
Washington 25, D. C.

Dear Dr. Hall:

This is in response to Dr. Gifford's letter to me of December 31, 1962 presenting the Committee's comments on the Start and Stop program portions of our over-all reactor safety research program.

I wish to express my appreciation of the Committee's interest in our program and the time and effort committee members have given to these technical meetings on our reactor safety research work. These informal technical meetings with our staff and contractors have been most helpful in focusing more specifically on the safety research work to be undertaken and in charting our future programs. I would hope that we may continue our present arrangements to call upon the Committee for assistance in this most important work.

I concur with the Committee's suggestion that for experiments involving small fission product inventories and conducted by competent and experienced groups, extended and detailed safety reviews by a number of groups within the AEC and by the AEC should be minimized commensurate with the actual potential hazards involved. I think it is true, in a number of cases in the past, we have tended to require additional detailed safety reviews even when the potential hazards of an experiment were clearly small; the additional work required and procedural delays of such reviews have not contributed significantly to the experiments or to increased safety. As the Committee points out, tests of the Start type do not constitute an undue hazard either on or off the site and such tests are an integral part of the reactor safety research program whose objective is to protect the health and safety of the public. We are currently revising our procedures for handling the safety review of AEC owned reactors. It is clear that the AEC must assure that the safety standards and practices employed at AEC owned reactors

D. M. C. 3

are adequate and are at least as stringent as those imposed on licensees, but it is not believed appropriate to subject all of our experimental and developmental reactors to the same review procedures which have been developed for power reactors operated by new groups and located near populated areas.

Since the Committee reviewed the Spart and Stop programs in August, 1962, these programs have been undergoing reevaluation and are being developed substantially in accord with the Committee's comments made at that time and generally repeated in the Committee's letter. It is now planned to conduct a destructive test of a low enrichment uranium dioxide core in Spart I in the fall of 1963. Arrangements are progressing to convert Sparts II, III, and IV to low enrichment oxide core kinetics work. Large core kinetics experiments will commence in Spart IV with possible extension of this work to Spart II or III. The costs involved in procuring new cores for the Spart reactors have to be considered in connection with the scheduling of the experimental program.

The current priority of funds for FY 64 has also necessitated postponing the proposed Four Burst Facility. We concur with the Committee's comments regarding the utility of this facility in the over-all kinetics program. We have included this item with high priority in the FY 65 Budget. Budget limitations had also delayed procurement of computer facilities which were commented on by the Committee to aid in analysis of the Spart tests. An IBM 7040 computer has been ordered with installation expected in August, 1963.

As the Committee noted in its letter, the Stop program was in its formative stage in August, 1962. Since that time, preliminary plans for the program and design of a test facility have been completed. We have previously sent copies of the report "Feasibility and Conceptual Design For The Stop Loss of Coolant Facility", IDO-16833, to the Committee. We would appreciate receiving the Committee's comments on the detailed program outlined in this report.

With regard to the Committee's comments on the nature of piping failures, we have recently announced an invitation to bid on a pipe rupture analytical and experimental study. We would hope to start this program within the next few months. I am enclosing five copies of the tentative scope for the study for

Dr. David B. Hall

- 3 -

the information of the Committee. At the next reactor safety research meeting on our containment work which I understand is scheduled for March, 1963, we will be prepared to discuss the scope of this study with the Committee and would appreciate receiving the Committee's informal comments at that time.

Again, I wish to express my appreciation of the Committee's valuable assistance in this important safety research work.

Sincerely yours,

SIGNED, A. R. LUEDECKE

General Manager

Enclosure:

"Initiative List of Topics
for Investigation of Pipe
Rupture in Water Systems"
(3 copies)

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<u>RD:INA</u>	<u>RD:IN</u>
MBooth:dgw	J.Lieberman
2/7/63	2/ /63

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M.H.S. 3 Hazardous Power
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Reference Stamp

UNITED STATES GOVERNMENT

Memorandum

TO : **Curtis A. Nelson, Director
Division of Inspection**

DATE: **February 1, 1963**

FROM : **W. B. McCool, Secretary**

*Original copy
in W. B. McCool's
file*

SUBJECT: **AEC 132/59 - REPORT OF THE DIVISION OF INSPECTION**

SECY:JYG

1. We informed your office on January 31, 1963, that at Meeting 1910 on January 29 the Commission during discussion of your seventh periodic report requested that consideration be given to the presentation of a special briefing on Operations Office performance.

2. You will recall also that you noted a staff paper on parallel procedures (AEC safety review and inspection procedures for second round reactors) would be submitted for early Commission consideration.

3. The General Manager has directed you to take the action required by the above request. I will be happy to assist you in arranging an appropriate time for the briefing.

- cc:
- Chairman
- Director of Regulation
- General Manager
- Deputy General Manager
- Asst. General Manager
- General Counsel

copies filed:
06 111-2 - Inspection
06 111-6 - Briefings
M.H.S. 3 Reg. Hazardous Power Reactors

OFFICIAL USE ONLY

2-1-63

UNCLASSIFIED

January 16, 1963

CORRECTION NOTICE

COPY NO. 45

ATOMIC ENERGY COMMISSION

CORRECTION TO AEC 940/10

REVIEW OF REACTOR SAFETY RESEARCH PROGRAM

Note by the Secretary

Please substitute the attached cover page for that currently on AEC 940/10 in order to reflect the correct staff paper number - AEC 943/10. *Done*

W. B. McCool

Secretary

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UNCLASSIFIED

AEC 943/10

January 10, 1963

COPY NO. 45

ATOMIC ENERGY COMMISSION

REVIEW OF REACTOR SAFETY RESEARCH PROGRAM

Note by the Secretary

1. The attached letter, together with enclosure, from the Chairman, Advisory Committee on Reactor Safeguards, is circulated for the information of the Commission. The correspondence, as appropriate, has been referred to the Director of Regulation and to the General Manager for any action indicated.

2. The referenced ACRS letter of August 30, 1962, on SPERT I destructive tests was circulated as AEC 149/18.

W. B. McCool

Secretary

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Draft Filed: O.M. - 7-ACRS

29-01-1

*AEC
943
10*

December 31, 1962

Honorable Glenn T. Seaborg
Chairman
U. S. Atomic Energy Commission
Washington, D. C.

Subject: REVIEW OF REACTOR SAFETY RESEARCH PROGRAM

Dear Dr. Seaborg:

The Advisory Committee on Reactor Safeguards has completed the following stages of a review of the program in reactor safety research that is supported by the Division of Reactor Development:

1. A complete summary of the program by Dr. J. A. Lieberman and his branch chiefs. (Summary Report, Nuclear Safety Research & Development Program, Division of Reactor Development, June 1962, by I. E. Jackson, Jr.)
2. Review of the Spert and Step programs at the National Reactor Testing Station presented by the Phillips Petroleum Company's research group and others.

In addition, a number of reports on the Spert program have been made available to the Committee. Recently, information on tests of fission-product release and transport has been received but this has not yet been studied by the Committee.

The Committee commented on the safety aspects of the Spert I destructive tests in our letter to you dated August 30, 1962. In a letter to the General Manager, dated December 31, 1962, copy attached, the ACRS has presented further opinions on the conduct of the program including individual tests at the NRTS. The attached letter provides the initial response to a request from the Director, Division of Reactor Development, for Committee comments on the entire reactor safety research program.

Sincerely yours,

/s/ F. A. Gifford, Jr.

F. A. Gifford, Jr.
Chairman

Att. Ltr to Gen. Mgr., dtd 12/31/62

December 31, 1962

A. R. Luedecke
General Manager
U. S. Atomic Energy Commission
Washington, D. C.

Subject: REVIEW OF REACTOR SAFETY RESEARCH PROGRAM

Dear General Luedecke:

The Advisory Committee on Reactor Safeguards has completed the following stages of a review of the program in reactor safety research that is supported by the Division of Reactor Development:

1. A complete summary of the program by Dr. J. A. Lieberman and his branch chiefs. (Summary Report, Nuclear Safety Research & Development Program, Division of Reactor Development, June 1962, by I. E. Jackson, Jr.)
2. Review of the Spert and Step programs at the National Reactor Testing Station presented by the Phillips Petroleum Company's research group and others.

In addition, a number of reports on the Spert program have been made available to the Committee. Recently, information on tests of fission-product release and transport has been received but this has not yet been studied by the Committee.

The Committee commented on the safety aspects of the Spert I destructive tests in our letter to Chairman Seaborg dated August 30, 1962. The present letter presents further opinions on the conduct of individual tests at the NRTS, and provides the initial response to a request from the Director, Division of Reactor Development, for Committee comments on the entire reactor safety research program.

General Remarks on the Spert Program

The Committee believes that the present series of Spert destructive tests, which are carried out with small fission-fragment inventories, cannot constitute a serious hazard to the health and safety of the public. Such experiments provide information very useful to the understanding of reactor accidents, and any delay of such experiments increases the probability that safety evaluations of other reactor projects may be erroneous due to lack of the new information. It is therefore recommended that review of such experiments by the ACRS, and possibly by other safety groups within the AEC, be eliminated if the operator of the experiment files with the AEC a document showing that the radiation limits specified in 10 CFR Part 20 will not be exceeded for the general public, even in case of dispersion to the atmosphere of the whole fission fragment inventory of the reactor at any time throughout the test. This simple procedure should be modified at the request of the AEC, the ACRS, or the contractor, if unusual circumstances so warrant.

The Committee also suggests that a planned program of press releases be instituted to educate the general public that releases of fission products from tests of the Spert type will not constitute an undue hazard to anyone either on or off the site. The publicity should emphasize the point that such releases are an integral part of a reactor-safety research program whose objective is to protect the health and safety of the public.

Specific Recommendations on the Spert Program

The Spert group has built up experience and skill. There are many results which give a good basis for planning future tests of this type and this part of the whole program should grow. The analytical part of the work is making progress, but it would profit from further strengthening. For example, more adequate computer facilities should be provided.

The Committee recommends that destructive tests be performed as soon as possible on low-enrichment oxide cores, since such cores are used in the majority of power reactors. The tests on highly enriched metal cores have to be relatively widely spaced to allow adequate analysis between tests. Since oxide fuel for about two cores is available at the Spert facility, consideration might be given to performing destructive tests on oxide cores while the analysis of a metal-core test is underway.

The Committee suggests that the following areas be studied:

1. The influence of slow acting, small, positive temperature and void coefficients (in particular positive coefficients extending over a limited range of temperature and voids) on destructive or other severe transients. Such limited positive coefficients may prove to be without much influence on these transients; and, if this is the case, they may be used to reduce the reactivity change from cold to hot-operating. Such reduction would improve the reactivity lifetime and economics of the reactor, or it could be used to reduce the excess reactivity that has to be controlled.
2. The possible existence of mechanisms by which catastrophic local disturbances in a large reactor can propagate. Perhaps large reactors could be built in such a manner that destruction of more than a small part of the reactor is demonstrably impossible.

The Committee wishes to encourage a program consisting of destructive testing of fuel assemblies, and employing a re-usable reactor as source of the neutron burst in order to supplement the whole core destructive tests. Such a program for the testing of small fuel assemblies is in progress at the KEMB facility. The Fast Burst Facility, proposed by Phillips Petroleum Company, would allow testing of somewhat larger assemblies. The fuel assembly destructive testing program would have the following advantages:

- a. It would save the cost of loss of material and cleanup involved in tests of whole-reactor destructions.
- b. It could provide answers more rapidly than can be obtained in the case of whole-reactor destructive tests.
- c. If tests were performed with "dirty" fuel, only a small amount of radioactivity would be dispersed.
- d. It would extend the range of available reactor periods into the important region of fast transients by more than an order of magnitude beyond that available at the transient facilities which are now in operation and could accommodate large samples.

The recent Spert I destructive test seems to indicate that the destructive effect is separate from the reactivity-feedback effects, and it is essentially this feedback which requires whole-reactor tests.

The Step Program

The Step program is in the formative stage. It is our understanding that the loss of coolant accident will figure prominently in these tests. The Committee recommends that the investigation of this potential accident be carried out in two steps:

- (a) Coolant loss from the reactor, at a controlled rate and correlation of this rate of loss with quantitative information on the behavior of the core;
- (b) Study of the nature of piping failures and their effects on the rate of coolant; this study should take full advantage of and should not duplicate work done outside the Step group.

Inasmuch as accident analyses usually assume that the pressure vessel containing the reactor will not fail, and since brittle failure of this vessel may lead to catastrophes far in excess of the "maximum credible accident", the Committee recommends that additional support be given to the groups now investigating brittle failure starting at defects in pressure vessels. Of particular interest would be tests using pressurization by gases rather than liquids and the effect of environment on crack propagation. Continued attention should be given to radiation damage on pressure vessels and the study of the effects of the significant variables on radiation damage specimens.

The results of the Reactor Safety Research Program are important in the work of the ACES. Quantitative data of general applicability are required to permit precise evaluation of reactor safety and for design and operation of economic nuclear power systems. The reviews to date have been extremely valuable to us.

Sincerely yours,

/s/ F. A. Gifford, Jr.

F. A. Gifford, Jr.
Chairman

DE 1516

Form 2-3-62

5/23/62

MEMORANDUM FOR CHAIRMAN SHADDOE
COMMISSIONER GRAHAM
COMMISSIONER HANFORTH
COMMISSIONER OLSON
COMMISSIONER WILSON

SUBJECT: OPERATION OF NUCLEAR SHIPS

In the Commission's discussion with members of the Advisory Committee on Reactor Safeguards on May 10, 1962, it was apparent that a statement of policy by the Commission with respect to operation of nuclear powered ships for civilian purposes would be highly desirable, would be useful to the Committee and would serve to expedite their consideration of the problems of the Savannah. The attached letter to Mr. Clifford, Chairman of the ACSRS has been prepared by the regulatory and operating staffs to fulfill this purpose. We jointly recommend that it be signed in order that it may be delivered to the Committee for their meeting on Friday, May 25, 1962.

I understand Commissioner Olson will not be available on May 24 but he has coordinated on the letter and recommends that it be transmitted.

SIGNED, A. R. LUEDECKE

General Manager

Attachment
Proposed ltr to ACSRS

- cc: Chairman
- cc: Each Commissioner
- cc: Secretariat *←*
- cc: Director of Regulation
- cc: GM Reading File - GT
- cc: GM Reading File - H St

X-Can. A-6 - Transport Ship
CACA-7 - ACSRS

5-23-62

Dear Mr. Clifford:

Reference to the discussions of May 1954 between the members of the Commission and the Advisory Committee on Reactor Safeguards, and the comments by some of the members of ACRS regarding the need for a policy relating to the operation of nuclear ships, we are pleased to state for the guidance of the Commission the basic considerations in this matter which we believe should apply. These are two in number:

1. It was recognized from the extent of the national atomic energy program that one of the major and most useful applications of nuclear energy would be its utilization for propulsion of sea-going vessels. In fulfillment of this expectation, a fleet of 20 nuclear submarines is in operation, a carrier and a cruiser have been commissioned, and the first merchant ship has successfully completed her sea trials.

At the time the program was proposed by the President and authorized by Congress it was implicitly recognized and accepted that the ship, in its operation and utilization for basically civilian purposes, could serve as a prototype to demonstrate the wide possibility of beneficial uses of nuclear vessels.

2. At the same time, it was also recognized from the beginning that potential hazards, unusual in type and in magnitude, could accompany such utilization of atomic energy.

It has been the underlying policy of the Commission that priority emphasis on safety, ahead of all other considerations, must be given to all nuclear operations under its surveillance. For each facility a finding of reasonable assurance that the health and safety of the public would not be unduly jeopardized by its operation has been required before operation has been authorized. This will continue to be the case also for operation of nuclear powered ships.

Secretary ✓

As the stage approaches for consideration of nuclear ship operation on civilian objectives in ports or near other inhabited areas, the basic policy to be observed will recognize these two overriding factors involved, namely, the great potential benefits which may be derived from this nuclear application and the paramount necessity for priority emphasis on safety.

Thus, the basic policy may be stated:

It is in the public interest for nuclear ships to be operated for civilian purposes, provided there is reasonable assurance that undue hazard to the health and safety of the public will not result therefrom.

As stated at the time of our discussion, we and the Maritime Administration are faced with decisions on operating schedules for the U.S. Savannah. Your advice on the safety issues involved in the operation of this nuclear vessel is essential to our consideration of this matter, and we are grateful for the time and effort the Advisory Committee is devoting to this.

Sincerely yours,

Chairman

Dr. V. A. Gifford, Jr.
Chairman
Advisory Committee on Nuclear Ship Operation

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U. S. ATOMIC ENERGY COMMISSION
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DATE:

INDEX: MH&S 3 Hazards of Power Reactors

TO:

FROM:

SUMMARY: Memo from Inspection to Commissioner Olson re Parallel Procedure Questions Raised by Contractors. This memo was prepared at the request of Commissioner Olson at Info Mtg. 115.

FILED: MH&S 3 reg. Hazards of Power Reactors

INDEXER: date of memo: 2-6-62

REMARKS:

THIS PAGE ONLY

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DOE NSI DECLASSIFICATION REVIEW E.O. 12958
BY: MARY DEFFENBAUGH DOE/NN-523

2-6-62
1

*M.A.S. 3 - Request for Paper
Reaction*

JAN 4 1962

**MEMORANDUM FOR CHAIRMAN
COMMISSION ON
COMMISSIONER
COMMISSIONER
COMMISSIONER**

JAN 6 1962

THROUGH GENERAL MANAGER, A. R. LUEDECKE

**SUBJECT: REACTOR SAFETY WORKING PROJECT WITH MASSACHUSETTS
INSTITUTE OF TECHNOLOGY (MIT)**

At a meeting last fall I briefed the Commission on preliminary negotiations with Dr. T. J. Thompson of MIT to prepare a comprehensive treatment of the technical factors bearing on reactor safety. A contract with MIT is now being finalized. Consistent with the Commission's desire, coverage will be limited to strictly technical topics. Commission policies will not be discussed nor will site selection and environmental factors. A brief outline of topics to be covered is attached.

The contract provides for AEC approval of (a) principal staff assigned by MIT to the project, (b) all authors, and (c) detailed outlines. The contract further provides for AEC review of draft manuscripts. The right to publish any or all of the final manuscript will rest with the AEC. The contract will be administered by the New York Operations Office but technical control will be retained in the Division of Technical Information, Washington. The project will be guided by a steering committee composed of representatives from the Division of Reactor Development, Division of Technical Information and the Division of Licensing & Regulation.

The total estimated cost of the project is \$300,000. Dr. Thompson, in his original proposal, requested \$320,000. This amount was reduced, however, on his covering certain policy

Copy filed M.A.S. 3 - Request for Paper Reaction

*Secretary
B-471*

1-4-62

Confidential

- 2 -

JAN 4 1962

editors and also environmental factors. The cost estimate was therefore correspondingly reduced when these topics were included. The cost estimate includes the sponsorship by EPC of a conference of three states' agencies during which the various authors will go over the draft manuscript. It is expected that out of this conference a final draft for submission to the IJC will emerge.

Dr. Thompson has held preliminary negotiations with Dr. James Buckley to serve as Senior Editor and Principal Assistant on the project. He understood that he has requested formally to participate in the project.

J. L. FINE

E. L. FINE
Director of Regulation

Enclosure:
Outline of topics

cc: Secretary



UNITED STATES DEPARTMENT OF JUSTICE
FEDERAL BUREAU OF INVESTIGATION

I. IDENTIFICATION
II. SUBJECT INFORMATION
III. SUMMARY OF FACTS AND ANALYSIS

A. IDENTIFICATION
B. SUBJECT INFORMATION
C. SUMMARY OF FACTS AND ANALYSIS

D. IDENTIFICATION
E. SUBJECT INFORMATION
F. SUMMARY OF FACTS AND ANALYSIS
G. IDENTIFICATION
H. SUBJECT INFORMATION
I. SUMMARY OF FACTS AND ANALYSIS
J. IDENTIFICATION
K. SUBJECT INFORMATION
L. SUMMARY OF FACTS AND ANALYSIS

DATE:

~~INDEX: Hazards of Military Reactors~~

INDEX: HRS-3-Hazards of Power Reactors

~~INDEX: Hazards of Military Reactors~~

~~INDEX: Hazards of Military Reactors~~

~~INDEX: Hazards of Military Reactors~~

TO:

FROM:

SUMMARY: AEC 1041/13: SAFETY STANDARDS AND INSTRUCTIONS APPLICABLE TO MILITARY AND CIVILIAN REACTORS. To consider a proposed draft reply to that portion of the JCAE letter dated February 23, 1961, which requested a review and analysis of AEC's past and current procedures for prescribing safety standards and instructions applicable to weapons and DOD and civilian reactors.

FILED:

INDEX: legal-4-leg. Program

REMARKS: date of papers 1-3-62

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DOE NSI DECLASSIFICATION REVIEW E.O. 12958
BY: MARY DEFFENBAUGH DOE/NN-823
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**U. S. ATOMIC ENERGY COMMISSION
CORRESPONDENCE REFERENCE FORM**

1-362

MHOS-3-*[handwritten]*

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~~CONFIDENTIAL~~

December 16, 1961

AEC 943/9

COPY NO. 12

ATOMIC ENERGY COMMISSION

REPORT ON CONFINEMENT OF PRODUCTION REACTORS

Note by the Secretary

The attached letter from the Chairman, ACRS, is forwarded for the information of the Commission. It has been referred to the General Manager for appropriate action.

W. B. McCool
Secretary

CLASSIFICATION CANCELLED
 DATE 7/13/73
 For The Atomic Energy Commission

Jack H Kahn
 Jack H. Kahn
 Staff Assistant
 Division of Classification

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BY AUTHORITY OF DOE/JOC
Per J. Diaz 6/6/90
Reviewed by DDC

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1346-61/19-97-2

~~CONFIDENTIAL~~

December 13, 1961

~~CONFIDENTIAL~~
Honorable Glenn T. Seaborg
Chairman
U. S. Atomic Energy Commission
Washington 25, D. C.

Subject: REPORT ON CONFINEMENT OF PRODUCTION REACTORS

Dear Dr. Seaborg:

The problem of confinement of the Hanford and Savannah River production reactors has been under review by the Advisory Committee on Reactor Safeguards for several years. E. I. du Pont de Nemours' most recent studies, reviewed at our October 1961 meeting, have led them to propose a comprehensive confinement program which is estimated to cost about 18 million dollars. Considering this, the Production Division suggested that the General Electric Company review the Hanford confinement program in order to determine whether it provides a level of safety approximately equivalent to that now proposed for Savannah River. This question was considered by the ACRS at its December 7-9, 1961 meeting, following presentations by Hanford and Savannah River representatives.

From the safety standpoint the Savannah River and Hanford reactors are not strictly comparable in detail, although they are similar with respect to certain basic safety-related features as well as from the standpoint of overall safety philosophy. For example, continuity of coolant flow is an absolute safety requirement in both systems; but at Savannah River secondary back-up coolant pumps are subject to flooding, whereas at Hanford this is not the case. Consequently, somewhat different safety measures are required at each site relative to this particular point.

To summarize, the Committee is convinced that confinement programs at both sites are necessary, in fact, urgent. We feel that the proposed Savannah River confinement program will result in a major reduction in the existing hazard to the health and safety of the public.

CLASSIFICATION CANCELLED
BY AUTHORITY OF [redacted]

Car J. Kahn 7-13-93
& J. Dwyer 6-6-90

This document contains restricted data as defined in [redacted]. Its transmission in any form or its content in any manner to an unauthorized person is prohibited.

[redacted]

~~CONFIDENTIAL~~

[REDACTED]

Honorable Glenn T. Seaborg - 2 -

December 13, 1961

The Hanford confinement program, which is now farther advanced, is scheduled to be completed by December 1962. If the comprehensive Savannah River proposal is adopted, we believe that the two sites will be, roughly, equal so far as confinement is concerned, after both installations are complete.

Sincerely yours,

/s/T. J. Thompson

T. J. Thompson
Chairman

References:

1. DPST 61-516 (Confidential) - Hazards Evaluation of Confinement Facilities with a \$10,000,000 Limit, dtd 11/14/61.
 2. HW-71742 (Secret) - A review of Hanford Production Reactor Hazards & Confinement, dtd 11/21/61.
 3. IFE-2122 (Secret) - Partial Containment in Savannah River Plant Reactors, Part III, dtd June 1960.
 4. IFE-2172 (Secret) - Concept of Minimum Basic Facilities for Additional Containment of the Savannah River Plant Production Reactors, issued June 13, 1961.
 5. DPST-61-371 (Secret) - Supplementary Reactor Safety Determination - Savannah River Plant Partial Containment Studies, Part I, dtd August 1961.
- [REDACTED]

M.H.S. 3 - Hazards from River Reactors
~~OFFICIAL USE ONLY~~

UNITED STATES GOVERNMENT

Memorandum

TO : Dwight A. Ink
Assistant General Manager

DATE: December 15, 1961

FROM : W. B. McCool, Secretary ^{Original signed}
W. B. McCool

SUBJECT: ESTABLISHMENT OF PROJECT CONTROL SYSTEM

SYMBOL: EBCY:WLW

At Information Meeting 92 on December 13, 1961, Mr. Hollingsworth, in discussing the problems encountered with the Elk River reactor project, commented on the necessity of establishing an AEC project control system. He said that he was directing you to initiate the design and establishment of such a system.

- cc:
- Chairman
- General Manager
- Deputy General Manager
- Asst. to the Gen. Mgr.
- General Counsel

copies filed:
J.A.P. - Res. Corp.
J.R.A. - Reg. Elk River
M.H.S. 3 - Reg. Safety
Survivability Reactors

~~OFFICIAL USE ONLY~~

13-56

DATE:

[REDACTED]

INDEX: NEAS-3-Hazards of Power Reactors

[REDACTED]

TO:

FROM:

SUMMARY: AED 1041/12: SAFETY STANDARDS AND INSTRUCTIONS APPLICABLE TO MILITARY AND CIVILIAN REACTORS. To consider a proposed draft reply to that portion of the JCAE letter dated February 23, 1961, (Appendix 9th) which requested a review and analysis of AED's past and current procedures for prescribing safety standards and instructions applicable to weapons and DGD and civilian reactors.

FILED:

INDEXER: LSMAI-4-Reg. Program Vol. 2

REMARKS: date of papers 9-11-61

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DOE NSI DECLASSIFICATION REVIEW E.O. 12065
BY: MARY DEFFENBAUGH DOE/NN-523

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U. S. ATOMIC ENERGY COMMISSION
CORRESPONDENCE REFERENCE FORM

10-11-61

MHC 5-3 - Hazard of Power Reactors

UNITED STATES GOVERNMENT

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Memorandum

TO : File

DATE: August 16, 1961

FROM : Harold D. Ansmosa, Acting Secretary

Harold Ansmosa

SUBJECT: ESTABLISHMENT OF AD HOC COMMITTEE TO STUDY RESPONSIBILITY FOR SAFETY OF COMMISSION-OWNED REACTORS

SYMBOL: SECY:DCR

At Meeting 1761 on August 4, 1961, during the report by the Division of Inspection (See AEC 132/41) the Commission requested an ad hoc committee composed of Commissioners Olson and Haworth and the General Manager to analyze procedures and responsibilities for the safety of Commission-owned reactors.

cc: Commissioner Olson
Commissioner Haworth
General Manager
Deputy General Manager

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Copy file. C-111-7

8-16-61

UNITED STATES GOVERNMENT

7-405 3 - Hazard. from Power Reactors
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Ref. Sec.

Memorandum

TO : File

DATE: August 8, 1961

FROM : W. B. McCool, Secretary

SUBJECT: ESTABLISHMENT OF AD HOC COMMITTEE TO STUDY RESPONSIBILITY FOR
SAFETY OF COMMISSION-OWNED REACTORS

SYMBOL: SECY:DCR

At Meeting 1761 on August 4, 1961, during the report by the Division of Inspection (see ABC 132/41) the Commission requested establishment of an ad hoc committee under the direction of Commissioner Haworth to analyze procedures and responsibilities for the safety of Commission-owned reactors.

cc: Deputy General Manager
Commissioner Haworth

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Copy Filed: 08-11-7

17-8-8

U. S. ATOMIC ENERGY COMMISSION
CORRESPONDENCE REFERENCE FORM

DATE:

INDEX: MH&S-3-Hazards of Power Reactors

TO:

FROM:

SUMMARY: AEC 934/3: SAFETY EVALUATION OF SANDIA PULSED REACTOR FACILITY (SPRF)
By memorandum dated April 14, 1961 the Commission directed the General Manager and the Acting Director of Regulation to take certain steps with respect to the safety review and subsequent operation of the Sandia Pulsed Reactor Facility. This paper is a report as a result of that request.

FILED:

INDEXER: PBB&L-50-Los Alamos Power Reactor

REMARKS: date of paper: 5-18-61

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DOE NSI DECLASSIFICATION REVIEW E.O. 12958
BY: MARY DEFFENBAUGH, DOE/NN-628
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1
5-18-61

WALTER D. HENNING, JR.
WALTER H. HENNING, JR.

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WALTER H. HENNING, JR.

Congress of the United States

JOINT COMMITTEE ON ATOMIC ENERGY

May 17, 1961

Dr. Glenn T. Seaborg
Chairman
U.S. Atomic Energy Commission
Washington 25, D.C.

Dear Dr. Seaborg:

The Joint Committee is planning hearings on "Radiation Safety and Regulation," commencing June 12 and continuing through June 15. A copy of the press release and outline for the hearings is attached. We would like to ask your cooperation in obtaining the following AEC and AEC contractor witnesses to testify as follows:

Topic I.B(1) - Technical Aspects of Reactor Safety

The technical aspects of reactor safety should be discussed under four principal headings: design, construction, operation, and siting.

Witness: Dr. Clifford K. Beck, Division of Licensing and Regulation
Monday, June 12, at 3:00 p.m.

Topic I.C(1) - The SL-1 Incident

Testimony should cover a review of the incident with a discussion of the investigation of the incident made by the AEC Ad Hoc Committee.

Witnesses: Mr. Curtis A. Nelson, Division of Inspection
Tuesday, June 13, at 10:00 a.m.
Mr. Sidney Cohen, Combustion Engineering
Tuesday, June 13, at 10:30 a.m.
Capt. Robert Morgan, U.S. Army
Tuesday, June 13, at 10:45 a.m.

Case #AEC 496/73 + file on 7-JUNE

5-11-61

Topic I.C(2) - Results of the AEC Inspection of Other
Facilities That Followed in the Aftermath of
the SL-1 Incident With Special Emphasis on
the Brookhaven Review

Witnesses: Dr. Frank Pittman, Division of Reactor Development
Tuesday, June 13, at 11:20 a.m.

Mr. E. D. Low, Division of Compliance
Tuesday, June 13, at 11:45 a.m.

Topic I.C(3) - Reactor Site Criteria

Discussion of the proposed AEC criteria dated February 11,
1961, and related matters.

Witness: Mr. Robert Lowenstein or Mr. Harold Price
Division of Licensing and Regulation
Tuesday, June 13, at 2:00 p.m.

Topic II.B - AEC Regulatory Organization and Procedures

Testimony should be descriptive of past and present AEC
organization and procedures. This discussion should be
limited to a factual account of organization and procedures
with discussion of recent changes in the Commission's
regulatory organization, reserved for later testimony by
Commissioner Olson.

Witness: Mr. Robert Lowenstein or Mr. Harold Price
Division of Licensing and Regulation
Wednesday, June 14, at 10:30 a.m.

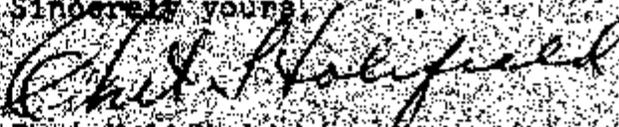
Topic I.C(4) - Problems in Materials Licensing and Waste
Disposal

Testimony should cover regulatory problems in the licensing
of materials and waste disposal activities.

Witness: Mr. Lester R. Rogers, Division of Licensing and
Regulation
Wednesday, June 14, at 3:30 p.m.

We shall write to Commissioner Olson separately
concerning his testimony at these hearings. Your
cooperation in this matter is appreciated.

Sincerely yours,


Chet Hollifield
Chairman

M. S. Z. Hazard From Board Report



UNITED STATES
ATOMIC ENERGY COMMISSION
WASHINGTON 25, D. C.

April 18, 1961

Dr. Kenneth S. Pitzer, Dean
College of Chemistry
University of California
Berkeley 4, California

Dear Ken:

13 W/4 NMS

With regard to the recommendation of the GAC at their last meeting, recorded on page 2, paragraph (c), regarding exchange of information through the IAEA on reactor safety, you will be interested to know that in my presentation at the Board meeting I made the following statement and proposal, which seemed to be well received and, I am sure, will be thoroughly considered by the Agency:

"I would like to end with a suggestion which I sincerely commend to the Secretariat when it comes to the preparation of the details of the 1962 program. We believe that the Agency should conduct in 1962 a conference or symposium on reactor safety. There have been in the past few years a number - fortunately a very small number - of reactor accidents, the latest of which occurred at the U. S. AEC's Idaho reactor testing station. We believe that the information which has developed as a result of the exhaustive investigations of these various accidents make it timely that the Agency arrange a conference or symposium during which this information can be thoroughly reviewed in a form which will be of great benefit to the entire membership of the Agency. For such a conference, the United States would be willing to present in some detail the results of its investigation by that time of the Idaho accident.

"A discussion of the type which we are here proposing, which would have as its objective a review of all of the reactor accidents on which information is available, together with some discussion of the problems of reactor siting and methods of containment, would provide a very valuable fund of information which could directly contribute to another scientific meeting which the Agency intends to hold in 1962, namely, the symposium on 'The Techniques of Evaluating Reactor Hazards,' one of the series of meetings which the Scientific Advisory Committee recommended be included in the 1962 program."

Inf. by 16

4-18-61

THE UNIVERSITY OF CHICAGO

DEPARTMENT OF CHEMISTRY

PHYSICAL CHEMISTRY



UNITED STATES
ATOMIC ENERGY COMMISSION
WASHINGTON 25, D. C.

7-4-61

MEMORANDUM FOR CONSIDERATION

GENERAL SUBJECT

SUBJECT: R&D ACTIVITY IN THE FIELD OF NUCLEAR SAFETY

The following information is provided pursuant to your request of yesterday afternoon.

1. What the Agency has done in the field of Nuclear Safety

- a. In September 1958 the Agency's Conference on Fuel and Material Reactor Research included papers on the problem of reactor safety.
- b. The Agency's Conference on Nuclear Ship Regulations in December 1958 gave particular emphasis to reactor safety.
- c. The Agency has provided grants for research evaluations of:
 - (1) The Swiss Reactor - October 1959
 - (2) The British reactor in the Netherlands - February 1961
 - (3) The site for the Tropicair Reactor at Lubbock - March 1961
- d. A Manual on Safe Operation of Critical Assemblies and Research Reactors is in preparation.

2. What the United States has requested the Agency to do in the field of Nuclear Safety

- a. At the Second General Conference of the IAEA (September 1958), Chairman Borne said "The Agency should also give forward with safety under various conditions, reactor siting, and the protection of workers at atomic energy establishments."

Info only
4/4/61

7-4-61

- b. At the Third General Conference (1959) Commissioner Vinberg stated, "My Government also believes the Agency should consider assuming responsibility in the field of reactor hazards evaluations."
- c. At the Fourth General Conference Chairman Merton in speaking generally of the Agency program stated, "Turning to another area, the consequences of improper or careless handling of the atom in our country might have serious consequences in the east. Hence it is vital that this Agency continue its pursuit of appropriate international standards for health and safety. It must press forward with its work in the disposal of radioactive waste in the safe design and operation of critical assemblies, research reactors and power reactors and in the transportation of radioactive materials."

In speaking specifically with reference to health and safety, Chairman Merton stated, "I believe the benefits of atomic energy can be realized without endangering the health of the beneficiaries. For this to be done, however, responsible authorities of all countries must first insure themselves of the necessary precautions, and then insist upon appropriate action. The Agency has not ignored this problem, but it must maintain a persistent vigilance. One serious reactor accident could undermine public confidence and could adversely affect the program in almost all countries."

1. Recommendations

It would appear timely for the Agency to sponsor a symposium on the specific problem of reactor safety with emphasis on the surveillance of operations from the safety standpoint. A number of countries already have, or will be bringing into operation, within the next year or so, reactors larger than research reactors. The U.S. experience with SI-1 at Idaho Falls might be a subject of particular interest at such a symposium.

A. S. Wells, Director
Division of International Affairs

DATE:

INDEX: MH&S 3 Hazards from Power Reactors

~~INDEX: 3 Reg. Safety Surveys of Reactors~~
~~DATE: 3-16-61~~
~~INDEX: 3 Reg. Hazards from Power Reactors~~

TO:

FROM:

SUMMARY: AEC-R 69 - SAFETY SURVEYS OF REACTORS AFTER SL-1 ACCIDENT
 Memo to the GM re the above, also attached to
 paper is a ltr. to the ACRS reporting completion of
 the initial surveys.

FILED: MH&S 3 Reg. Safety Surveys of Reactors

INDEXER: date of paper: 3-16-61

REMARKS:

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5-16-61

Revised

*10 sub 3 Hazardous Waste
Power Reactors*

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AEC 943/B

February 28, 1961

COPY NO. 10

AEC
943
8

ATOMIC ENERGY COMMISSION

REACTOR SAFETY CRITERIA

Note by the Secretary

The Acting Chairman has requested that the attached letter and enclosure to the Chairman, ACRS, be circulated for the information of the Commission.

W. B. McCool
Secretary

DISTRIBUTION

COPY NO.

Secretary	1
Commissioners	2 - 6, 15
D. C. Office	7 - 9
Secretariat	10 - 14

*X. OAM 7-ACRS
10 sub 3 Reg. Hazardous Waste Reactors
P2C-1-1-Reg Reactor Mfg. Facs*

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UNITED STATES
ATOMIC ENERGY COMMISSION
WASHINGTON 25, D. C.

February 23, 1961

Dear Dr. Thompson:

At the Commission meeting on January 31, 1961, to consider proposed reactor site criteria, you asked about the status of studies to establish the feasibility of developing reactor safety criteria and of research relating thereto recommended by the ACRS in its letter of November 16, 1959.*

As indicated in our letter of January 7, 1960,** the Commission has devoted considerable time and effort to the Committee's suggestions and has given serious study to the extent and direction of efforts which the Commission should exert on the definition of criteria and standards for reactor safety and how handling of matters closely related to this topic might be arranged to best advantage.

In December 1959 the General Manager appointed an Ad Hoc Committee to consider these matters further and recommended steps that should be taken. Committee membership included persons from the AEC, from nuclear industrial concerns and from the ACRS. The Ad Hoc Committee study was completed in September 1960 and copies of its report dated September 29, 1960 have been forwarded to the ACRS.

We believe the recommendations of this Committee constitute reasonable steps in the direction of achieving the objectives expressed by the Advisory Committee, although the Commission has not depended solely for guidance in these matters on the Ad Hoc Committee. Implementation of these Ad Hoc Committee recommendations has been initiated as shown in some detail in the attached staff report.

I suggest that the Advisory Committee on Reactor Safeguards appoint a small subcommittee to consult with the Division of Licensing and Regulation and the Office of Technical Information on the selection, scope, authors and priority scheduling of the monographs and review articles discussed under Item 6 of the attached staff report.

You may be aware that the Commission's Reactor Safety Research program as contained in next year's budget will be expanded. Not only have the projects (SPERT, TREAT, fuel meltdown, fission product release, containment concepts, water-metal reactions, etc.) supported by this year's \$11 million

*Circulated as AEC 943/5

**Copy on file in Licensing and Regulation

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budget been continued and in some cases expanded, but the budget support has been increased to \$13 million to accommodate extension of laboratory experiments in certain of the areas of investigation to large-scale field experiments. Controlled explosions in large scale containers for missile studies, and release, containment, "washdown" and clean-up of larger scale fission products releases are among those visualized. Planning discussions are also under way for systematic meteorology studies in special areas such as California.

Sincerely yours,

/s/

John S. Graham
Acting Chairman

Dr. T. J. Thompson, Chairman
Advisory Committee on Reactor Safeguards
U. S. Atomic Energy Commission

Enclosure:
Staff Report with Annex I

UNCLASSIFIED

February 13, 1961

STAFF REPORT
ON
IMPLEMENTATION OF RECOMMENDATIONS OF
AD HOC COMMITTEE
RELATING TO REACTOR SAFETY CRITERIA

The recommendations of the Ad Hoc Committee are listed below along with a discussion of measures that have been taken to implement those recommendations:

(1) Recommendations:

"We recommend that there be established rules, which may of necessity involve some degree of arbitrariness, by which sites that would be considered acceptable for locations of reactors can be selected."

The AEC staff has, with the assistance of the ACRS, recently completed a set of proposed guides to be used in considering the acceptability of sites for power and test reactors. The Commission has approved publication of these guides in the Federal Register for public comment. It is intended that these guides will receive continued attention with the view to updating them as the technology advances.

(2) Recommendation:

"We recommend that the AEC does not at this time attempt to standardize the technical design and construction specifications and procedures for reactors or for the various components of reactors."

In making this recommendation the Committee explained this conclusion on the basis that at the present time, standard patterns of general practice in types and general characteristics of reactors, or in the design arrangements and construction plans for reactor components have not emerged. It appeared to the Committee that in this transitional developmental stage of reactors it was too early to bind designers to fixed design standards as long as safety was not being compromised. Rather, concern was expressed that issuance of standard design and construction specifications might discourage incorporation of alternate arrangements which further experience might reveal to offer greater safety than that achieved by the best now known.

The Commission staff agrees with this recommendation against freezing the advancing technology at this time through issuance of standardized technical design specifications. There is a need, however, to develop criteria or guides, which, while not attempting to tell applicants specifically how to design, will inform them as definitely as we can, on practices that have been found acceptable and on the factors the AEC will consider in reviewing their design proposals. This is discussed further below.

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(3) Recommendation:

"We recommend that there be initiated a continuing effort within the AEC on the collection and organization of safety guides, or state-of-the-art practices on reactors and reactor components and on a systematic tabulation of safety performance objectives for reactors and reactor components and that these be made available as guides to the nuclear community, but not at this time as regulations."

Work along these lines began many months ago. Performance objectives on such subjects as containment, control rods, monitoring systems, waste disposal systems and organization and operating procedures were developed in preliminary form. Copies of these were furnished the ACRS for information and comment. The AEC staff has renewed and expanded its efforts on these guides and expects in the near future to have considerably revised and expanded versions prepared.

(4) Recommendation:

"We recommend that, to inform the general public and to assist applicants in the preparation of information required in support of license applications, there be prepared an explanation of the AEC licensing procedures and a guide or set of instructions, with appropriate illustrations and examples, on the preparation of hazards summary reports, which, to some extent, should follow a standard pattern."

Work on a revision of formal instructions on hazards summary reports (10 CFR 50) containing sections which would amplify and clarify the procedures and requirements relating to hazards summary reports has been initiated. It is intended that this effort will also result in formulation of additional guidance to applicants in the areas of change procedures and technical specifications.

(5) Recommendation:

"We recommend that the safety research projects of the AEC scattered among many administrative units, be brought under the surveillance and co-ordination of one appropriately located person having sufficient authority and staff to achieve appropriate scope and coherence in the program."

It is recognized that in the pursuit of the objectives of the many programs of the AEC, there is generated much technical information of value to those charged with the safety analysis of existing data and programs with the view of comparing what already is known with the needs and gaps as they appear in the course of hazards evaluations, after which specific steps to augment existing safety research programs can be recommended. Steps have been taken to supplement the staff of the Division of Licensing and Regulation with specific assignment to this task. Insofar as this recommendation of the Ad Hoc Committee relates to administrative responsibilities, its implementation will have to await the results of the Commission's study on organization.

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(6) Recommendation:

"We recommend that the Nuclear Safety Journal receive full time direction, and support from some appropriate person on the staff of the Commission, that it be increased in frequency to at least six issues per year and that it be expanded to include in each issue authoritative monographs or review articles on pertinent reactor safety topics prepared by experts in the field."

This recommendation related to the need expressed in the ACRS letter for a study of the available information on reactor safety. The Ad Hoc Committee agreed on the desirability of a series of monographs on pertinent reactor safety topics. The majority visualized that such effort should constitute a continuing program by which the AEC would provide the nuclear community with a comprehensive flow of information from research projects and experience gained in reactor operation. Expansion of the coverage of the Nuclear Safety Journal was suggested. This recommendation is being considered along with other possible means to achieve the same objective.

The AEC has in the past sponsored the publication of books and review-type reports on subjects directly relating to safety analysis and currently has an active program along similar lines. A summary of such projects currently in progress is attached hereto. These efforts are to be expanded.

One method of extending this review, collection and evaluation work is through appropriate contractual arrangements with selected professional technical societies whereby monographs and review articles on specified topics will be prepared. Contracts have been or are now being negotiated with the American Society of Metals, the American Nuclear Society, and the American Institute of Biological Sciences. The role visualized for the societies would be one of arranging for specialists in the various fields to act as a committee to advise on the over-all project, recommend titles with specific scope outlines, recommend authors and reviewers for monographs and articles and render advice based on its own review of manuscripts. A number of the society would be expected to act as a project supervisor. Titles, authors and texts in all cases would be worked out in discussions between the society and the AEC. By attempting to utilize the familiarity society personnel have with the ability of men within their own fields and the problem areas peculiar to these fields that relate to nuclear safety, this approach should result in a broad attack on the problem. The Division of Licensing and Regulation is working with the Office of Technical Information in establishing titles of subjects that are in most urgent need for monograph type coverage.

In addition, the Division of Licensing and Regulation and Office of Technical Information are setting up a list of topics for comprehensive review articles which are to be covered in forthcoming issues of the Nuclear Safety Journal. Such articles are intended to be on more narrow technical areas and hence will be less extensive in scope than the monograph series.

The Advisory Committee on Reactor Safeguards should be asked to appoint a small subcommittee to consult with the staff on the selection, scope, authors and priority scheduling of both the monographs and the review articles.

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Meanwhile, as the steps described above are taken to gather and publish information pertinent to better understanding of problems of nuclear safety, AEC efforts will continue also to encourage the interchange of new knowledge in these areas through conferences and symposia by the technical experts, professional societies and the nuclear industry. Oral discussion among the expert participants and publication of the proceedings of such conferences are both recognized as important contributions to efforts for making new information readily accessible. The AEC, for example, has in the past fifteen months either organized or participated in numerous conferences devoted to the interchange of ideas and information on matters relating to nuclear safety.

(7) Recommendation:

"We recommend that means be found for making widely available the discussions of the Commission and its Hearing Examiners and the AEC staff analyses and evaluations of safety aspects of projects considered in the regulatory process, and that consideration be given to making more accessible the hazards summary reports."

The applicants' Hazards Summary Reports, the Division of Licensing and Regulation staff analyses (testimony in the hearing cases) and the decisions of the Hearing Examiner and the Commission have always been available. The bulk of material involved is formidable but copies can be obtained (1) for the first listed, from the applicant or from the Public Document Room reproduction services and (2) transcripts of hearings, including the detailed AEC staff analyses, from the Alderson Reporting Service, and (3) decisions of Hearing Examiners and the Commission, from the Office of the Secretary. There has been no interest indicated by any technical or trade journal in reproducing these documents, no doubt because of their bulk. Usually the documents listed are cited or extracted by commercial news letters and trade journals so that their existence is broadcast. To insure that their availability as described above is known, appropriate notices will be distributed to that effect.

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ANNEX I

BOOK AND REVIEW-TYPE REPORTS ALREADY IN
PRESS OR IN PREPARATION

1. On Reactor Site and Environment
 - a) Reactor Handbook (2nd Ed.) Vol II, Fuel Processing, Interscience (600 p)
 - b) Chapter 12 of Reactor Handbook (2nd Ed.) Vol IV, Engineering, Interscience
 - c) Treatment and Disposal of Low Level Radioactive Wastes, Straub. (300 p)
2. On Meteorology
 - a) AECU 3066, Meteorology and Atomic Energy is being revised (under the direction of the Weather Bureau)
3. On Containment
 - a) Chapter 11 of Reactor Handbook (2nd Ed) Vol IV, Engineering, Interscience
4. On Reactor Design
 - a) Reactor Handbook (2nd Ed) Vol III, Physics and Shielding, Interscience (300 p)
 - b) Chapters 1, 2, 3, 4, 5, 6 & 1 of Reactor Handbook (2nd Ed) Vol IV, Engineering, Interscience
 - c) Fast Reactor Handbook, 'Amareosi, Vol .II on theory and core design (450-p)
 - d) Principles of Nuclear Reactor Engineering (2nd Ed) Glasstone, Van Nostrand (900 p)
 - e) Nuclear Reactor Design Manual, Palladine, Panger, and Mandill. NRB sponsorship.
5. On Metallurgy and Materials Radiation Effects
 - a) Properties of Uranium Dioxide, Belle, NRB sponsorship
 - b) Effects of Radiation on Organic Materials, Bolt and Carroll, (500 p)
 - c) Radiation damage to Reactor Fuels, Howe (500 p)
 - d) Plutonium Handbook, Wick (300 p)
 - e) Metallic Hydrides, Muller and Blackledge
 - f) Nuclear Graphite, Nightengale
 - g) Irradiation Testing and Hot Laboratory Techniques, Wroughton, Glasson, and Roof, NRB sponsorship

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6. On Instrumentation and Control
 - a) Theory and Design of Nuclear Reactor Control Systems, Harrer
 - b) Chapter 8 of Reactor Handbook (2nd Ed) Vol IV, Engineering, Interscience
 - c) Neutron Absorber Materials for Reactor Control, Anderson and Theilacker. NRB sponsorship
7. On Chemical Reactions
 - a) Reactor Handbook (2nd Ed) Vol II, Fuel Reprocessing, Interscience (600 p)
 - b) Analysis of Essential Reactor Materials, Rødden. (700 p)
8. On Reactor Operation
 - a) Chapters 10 and 13 of Reactor Handbook, (2nd Ed) Vol IV, Engineering, Interscience
9. On Mechanical Systems
 - a) Thermal stresses in Reactor Design, Franklin Institute, (750 p)
 - b) Reactor Heat Transfer and Fluid Flow, Zerbe. NRB sponsorship
 - c) Piping Handbook for Pressurized Water Nuclear Power Plants, Shaw. NRB sponsorship

U. S. ATOMIC ENERGY COMMISSION
CORRESPONDENCE REFERENCE FORM

DATE:

INDEX: MHAS 3 Hazards from Power Reactors

TO:

FROM:

SUMMARY: Memo from Commissioner Olson to the GM stating that the ACRS has not received a reply to their Nov. 16, 1959 ltr. in re Proposed Study of the Reactor Hazard and Criteria Problem.

FILED: PFC 1-1 Reg. Prod. & Util. Fac.

INDEXER: date of memo: 2-2-61

REMARKS:

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DOE NSI DECLASSIFICATION REVIEW E.O. 12958
BY: MARY DEFFENBAUGH DOE/NSI-623
THIS PAGE ONLY

1
2-2-61

AEC

*7th Nat. S. Hygiene of Power
Reactors*

UNITED STATES
ATOMIC ENERGY COMMISSION
Washington 25, D.C.

No. D-12
Tel. HAZELWOOD 7-7831
Ext. 3446

FOR IMMEDIATE RELEASE
(Thursday, January 12, 1961)

AEC MAKES SURVEY OF ALL REACTOR OPERATIONS

The Atomic Energy Commission has sent telegrams (copies attached) to the operators of all reactors licensed by the AEC, asking for current information regarding the performance of the reactor and safety practices and controls. The information is similar to that obtained in Commission inspections of licensed reactors. Purpose of the present inquiry is to obtain a comprehensive, current picture of certain aspects of reactor operations, as well as to assure that all needed steps are taken during maintenance operations to avoid an inadvertent criticality. The Commission is making a similar survey of its own reactors.

The Commission's survey is a precautionary measure in view of the recent reactor accident at the National Reactor Testing Station in Idaho.

- 30 -

Attachments

11261

Copy filed: 7th Nat. S. Hygiene of Power - Incident

1-13-61

ATTACHMENT #1

Text of telegram to 36 licensees, including industrial organizations, research laboratories and universities, operating a variety of power, testing and research reactors:

January 10, 1961

We are surveying all licensed reactor facilities for information gained from operating experience which indicates confirmation of or variance from nuclear characteristics shown in your license application at time of license issuance. This will up-date information on your facility which was reviewed by us during evaluation of your facility license application and during inspections. Accordingly, pursuant to Section 50.54(f) of Commission regulations, you are requested to submit within 20 days of receipt of this message a report containing the following information concerning each reactor or critical experiment facility operated by you under AEC license:

1. Maximum excess reactivity of your reactor, not including the worth of control rods or other control devices such as burnable poison strips or soluble poison, or any experiments, and variation of excess reactivity over core life.
2. Total control rod worth.
3. Minimum shut-down margin both at room temperature and operating temperature.
4. Maximum worth of single control rod of highest reactivity value.
5. Description and worth of other methods used for controlling reactivity, such as burnable poison strips or soluble poison, and variation of the worth of these methods over core life.
6. Maximum total and individual worth of any fixed or moveable experiments inserted in your reactor.

(more)

7. With respect to items 1-6 above, the following information should be included: basis for reactivity values (measured, calculated or estimated); condition of core for which values are applicable (operating or shut-down, amount of burnup); and dates on which reactivity values were last determined.

8. The following information with respect to operations which could involve changes in core reactivity when the reactor is shut-down:

a. Special precautions taken to prevent inadvertent criticality.

b. Whether nuclear instrumentation is used.

c. Methods used to limit and control rate and amount of reactivity changes.

d. Minimum amount that reactor is sub-critical during such operations and how the sub-critical margin is achieved.

e. Whether such operations are conducted under direct and personal supervision of technically qualified and designated supervisors.

f. Whether such operations are conducted in accordance with written procedures. Report should be submitted in 15 copies. End of message.

Text of telegram to Aerojet-General Nucleonics, San Ramon, California, and 10 colleges and universities operating low-powered training reactors known as AGN-201 reactors:

January 11, 1961

We are surveying all licensed reactor facilities for information concerning procedures which are observed when the reactor is shut-down and during maintenance operations when changes in core reactivity may be involved. This will up-date information on your facility which was reviewed by us during evaluation of the facility license application and during inspection. Accordingly, pursuant to Section 50.54(f) of Commission regulations, you are requested to submit within twenty days of receipt of this message a report on the AGN-201 reactor operated by you under AEC license, concerning procedures which are observed by you during such operations. The report should contain the following information:

1. Special precautions taken to prevent inadvertent criticality.
2. Whether nuclear instrumentation is used.
3. Methods used to limit and control rate and amount of reactivity changes.
4. Minimum amount that reactor is sub-critical during such operations and how the sub-critical margin is achieved.
5. Whether such operations are conducted under direct and personal supervision of technically qualified and designated supervisors.
6. Whether such operations are conducted in accordance with written procedures.

Report should be submitted in 15 copies. End of message.

AB-2
74
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AEC 943/7

December 27, 1960

COPY NO. 63

ATOMIC ENERGY COMMISSION

POOL - TYPE REACTORS

Notes by the Secretary

The attached letter from the Chairman, ACRS, is circulated for the information of the Commission. The letter has been referred to the Division of Licensing and Regulation.

W. B. McCool
Secretary

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Copy filed: RD-13. Development

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ADVISORY COMMITTEE ON REACTOR SAFEGUARDS
UNITED STATES ATOMIC ENERGY COMMISSION
WASHINGTON 25, D. C.

December 13, 1960

Honorable John A. McCone
Chairman
U.S. Atomic Energy Commission
Washington, D. C.

Subject: POOL-TYPE REACTORS

Dear Mr. McCone:

In response to its request of November 17, 1960, the Advisory Committee on Reactor Safeguards received a report dated December 6, 1960 from the Division of Licensing and Regulation on pool-type control rod problems.

From the information contained in this report, it is evident that in certain pool-type reactors a control rod jamming in a fuel element could withdraw the element from the core and then subsequently permit it to drop back into the core. This type of malfunction could result in a serious accident.

It is therefore the recommendation of the Advisory Committee on Reactor Safeguards that, in view of the possibility of a serious accident, all operators of pool-type reactors should be notified to take special immediate action to make sure that no fuel elements can be withdrawn with control rods.

Sincerely yours,

/s/ Leslie Silverman

AEC

*M.H.A. 3-Hazardous
D.N. Power Reactors*

UNITED STATES
ATOMIC ENERGY COMMISSION
Washington 25, D. C.

No. C-241
Tel. HAZELWOOD 7-7831
Ext. 3446

FOR IMMEDIATE RELEASE
(Thursday, December 1, 1960)

AEC TO FORMALIZE PROCEDURES FOR PUBLIC PARTICIPATION
IN SAFETY REVIEW OF ALL DEMONSTRATION POWER REACTORS

The Atomic Energy Commission has issued for public comment proposed regulations formalizing procedures by which members of the public may participate in safety considerations of Commission-owned power reactors installed at non-AEC sites as part of conventional electric utility systems.

The proposed regulations formally establish steps outlined in a Commission decision announced on March 12, 1959 setting up the Commission's "parallel procedures" program for public participation in the safety review of such AEC-owned reactors.

In its March, 1959, announcement the AEC pointed out that up to that time the public had had opportunity to participate in the safety review of only those reactors in its Power Demonstration Reactor Program which were privately owned and which, therefore, were subject under the Atomic Energy Act of 1954 to licensing by the Commission.

The announcement added that the new policy extended to the public the same opportunity regarding power demonstration program reactors which were Commission-owned and which, therefore, were not subject to licensing.

"The procedures to be observed," the Commission said, "will parallel those observed in power reactor licensing procedures."

(more)

Copy filed: M.H.A. 3-By Hazardous of Power Reactors

12-1-60

The proposed rules would apply to the construction and operation of any Commission nuclear reactor which (a) is not subject to licensing requirements, (b) is not located at a Commission installation, and (c) is to be operated as part of the power generating facilities of an electric utility system.

The proposed rules would require the Commission's prime contractors to obtain a construction "authorization" and an operating "authorization" corresponding to the construction permits and operating licenses issued by the Commission under Part 50, Title 10, Code of Federal Regulations, entitled "Licensing of Production and Utilization Facilities."

Reactor projects subject to the proposed rules would also be made subject to public hearings and to other formal regulatory requirements including those in Part 20, Title 10, Code of Federal Regulations, entitled "Standards for Protection Against Radiation."

The projects under construction to which the proposed regulations have been applied include the 75,000 electrical kilowatt reactor being built for the Consumers Public Power District of Lincoln, Neb., near Hallam, Neb.; the 22,000 electrical kilowatt plant being built for the Rural Cooperative Power Association, of Elk River, Minn.; the 11,400 electrical kilowatt plant being built for the City of Piqua, Ohio, and the 16,300 electrical kilowatt reactor under construction for the Puerto Rico Water Resources Authority at Punta Higuera, Puerto Rico.

All persons who wish to submit written comments and suggestions on the proposed regulations, which will become Part 115, Title 10, Code of Federal Regulations, should do so within 30 days after publication of the Commission's notice of rule making in the Federal Register on December 2, 1960.

Comments and suggestions should be sent in triplicate to the Secretary, Atomic Energy Commission, Washington 25, D.C.; Attention: Director, Division of Licensing and Regulation.

McConne 3 August 1960

UNIVERSITY OF CALIFORNIA

LAWRENCE RADIATION LABORATORY
BERKELEY 4, CALIFORNIA

August 18, 1960

The Honorable John A. McConne
Chairman
U. S. Atomic Energy Commission
Washington 25, D. C

Dear Mr. McConne:

According to our conversation on Monday, August 15th, I am mentioning below two topics connected with the safety of nuclear reactors.

I understand that in our cooperation with foreign governments careful steps have been taken to give full responsibility to the recipient government for reactor operation and reactor safety. Nevertheless a reactor accident might be damaging to the United States and might have serious effects upon our own reactor program. I wonder whether in the forthcoming international atomic energy meeting in Vienna we could take a strong step advocating the establishment of a committee of experts which could advise and help in the formulation of safety regulations for foreign reactors.

The second topic is connected with containment. I believe that under special circumstances deep underground containment of reactors may be preferable to enclosure in a steel shell. To my knowledge no thorough study of price and feasibility has been undertaken. Underground containment might have the additional advantage that such reactors could survive a nuclear attack.

I am fully aware of the great care with which the Atomic Energy Commission and the Reactor Safeguards Committee approach all problems of reactor safety. I am grateful that you have given me the opportunity of bringing up these two additional topics.

Sincerely yours,



Edward Teller

ET:gg

8/18/60

DATE:

INDEX: MH&S-3-Hazards of Power Reactors

~~_____~~
~~_____~~
~~_____~~
~~_____~~
~~_____~~
~~_____~~

TO:

FROM:

SUMMARY: AEC 751/277: HEALTHY AND SAFETY ASPECTS OF THE SENN REACTOR. To advise the Commission of the factors reviewed by the US-Exatom Joint Reactor Board in its consideration of the health and safety aspects of the SKE reactor.

FILED:

INDEXER: R&D-1-Peacetime Uses of AE

REMARKS: date of paper: 8-16-60

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BY: MARY DEFFENBAUGH DCANN-688
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U. S. ATOMIC ENERGY COMMISSION
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8-16-60

U. S. ATOMIC ENERGY COMMISSION
CORRESPONDENCE REFERENCE FORM

DATE:

INDEX: ~~MHS-3~~-Hazards of Power Reactors

TO:

FROM:

SUMMARY: AEC 751/276: AEC ROLE IN REACTOR SAFETY FOR U.S.-EURATOM JOINT PROGRAM.
To consider the role of the AEC in the matter of analyzing and evaluating the safety of the U.S. type power reactors to be built in the Euratom Joint Power Reactors Program.

FILED:

INDEXER: ~~RD-1~~-Peacetime Uses of AE

REMARKS: date of paper: 8-15-60

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BY: MARY DEFFENBAUGH COGN-228

02-248

7/1/60 3 Hazards of Power Reactors

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AEC 943/6

May 9, 1960

COPY NO. 36

ATOMIC ENERGY COMMISSION

REQUEST FOR AEC ASSISTANCE ON SAFETY SURVEYS OF USAP REACTORS

AEC
943
6

Note by the Secretary

The General Manager has requested that the attached memorandum and enclosures from the Director of Inspection be circulated for the information of the Commission.

W. B. McCool
Secretary

DISTRIBUTION

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ENCLOSURE I

Office Memorandum • UNITED STATES GOVERNMENT

TO : A. R. Luedcke, General Manager DATE: March 24, 1960

FROM : Curtis A. Nelson, Director
Division of Inspection *Curtis Nelson*

SUBJECT: REQUEST FOR AEC ASSISTANCE ON SAFETY SURVEYS
OF USAF REACTORS

Reference is made to a memorandum regarding the subject matter from Maj. General Caldara, USAF, dated March 2, 1960.

I have been cooperating with both the Air Force and the Army in assisting them to prepare for current and future reactor inspection responsibilities. We have, in fact, conducted a safety review of the Air Force's Radiation Effects Reactor at their request. The Air Force has indicated that they would like to continue to have us assist them in their inspection plans and safety reviews. I have advised them informally that as a very temporary expedient this is satisfactory. However, it is my opinion that the services must proceed forthwith to get themselves into a position of self-sufficiency, both for their own best interests and because the Commission cannot do the reactor inspections for them without neglecting its own responsibility.

It is my plan, therefore, to request both the Air Force and the Army to detail to my Division at least one reactor engineer or physicist with the necessary academic training and experience to learn reactor inspection through on-the-job training under my direction for one to two years.

If you concur, I will proceed on this basis in future negotiations.

Approved:

A. R. Luedcke
General Manager

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ENCLOSURE II

DEPARTMENT OF DEFENSE
MILITARY LIAISON COMMITTEE
TO THE
ATOMIC ENERGY COMMISSION
WASHINGTON 25, D. C.

March 23, 1960

Dear Mr. McCone:

Forwarded herewith for your information and appropriate action is a letter to the General Manager, Atomic Energy Commission, from the Deputy Inspector General for Safety, U. S. Air Force, concerning nuclear reactors.

In my letter to you dated 26 May 1959, the Committee requested your concurrence in interpreting the 1954 Statement of Policy for Operation of Military Power Reactors to be applicable to all Department of Defense reactors authorized under Section 91b of the Atomic Energy Act. Under terms of the 1954 Statement, the Atomic Energy Commission provides advice and assistance to the military department concerned in the conduct of reactor safety responsibilities for "power reactors". The five Air Force reactors listed in the letter attached hereto are not classified as "power reactors"; thus, according to literal interpretation, they are not covered by that Statement. This was one of the principal factors which caused the Committee to draft the 26 May 1959 letter.

In the 21 August 1959 reply by the General Manager, it was indicated that answers to questions in our 26 May letter would not be forthcoming until Congress had acted upon proposed legislation for amending Section 91 of the Atomic Energy Act. As indicated in the Statement of Policy and the Air Force letter, under the present system the military department concerned assumes responsibility for reactors transferred under Section 91b. The Committee considers that this is a satisfactory arrangement. At the same time, the Committee is of the opinion that the Air Force request is not contingent upon assignment of responsibility for reactors; therefore, the Committee believes that this subject can be considered without reference to the proposed legislation.

It is requested that the Atomic Energy Commission continue to provide technical advice and assistance on matters pertaining to reactor safety to the military departments for non-power reactors, as well as for power reactors.

Sincerely yours,
/s/ Herbert B. Loper
Herbert B. Loper
Chairman

1 Inclosure:
Ltr to GM/AEC thru Chmn, MLC from
Dep Insp Gen for Safety, USAF,
dtd 2 Mar. 60.

Honorable John A. McCone
Chairman
U. S. Atomic Energy Commission

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ENCLOSURE III

DEPARTMENT OF THE AIR FORCE
HEADQUARTERS UNITED STATES AIR FORCE
WASHINGTON 25, D. C.

March 2, 1960

REPLY TO

ATTN OF: AFCEFN-N

SUBJECT: Request for AEC Assistance on Safety Surveys of USAF
Reactors

TO: General Manager
U. S. Atomic Energy Commission
Washington 25, D. C.

THRU: Chairman, Military Liaison Committee
U. S. Atomic Energy Commission
Washington 25, D. C.

1. In a memorandum for the Chairman, Military Liaison Committee, dated 29 June 1959, subject, Policy for Administration and Operation of Department of Defense Reactors, the Secretary of the Air Force assigned The Inspector General "responsibility for inspection of Air Force reactors to insure adherence to safe operating techniques and proper health physics standards." This reactor safety function has since been delegated to the Directorate of Nuclear Safety Research within the Office of the Deputy Inspector General for Safety.

2. Research and test reactors which have been acquired by the Air Force under terms of Section 91b, Atomic Energy Act of 1954, include the following facilities:

- a. Radiation Effects Reactor (RER) - Air Force Plant #67, Dawsonville, Georgia.
- b. Critical Experiment Reactor (CER) - Air Force Plant #67, Dawsonville, Georgia.
- c. Ground Test Reactor (GTR) - Air Force Plant #4, Fort Worth, Texas.
- d. Aircraft Shield Test Reactor (ASTR) - Air Force Plant #4, Fort Worth, Texas.
- e. Nuclear Engineering Test Facility (NETF) - Wright-Patterson Air Force Base, Ohio.

3. The Fort Worth and Dawsonville reactors are now operational. Prior to the operation of each of these reactors, hazards analyses were made by the Reactor Hazards Evaluation Branch (RHEB) of the AEC Division of Licensing and Regulation. The Wright Air Development Division, Air Research and Development Command, is preparing at this time a Final Hazards Summary Report on the

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NETF for review by the RHEB prior to completion of construction on this Wright Field facility. In addition, the Air Force and the AEC have jointly contracted for the construction and installation of the Portable Medium Power Reactor (PM-1) at the Sundance Air Force Station in Wyoming. Responsibility for operation of this reactor as a space heating and electrical power facility will be transferred to the Air Force by February 1962. The Preliminary Hazards Report for the PM-1 is currently being reviewed by the RHEB.

4. In addition to the support provided by the RHEB, the AEC Division of Inspection has provided assistance in the conduct of survey and inspection of USAF reactors.

5. As indicated above, the Reactor Hazards Evaluation Branch and the Division of Inspection are playing a vital role in the safety evaluations of Air Force reactors. As of this date the Air Force has not developed a comparable capability for accomplishing the detailed and complex analyses required for evaluating reactor hazards prior to operation, or at such times as major modifications become necessary in design features or operating procedures. Technical support of this type must be available if acceptable safety evaluation and surveys of Air Force reactors are to be accomplished by the Directorate of Nuclear Safety Research.

6. Request that the AEC continue to provide advice and assistance to the USAF in the conduct of their reactor safety responsibilities, final decisions to remain within the Department of Defense.

7. To simplify administrative procedures, it is requested that the Director of Nuclear Safety Research be authorized to contact directly such agencies as you may designate for the requested advice and assistance.

JOSEPH D. CALDARA
Major General, U. S. Air Force
Deputy Inspector General for Safety
The Inspector General

UNITED STATES GOVERNMENT

Mr. S. Z. ...
Reference Sec

Memorandum

TO : William F. Finsa, Asst. Gen. Manager for
Regulation & Safety
Curtis A. Nelson, Director, Div. of Inspection

February 8, 1960
DATE:

FROM : Harold D. Anamosa, Acting Secretary

SUBJECT: REPORT ON SEMI REACTOR

SYMBOL: SECY:RDC

1. During discussion of AEC 751/258 - SEMI Reactor Safety Considerations, at Meeting 1589 on February 3, 1960, Commissioner Graham requested a report on the health and safety aspects of the SEMI reactor, including a technical review of the data considered by the Joint Reactor Board prior to its evaluation of this reactor.

2. The General Manager has directed that this report be prepared by the Assistant General Manager for Regulation and Safety and the Director, Division of Inspection. We will assist in circulating the report to the Commission.

cc: Commissioner Graham
General Manager
Deputy General Manager
Asst. Gen. Mgr. for Adm.
Asst. Gen. Mgr. for IA
Asst. Gen. Mgr. for R&ID
Director, International Affairs
Director, Reactor Development
General Counsel
Congressional Liaison

*copies filed
in ...
of ... Italy*

2-8-60

DATE:

INDEX: MH&S 3 Hazards from Power Reactors

TO:

FROM:

SUMMARY: AEC 653/63 - PUBLIC HEARING CONSIDERATIONS OF THE N.S. SAVANNAH
The Gen. Mgr. recommends that the Commission approve the policy that no public hearings shall be held in connection with construction and operation of the N.S. SAVANNAH.

FILED: MR&A 6 Merchant Ship Reactor - Vol. 2

INDEXER: date of paper: 1-6-60

REMARKS:

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BY: MARY DEFFENBAUGH DOENN-623
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DATE:

~~Legal-4-Administrative to the Act~~

INDEX: ~~MS-3-Hazards of Power Reactors~~

~~MS-3-ACRS~~

TO:

FROM:

SUMMARY: AEO 1006/5: REVIEW OF ATOMIC ENERGY ACT - SAFETY, LICENSING AND REGULATIONS
Letter to the Chairman, ^{McGowan} AEC from ^{ACRS} Mr. Malone, with re to a request made by the ACRS. The Commission has made a review of the Atomic Energy Act of 1954 and its Amendments. This review has been directed to the policies, objectives and requirements of the act as they relate to safety, licensing, and regulation of atomic energy activities. Among some of the points of the review are the various regulations governing the health and safety of the public and employees, use of facilities and materials, public hearings, etc.

FILED:

INDEXER: ~~Legal-4-Legislative Program~~

REMARKS: date of paper: 12-31-59

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DOE NSI DECLASSIFICATION REVIEW E.O. 13526
BY: MARY DEFFENBAUGH DOE/NN-523

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Office Memorandum • UNITED STATES GOVERNMENT

TO : Files

DATE: December 29, 1959

FROM : Anthony H. Ewing, *A. H. Ewing*
Office of the Secretary

SUBJECT: PROPOSED STUDY OF THE REACTOR HAZARDS AND SAFETY PROBLEM

The attached letter and memorandum were discussed at the Informal Meeting held on December 4, 1959, at 11:00 a.m.

12-29-59

ADVISORY COMMITTEE ON REACTOR SAFEGUARDS
UNITED STATES ATOMIC ENERGY COMMISSION
WASHINGTON 25, D. C.

November 16, 1959

Honorable John A. McCone
Chairman
U. S. Atomic Energy Commission
Washington 25, D. C.

Subject: PROPOSED STUDY OF THE REACTOR HAZARD AND CRITERIA PROBLEM

Dear Mr. McCone:

The Advisory Committee on Reactor Safeguards has become keenly aware of the increasing difficulties which it foresees in the adequate evaluation of the hazards of reactor facilities. It seems to the Committee that this is due to:

- 1) The absence of a correlation and critical evaluation of existing data relating to reactor safety.
- 2) The absence of written and agreed upon criteria for judging the adequacy of the proposed design, construction and operation of the various parts of a reactor.

The Committee knows of the research on safety features, the attempted writing of meaningful criteria, and the recently inaugurated quarterly technical progress review in Nuclear Safety. These are all excellent steps to a better understanding of the problem. The amount of pertinent information has now reached a volume at which intensive study undertaken now has an excellent chance of reaching helpful answers to most of the critical problems. The increasing number of reactors, and the growing difficulty of handling cases in a reasonable length of time, make it important that the additional effort be started now.

It is the Committee's belief that the problem requires a study of the available information on reactor safety, arranging it so it is readily available and deriving from it logical conclusions pertinent to answering the questions:

- A) Is the available knowledge sufficient to set criteria?
- B) Is more research needed and of what kind?

Honorable John A. McClean
Subject: Proposed Study of the
Reactor Hazard and Criteria Problem

- 2 -

Nov. 16, 1959

- c) Is this the sort of problem that is not susceptible to solution by planned research and, therefore, must primary reliance be placed upon judgment and experience?

The problem might be broken down into the following categories:

- 1) Site and environment
- 2) Nuclear Core Design
- 3) Reactor Kinetics
- 4) Fuel Elements
- 5) Metallurgy and Material Radiation Effects
- 6) Instrumentation and Control
- 7) Chemical Reactions
- 8) System Interactions
- 9) Reactor Operating Organization and Procedures

Additional categories on a somewhat different outline may be required.

The proposed study must be conducted on a full time basis by persons fully conversant with the reactor field and having scientific and technical competence in the several disciplines involved. The National Laboratories have men of the necessary qualifications, and it is the Committee's belief that it is logical to draw the men from these sources. It is difficult to estimate the extent of effort required but it is certainly not a small one. At a rough guess it might require as much as twenty-five man-years of effort. This work would require at least one year and might require two or more. It is anticipated that worthwhile results would start to flow within three months of the start and at that time the size of the problem could be better appraised.

The nature of the work is such that this effort should be organized as a working group but close contact should be maintained with the Divisions

Honorable John A. Malone
Subject: Proposed Study of the
Roster Board and Criteria Problem

- 3 -

Nov. 16, 1959

of Inspection, Licensing and Regulation, Biology and Medicine, Office of Health and Safety, the Advisory Committee on Roster Safeguards, and the National Laboratories, as well as with other useful groups. A steering committee representative of these various interests might well be appointed.

It is our hope that the Commission will proceed with this effort at once.

Sincerely yours,

G. Regus McCallough
Chairman

cc: A.R.Lueders, CM
H.L.Price, HARB

December 3, 1959

MEMORANDUM FOR: THE GENERAL MANAGER

With respect to Mr. Graham's memorandum of November 19, a copy of which is attached, Mr. McCone believes that Mr. Graham's suggestion deserves thoughtful study and action. The Chairman has also read Dr. McCullough's letter of November 16 suggesting a study of reactor hazard criteria and feels that Dr. McCullough's suggestion might logically be combined with Mr. Graham's to form an integrated approach to this problem.

W. L. Oakley
Staff Assistant
to the Chairman

WLO Att.

I understand that Mr. McCone raised the subject of Dr. McCullough's suggestion at the Commission Meeting this morning. Nevertheless, some action on Mr. Graham's memorandum is necessary and I believe they are interrelated.

12/4
WLO

WLOakley/lm

Informal Mtg.
12-4-59
ouc

1 Proposed Study of the Reactor Hazard and Criteria Problem

Mr. McCone said he had received a letter from Mr. C. Rogers McCullough, Chairman of the Advisory Committee of Reactor Safeguards, proposing a study of reactor hazards and criteria. The Chairman noted that reactor containment might well be included as an additional topic in paragraph (c) of the letter. He then referred the matter to Mr. Luedecke for staff recommendations. **

*4-Ltr for ACRS circulated in AEC 943/5
#7-memo from Oakley to Soren attaching memo
from. Chabon - filed under date of 12-3-59*

*Complete copies of Informal Mtg. filed:
Co. M-6 - Informal Mtg.
Reactor Div. 1*

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12-4-59

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Commissioners
General Manager
Secretary

December 3, 1959

MEMORANDUM FOR: THE GENERAL MANAGER

With respect to Mr. Graham's memorandum of November 19, a copy of which is attached, Mr. McCone believes that Mr. Graham's suggestion deserves thoughtful study and action. The Chairman has also read Mr. McCullough's letter of November 16 suggesting a study of reactor board criteria and feels that Mr. McCullough's suggestion might logically be combined with Mr. Graham's to form an integrated approach to this problem.

W. L. Oakley
Staff Assistant
to the Chairman

WLO

WLOakley/lm

12-3-59



UNITED STATES
ATOMIC ENERGY COMMISSION
WASHINGTON 25, D. C.

November 13, 1959

MEMORANDUM FOR: John A. McCone, Chairman

Re: Reactor Safety Experiments - Idaho Falls - Possible Impact on Design Criteria, etc.

During my two recent visits to Idaho Falls with Dr. Bhabha and his associates, as well as Professor Emelyanov and his associates, I received the impression that both groups were impressed with the results of safety experiments being conducted on the SPERT reactors (Nos. 1 and 3) and on the TREAT reactor.

The SPERT reactor experiments concern water with aluminum fuel elements; the TREAT reactor concerns the fast breeder system. One dramatic movie shown to the Russians was the oscillation of water when there is a deliberate addition of reactivity, and the violent, but delayed, reaction which occurred. Dr. Finn observed from this movie demonstrated that there could be difficulty in getting a reactor to explode just as it takes work to do so for a weapon. The gist of his remark was that there is a measurable period of time between when the reactivity is added and when violence results, which should make control by instrumentation possible.

In his opinion, a greater dissemination and understanding of this phenomenon, if borne out by further experiments, could affect design characteristics of reactors.

It seemed to me that the results of these early tests might also be of interest to people who are concerned with the aspects of health and safety, including the Commissioners.

Dr. Bhabha said that so far as he was aware there was no similar work going on anywhere else in the world.

Eventually the results of a broad reactor safety program will have a salutary effect upon the regulatory program for there will then be a group of independent expert witnesses who can testify from their own experiments as to how varied conditions will affect matters of safety. In the meantime, this type of information should be increasingly helpful to our inspection people as well as the ACRS.

I recognize that regulatory problems will not be confined to just the kinetic effects of reactors, but that would be an important element.

Perhaps the able Dr. Myer, who is in charge of the SPERT programs at Idaho Falls, should be asked to talk with the Assistant General Manager

for Health and Safety, as well as the ACRS, so that an outline could be made of future steps toward obtaining basic data which will be related toward the broad aspects of regulatory problems.

John S. Graham
John S. Graham

cc: Mr. Floberg
Dr. Williams
Gen. Ludecke

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AEC 943/5

November 23, 1959

COPY NO. 22

ATOMIC ENERGY COMMISSION

ACRS PROPOSES STUDY OF THE REACTOR HAZARD AND CRITERIA PROBLEM

Note by the Secretary

The attached letter from the Chairman, Advisory Committee on Reactor Safeguards, is circulated for the information of the Commission. The letter has been referred to the Division of Licensing and Regulation.

W. B. McCool

Secretary

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See AEC 943/5 under copy 22 to ACRS file.

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943
-5

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ADVISORY COMMITTEE ON REACTOR SAFEGUARDS
UNITED STATES ATOMIC ENERGY COMMISSION
WASHINGTON 25, D. C.

November 16, 1959

Honorable John A. McCone
Chairman
U.S. Atomic Energy Commission
Washington 25, D. C.

Subject: PROPOSED STUDY OF THE REACTOR HAZARD AND CRITERIA PROBLEM

Dear Mr. McCone:

The Advisory Committee on Reactor Safeguards has become keenly aware of the increasing difficulties which it foresees in the adequate evaluation of the hazards of reactor facilities. It seems to the Committee that this is due to:

1) The absence of a correlation and critical evaluation of existing data relating to reactor safety.

2) The absence of written and agreed upon criteria for judging the adequacy of the proposed design, construction and operation of the various parts of a reactor.

The Committee knows of the research on safety features, the attempted writing of meaningful criteria, and the recently inaugurated quarterly technical progress review in Nuclear Safety. These are all excellent steps to a better understanding of the problem. The amount of pertinent information has now reached a volume at which intensive study undertaken now has an excellent chance of reaching helpful answers to most of the critical problems. The increasing number of reactors, and the growing difficulty of handling cases in a reasonable length of time, make it important that the additional effort be started now.

It is the Committee's belief that the problem requires a study of the available information on reactor safety, arranging it so it is readily available and deriving from it logical conclusions pertinent to answering the questions;

A) Is the available knowledge sufficient to set criteria?

B) Is more research needed and of what kind?

C) Is this the sort of problem that is not susceptible to solution by planned research and, therefore, must primary reliance be placed upon judgment and experience?

The problem might be broken down into the following categories:

1) Site and environment

2) Nuclear Core Design

3) Reactor Kinetics

UNCLASSIFIED

- 4) Fuel Elements
- 5) Metallurgy and Material Radiation Effects
- 6) Instrumentation and Control
- 7) Chemical Reactions
- 8) System Interactions
- 9) Reactor Operating Organization and Procedures

Additional categories on a somewhat different outline may be required.

The proposed study must be conducted on a full time basis by persons fully conversant with the reactor field and having scientific and technical competence in the several disciplines involved. The National Laboratories have men of the necessary qualifications, and it is the Committee's belief that it is logical to draw the men from these sources. It is difficult to estimate the extent of effort required but it is certainly not a small one. At a rough guess it might require as much as twenty-five man-years of effort. This work would require at least one year and might require two or more. It is anticipated that worthwhile results would start to flow within three months of the start and at that time the size of the problem could be better assayed.

The nature of the work is such that this effort should be organized as a working group but close contact should be maintained with the Divisions of Inspection, Licensing and Regulation, Biology and Medicine, Office of Health and Safety, the Advisory Committee on Reactor Safeguards, and the National Laboratories, as well as with other useful groups. A steering committee representative of these various interests might well be appointed.

It is our hope that the Commission will proceed with this effort at once.

Sincerely yours,

/s/ C. Rogers McCullough

C. Rogers McCullough
Chairman

U. S. ATOMIC ENERGY COMMISSION
CORRESPONDENCE REFERENCE FORM

DATE:

~~1959-10-29-1959 Public Power District~~
~~1959-10-29-1959 Public Power District~~

INDEX: NRS-3-Hazards of Power Reactors

TO:

FROM:

SUMMARY: AEC R 147: PROCEDURES FOR PUBLIC PARTICIPATION IN REVIEW OF SAFETY ASPECTS OF DEMONSTRATION POWER REACTORS. To consider proposed regulations establishing procedures for public participation in the hazards review of Consumers Public Power District (CPPD) reactor project and reactor projects in the second round of the power reactor demonstration program.

FILED:

INDEXED: NRS-3-Haz. Hazards of Power Reactors

REMARKS: date of paper: 10-29-59

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DOE NSI DECLASSIFICATION REVIEW E.O. 12958
BY: MARY DEFFENBACH DOE/NN-623

3
10-29-59

DATE:

INDEX: MISS 3 Hazards frm. Power Reactors

~~MISS 11-3 Accidents & Accident Prevention~~

~~MISS 60 Naval Propulsion~~

~~MISS 40 Military Power Reactors~~

TO:

FROM:

SUMMARY: Ltr. to Adm. Burke from Chairman McCone in reference to letters & instructions on nuclear powered naval ships. From the standpoint of public safety, the Commission does not now deem it necessary or desirable to issue any Commission rules, regulations, or orders concerning nuclear powered naval ships. The Commission does not, by reason of this determination, accept responsibility for operational decisions made by the Chief of Naval Operations.

FILED: MR&A 6 Vessel Propulsion

INDEXER: date of letter: 6-23-59

REMARKS:

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DOE NSI DECLASSIFICATION REVIEW E.O. 12958
BY: MARY DEFFENBAUGH DOE/NN-623

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U. S. ATOMIC ENERGY COMMISSION
CORRESPONDENCE REFERENCE FORM

6-23-59

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Office Memorandum • UNITED STATES GOVERNMENT

TO : Files

DATE: June 11, 1959

FROM : Richard V. Willitt *R.V. Willitt*
Office of the Secretary

SUBJECT: COMMISSION BRIEFING ON CRITERIA FOR REACTOR SAFETY

The briefing on criteria for reactor safety outlined in the attached statement was presented to the Commission by Mr. C. Rogers McCullough at Meeting 1520 held on June 9, 1959.

cc: D.C. Office

~~OFFICIAL USE ONLY~~*Copy filed in Com. Briefings**6-11-59*

OUTLINE FOR STATUS OF CRITERIA FOR REACTOR SAFETY

DISCUSSION WITH THE COMMISSION

by

C. Rogers McCullough, Chairman

ADVISORY COMMITTEE ON REACTOR SAFEGUARDS

June 9, 1959

- I. MEANS OF RELEASE OF FISSION PRODUCTS
- A. Nuclear Excursion
 - 1. Melting Fuel
 - 2. Vaporization of Fuel
 - B. Loss of Cooling
 - 1. Break in Primary System
 - 2. Failure in Supply
 - 3. Loss of Heat Sink
 - C. Chemical Reaction Including Fire
 - D. Release of Liquid Fuel and Fission Products (Homogeneous Systems only)
- II. CONCEPT OF MULTIPLE BARRIERS
- A. Fuel
 - 1. Solid
 - 2. Liquid
 - B. Fuel Cladding
 - C. Primary Heat Transfer Loop
 - D. Secondary and Added Loops and Heat Sink
 - E. Containment or Confinement and Shielding
 - F. Environment

V. PAST ATTEMPTS

VI. FUTURE

- A. Site
- B. Pressure Vessels
- C. Heat Flux
- D. Control

Table I

LISTING OF REACTORS ACCORDING TO TYPES

1. Water Moderated and Cooled

	<u>Operating</u>	<u>Total</u>
Power (Pressurized) - Civilian	1	3
- Naval	4	36
- Marine	-	1
- Prototypes	<u>4</u>	<u>8</u>
Subtotal	<u>9</u>	<u>48</u>
General Test (Atmospheric or low pressure)	3	6
Special Test (BSF, SPERT, etc.)	4	7
Research and Training - Civilian	10	15
Research and Training - Military	<u>4</u>	<u>8</u>
Subtotal	<u>21</u>	<u>36</u>
Total	<u>30</u>	<u>84</u>

2. Boiling

	<u>Operating</u>	<u>Total</u>
Power - Civilian	-	4
- Reactor Experiments	3	3
Prototypes	<u>1</u>	<u>1</u>
Total	<u>4</u>	<u>8</u>

<u>3. Miscellaneous</u>		<u>Total</u>
Fast Breeders	- 1 Small 2 Large	3
Gas Cooled Graphite	- 2 Power 1 Maritime 2 Research	5
Organic Moderated and Cooled	- 1 Power 1 Experimental	2
Sodium Graphite	- 1 Power 1 Experimental	2
Aqueous Homogeneous	- 1 Power 7 Research	8
Heavy Water	- 1 Pressure Tube Power 1 Gas Cooled Power 1 Sodium Cooled Power Experiment 3 Test 4 Research	10
Aerojet-General Nucleonics	-	47
Argonaut	-	5
General Atomics - Triga Type	-	4
Liquid Plutonium	-	1
Production	-	<u>14</u>
	Total	<u><u>101</u></u>

Mr. S. B. ...

Mr. James ...

Ruth T.

UNITED STATES
ATOMIC ENERGY COMMISSION
WASHINGTON, D. C.

June 9, 1959

MEMORANDUM FOR THE COMMISSIONERS AND GENERAL MANAGER

Subject: BRIEFING ON STATUS OF RESEARCH FOR REACTOR

On Monday, June 8, 1959 at 2:30 p.m. an hour
scheduled a half-hour briefing on Status of Research
for Reactor Safety in Room A-410.

Mr. S. James MacCallough, Chairman of the Advisory
Committee on Reactor Safeguards will present the briefing
and will be assisted by Mr. Willard F. Scherer, Jr., Vice
Chairman of ACRS, of the American Nuclear Society,
Washington, D.C.

W. A. ...
Secretary

cc: Asst. General Manager, AEC
General Manager
Director, IAS
Executive Secy., AEC

copy filed. O.M. - Briefings

6719

AEC

*W. H. P. S. S. - Haynes
7 Power Reactor*

UNITED STATES
ATOMIC ENERGY COMMISSION
Washington 25, D. C.

No. B-79
Tel. HAZELWOOD 7-7831
Ext. 3446

FOR IMMEDIATE RELEASE
(Friday, May 22, 1959)

AEC CONSIDERING REGULATORY AMENDMENT
ESTABLISHING SAFETY CRITERIA FOR REACTOR SITES

The Atomic Energy Commission is publishing in the Federal Register for public comment a general statement of safety factors considered by the Commission in its evaluation of proposed sites for nuclear power and testing reactors.

The statement is being published in connection with the Commission's consideration of a possible amendment to its regulations which would add a section describing the safety factors relating to a proposed site which bear on the Commission's decision to issue or refuse a construction permit.

Important considerations in site evaluation are the exclusion distance - the area around the reactor which will be under the reactor owner's complete control; the population density of surrounding areas; the area's meteorology - variations in temperature, moisture and winds; the area's earthquake history; and the hydrology and geology of the area - surface water drainage, the presence and movement of underground waters, the permeability and depth of the soils, and their capacities to remove and retain reactor effluents.

These factors are discussed individually in the published statement, but only a general statement is possible at this time concerning criteria which must be met to establish acceptability of a proposed reactor site. Further work looking toward a more precise description of safety factors is being done by the Commission in consultation with its Advisory Committee on Reactor Safeguards. Meanwhile, the statement is believed to represent a first step toward development and publication of complete site criteria.

(more)

copy filed 872-1-1 by Radiation Protection Div.

5-22-59

The text of the statement will be published in the Federal Register on May 23, 1959. Copies are available for public inspection in the Commission's Public Document Room at 1717 H Street, N.W., Washington, D. C. Written comments or suggestions should be sent within 30 days to Atomic Energy Commission, Washington 25, D. C., Attention Director, Division of Licensing and Regulation.

DATE:

INDEX: MR&S-3-Hazards from Power Reactors

~~CONFIDENTIAL~~

~~TOP SECRET - Atomic Energy of U.S.~~

TO:

FROM:

SUMMARY: AEC 293/43: IN March, at the request of DIA, Clifford Beck, L&R attended a series of conferences with EURATOM personnel in Brussels, and discussed matters relating to reactor safety evaluations and procedures. There was also opportunity to spend one day with the Directors of OEEC in Paris and, at the request of the Reactor Director of IAEA, two days were spent in Vienna on matters relating to reactor safety, evaluations, procedures and IAEA's possible participation in these.

FILED:

INDEXED: SECURITY-4-5-Visits to Foreign Countries

REMARKS: date of paper: 5-29-59

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DOE NSI DECLASSIFICATION REVIEW E.O. 12958
BY: MARY DEFFENBAUGH DOE/NN-623

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5-29-59

7th 5-3. Hazards for Power Reactors

Office Memorandum • UNITED STATES GOVERNMENT

April 6, 1959

TO : Principal Staff, Headquarters
Managers Of Operations Offices

DATE:

FROM : A. R. Luedecks
General Manager*A. R. Luedecks*

SUBJECT: HAZARDS EVALUATION OF AEC REACTORS

Pending revision of AEC Manual Chapter 8401, preliminary hazards summary reports, including site information, should be submitted and their review by the Hazards Evaluation Branch of the Division of Licensing and Regulation and the ACRS completed before commitments are made for sites for new AEC-owned reactor projects. Requests for exceptions to this policy should be submitted to the General Manager through the appropriate Operating Division.

M.H.S. - 3 - Hwy for Power Reactors

A E C

UNITED STATES
ATOMIC ENERGY COMMISSION
Washington 25, D. C.

No. B-42
Tel. HAZELWOOD 7-7831
Ext. 3446

FOR IMMEDIATE RELEASE
(Thursday, March 12, 1959)

**AEC TO PERMIT PUBLIC PARTICIPATION IN REVIEW OF
SAFETY ASPECTS OF ALL DEMONSTRATION POWER REACTORS**

Chairman John A. McCone of the Atomic Energy Commission today announced that the public will have opportunity to participate in consideration of the safety aspects of all reactor projects in the Commission's Power Demonstration Reactor Program.

Heretofore the public has had opportunity to participate in the review of safety aspects of only those reactors in the Power Demonstration Program that were privately owned and, therefore, subject to licensing by the Commission. The new policy extends to the public the same opportunity with respect to reactors in the program which are Commission-owned and, therefore, are not subject to licensing. The procedures to be observed will parallel those observed in power reactor licensing proceedings.

The projects to which the new policy applies presently include the 75,000 electrical kilowatt reactor proposed by the Consumers Public Power District for construction at Hallam, Nebraska - a project resulting from the Commission's first invitation under the demonstration program - and two projects resulting from the second invitation - the reactor for the proposed 22,000 electrical kilowatt nuclear power plant for the Rural Cooperative Power Association at Elk River, Minnesota, and the 11,400 electrical kilowatt reactor to be built for the City of Piqua, Ohio.

(more)

3-12-59

of file 12-A-1000

3-12-59

A distinguishing feature of these projects is that while they will not be located at AEC installations, the reactors themselves will be Government-owned and therefore will not be subject to the licensing procedures under which safety analyses are made public and public hearings may be held before issuance of construction permits and operating licenses. The Commission's decision to give similar opportunity for public participation with respect to such reactors as the Hallam, Elk River and Piqua reactors is made known through the following policy statement by the Commission:

"The nuclear power reactors which are planned for operation under the so-called 'second round' of the Commission's power demonstration reactor program, and the proposed reactor to be operated by Consumers Public Power District in Nebraska, are not subject to the formal licensing requirements of the Atomic Energy Act of 1954, as amended. Under Section 110 of the Act they are exempt from licensing requirements because they are to be constructed and operated under contracts 'with and for the account' of the Commission. However, these and all other Commission-owned reactors receive the same technical review to assure the public health and safety as do licensed reactors.

"Unlike most Commission-owned reactors, these Commission-owned demonstration reactor projects will not be located at Commission installations but will be operated as an integral part of the power-generation facilities of operating utility systems. For this reason, the Commission has decided that the public interest would best be served by making available to members of the public opportunity for participation in safety considerations concerning these projects in accordance with procedures which would parallel those observed in licensing proceedings. Accordingly, the hazards summary reports filed by the prime contractors for the construction or operation of these reactors will be made available for public inspection in the Commission's Public Document Room. As in the case of license applications, the Commission will publish and make available in the Public Document Room copies of the reports of the Advisory Committee on Reactor Safeguards and copies of the hazards evaluations prepared by the Division of Licensing and Regulation.

(more)

"In addition, the Commission has decided to set these cases down for public hearing to consider health and safety questions involved in the proposed construction and operation of the reactors. A notice of hearing will be issued in each case at least 30 days prior to the date of hearing. Following the issuance of the notice of hearing, proceedings will be conducted in accordance with the provisions of Part 2 of the Commission's regulations (10 C.F.R., Part 2 "Rules of Practice") applicable to formal hearings.

"This policy will also be applied to all future Commission-owned reactors not located at Commission-owned installations, which are to be operated as part of conventional electric utility systems."

The Rules of Practice referred to in the Commission's policy statement provide that after notice of public hearing interested persons may petition for leave to intervene and, if the petition is granted by the Hearing Examiner, may become parties to the hearing and may offer evidence and examine witnesses. Provision is made also for "limited appearances" by interested persons for the purpose of making oral or written statements.

MAR 5 1959

Dear Senator Anderson:

This will inform the Joint Committee of the establishment by the Commission of a policy to provide for public participation in the safety review of those power reactors in the power demonstration program which are not subject to licensing and are not to be located at Commission-owned installations. These include the Commerce Public Power District project and reactor projects in the second group of the Power Reactor Demonstration Program.

The new policy is described in the statement enclosed herewith and will be incorporated in a public announcement. The procedures under this policy will parallel those observed in the licensing of nuclear power reactors. Appropriate amendments to the Commission's Rules of Practice (16 CFR Part 2) are being prepared.

Sincerely yours,

SIGNED, J. R. LUEDECKE

General Manager

Enclosure

Honorable Clinton F. Anderson, Chairman
Joint Committee on Atomic Energy
Congress of the United States

CC's: Congressional Liaison (2)
General Manager

OFFICE	L&R -	L&R	CONG. LIAISON	AGMA	GM		
SURNAME	ERPRICE: bh	H. S. PRICE	Law	Price			OGC Ph 3/1/59
DATE	2/27/59		3-4-59	3/4			

Handwritten notes:
3/4/59
3-4-59
3/1/59
6-5-59

MAR 5 1959

**FRAMEWORK OF POLICY ON PUBLIC PARTICIPATION
IN SAFETY REVIEW OF DEMONSTRATION POWER REACTORS**

The nuclear power reactors which are planned for operation under the so-called "second round" of the Commission's power demonstration reactor program, and the proposed reactor to be operated by Commerce Public Power District in Nebraska, are not subject to the formal licensing requirements of the Atomic Energy Act of 1954, as amended. Under Section 139 of the Act they are exempt from licensing requirements because they are to be constructed and operated under contracts "with and for the account" of the Commission. However, these and all other Commission-owned reactors receive the same technical review to assure the public health and safety as do licensed reactors.

Unlike most Commission-owned reactors, these Commission-owned demonstration reactor projects will not be located at Commission installations but will be operated as an integral part of the power-generation facilities of operating utility systems. For this reason, the Commission has decided that the public interest would best be served by making available to members of the public opportunity for participation in safety considerations concerning these projects in accordance with procedures which would parallel those observed in licensing proceedings. Accordingly, the boards' quarterly reports filed by the prime contractors for the construction or operation of these

OFFICE ▶						
SURNAME ▶						
DATE ▶						

reactors will be made available for public inspection in the Commission's Public Documents Room. As in the case of license applications, the Commission will publish and make available in the Public Documents Room copies of the reports of the Advisory Committee on Reactor Safeguards and copies of the records evaluations prepared by the Division of Licensing and Regulation.

In addition, the Commission has decided to set these cases down for public hearing to consider health and safety questions involved in the proposed construction and operation of the reactors. A notice of hearing will be issued in each case at least 30 days prior to the date of hearing.

Following the issuance of the notice of hearing, proceedings will be conducted in accordance with the provisions of Part 2 of the Commission's regulations (10 C.F.R., Part 2 'Rules of Practice') applicable to formal hearings.

This policy will also be applied to all future Commission-owned reactors not located at Commission-owned installations, which are to be operated as part of conventional electric utility systems.

OFFICE #						
SURNAME #						
DATE #						

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MHS-3-Hazards of Power Reactors Yellow

Office Memorandum • UNITED STATES GOVERNMENT

TO : Harold L. Price, Director
Division of Licensing & Regulation

DATE: February 25, 1959

FROM : W. B. McCool, Secretary

SUBJECT: COMMISSION DECISION ON AEC 1016 - PROPOSED STATEMENT ON PUBLIC PARTICIPATION IN HAZARDS REVIEW OF CERTAIN REACTORS

SYMBOL: SECT:RDC

1. Confirming our February 20, 1959 notification to your office, at Meeting 1474 on February 19, 1959, the Commission:

a. Approved the statement attached as the Appendix;

b. Noted that the statement will be incorporated in a press release, and that the JCAB will be advised by appropriate letter prior to issuance of the release; and

c. Noted that AEC 1016 is unclassified.

2. You will recall that the Commissioners requested there be official publication of AEC policy in this matter, and Mr. Olson said he would submit to the Commission a draft Amendment to Part 2, 10 C.F.R., Rules of Practice.

3. The General Manager has directed you take the action necessary to implement the Commission's decision and, by copy of this memorandum, that Mr. Olson prepare the draft Amendment for early Commission consideration. Copies of pertinent correspondence should be provided the Office of the Secretary.

cc: General Manager
Asst. Gen. Mgr. for Adm.
General Counsel
D. C. Office

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DATE:

INDEX: MRS-3-Hazards of Power Reactors

~~CONFIDENTIAL~~

~~CONFIDENTIAL~~

TO:

FROM:

SUMMARY: AEC 719/27: WASTE DISPOSAL HEARINGS Memo to the GM re Mr. H.L. Price, Director of I&R and his testimony before the Waste Disposal Hearings. Things discussed are included in this paper. Mr. Holifield wanted to know if the Commission considered the Div. of I&R to be a separate and independent division. Discussion re the role of the ~~xxx~~ states re health and safety precautions around installations.

FILED:

INDEXED: MATERIALS-12-Waste Processing & Disposal

REMARKS: date of paper: 2-17-59
date of memo: 2-3-59

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DOE NSI DECLASSIFICATION REVIEW E.O. 12958
BY: MARY DEFFENBAUGH DOE/NM-628

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2-17-59

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February 16, 1959

AEC 1016

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COPY NO. _____

ATOMIC ENERGY COMMISSION

PROPOSED STATEMENT ON PUBLIC PARTICIPATION IN HAZARDS
REVIEW OF CERTAIN REACTORS

Note by the Secretary

The General Manager has requested that the attached report by the Director of Licensing and Regulation be circulated for consideration by the Commission during the week of February 16, 1959.

W. B. McCool
Secretary

AEC
1016

DISTRIBUTION

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2/16/59

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ATOMIC ENERGY COMMISSION

PROPOSED STATEMENT ON PUBLIC PARTICIPATION IN HAZARDS
REVIEW OF CERTAIN REACTORS

Report to the General Manager by the
Director, Division of Licensing and Regulation

THE PROBLEM

1. To consider a policy statement with respect to procedures for public participation in the hazards review of the Consumers Public Power Reactor District project and the reactor projects in the second round of the power reactor demonstration program.

SUMMARY

2. At the waste disposal hearings before the JCAE on February 3, 1959, Congressman Hollifield inquired as to the procedures under which members of the public might participate in the safety review of government-owned reactors in the power reactor demonstration program. The Director, Licensing and Regulation advised that the Commission's staff is working on procedures for public participation in the review of these projects.

3. There is attached a proposed statement of Commission policy concerning the reactors in the "second round" of the power reactor demonstration program and the Consumers Public Power Reactor District project. Under the proposed policy statement, formal, adjudicatory-type hearings corresponding to those held in connection with the issuance of power and test reactor construction permits and licenses will be held to consider health and safety questions involved in the proposed construction and operation of the reactors. The hearings will not, however, result in an issuance of a license or construction permit.

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4. It is anticipated that, if approved by the Commission, this statement will be incorporated in an appropriate press release.

STAFF JUDGMENTS

5. The Divisions of Reactor Development and Inspection and the Office of the General Counsel concur in the recommendation of this paper.

RECOMMENDATION

6. The General Manager recommends that the Atomic Energy Commission:

- a. Approve the statement attached as the Appendix;
- b. Note that the statement will be incorporated in a press release, and that the JCAE will be advised by appropriate letter prior to issuance of the release;
- c. Note that this paper is unclassified.

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APPENDIX

1. The nuclear power reactors which are planned for operation under the so-called "second round" of the Commission's power demonstration reactor program, and the proposed reactor to be operated by Consumers Public Power District in Nebraska, are not subject to the formal licensing requirements of the Atomic Energy Act of 1954, as amended. Under Section 110 of the Act they are exempt from licensing requirements because they are to be constructed and operated under contracts "with and for the account" of the Commission. However, these and all other Commission-owned reactors receive the same technical review to assure the public health and safety as do licensed reactors.

2. Unlike most Commission-owned reactors, these Commission-owned demonstration reactor projects will not be located at Commission installations but will be operated as an integral part of the power-generation facilities of operating utility systems. For this reason, the Commission has decided that the public interest would best be served by making available to members of the public opportunity for participation in safety considerations concerning these projects in accordance with procedures which would parallel those observed in licensing proceedings. Accordingly, the hazards summary reports filed by the prime contractors for the construction or operation of these reactors will be made available for public inspection in the Commission's Public Documents Room. As in the case of license applications, the Commission will publish and make available in the Public Documents Room copies of the reports of the Advisory Committee on Reactor Safeguards and copies of the hazards evaluations prepared by the Division of Licensing and Regulation.

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~~OFFICIAL USE ONLY~~

3. In addition, the Commission has decided to set these cases down for public hearing to consider health and safety questions involved in the proposed construction and operation of the reactors. A notice of hearing will be issued in each case at least 30 days prior to the date of hearing. Following the issuance of the notice of hearing, proceedings will be conducted in accordance with the provisions of Part 2 of the Commission's regulations (10 C.F.R., Part 2 "Rules of Practice") applicable to formal hearings.

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Handwritten signature
February 12, 1959

MEMORANDUM FOR THE COMMISSIONER AND SENIOR COUNSEL

Request for new information in a copy of the bill for the President of "FEDERAL BOARD OF LABOR RELATIONS"

**F. L. Board
Requesting**

ATTENTION:

Handwritten note: In order above for *Handwritten signature*

DATE	FILE NO.	STATUS	REMARKS	APPROVED
2/12/59				

2-12-59

21 No 5 3 - Approval for Public Review

STANDARD FORM NO. 64

Office Memorandum • UNITED STATES GOVERNMENT

TO : W. B. McNeal
Secretary

DATE: FEB 6 1959

FROM : H. L. Price, Director
Division of Licensing and Regulation

SUBJECT: PROPOSED POLICY STATEMENT ON PUBLIC PARTICIPATION
IN HAZARDOUS REVIEW OF CERTAIN REACTORS

The attached staff paper recommends approval of a policy statement with respect to procedures for public participation in the hazards review of the Consumers Public Power reactor project and reactor projects in the 2nd round of the Power Demonstration Program.

Will you please circulate the paper when it has been approved by the General Manager.

Attachment:
Staff paper

REPRODUCTION OF THIS DOCUMENT IS PROHIBITED

STANDARD FORM NO. 64

*Reproduced as
ACC 1016
2/16/59*

~~OFFICIAL USE ONLY~~*MHA S-3. Hazards from
Plutonium Yellow.***Office Memorandum • UNITED STATES GOVERNMENT**

TO : Harold L. Price, Director,
Division of Licensing and Regulation

DATE: January 30, 1959

FROM : W. B. McCool, Secretary

SUBJECT: PRESIDENTIAL BRIEFING

SYMBOL: SECY:HDC

1. At Meeting 1462 on January 30, 1959, Chairman McCone informed the Commission of your January 29, 1959 briefing for the President on reactor hazards, and requested a copy of this briefing and exhibits be placed in the Commission record.

2. The General Manager has directed that you take the action necessary to implement this request by providing the Secretary a copy.

cc: Chairman McCone
General Manager
Asst. Gen. Mgr. for Adm.
D. C. Office

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~~OFFICIAL USE ONLY~~

January 23, 1959

MEMORANDUM FOR THE COMMISSIONERS AND GENERAL MANAGER

Subject: DRY RUN OF THE REACTOR HAZARDS BRIEFING

Arrangements have been made for the President to be briefed on Reactor Hazards at 11:30 a.m., Thursday, January 29, 1959.

Preparatory to briefing the President we have scheduled a dry run of the Reactor Hazards Briefing to follow the ANP Briefing which is scheduled at 9:30 a.m. on Monday, January 26, 1959 in Room 1113B, D. C. Office. Mr. Harold L. Price and Mr. Clifford K. Beck, Division of Licensing and Regulation will make the presentation.

W. B. McCool
Secretary

RECEIVED
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JAN 23 1959
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OFFICE >	SECY					
SERNAME >	RThomas/ckf					
DATE >	1/23/59					

123-59

Miss J. ...

January 28, 1950

MEMO

MEMORANDUM FOR THE CHIEF OF BUREAU

SUBJECT: REACTOR HAZARD EXERCISE ON THE PRESIDENT

General Goodrich has arranged that the time for the Reactor Hazard Exercise of the President will be 11:30 a.m. Thursday, January 29, 1950. He suggests that the actual briefing be 30 to 45 minutes, leaving some time for discussion if necessary.

A. F. ...

- Mr. Harold Price, SAC
- Mr. ...
- Mr. ...
- Mr. ...
- Mr. ...

ABD

5001

John ...

M H + A. 3 -
Wizards of Power
Blasted

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January 5, 1959

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ATOMIC ENERGY COMMISSION

REACTOR PROJECTS SAFETY REPORTS

Note by the Secretary

1. At Meeting 1411 on October 10, 1958, during discussion of AEC 842/18, Proposed Site for the Elk River, Minnesota, Power Station, the Chairman requested safety reports on all reactor projects now planned.

2. Attached for the information of the Commission is a report submitted by the Director of Reactor Development in response to the above request. The report includes all actions taken up to November 1, 1958.

W. B. McCool
Secretary

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ATOMIC ENERGY COMMISSION

REACTOR PROJECTS SAFETY REPORT

Report to the General Manager by the
Director of Reactor Development

The following is the status of all planned power reactor projects and all planned experimental reactors located outside of NRTS, both Commission and privately owned, with the exception of military reactors and their prototypes, production reactors, and the N.S. Savannah. All of the projects listed are at various stages of planning and construction. In every case the completed design of the reactors and proposed operating procedures will be reviewed by the Division of Licensing and Regulation and by the ACRS before operation will be approved.

A. Commission-Owned Reactors

(1) Pu Recycle Test Reactor

The suitability of the site at Hanford was reviewed by the Division of Licensing and Regulation in October, 1957. The design of the reactor, as described in the preliminary hazards report, is presently under review by the Division of Licensing and Regulation and the ACRS. Construction was started in March 1958, and is scheduled for completion in October, 1960.

(2) Hallam Nuclear Power Facility

The ACRS, after reviewing preliminary site data in November, 1955, concluded that the site was satisfactory. Design of the facility was started in October, 1957 and a preliminary safeguards report describing the proposed design is presently under review by the Division of Licensing and Regulation. The comments of the ACRS on the plant design will also be obtained in the course of this review. Construction is scheduled to commence in December 1959, and to be completed in December, 1961.

(3) Elk River Reactor Facility

An evaluation of the site prepared by ACF was submitted in July and August 1958. On the basis of the information submitted, the Division of Licensing and Regulation and the ACRS have concluded that the site is suitable for a reactor of the power level and general type proposed, and Commission approval is pending. Construction of the facility is underway and a review of the design of the reactor, as described in the preliminary hazard report, is scheduled in February, 1959.

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(4) Heavy Water Components Test Reactor (HWCTR)

A review of the proposed reactor site is presently being conducted by the Division of Licensing and Regulation and the ACRS. The preliminary hazards report will be completed in March, 1959, three months before construction is scheduled to start.

(5) Liquid Metal Fuel Reactor Experiment (LMFRE-I)

The Division of Reactor Development has recommended that the reactor be constructed at ENL, and has asked for the comments of the Division of Licensing and Regulation on the suitability of the proposed site. The site is presently being reviewed by the Division of Licensing and Regulation, who will also obtain the comments of the ACRS.

The design of the reactor, as described in the preliminary hazard report, will be reviewed in April 1959, when construction is scheduled to commence.

(6) Piqua Organic Moderated Reactor

A review to determine the suitability of the Piqua Site for this reactor is presently underway. As a result of a preliminary analysis, the ACRS in August, 1958, stated that it was their tentative view that the Piqua site was not a suitable one. Further discussions were held with the ACRS concerning the site and conceptual design of this reactor in October and November, 1958. Results of these reviews and that of the Division of Licensing and Regulation are still pending.

Assuming approval of the site, construction will commence in December 1959. The proposed design of the reactor, as described in the preliminary hazards report, will be reviewed in September, 1959, three months prior to the start of construction.

(7) Sodium Deuterium Reactor (SDR)

A safety report on the SDR and a fixed price bid for the construction of the reactor will be submitted by NDA by January 31, 1959. This report will be transmitted to the Division of Licensing and Regulation for their comments on the proposed site, and ACRS comments will also be obtained. This is six months prior to the start of design.

The preliminary safeguards report is presently scheduled for submission in November, 1959, five months in advance of the start of construction.

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(8) Gas Cooled Power Reactor (GCPR)

The site for this reactor has not yet been determined, but it will be located either at NRTS, Oak Ridge, Savannah River, or Hanford. The site selection Committee is now evaluating the merits of the several sites. A preliminary hazards review will be held in the spring of 1959 prior to ground breaking.

B. Privately Owned Reactors with Partial Commission Financing

(1) Enrico Fermi Fast Breeder Reactor (PRDC)

Based upon review by the Division of Licensing and Regulation and the ACRS of a preliminary hazards report submitted in January, 1956, a provisional construction permit was issued in August, 1956. Issuance of the construction permit was contested and a hearing on the application was held January 1957 through August 1957. This matter is now before the Commission for decision. Construction of the facility was started in August 1956 and operation is scheduled for 1960.

(2) Yankee Atomic Electric Company

Based upon review by the Division of Licensing and Regulation and the ACRS of a preliminary hazards report submitted in April, 1957, a provisional construction permit was issued in November, 1957. At the mandatory public hearing held before the construction permit was granted, no petitions of leave to intervene were received. Construction of the facility was started in November, 1957, and is scheduled for completion in 1960 or 1961.

(3) Carolinas - Virginia Reactor

An analysis of the proposed site is under preparation, and will be submitted to the Division of Licensing and Regulation for their comments in December 1958. Comments of the ACRS on the proposed site will also be obtained. A preliminary hazards report will be submitted in May 1959, one month prior to the start of construction.

(4) Northern States Power Reactor

A draft of the preliminary hazards report for this reactor, which includes extensive site analysis, is presently being reviewed by the Division of Reactor Development. The report is scheduled to be submitted to the Division of Licensing and Regulation for their comments and for the comments of the ACRS in March 1959. Plant construction is scheduled to begin July 1, 1959.

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(5) Gas Cooled Heavy Water Reactor (GCHWR)

The reactor will be located on an as yet unspecified site. A site review will be conducted before the planned start of construction in January 1961. A preliminary hazards review will be conducted late in 1960, six months before the planned start of construction.

(6) Pennsylvania Advanced Reactor (PAR)

Meetings have been held between PAR representatives and the Division of Licensing and Regulation to discuss possible plant sites. The field has been narrowed by mutual agreement to three possible locations. When final selection has been made by PAR, a site analysis will be forwarded for AEC and ACRS review and comments. This is expected early in 1959. Final discussion as to whether to proceed with final design and construction will not be made until February 1960. If the decision is made to proceed, a preliminary hazards review will be held in early 1960, before the start of construction.

C. Privately Owned Reactors

(1) Consolidated Edison Company Reactor

Based upon review by the Division of Licensing and Regulation and the ACRS of a preliminary hazards report submitted in March, 1955, a provisional construction permit was issued in May, 1956. Construction of the facility is underway and is scheduled for completion in 1960.

(2) Commonwealth Edison Reactor

Based upon review by the Division of Licensing and Regulation and the ACRS of a preliminary hazards report submitted in June, 1955, a provisional construction permit was issued in April, 1956. Construction is underway and presently scheduled for completion in September, 1959. The last section of the final hazards summary report was received in June, 1958, and is presently under review by the Division of Licensing and Regulation. The final hazards summary report must also be reviewed by the ACRS before a operating license can be granted.

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APPENDIX

SAFETY REPORT ON
REACTOR PROJECTS NOW PLANNED

Project or Station Name: Plutonium Recycle Test Reactor (PRTR)

Location: Hanford Operations Office

Owner: AEC

Principal Reactor Contractor: General Electric Co.

Office Administering Contract: Hanford Operations Office

Reactor Schedule:

Decision to Proceed:	October 1956
Design Started	
a. Reactor	January 1957
b. Plant Facility	February 1957
Construction Started:	
a. Reactor	November 1958
b. Plant Facility	March 1958
Construction Complete	November 1960
Criticality	October 1960

Hazards Review Schedule:

Pre Preliminary - Site Review Analysis:

Based on a review by the Division of Licensing and Regulation, the General Manager approved site in November 1957.

Regular preliminary Hazards Review:

Division of I&R and ACRS review is presently being carried out.

Final Hazards Review:
(prior to reactor startup)

July 1960

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SAFETY REPORT ON
REACTOR PROJECTS NOW PLANNED

Project or Station Name: Hallam Nuclear Power Facility (HNPF)

Location: Near Hallam, Lancaster County, Nebraska

Owner: AEC

Principal Reactor Contractor: Atomics International

Office Administering Contract: Chicago Operations Office

Reactor Schedule:

Decision to Proceed	October 1955
Design Started	
a. Reactor	October 1957
b. Plant Facility	October 1957
Construction Started	
a. Reactor	December 1959
b. Plant Facility	June 1958
Construction	December 1961
Criticality	January 1961

Hazards Review Schedule:

Pre Preliminary - Site Review Analysis

On November 4, 1955, the ACRS stated that the site is considered acceptable if the reactor is determined to be satisfactory from a hazards point of view.

Regular Preliminary Hazards Review
(prior to ground breaking)

Review by L&R and ACRS is scheduled for early 1959.

Final Hazards Review
(prior to reactor start-up) October, 1961

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SAFETY REPORT ON
REACTOR PROJECTS NOW PLANNED

Project or Station Name: R. C. P. A. - "Elk River Reactor"

Location: Elk River, Minnesota

Owner: Reactor Plant - AEC, Conventional Plant RCFA

Principal Reactor Contractor: ACF prime - Sargent & Lundy A-E

Office Administering Contract: Chicago Operations Office

Reactor Schedule:

Decision to Proceed	April 1956
Design Started	June 1958
a. Reactor	
b. Plant Facility	June 1958
Construction Started	
a. Reactor	April 1959
b. Plant Facility	August 5, 1958
Construction to end	December, 1960
Criticality	January 1961

Hazards Review Schedule:

Pre Preliminary - Site Review Analysis
Preliminary site evaluation submitted in July, 1958
Preliminary appraisal by D. L&R & ACRS made in August, 1958.
Conclusion - "conditional" site approval.

Regular Preliminary Hazards Review

Due in February, 1958

Final Hazards Review

(prior to reactor start-up) Nov. 1960

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SAFETY REPORT ON
REACTOR PROJECTS NOW PLANNED

Project or Station Name: HWCTR

Location: SROO

Owner: AEC

Principal Reactor Contractor: Dupont

Office Administering Contract: SROO

Reactor Schedule:

Decision to Proceed	May 1958
Design Started	
a. Reactor	June 1958
b. Plant Facility	May 1958
Construction Started	
a. Reactor	June 1959
b. Plant Facility	June 1959
Construction Completion	March 1961
Criticality	February 1961

Hazards Review Schedule:

Pre Preliminary - Site Review Analysis
Review by I&R and ACRS now being conducted.

Regular Preliminary Hazards Review
(prior to ground breaking)

March 1959

Final Hazards Review
(prior to reactor start-up)

January 1961

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SAFETY REPORT ON
REACTOR PROJECTS NOW PLANNED

Project or Station Name: LMFRE - I

Location: Proposed: Brookhaven National Laboratory

Owner: USAEC

Principal Reactor Contractor: Babcock and Wilcox Company

Office Administering Contractor: New York Operations

Reactor Schedule:

Decision to Proceed	May 1956
Design Started	Final Design December 1958
a. Reactor	
b. Plant Facility	
Construction Started	
a. Reactor	April 1959
b. Plant Facility	March 1959
Construction Completed	February 1961
Criticality	June 1961

Hazards Review Schedule:

Pre Preliminary Site Review Analysis
Review by I&R and ACRS now being conducted.

Regular Preliminary Hazards Review
(prior to ground breaking)

Approximately January, 1959.

Final Hazards Review
(prior to reactor startup)

Approximately February 1961.

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SAFETY REPORT ON
REACTOR PROJECTS NOW PLANNED

Project or Station Name: Piqua, Ohio Organic Moderated Reactor

Location: Piqua, Ohio

Owner: AEC

Principal Reactor Contractor: Atomics International

Office Administering Contract: Chicago Operations Office -
Canoga Park Area Office

Reactor Schedule:

Decision to Proceed: September 1956

Design Started:

a. Reactor (January 1959)

b. Plant Facility (January 1959)

Construction Started:

a. Reactor (December 1959)

b. Plant Facility (December 1959)

Construction Ended: (July 1961)

Criticality (August 1961)

Hazards Review Schedule:

Pre Preliminary - Site Review Analysis
Review by I&R and ACRS presently underway.

Regular Preliminary Hazards Review
(prior to ground breaking)

September 1959

Final Hazards Review
(prior to reactor start-up)

May 1961

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SAFETY REPORT ON
REACTOR PROJECTS NOW PLANNED

Project or Station Name: Sodium Deuterium Reactor (SDR)

Location: Anchorage, Alaska

Owner: AEC

Principal Reactor Contractor: Nuclear Development Corporation of America

Office Administering Contract: New York Operations Office

Reactor Schedule:

Decision to Proceed:	August 1956
Design Started:	
a. Reactor	July 1959
b. Plant Facility	July 1959
Construction Started	
a. Reactor	April 1960
b. Plant Facility	April 1960
Construction	July 1962
Criticality	July 1962

Hazards Review Schedule:

Pre Preliminary - Site Review Analysis

January 31, 1959

Regular Preliminary Hazards Review
(prior to ground breaking)

November 1959

Final Hazards Review
(prior to reactor start-up)

May 1962

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SAFETY REPORT ON
REACTOR PROJECTS NOW PLANNED

Project or Station Name: Gas Cooled Power Reactor

Location: Not selected

Owner: AEC

Principal Reactor Contractor: Kaiser-ACF

Office Administering Contract: IDO

Reactor Schedule:

Decision to Proceed	August 1957
Design Started	
a. Reactor	} July 1958
b. Plant Facility	
Construction Started	
a. Reactor	} April 1959
b. Plant Facility	
Construction-Completion	December 1962
Criticality -	March 1963

Hazards Review Schedule:

Pre Preliminary - Site Review Analysis
Site selection committee presently evaluating merits
of four sites.

Regular Preliminary Hazards Review
(prior to ground breaking)

March 1951

Final Hazards Review
(prior to reactor start-up)

Late 1962

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SAFETY REPORT ON
REACTOR PROJECTS NOW PLANNED

Project or Station Name: Enrico Fermi Fast Breeder Reactor

Location: Monroe, Michigan

Owner: Power Reactor Development Company

Principal Reactor Contractor: Power Reactor Development

Office Administering Contract: PRDP - Chicago Operations Office

Reactor Schedule:

Decision to Proceed	July 1955
Design Started	
a. Reactor	January 1956
b. Plant Facility	January 1956
Construction Started	
a. Reactor	August 1956
b. Plant Facility	August 1956
Construction Ends	August 1960
Criticality	August 1960
Nuclear Testing	August 1960 - August 1961
Power Operation	September 1961

Hazards Review Schedule:

Pre Preliminary - Site Review Analysis

Included in preliminary hazards review.

Regular Preliminary Hazards Review

Based upon a review by I&R and ACRS, a provisional construction permit was granted in August, 1956. Issuance was contested, and a hearing was held January 1957 through November, 1957. The matter is now before the Commission for decision.

Final Hazards Review (prior to reactor start-up)

A Final Hazards Review will be conducted before Operating License is issued.

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SAFETY REPORT ON
REACTOR PROJECTS NOW PLANNED

Project or Station Name: Yankee Atomic Electric Co. Plant

Location: Rowe, Massachusetts

Owner: Yankee Atomic Electric Co., Boston, Massachusetts

Principal Reactor Contractor: Westinghouse Electric Co.,
Atomic Power Dept.

Office Administering Contract: New York Operations Office

Reactor Schedule:

Decision to Proceed	Feb. 1956 (AEC accepts proposal as basis for negotiation)
Design Started	June 4, 1956, AEC-YAEC R&D contract signed.
a. Reactor	July 1956 Reported in YAEC-1,
b. Plant Facility	July 1956 "Reference Design", July 20, 1956.
Construction Started	
a. Reactor	November 1957
b. Plant Facility	November 1957
Construction Complete	June 1960
Criticality	July 1960
Full Power Operation	Late 1960

Hazards Review Schedule:

Pre Preliminary - Site Review Analysis: Included in preliminary hazards review.

Regular Preliminary Hazards Review (prior to ground breaking) Based upon review of I&R and ACRS, a provisional construction permit was issued in November, 1957.

Final Hazards Review (prior to reactor start-up) Spring of 1960.

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SAFETY REPORT ON
REACTOR PROJECTS NOW PLANNED

Project or Station Name: Carolinas Virginia Reactor (CVR)

Location: Parr Shoals, South Carolina (CVNPA)

Owner: Carolinas-Virginia Nuclear Power Associates

Principal Reactor Contractor: CVNPA-Prime WAPD-Sub for design

Office Administering Contract: NYOO

Reactor Schedule: (Note: Contract not signed as of this date)

Decision to Proceed	April 1958
Design Started	
a. Reactor	July 1958
b. Plant Facility	July 1958
Construction Started	
a. Reactor	June 1959
b. Plant Facility	June 1959
Construction to End	April 1962
Criticality	June 1962

Hazards Review Schedule:

Pre Preliminary - Site Review Analysis
Material being accumulated. Site analysis will be submitted to I&R in November 1958. Comments of ACRS will also be obtained during this review.

Regular Preliminary Hazards Review
(prior to ground breaking)
May 1959

Final Hazards Review
(prior to reactor start-up)
April 1962

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SAFETY REPORT ON
REACTOR PROJECTS NOW PLANNED

Project or Station Name: "Pathfinder Plant"

Location: 6 miles northeast of Sioux Falls, South Dakota

Owner: Northern States Power Company

Principal Reactor Contractor: Allis - Chalmers Manufacturing Co.

Office Administering Contract: Chicago Operations Office

Reactor Schedule:

Decision to Proceed	May 1957	
Design Started		
a. Reactor	June 1958	} Proposal approved by AEC as basis for negotiation on June 27, 1957
b. Plant Facility	June 1958	
Construction Started		
a. Reactor	July 1959	
b. Plant Facility	July 1959	
Construction Complete	March 1962	
Criticality	May 1962	
Full Power Operation	Mid 1962	

Hazards Review Schedule:

Pre Preliminary - Site Review Analysis: To be included in Preliminary Hazards Review.

Regular Preliminary Hazards Review
(prior to ground breaking)
March 1959

Final Hazards Review
(prior to reactor start-up)
Spring, 1962

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SAFETY REPORT ON
REACTOR PROJECTS NOW PLANNED

Project or Station Name: ECNG - FWCNC D₂O Moderated Gas Cooled

Location: Florida

Owner: FWCNG

Principal Reactor Contractor: General Nuclear Engineering Corp.

Office Administering Contract: SROO

Reactor Schedule:

Decision to Proceed	February 1958
Design Started	
a. Reactor	} January 1960
b. Plant Facility	
Construction Started	
a. Reactor	} January 1961
b. Plant Facility	
Construction to End	June 30, 1963
Criticality	July 1963

Hazards Review Schedule:

Pre Preliminary - Site Review Analysis
Under review by L&R who will obtain comments of ACRS

Regular Preliminary Hazards Review
(prior to ground breaking)

late 1960

Final Hazards Review
(prior to reactor start-up)

1963

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SAFETY REPORT ON
REACTOR PROJECTS NOW PLANNED

Project or Station Name: PAR

Location: Northeastern, Pennsylvania

Owner: PP & L

Principal Reactor Contractor: PP & L and Westinghouse

Office Administering Contract: New York Operations Office

Reactor Schedule:

Decision to Proceed - (if so desired) February 1960
Design Started - Reference Design (R&D)-1956-1959
a. Reactor - Detailed Design - Early 1960
b. Plant Facility - Reference Design (R&D)
Detailed Design - Early 1960

Construction Started
a. Reactor - During 1960 (Estimated)
b. Plant Facility - During 1961 (Estimated)

Construction completed - December 1963

Criticality - 1963

Hazards Review Schedule:

3 sites still under consideration. When selection is made, site will be reviewed by L&R who will obtain comments of ACRS - probably late 1958 or early 1959.

Regular Preliminary Hazards Review
(prior to ground breaking)
Not yet scheduled. However, this review should be held not later than first half of 1960, so as to be prior to start of construction.

Final Hazards Review

(prior to reactor start-up)
Sometime during 1963, based on above construction schedule.

Alvin S. Inselsack, General Manager
(TRHU) J. Tammaro, Assistant General Manager
for Research and Industrial Development
Frank E. Pittman, Director
Division of Reactor Development
Frank J. Emulian

REACTOR PROJECT SAFETY REPORTS

SYMBOL: RD-CR-SP-158

A memorandum on October 15, 1958 from Harold L. Fride
and Frank E. Pittman, requested that safety reports be made to
the Commission on all reactor projects now active. The
subject report includes all actions taken up to November 3, 1958.
This report has been prepared by the Division of Reactor Develop-
ment with the assistance of the Division of Licensing and
Regulation and is hereby forwarded for the information of the
Commissioners.

CE: W. B. Nelson, SR
H. H. Stewart, SR

REACTOR PROJECTS SAFETY REPORT

The following is the status of all planned power reactor projects and all planned experimental reactors located outside of NRTS, both Commission and privately owned, with the exception of military reactors and their prototypes, production reactors, and the U. S. Savannah. All of the projects listed are at various stages of planning and construction. In every case the completed design of the reactors and proposed operating procedures will be reviewed by the Division of Licensing and Regulation and by the ACRS before operation will be approved.

A. Commission-Owned Reactors

1. Pu Reactor Test Reactor

The suitability of the site at Hanford was reviewed by the Division of Licensing and Regulation in October, 1957. The design of the reactor, as described in the preliminary hazards report, is presently under review by the Division of Licensing and Regulation and by the ACRS. Construction was started in March 1958, and is scheduled for completion in October, 1960.

2. Hallam Nuclear Power Facility

The ACRS, after reviewing preliminary site data in November, 1955, concluded that the site was satisfactory. Design of the facility was started in October, 1957 and a preliminary safeguards report describing the proposed design is presently under review by the Division of Licensing and Regulation. The comments of the ACRS on the plant design will also be obtained in the course of this review. Construction is scheduled to commence in December 1959, and to be completed in December, 1961.

3. Elk River Reactor Facility

An evaluation of the site prepared by ACF was submitted in July and August 1958. On the basis of the information submitted, the Division of Licensing and Regulation and the ACRS have concluded that the site is suitable for a reactor of the power level and general type proposed, and Commission approval is pending. Construction of the facility is underway and a review of the design of the reactor, as described in the preliminary hazard report, is scheduled in February, 1959.

4. Heavy Water Components Test Reactor (HWCTR)

A review of the proposed reactor site is presently being conducted by the Division of Licensing and Regulation and the ACRS. The preliminary hazards report will be completed in March, 1959, three months before construction is scheduled to start.

5. Alkali Metal Fuel Reactor Experiment (AMFREX)

The Division of Reactor Development has recommended that the reactor be constructed at ORNL, and has asked for the comments of the Division of Licensing and Regulation on the suitability of the proposed site. The site is presently being reviewed by the Division of Licensing and Regulation, who will also obtain the comments of the ACRS.

The design of the reactor, as described in the preliminary hazards report, will be reviewed in April 1959, when construction is scheduled to commence.

6. Plasma Organic Moderated Reactor

A review to determine the suitability of the Plasma Site for this reactor is presently underway. As a result of a preliminary analysis, the ACRS in August, 1958, stated that it was their tentative view that the Plasma site was not a suitable one. Further discussions were held with the ACRS concerning the site and conceptual design of this reactor in October and November, 1958. Results of these reviews and that of the Division of Licensing and Regulation are still pending.

Final approval of the site, construction will commence in December 1959. The proposed design of the reactor, as described in the preliminary hazards report, will be reviewed in September, 1959, three months prior to the start of construction.

7. Sodium Deuterium Reactor (SDR)

A safety report on the SDR and a fixed price bid for the construction of the reactor will be submitted by RDA by January 31, 1959. This report will be transmitted to the Division of Licensing and Regulation for their comments on the proposed site, and ACRS comments will also be obtained. This is six months prior to the start of design.

The preliminary safeguards report is presently scheduled for submission in November, 1959, five months in advance of the start of construction.

D. Gas Cooled Power Reactor (GCPR)

The site for this reactor has not yet been determined, but it will be located either at HITS, Oak Ridge, Savannah River, or Hanford. The site selection Committee is now evaluating the merits of the several sites. A preliminary hazards review will be held in the spring of 1959 prior to ground breaking.

B. Privately Owned Reactors with Partial Commission Financing

1. Early Fermi Fast Breeder Reactor (EFBR)

Based upon review by the Division of Licensing and Regulation and the ACRS of a preliminary hazards report submitted in January, 1956, a provisional construction permit was issued in August, 1956. Issuance of the construction permit was contested and a hearing on the application was held January 1957 through August 1957. This matter is now before the Commission for decision. Construction of the facility was started in August 1956 and operation is scheduled for 1963.

2. Lockport Atomic Electric Generator

Based upon review by the Division of Licensing and Regulation and the ACRS of a preliminary hazards report submitted in April, 1957, a provisional construction permit was issued in November, 1957. At the mandatory public hearing held before the construction permit was granted, no petitions of leave to intervene were received. Construction of the facility was started in November, 1957, and is scheduled for completion in 1960 or 1961.

3. Caroline - Virginia Reactor

An analysis of the proposed site is under preparation, and will be submitted to the Division of Licensing and Regulation for their comments in December 1958. Comments of the ACRS on the proposed site will also be obtained. A preliminary hazards report will be submitted in May 1959, one month prior to the start of construction.

4. Northern States Power Reactor

A draft of the preliminary hazards report for this reactor, which includes extensive site analysis, is presently being reviewed by the Division of Reactor Development. The report is scheduled to be submitted to the Division of Licensing and Regulation for their comments and for the comments of the ACRS in March 1959. Plant construction is scheduled to begin July 1, 1959.

5. Gas Cooled Heavy Water Reactor (GCHWR)

The reactor will be located on an as yet unspecified site. A site review will be conducted before the planned start of construction in January 1961. A preliminary hazards review will be conducted late in 1960, six months before the planned start of construction.

6. Pennsylvania Advanced Reactor (PAR)

Hearings have been held between PAR representatives and the Division of Licensing and Regulation to discuss possible plant sites. The field has been narrowed by mutual agreement to three possible locations. When final selection has been made by PAR, a site analysis will be forwarded for ABC and ACRS review and comments. This is expected early in 1959. Final discussion as to whether to proceed with final design and construction will not be made until February 1960. If the decision is made to proceed, a preliminary hazards review will be held in early 1960, before the start of construction.

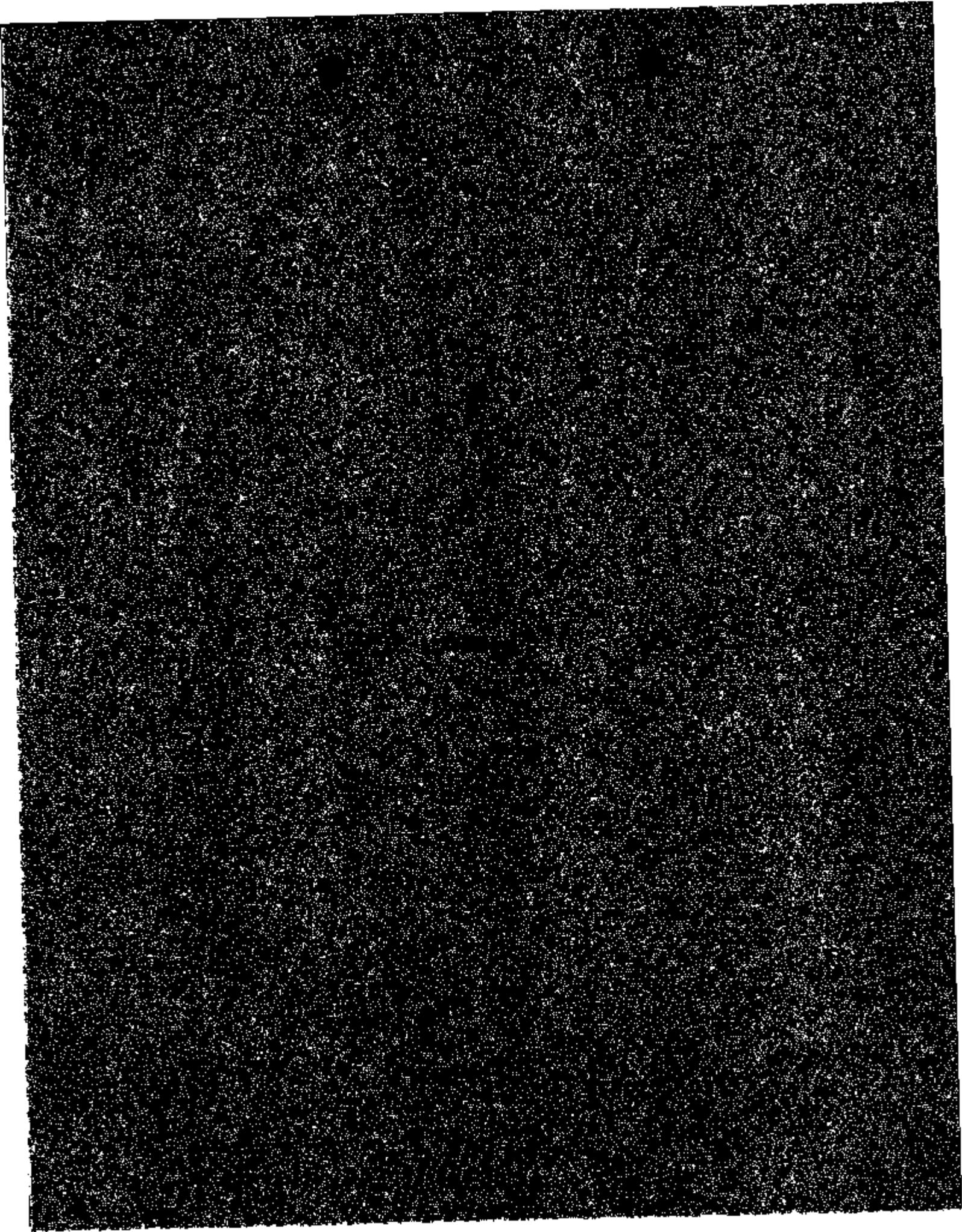
C. Privately Owned Reactors

1. Consolidated Edison Company Reactor

Based upon review by the Division of Licensing and Regulation and the ACRS of a preliminary hazards report submitted in March, 1955, a provisional construction permit was issued in May, 1956. Construction of the facility is underway and is scheduled for completion in 1960.

2. Consolidated Edison Reactor

Based upon review by the Division of Licensing and Regulation and the ACRS of a preliminary hazards report submitted in June, 1955, a provisional construction permit was issued in April, 1956. Construction is underway and presently scheduled for completion in September, 1959. The last portion of the final hazards summary report was received in June, 1958, and is presently under review by the Division of Licensing and Regulation. The final hazards summary report must also be reviewed by the ACRS before a operating license can be granted.



SAFETY REPORT ON

REACTOR FACILITY NO. 1 PLANNED

Project by Station Area, Planning, Research and Design (PRA)

Location: Harford Operations Office

Case: 100

Principal Engineer Contractor: General Electric Co.

Office Assistant and Contracts: Harford Operations Office

Reaction Schedule

Design in Progress: October 1955

Design Started:

a. Reactor: January 1957

b. Plant Facility: February 1957

Construction Started:

a. Reactor: November 1958

b. Plant Facility: March 1959

Construction Complete: November 1960

Criticality: October 1960

Hazards Review Schedule

Pre-Preliminary - Site Review Analysis:

Based on a review by the Division of Licensing and Regulation, the General Manager approved site in November 1957.

Regular preliminary Hazards Review:

Division of L&R and D&S review is presently being carried out.

Final Hazards Review:

(prior to reactor startup)

July 1960

SAFETY REVIEW OF
REACTOR PROJECT, NEB PLANT

Project or Station Name: HALLAM REACTOR PLANT FACILITY (HRPF)

Location: Near Hallam, DeWitt County, Nebraska

Owner: AEC

Principal Reactor Contractor: Atomic International

Office Administering Contract: Civilian Operations Office

Reaction Schedule:

Decision to Proceed	October 1955
Design Started	
a. Reactor	October 1957
b. Plant Facility	October 1957
Construction Started	
a. Reactor	December 1959
b. Plant Facility	June 1960
Commissioning	December 1961
Criticality	January 1961

Hazards Review Schedule:

Pre Preliminary - Site Review Analysis

On November 4, 1955, the RRS stated that the site is considered acceptable if the reactor is determined to be satisfactory from a hazards point of view.

Regular Preliminary Hazards Review
(prior to ground breaking)

Review by LER and RRS is scheduled for early 1960

Final Hazards Review
(prior to reactor start-up) October, 1961

SAFETY REPORT ON
REACTOR PROJECTS NOT PLANNED

Project or Station Name: R.C.P.A. - "Elk River Reactor"

Location: Elk River, Minnesota

Owner: Reactor Plant - AEC, Conventional Plant - CPA

Principal Reactor Contractor: AEC Prime - Sargent & Lundy A-E

Office Administering Contract: Chicago Operations Office

Reactor Schedule:

Decision to Proceed	April 1958
Design Started	June 1958
a. Reactor	
b. Plant Facility	June 1958
Construction Started	
a. Reactor	April 1959
b. Plant Facility	August 5, 1958
Construction to end	December, 1960
Criticality	January 1961

Hazards Review Schedule:

Pre Preliminary - Site Review Analysis
Preliminary site evaluation submitted in July, 1958
Preliminary appraisal by D. LAR & ACRS made in August, 1958. Conclusion -
"conditional" site approval.

Regular Preliminary Hazards Review:

Done in February, 1958

Final Hazards Review:

(prior to reactor start-up) Nov. 1960

STATE OF TEXAS
COUNTY OF DALLAS

Property of Station East, LLC

Address: 2001

City: Dallas

Tract or Block: 2001

Official Addressing: 2001

APPLICANTS:

Michael J. Freeman, 2001

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APPLICANT'S ATTORNEY:

By: [Name], 2001

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SAFETY REPORT ON
REACTOR PROJECTS NOW PLANNED

Project or Station Name: HTGR #1

Location: Princeton, Brookhaven National Laboratory

Owner: USAE

Principal Reactor Contractor: General and Atomic Company

Office Administering Contractor: New York Operations

Reactor Schedule

Decision to Proceed	May 1958
Design Started	Final Design December 1958
a. Reactor	
b. Plant Facility	
Construction Started	
a. Reactor	April 1959
b. Plant Facility	March 1959
Construction Completed	February 1961
Operation	June 1961

Design Review Schedule

Pre-Final Review: Site Review Available
Review by ICR and ACRB now being conducted

Final Preliminary Records Review
(prior to ground breaking)
Approximately January 1959

Final Records Review
(prior to reactor startup)
Approximately February 1961

SAFETY REPORT
REACTOR PROJECT NO. 114888

Project or Station Name Plant, Oak Ridge Y-12, Industrial Reactor

Location Plant, Oak

Date 12/1/57

Principal Investigator William C. Coker

Office and/or Project Contract Atomic Operations Office - Safety and Area Office

Event Details

Incident 15, 27, 28, 29
Action Started September, 1956

In Reactor (January, 1957)
In Plant Facility (January, 1957)

Construction Started
as Reported (December, 1956)
In Plant Facility (December, 1956)

Construction Ended (July, 1957)

Crushed (August, 1957)

Records and/or Schedule

Pre-Operational - Site Review Analysis
Report by AEC and AEC's present schedule

Regular Preliminary Records Review
(with to ground breaking)

September, 1957

Final Records Review
(with to ground breaking)

Nov 1957

SAFETY REPORT ON
REACTOR PROJECTS NOW PLANNED

Project or Station Name: Sodium Deuterium Reactor (SDR)
Location: Anchorage, Alaska
Owner: AEC
Principal Reactor Contractor: Nuclear Development Corporation of America
Office Administering Contract: New York Operations Office

Reactor Schedule:

Decision to Proceed: August 1956

Design Started:

a. Reactor July 1959

b. Plant Facility July 1959

Construction Started:

a. Reactor April 1960

b. Plant Facility April 1960

Construction July 1962

Criticality July 1962

Hazards Review Schedule:

Pre Preliminary - Site Review Analysis

January 31, 1959

Regular Preliminary Hazards Review
(prior to ground breaking)

November 1959

Final Hazards Review
(prior to reactor start-up)

May 1962

UNITED STATES OF AMERICA
OFFICE OF THE ATTORNEY GENERAL

MEMORANDUM FOR THE ATTORNEY GENERAL
DATE: [illegible]
SUBJECT: [illegible]

[illegible text]

[illegible text]

SAFETY REVIEW OF
REACTOR FACILITY FOR PLANNED

Project or Station Name: Union Carbide Test Reactor
Location: Danbury, Michigan
Owner: Power Reactor Development Company
Principal Reactor Contractor: Power Reactor Development
Office Administering Contract: EHE - Chicago Operations Office
Reactor Schedule:

Contract to Proceed Design Started	July 1954
a. Reactor	January 1955
b. Plant Facility	January 1955
Construction Started	
a. Reactor	August 1954
b. Plant Facility	August 1954
Construction Done	August 1955
Criticality	August 1955
Initial Testing	August 1955 - August 1956
Normal Operation	September 1955

Atomic Energy Schedule:

Pre-Preliminary - Site Review Analysis

Included in preliminary hazards review

Reactor Preliminary Hazards Review

Based upon a review by AEC and EHE, a provisional construction permit was granted in August, 1954. Insurances were obtained and a hearing was held January 1957 through February, 1957. The safety is now before the Commission for decision.

Final Hazards Review (prior to reactor start-up)

A final hazards review will be conducted before operating license is granted.

SAFETY REPORT ON
REACTOR PROJECTS NOW PLANNED

Project or Station Name: Yankee Atomic Electric Co. Plant

Location: Windsor, Massachusetts

Owner: Yankee Atomic Electric Co., Boston, Massachusetts

Principal Reactor Contractor: Westinghouse Electric Co., Atomic Power Dept.

Office Administering Contract: New York Operations Office

Reactor Schedule

Decision to Proceed	Feb. 1956 (AEC accepts proposal as basis for negotiation)
Design Started	June 3, 1956, AEC-TAES R&D contract signed
a. Reactor	July 1956. Reported in Table 1, "Reference 1957 1956 Design", July 20, 1956.
b. Plant Facility	
Construction Started	
a. Reactor	November 1957
b. Plant Facility	November 1957
Construction Complete	June 1960
Criticality	July 1960
Full Power Operation	Late 1960

Hazardous Review Schedule

Pre-Preliminary - Site Review Analysis: included in preliminary hazardous review.

Regular Preliminary Hazardous Review (prior to ground breaking): Based upon review of LAR and ACRS, a provisional construction permit was issued in November, 1957.

Final Hazardous Review (prior to reactor start-up): Spring of 1960.

REPORT FROM THE LAMBD

Project or Station Name: Cambridge District Station (CDS)

Location: East Booth, South Bay, Cambridge, MA

Owner: Cambridge District Station, Cambridge, MA

Principal Resident Contractor: CH2M Hill, MA - Sub for Boston

Office Administering Contract: NYC

Summary Schedule: (Dates shown are as shown on or after this date)

Design in Progress: April 1957

Design Complete:

A. Station: May 1957

B. Plant Facility: July 1957

Construction Started:

A. Station: June 1957

B. Plant Facility: Aug 1957

Construction to End:

A. Station: April 1958

B. Plant Facility: May 1958

Design Review Schedule

Pre-Proprietary - Site Review Analysis
Material being submitted. The analysis will be submitted to
NYC in November 1957. Comments of NYC will also be obtained
during this review.

Regular Proprietary Design Review
(prior to ground breaking)
May 1957

Final Design Review
(prior to contract start-up)
April 1958

SAVED REPORT ON
WATER PROJECT, HO-PLANNED

Project or Station Name: Fachinon Falls
Location: 1/2 mile northeast of Snow Hill, Snow Lake
Name: Northwestern Paper Company
Principal Contact: W. H. ...
Office Administering Contract: ... Operations Office

Project Schedule

Location of Project	May 1957
Design Started	
a. Dam	June 1957 - Proceeds approved by AEC on
b. Plant Facility	June 1957 - Plans for registration on
	June 27, 1957
Construction Started	
a. Dam	July 1957
b. Plant Facility	July 1957
Construction Complete	March 1958
Drilling	July 1957
Full Power Operation	July 1957

Review Schedule

Pre Preliminary - Site Review (not to be included in Preliminary Report Review)

Final Preliminary Report Review (prior to ground breaking) - March 1957

Final Report Review (prior to reactor start-up) - Spring 1958

RESTRICTED

REACTOR SCHEDULE - NOT PLANNED

Project or Station Name: EMU - FORT MC GREGG Gas-cooled

Location: Florida

Owner: USMC

Principal Reactor Contractor: General Nuclear Engineering Corporation

Office Administering Contract: EMU

Reactor Schedule:

Decision to Proceed	February 1959
Design Started	
a. Reactor	January 1960
b. Plant Facility	
Construction Started	
a. Reactor	January 1961
b. Plant Facility	
Construction is End	June 30, 1961
Criticality	July 1961

Reactor Review Schedule:

Pre Preliminary - Site Review Analysis
Under review by IAS with final comments of IAS

Regular Preliminary Reactor Review
(prior to ground breaking)

late 1960

Final Reactor Review
(prior to reactor start-up)

1960

SAFETY REPORT ON

REACTOR PROJECTS NOW PLANNED

Project or Station Name: PAH
Location: Northeastern, Pennsylvania
Owner: EP & L
Principal Reactor Contractors: EP & L and Westinghouse
Office Administering Contract: New York Operations Office

Reactor Schedule:

Decision to Proceed - (if so desired) February 1960
Design Started - Reference Design (R&D) - 1956 - 1959
a. Reactor - Detailed Design - Early 1960
b. Plant Facility - Reference Design (R&D)
Detailed Design - Early 1960

Construction Started
a. Reactor - During 1960 (Estimated)
b. Plant Facility - During 1961 (Estimated)

Construction completed - December 1963

Criticality - 1963

Hazards Review Schedule:

3 sites still under consideration. When selection is made, site will be reviewed by I&E who will obtain comments of ACRS - probably late 1958 or early 1959.

Regular Preliminary Hazards Review
(prior to ground breaking)

Not yet scheduled. However, this review should be held not later than first half of 1960, so as to be prior to start of construction.

Final Hazards Review

(prior to reactor startup)

Sometime during 1963, based on above construction schedule.

RECEIVED
APR 11 1960
U.S. DEPARTMENT OF COMMERCE
BUREAU OF MARINE ENGINEERING