UNITED STATES OF AMERICA
NUCLEAR REGULATORY COMMISSION

In The Matter Of	)
	)
DUKE POWER COMPANY	) Dkt. No. 70-2623
	)
(Amendment to Operating License SNM-1773	)
for Oconee Spent Fuel Transportation and	)
Storage at McGuire Nuclear Station)	)

NATURAL RESOURCES DEFENSE COUNCIL
STATEMENT OF FACTS WHICH ARE DISPUTED
ON STAFF MOTIONS FOR SUMMARY DISPOSITION

Contention I

With respect to the specific listing of indisputable facts, the Staff's recitation of the Commission policy statement, either verbatim or by summary, is not acceptable. That document speaks for itself. Thus, facts 1-10 should be rejected. We agree the Commission statement exists and until it is overturned by a court it is legally binding here.

Facts 11 and 12 are legal conclusions, which we dispute.

Fact 13 is erroneous since reracking of Oconee Units 1 and 2 will extend FCR life through May 1982 and use of spent fuel casks would also extend the FCR availability. Affidavit of Arthur Tamplin (II).

Facts 14 and 15 confirm the reracking availbility, and we agree with them.

We accept Fact 16.

The first sentence of Fact 17 as worded is acceptable, but the second sentence is a legal conclusion and disputed.

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Fact 18 is disputed because a short term solution does not address the problem as we define it.

Fact 19 is a legal conclusion and speculates on Commission motives. The Commission statement speaks for itself.

Fact 20 is disputed because a proper interpretation of 10 CFR § 20.1(c) could require retention of an FCR and use of shipping casks could obviate the need to keep an FCR in the spent fuel pool.

Fact 21 is a legal conclusion and disputed.

Fact 22 is a legal conclusion and disputed.

Fact 23 is a legal conclusion and disputed.

Fact 24 is correct through the first 14 words, but the remainder is disputed.

Fact 25 is not disputed.

Fact 26 is disputed. The public will be harmed if the proposal is approved without the careful evaluation required by law.

Fact 27 is disputed as a distortion of our position.

Fact 28 is disputed on too many grounds to list.

Fact 29 is disputed as contrary to the Commission statement on interim spent fuel storage and is also a legal conclusion.

<u>Contention 2</u>

Fact 1 is disputed because it is a legal conclusion.

Fact 2 is not disputed.

Fact 3 is disputed primarily because of the failure to view the entire cascade program.

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Fact 4 is not disputed.

Fact 5 is not disputed and not relevant.

In Fact 6, the first sentence is not disputed. The second sentence is disputed.

Fact is 7 is disputed because "negligibly small" is meaningless.

Fact 8 is disputed.

Fact 9 is disputed.

Fact 10 is disputed because there is no quantitative value placed on "unlikely" but it is agreed some accidents were postulated and evaluated.

Fact 11 is disputed because "insignificant" is not quantitative, there is no evidence that the range of accidents examined is sufficiently extensive and the detectability of accident consequences depends upon the nature of the devices used to measure those consequences.

Fact 12 is disputed as not being comprehensible. The mere use of 270 days cooldown does not guarantee that all possible impacts will be negligible or that all worker and public exposures will be ALARA.

<u>Contention 4</u>

Fact 1 is not disputed if it is limited to the specific application now pending.

Fact 2 is disputed. At best this spent fuel shipment will not be better than other routine spent fuel shipments of 270-day-old fuel.

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Fact 3 is disputed because "insignificant" is not quantified.

Fact 4 is disputed because "negligibly small" is not quanitfied, comparison with background doses is not legally relevant and the dose calculations are not properly verified.

Fact 5 is disputed. Any radiation exposure is potentially harmful and is not insignificant to the person receiving it.

Fact 6 is disputed. Any radiation exposure is potentially harmful and is not insignificant to the person receiving it.

Fact 7 is not disputed.

Fact 8 is disputed because the "unlikely" is unquantified and it is not established that a worst case was identified.

Fact 9 is not disputed.

Fact 10 is disputed because the comparison to background is not a relevant basis for judging the severity of the consequences.

Fact 11 is disputed for the same reason as Fact 10 but the fact that using the BEIR model produces a less in quantity and no different in kind effect than natural background is not disputed.

Fact 12 is disputed because the proposed action does not comply with ALARA.

Fact 13 is disputed both as to the public and workers, including the imprecision of the term negligible.

Fact 14, sentence 2, is disputed for the reasons discussed in more detail elsewhere in our filings.

Fact 15 is disputed as irrelevant because average exposures are not relevant and because the Nehemias chart does not purport to include all spent fuel pool modification.

Fact 16 is disputed because the data relied on is selected spent fuel modifications and the quality and nature of measuring devices and procedures are not given.

Fact 17 is disputed.

Fact 18 is disputed as to the second sentence because the quantity of reduction is not "very minor" particularly to the persons involved.

Fact 19 is disputed as being an irrelevant comparison and without a factual basis for the assumptions that the workers who get the spent fuel storage doses are getting the average occupational dose or not.

Fact 20 is disputed as to each sentence because the comparisons are meaningless and the "negligibly small" phrase is not quantitative.

Contention 5

Fact 1 is disputed. The record is insufficient to conclude whether FCR is needed for environmental or health and safety reasons.

Fact 2, sentence 1, is not disputed. Sentence 2 is disputed as speculative and the Commission statement speaks for itself.

Fact 3 is disputed.

Fact 4 is not disputed.

Respectfully submitted,

Anthony Z. Roisman
Natural Resources Defense Council
917 15th Street, N.W.
Washington, D.C. 20005
(202)737-5000

Dated:

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UNITED STATES OF AMERICA
NUCLEAR REGULATORY COMMISSION

In The Matter of DUKE POWER COMPANY (Amendment to Operating License SNM-1773 for Oconee Spent Fuel Transportation and Storage at McGuire Nuclear Station)	Dkt. No. 70-2623

AFFIDAVIT OF ARTHUR R. TAMPLIN (II)

City of Washington)
) ss:
District of Columbia)

Arthur R. Tamplin, being first duly sworn, hereby deposes and says:

1. The description of my conversation with Morton B. Fairtile contained on page 5 of NRDC's Response to Staff Motions for Summary Disposition is true and correct to the best of my personal knowledge.

2. The BEIR Committee and most radiation health physicists agree that it must be assumed that there is no safe level of radiation and even very small doses must be assumed to be harmful.

All above statements are true and correct to the best of my knowledge.

Arthur R. Tamplin
Arthur R. Tamplin

Signed and sworn to before me
this 4th day of June 1979.

Notary Public

POOR ORIGINAL

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EXHIBIT A

December 29, 1978

Mr. K. S. Canady

Attention: Mr. K. R. Wilson

Subject: Oconee Nuclear Station
Unit 1 and 2 Spent Fuel Modification
File No. OS 514.27

Reference: Letter Dated December 18, 1978, Mr. K. R. Wilson to
Mr. H. T. Snead, Same Subject as Above

This letter should serve to provide you with the information requested in the subject letter to be used in the preparation of the licensing submittal. In response to your request for a schedule of refueling dates, attachment 1 to this letter shows our current best estimate of the refueling dates for the three Oconee units through 1981.

If the planned pool expansion were not to occur and, assuming that no offsite fuel shipments were allowed and, further, if all non fuel items now in place at the Oconee pools were to remain, the station would lose full core discharge capability in May, 1979. If all non fuel items now at the Oconee pools were removed, the station would lose full core discharge capability in November, 1979. In either case, without the pool expansion and assuming no offsite shipments, the Oconee units would be unable to refuel in 1981. Thus, unit 1 would be forced to shut down in April, 1981, unit 2 in May, 1981 and unit 3 in August, 1981.

Assuming that no offsite shipment of fuel is allowed and assuming that the current planned unit 1 and 2 pool modification were completed, the station full core discharge capability would be lost for a short time during the reracking operation but would be regained with the installation of the new modules. After the completion of the modification, Oconee would lose its full core discharge capability in mid 1982 and the Oconee units would be forced to shut down due to lack of pool space during their respective refueling outages in 1984. This schedule does not include consideration of removal of all non fuel items now in the pool, because these items would have to be removed the accomplish the planned modification.

Attachment 2 will provide you with the proposed schedule for reracking operations. It is our opinion that the proposed schedule does not preclude the installation of poison type storage racks. Our information does indicate, however, that the selection of poison type storage racks would require the modification to be performed in two phases, one phase

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to be completed prior to the unit 1 and 2 refuelings in late 1979 and the second phase to be completed in 1980, after the completion of these refueling outages. Thus, the process of modification of the fuel pool would be greatly extended. The overriding consideration in selection of the racks, however, was the [illegible] of the Steam Production Licensing Section that the selection [illegible] racks would greatly increase the probability of licensing delays, which would in turn postpone the date at which modification work could be done. In light of the fact that some modification work must be completed prior to the unit 1 and 2 outages in 1979 or else no type of modification would be possible due to the number of assemblies in the pool, it was decided that the selection of a high density non-poison type rack provided the best chance of completion in the required time.

With respect to your request for cost estimates, the estimated total project cost for the reracking of the unit 1 and 2 pool with the non poison high density racks is $2,985,000.00. A cost estimate for the poison rack option is not readily available since firm proposals for this type of rack were not solicited, but our information at hand suggests that the cost of pursuing the poison rack option would have been somewhat higher.

Regarding the cost and availability of reprocessing facilities, Duke has a reprocessing contract with Allied General Nuclear Services, however, their facility at Barnwell, South Carolina does not have an NRC license to reprocess or store spent fuel.

Regarding your request for information on cost of shipment, the most recent estimate of truck shipment cost from Oconee to McGuire in 1979 dollars would be $2,102.00 per shipment. Our best estimate for cost of truck shipment from Oconee to Catawba in 1982 dollars would be $2,450.00 per shipment. This estimated cost per shipment to Catawba assumes that the labor charges and standing charges will be the same as those arrived at for shipment to McGuire and that the only difference in cost will be the reduced mileage charge due to the shorter distance from Oconee to Catawba versus McGuire. The current best estimate date for the availability of the Catawba 1 spent fuel storage pool is June, 1981.

I hope that this information will satisfy your needs in preparing the licensing submittal, however, if you have any further questions or if I can be of any assistance, please call.

William R. McCollum Jr.

William R. McCollum
Associate Engineer
Core Performance

WRMc:mo
CC: Mr. R. M. Glover (w/a)
Mr. H. T. Snead (w/a)
Mr. D. C. Holt (w/o att)

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ATTACHMENT 1

OCONEE NUCLEAR STATION

PLANNED REFUELING OUTAGES THROUGH 1981

Oconee 3 - June 1, 1979 - July 20, 1979

Oconee 1 - December 1, 1979 - January 17, 1980

Oconee 2 - January 25, 1980 - March 10, 1980

Oconee 3 - July 6, 1980 - August 24, 1980

Oconee 1 - April 2, 1981 - May 17, 1981

Oconee 2 - May 25, 1981 - July 11, 1981

Oconee 3 - August 10, 1981 - September 28, 1981

ATTACHMENT 2
INSTALLATION SCHEDULE

LICENSE APPROVAL

COMPLETE RERACKING

SHIPMENT OF RACKS

...MENT AND MATERIALS (AS REQUIRED) TO INCREASE SPENT FUEL COOLING CAPACITY
...RIAL FROM POOL

...CASE RATES
...PLIES)

SET UP DECONTAMINATION TENT, PACKAGING, SHIPPING AND NEW RACK RECEIPT WORK AREA
INSTALL TEMPORARY CRANES & HOISTS

HEALTH PHYSICS TESTING
VACUUM POOL

...EST DIVING CONTRACTOR

REMOVE 1ST SECTION OF EXISTING RACKS (1/3)
PLACE 4 NEW RACK MODULES
TRANSFER ~100 ASSEMBLIES IN POOL
REMOVE CENTER 1/3 OF EXISTING RACKS
PLACE 2 MORE MODULES
TRANSFER REMAINING FUEL (~40 ASSEMBLIES)
REMOVE REMAINING RACKS (1/3)
PLACE FINAL MODULES (10 EA.)

REINFORCING FUEL BRIDGE
TESTING RACK INSTALLATION

RECEIPT OF NEW FUEL

OUTAGE #3

OUTAGE #1

POOR ORIGINAL

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JUNE	JULY	AUG	SEPT	OCT	NOV	DEC

1979

EXHIBIT B

STONE & WEBSTER ENGINEERING CORPORATION

NEW YORK OPERATIONS CENTER
ONE PENN PLAZA
NEW YORK, NEW YORK
ADDRESS ALL CORRESPONDENCE TO P. O. BOX ' 50, NEW YORK, N. Y. 10001

BOSTON
NEW YORK
CHERRY HILL, N.J.
DENVER
CHICAGO
HOUSTON
PORTLAND, OREGON
SAN DIEGO
WASHINGTON, D.C.

DESIGN
CONSTRUCTION
REPORTS
EXAMINATIONS
CONSULTING
ENGINEERING

Mr. Furman Wardell
Duke Power Company
P.O. Box 2178
Charlotte, N.C. 28141

September 6, 1978

Dear Mr. Wardell:

I am enclosing a brief description of the Stone & Webster Interim Spent Fuel Storage Facility design and the press release announcing the NRC acceptance of this design.

As we had discussed by telephone on August 18, 1978 we believe that this facility could be constructed and in operation within 33 months of an authorization to proceed at a site with an existing operational nuclear power plant. The time of 33 months assumes that procurement activities for long lead time items start immediately upon job authorization and that there is no protracted federal, local or state licensing. We do not anticipate protracted licensing at an operating plant site.

Our order of magnitude figure for costs are the mid $20 millions for the facility without fuel racks and $5-8 million for racks depending on type, design and number.

A specific fuel rack design has not been developed. High-density racks of the flux trap type have been assumed for this facility for arrangement and storage purposes. Poison type racks could also be provided.

I hope this provides you with sufficient information for your present requirements. If you have any questions at the present or in the future please contact myself or Mr. J.N. White (617)973-5552.

Very truly yours,

W. Willoughby, II

W. Willoughby, II

WW:md
enc.

cc: I. Wecker, E.F. Haslam, Jr., R. Phillips, T. Flynn, J.N. White

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ABOTB
DFF — file

September 14, 1978

H. T. Snead
S. B. Hager, Attention: D. M. E. Rogers

Re: Spent Fuel Storage Facility
File: N-9

Enclosed is some material I have received recently from Stone and Webster regarding their Interim Spent Fuel Storage Facility which may be useful in your related work on Oconee.

S. K. Blackley, Jr., Chief Engineer
Mechanical & Nuclear Division

R. F. Wardell

R. F. Wardell, Design Engineer

RFW/sr

cc: W. H. Rasin, w/attachments

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INTERIM SPENT FUEL STORAGE FACILITY

By

Brian G. Schultz, Project Engineer

STONE & WEBSTER ENGINEERING CORPORATION
BOSTON, MASS.

Atomic Industrial Forum, Inc.
Fuel Cycle Conference 1977
April 26, 1977
Kansas City, Missouri

INTERIM SPENT FUEL STORAGE FACILITY

INTRODUCTION

The uncertainty associated with spent fuel reprocessing facilities and capabilities in the United States over the next few decades is a well-recognized problem in the nuclear industry. Many utilities have taken steps to incorporate high-density fuel storage racks at their existing nuclear power plants as well as those in various stages of design and construction. This is certainly the most economical solution to increasing spent fuel storage capacity for the time being. For some older plants, however, even the use of high-density fuel storage racks in existing spent fuel pools may be insufficient. Furthermore, increased storage capacity may be required due to the inability of fuel reprocessing plants, when they become operational, to reduce any backlogs of spent fuel significantly. The U.S. Energy Research and Development Administration, in its report 76-25, provides statistical data on spent fuel storage and reprocessing capabilities both present and projected in the United States. The need for additional spent fuel storage capacity is summarized in Fig. 2.

One solution to this need is a separate spent fuel storage facility. This paper describes such as design which has been designated an Interim Spent Fuel Storage Facility (ISFSF).

OBJECTIVES

Over the past two years, our organization has been involved in the development of a design for a separate spent fuel storage facility. Such a facility could serve a single site, a utility system, or a group of utilities on a regional basis. The primary objectives for the facility are shown in Fig. 3. Some of these objectives are very similar to those established several years ago in the development of our nuclear power plant standardization program. Methods of achieving each of these objectives will be described throughout this paper.

Consistent with the primary objectives, some arrangement objectives were also established. These are shown in Fig. 4.

Locating the spent fuel storage facility on an existing site has several advantages. Site meteorological and seismic data are available, and immediate licensing, detailed design, and procurement activities can begin. In addition, site access by road, rail, or barge is readily available and minimizes site preparation activities.

Existing security forces and operating personnel can be used for the facility resulting in a minimum increase in personnel requirements.

Utilization of some of the parent plant systems can minimize the cost of the spent fuel storage facility. Examples include the makeup water system, radioactive liquid and solid waste systems, and power systems.

LICENSING

To reduce the front-end licensing exposure of a utility, Stone & Webster has submitted a topical report (SWECO-7601) to the Nuclear Regulatory Commission (NRC) for review under 10CFR70. The report, submitted in November, 1976, was accepted for review by the NRC in January 1977. Fig. 5 shows the key licensing milestones. NRC approval is expected in the fall of 1977.

SITE PARAMETERS

An enveloping technique has been utilized to provide a design suitable for nearly all existing nuclear power plant sites in the continental United States. Fig. 6 summarizes the site envelope conditions.

The safe shutdown earthquake (SSE) for the actual site should not exceed 0.3 g and the subgrade conditions may be soil or rock with shear moduli ranging from 6 to 1,000 ksi.

Tornado protection is provided based on NRC Regulatory Guide 1.76 criteria for Region 1 which envelops the entire continental United States.

Due to the lengthy decay periods of the fuel expected to be stored in the facility, the limiting X/Q value is approximately 0.4 sec/m^3 to ensure that a postulated fuel handling accident will not exceed 10CFR100 limits at the site boundary. Typically, the site boundary could be as little as 200 ft. In practice, it will most likely be in excess of 1,500 ft since it would be located near the parent plant.

FACILITY ARRANGEMENT

In developing an arrangement for the ISFSF to meet the objectives, some key parameters had to be established. These included the type, quantity, and previous storage history of the fuel to be placed in the facility. Fig. 7 summarizes these parameters.

Pressurized water reactor (PWR), boiling water reactor (BWR), or a combination of the two types of fuel can be accommodated with appropriate fuel storage rack designs. The limiting quantity of fuel was established at 1,300 metric tons (as UO_2) of BWR fuel. This equates to approximately seven full cores storage capacity for a modern 1,300 MWe BWR or nine to twelve PWR cores, depending on reactor manufacturer, or approximately a 30 year storage capacity for a single 1,300 MWe reactor, with numerous combinations for two or more reactors.

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The design mix of fuel, based on out-of-core storage time, is also shown on Fig. 7.

The quantity and previous storage history of the spent fuel are based largely on engineering judgment. These parameters have been discussed with several utilities and are believed to be generally acceptable and conservative. To provide a degree of flexibility, however, the arrangement of the facility permits doubling the storage capacity either by doubling the pool length early in the detailed design or by adding a parallel pool of the same size at a later date.

Fig. 8 shows an isometric view of the facility. There are three primary areas, the rail bay area, the spent fuel storage pool area, and the auxiliary equipment area. Fig. 9 through 13 show plan and elevation views of the facility.

The facility yard grade plan view is shown in Fig. 9. The spent fuel pool bottom is approximately 25 ft below yard grade so that the spent fuel racks and spent fuel are located below yard grade. The fuel storage area is considered the only nuclear safety-related portion of the facility. The fuel pool and fuel pool structural enclosure above-grade are the only portions of the facility which must be designed to meet Seismic Category I requirements. The pool width was determined based on standard fuel handling platforms which have been seismically qualified by the major NSSS manufacturers.

A specific fuel rack design has not been developed. High-density racks of the flux trap type have been assumed for this facility for arrangement and storage purposes. Poison type racks could also be provided. In either case, rack selection would be based on the owner's requirements and competitive bidding.

A separate spent fuel shipping cask area is provided adjacent to the pool. The location of this cask area in the rail bay precludes travel of the 130 ton cask handling crane over any portion of the spent fuel storage pool.

Various fluid and electrical system components occupy most of the remainder of the facility in the auxiliary equipment area at the yard grade elevation. Other key areas at the grade elevation include the security station, health physics, locker room areas, and the facilities monitoring area.

Additional system components are located in the auxiliary equipment area at El 15 ft (Fig. 10). The largest components are the demineralized water tank and fuel pool cooling water heat exchangers.

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FACILITY SYSTEMS AND INTERFACES

A list of the systems incorporated in the ISFSP is given in Fig. 14. Consistent with the objectives for the design of the facility, most of these systems have been incorporated in the facility. Existing parent plant systems, however, have been utilized while considering the universal siting criterion.

Major facility systems are described in the following paragraphs.

The cooling water system removes heat from the fuel pool cooling system and ventilation condensing units. Major system components include two half-size pumps and a mechanical draft cooling tower.

The fuel pool cooling system maintains the fuel pool temperature at 120 F or less with the design basis heat load of approximately 30 x 10^6 Btu/hr. Principal system components include two half-size pumps and two half-size heat exchangers.

The fuel pool purification system maintains purity and clarity of the fuel pool water. It removes suspended and dissolved radionuclides. It is capable of filtering and purifying the fuel pool in 24 hr. Principal system components include two full size pumps, two filters, and a mixed bed demineralizer.

The facility heating, ventilation, and air conditioning systems limit temperatures in the pool area and equipment cubicles to less than 104 F. Offices and the facility monitoring areas are maintained at approximately 75 F and a relative humidity below 50 percent. Principal components include two 50 percent air conditioning and condensing units for the auxiliary equipment area. Three supply fans and three exhaust fans are provided for the rail bay and pool areas. A HEPA filter is provided in the event high radiation is detected.

Either truck or rail spent fuel storage casks can be accommodated in the facility. A 130-ton capacity cask handling crane moves the cask to the cask pool after appropriate inspections and initial cask cleanup. The cask head is removed, and the spent fuel is moved from cask to the spent fuel racks by the fuel manipulator platform. A fuel cask decontamination area is provided adjacent to the rail bay.

Although the facility arrangement is based on a wet cask handling system, a dry cask handling system could be accommodated with minimal structural modifications.

A summary of the principal interfaces between the ISFSF and the parent plant is shown in Fig. 15. Engineering evaluations will be made to assure that interfaces result in minimal impacts on the parent plant.

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Solid waste consists primarily of spent resins which are sluiced into a cask at the spent fuel storage facility. After removal of excess water from the cask, it is transported to the parent facility for solidification. Approximately 60 cu ft of such resin is expected annually.

Liquid waste generated in the facility is stored initially in waste tanks located within the facility. The contents of the tanks are then pumped to the parent plant for batch processing. Less than 25,000 gal per year are expected to be processed by the parent plant.

A seismically qualified source of makeup water of approximately 100 gpm should be available from the parent facility. The fire protection system should be capable of providing approximately 1,300 gpm for a minimum duration of 3 hours for the facility fire protection system.

Electric power estimated at 1,000 kVA (total for two sources) is required for the facility. This power is expected to come via the two parent plant offsite power sources.

Direct extensions of portions of the parent plants communications systems and security systems for the facility are also assumed.

SCHEDULE

A comprehensive schedule for the licensing, design, equipment procurement, and construction of the facility is under development. The total duration for the schedule is expected to be 3 to 4 years from engineering authorization to completion of preoperation testing. The duration will be governed largely by the procurement and delivery cycle for the spent fuel pool liner and cask handling crane, both of which are currently projected to require a 2 year period.

As mentioned earlier, the principal schedule benefits of the facility accrue from the use of an existing nuclear power plant site and an NRC approved design based on a topical report. These savings are conservatively estimated at 12 to 18 months.

SUMMARY

One method of providing additional spent fuel storage capacity is by means of an interim spent fuel storage facility (ISFSF) at an existing nuclear power plant site. A preapproved design based on a topical report should minimize the licensing time for such a facility.

The facility design is based on approximately seven BWR cores or twelve full PWR cores of spent fuel. This storage capacity could be doubled with minimal impact on the facility arrangement.

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The ISFSF is nominally an independent facility, but it uses existing parent plant systems and personnel to minimize cost where possible consistent with a near universal siting criteria.

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INTERIM SPENT FUEL STORAGE FACILITY (ISFSF)

567 158

77-8294

FIG. 1

NEED FOR FACILITY

- LIMITED IN-PLANT STORAGE CAPABILITIES
- LIMITED U.S. REPROCESSING
- LIMITED COMMERCIAL STORAGE CAPACITY
- FORECAST GROWTH OF NUCLEAR FACILITIES

567 159

77-8344

FIG.

OBJECTIVES

- NRC TOPICAL REPORT APPROVAL
- ACCOMMODATE BWR OR PWR FUEL
- DESIGN FOR WIDE VARIETY OF SITE CONDITIONS
- NO RESTRICTIONS ON EQUIPMENT VENDOR SELECTION
- FLEXIBILITY IN STORAGE CAPACITY

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ARRANGEMENT OBJECTIVES

- ACCOMMODATE RAIL AND TRUCK SPENT FUEL CASKS
- UTILIZE EXISTING NUCLEAR PLANT SITE
- MINIMIZE REQUIREMENTS FOR ADDITIONAL OPERATOR & SECURITY PERSONNEL
- OPTIMIZE FACILITY/PARENT PLANT INTERFACES

FIG. 4

TOPICAL REPORT MILESTONES

DATE	MILESTONE
11/76	SUBMITTAL FOR NRC REVIEW
1/77	ACCEPTANCE FOR REVIEW
4/77	NRC QUESTIONS
6/77	RESPONSE TO QUESTIONS
9/77	NRC SAFETY EVALUATION REPORT

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FIG. 5

77-8298

SITE PARAMETERS

- 0.3g SAFE SHUTDOWN EARTHQUAKE
- ENVELOPE OF SUBGRADE CHARACTERISTICS
- REGION I DESIGN-BASIS TORNADO
- FLOOD PROTECTION TO YARD GRADE
- OFFSITE ACCIDENT DOSES

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FIG. 6

SPENT FUEL PARAMETERS

TYPE: BWR, PWR, OR COMBINATION

FUEL ASSEMBLY QUANTITY LIMITS:

6000 BWR

2300 PWR

PREVIOUS TIME OF IN-PLANT STORAGE: 3 CORES

- 1 YEAR
- 2 YEARS
- 3 YEARS
- 4 YEARS

567 164

77-8891

INTERIM SPENT FUEL STORAGE FACILITY

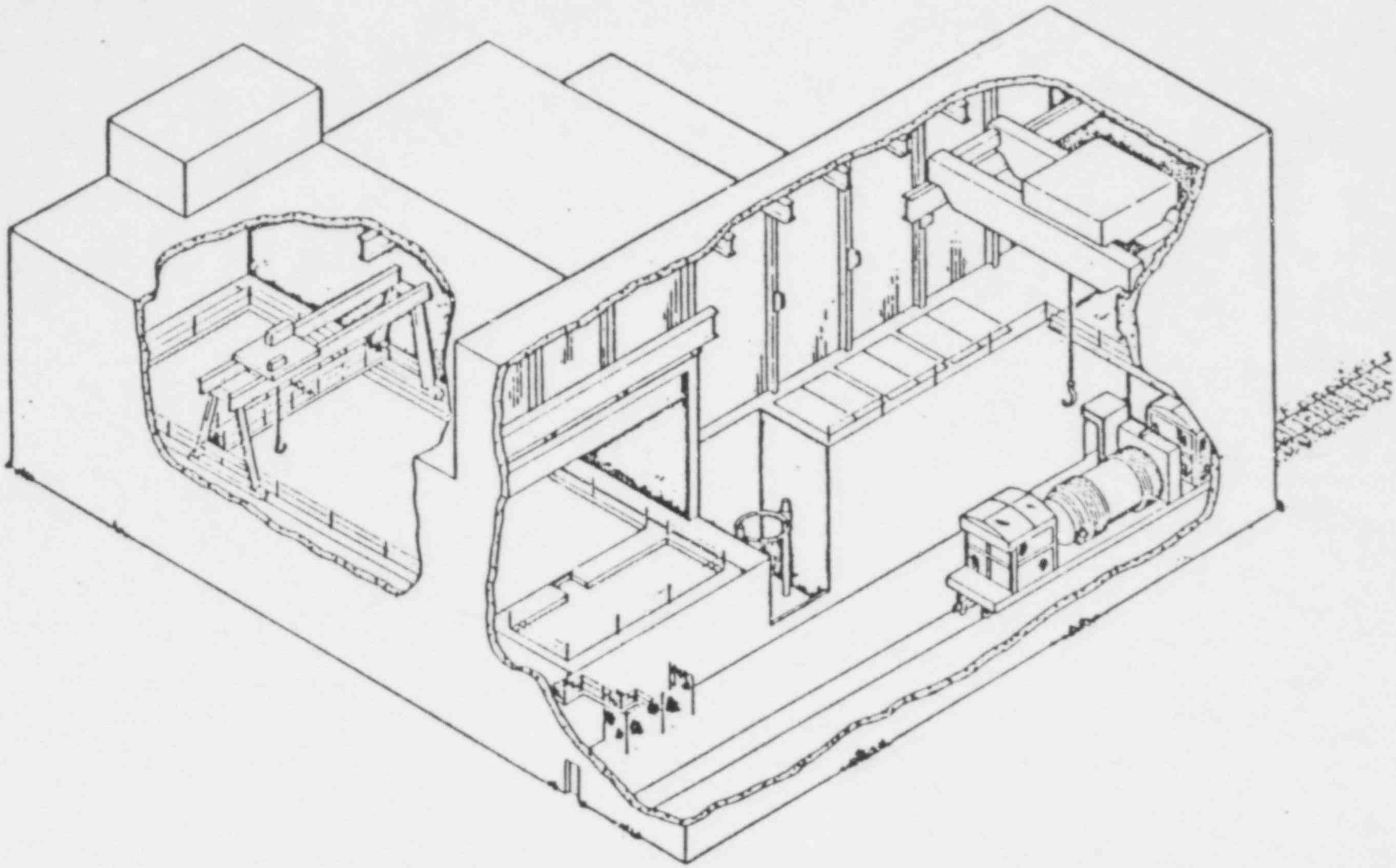

FIG. 8

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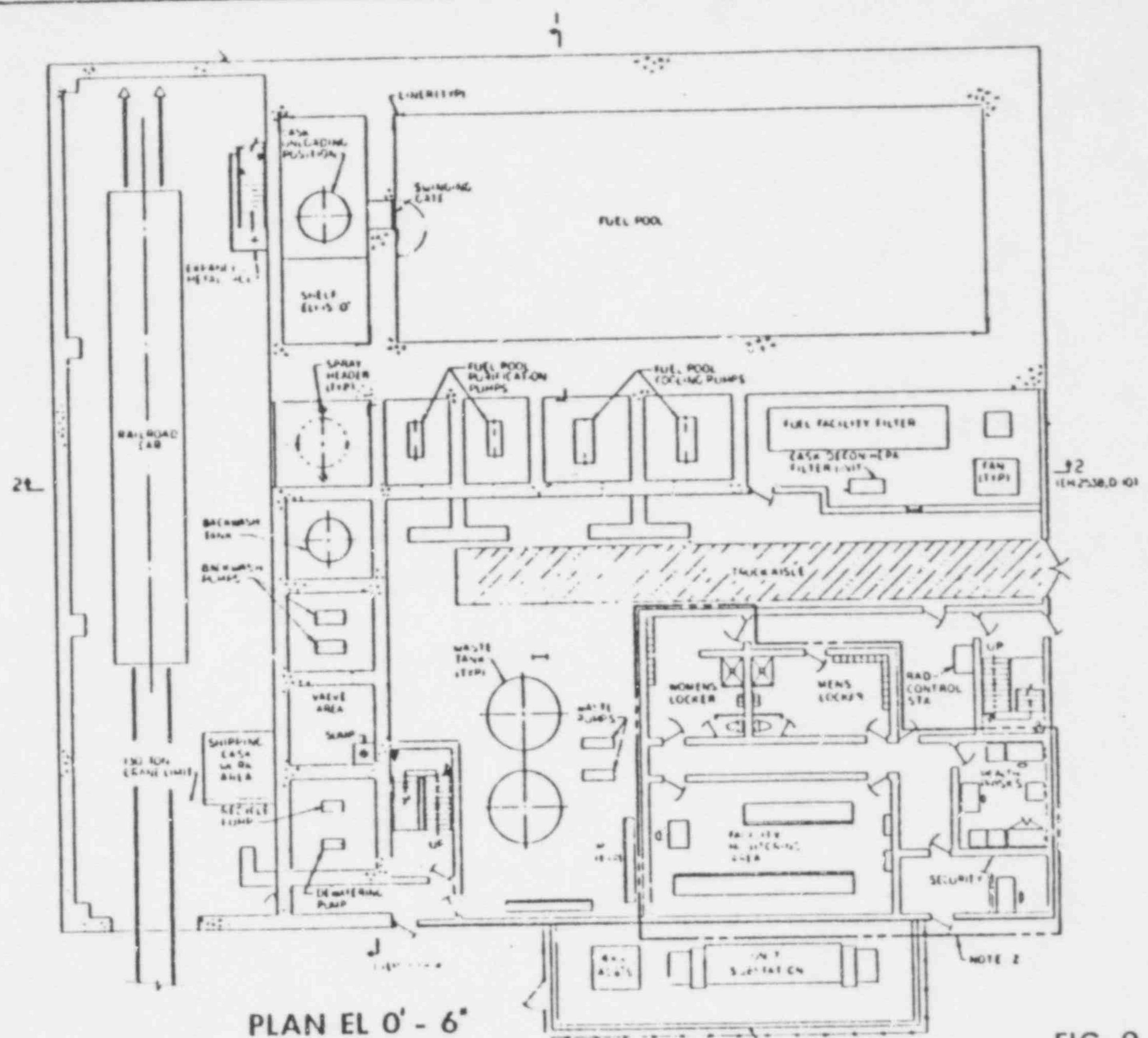
INTERIM SPENT FUEL STORAGE FACILITY



PLAN EL 0' - 6"

FIG. 9

POOR ORIGINAL

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INTERIM SPENT FUEL STORAGE FACILITY

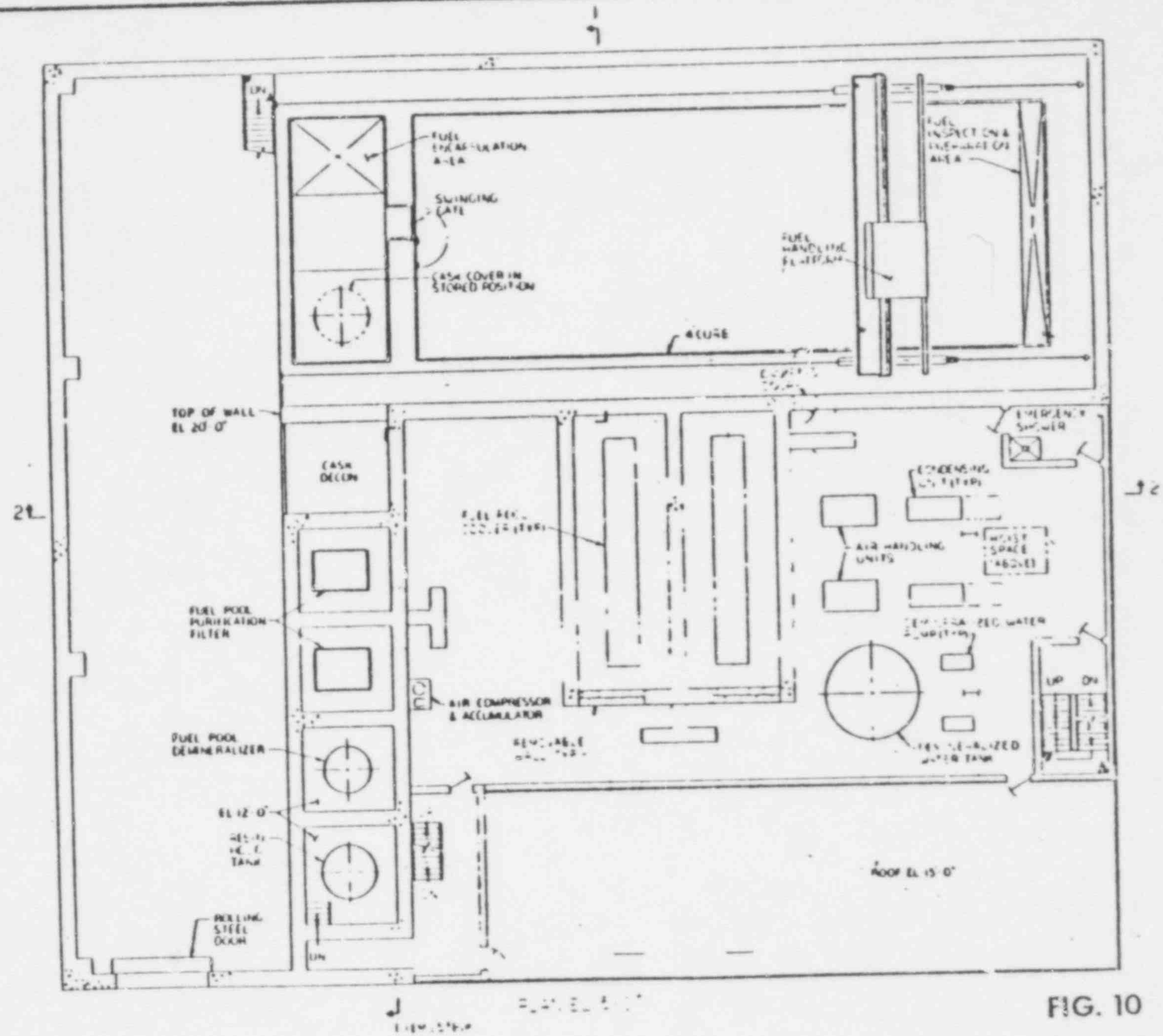

FIG. 10

POOR ORIGINAL

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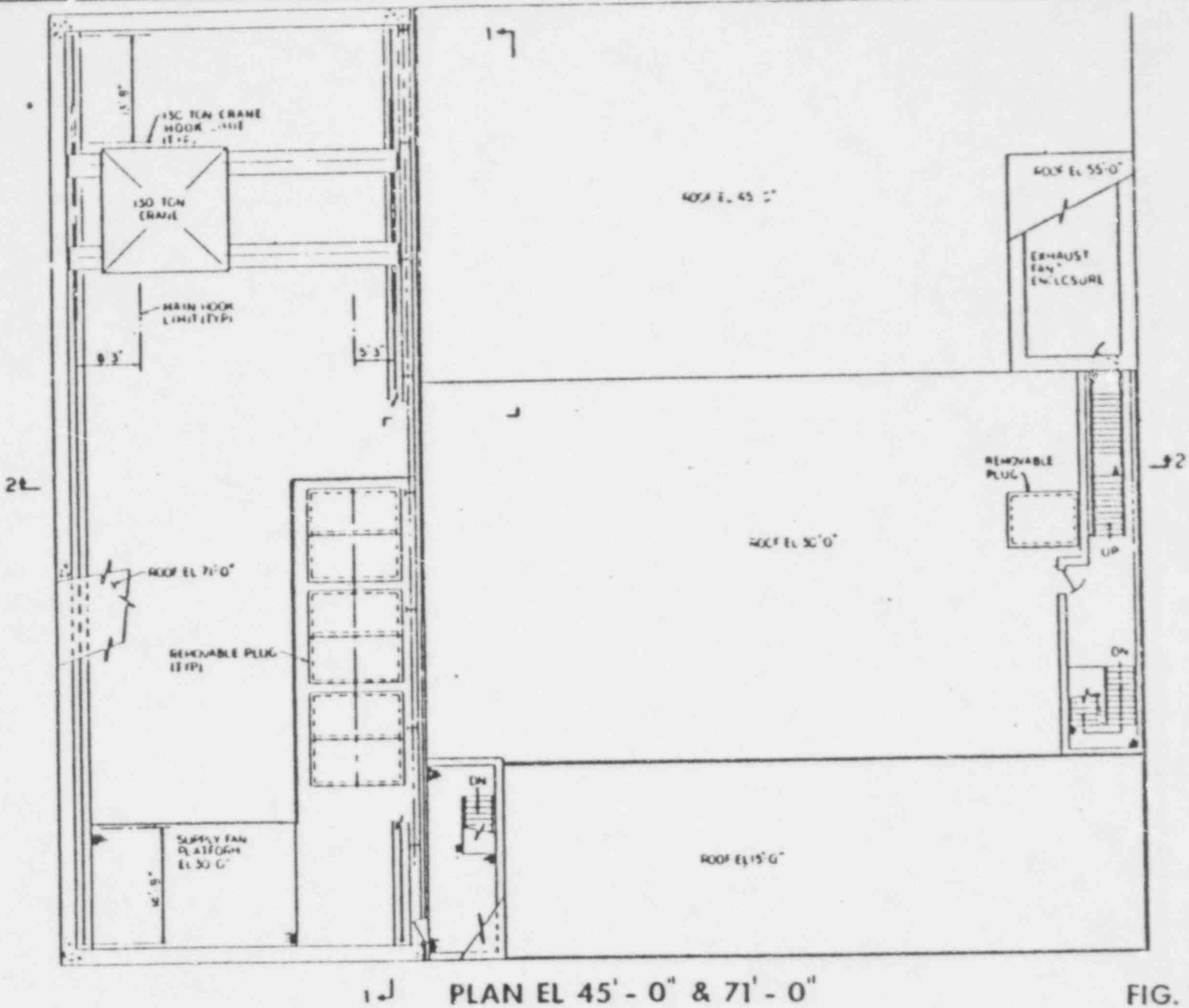
INTERIM SPENT FUEL STORAGE FACILITY



PLAN EL 45' - 0" & 71' - 0"

FIG. 11

POOR ORIGINAL

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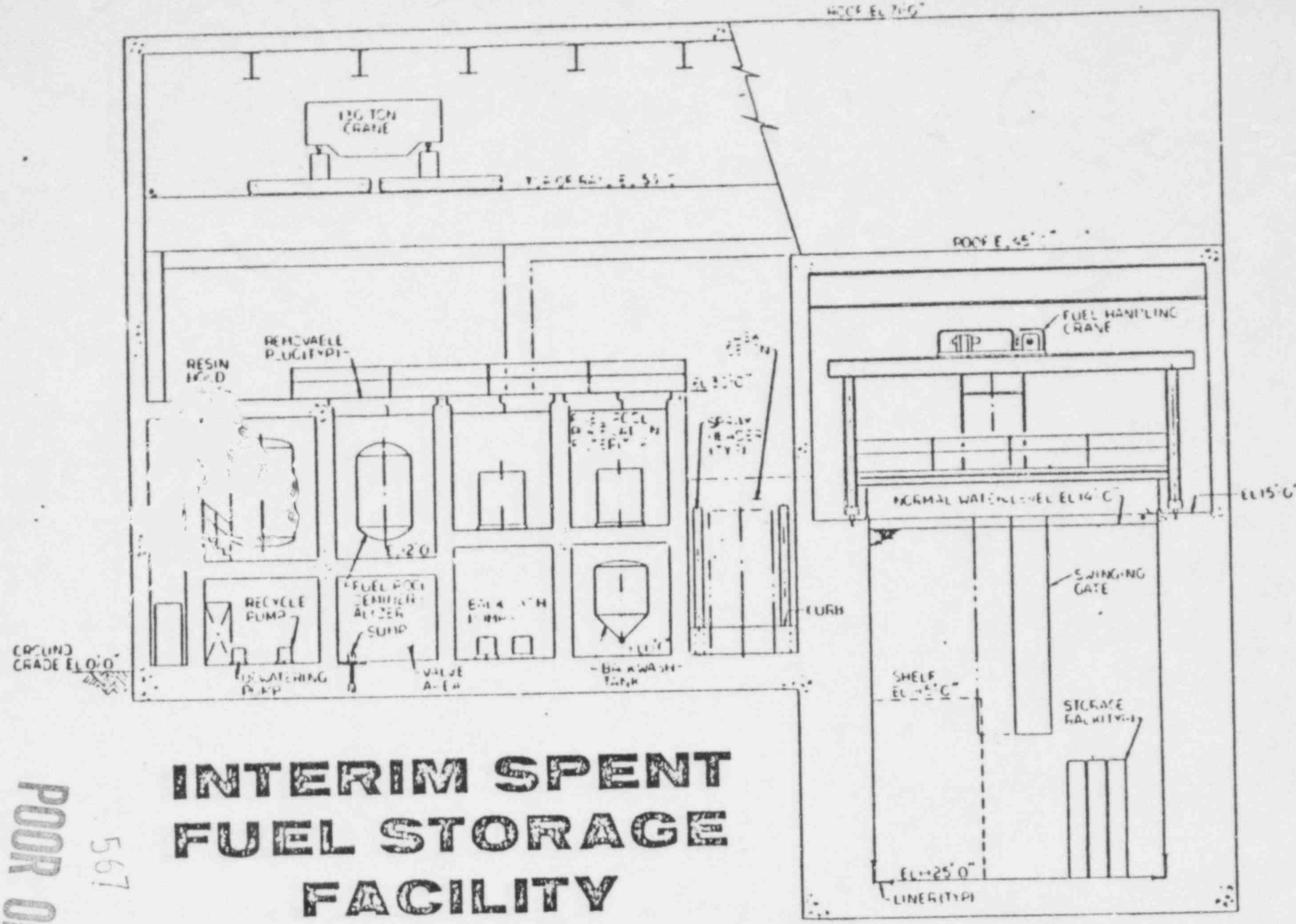

INTERIM SPENT FUEL STORAGE FACILITY

SECTION 1 - 1

FIG. 12

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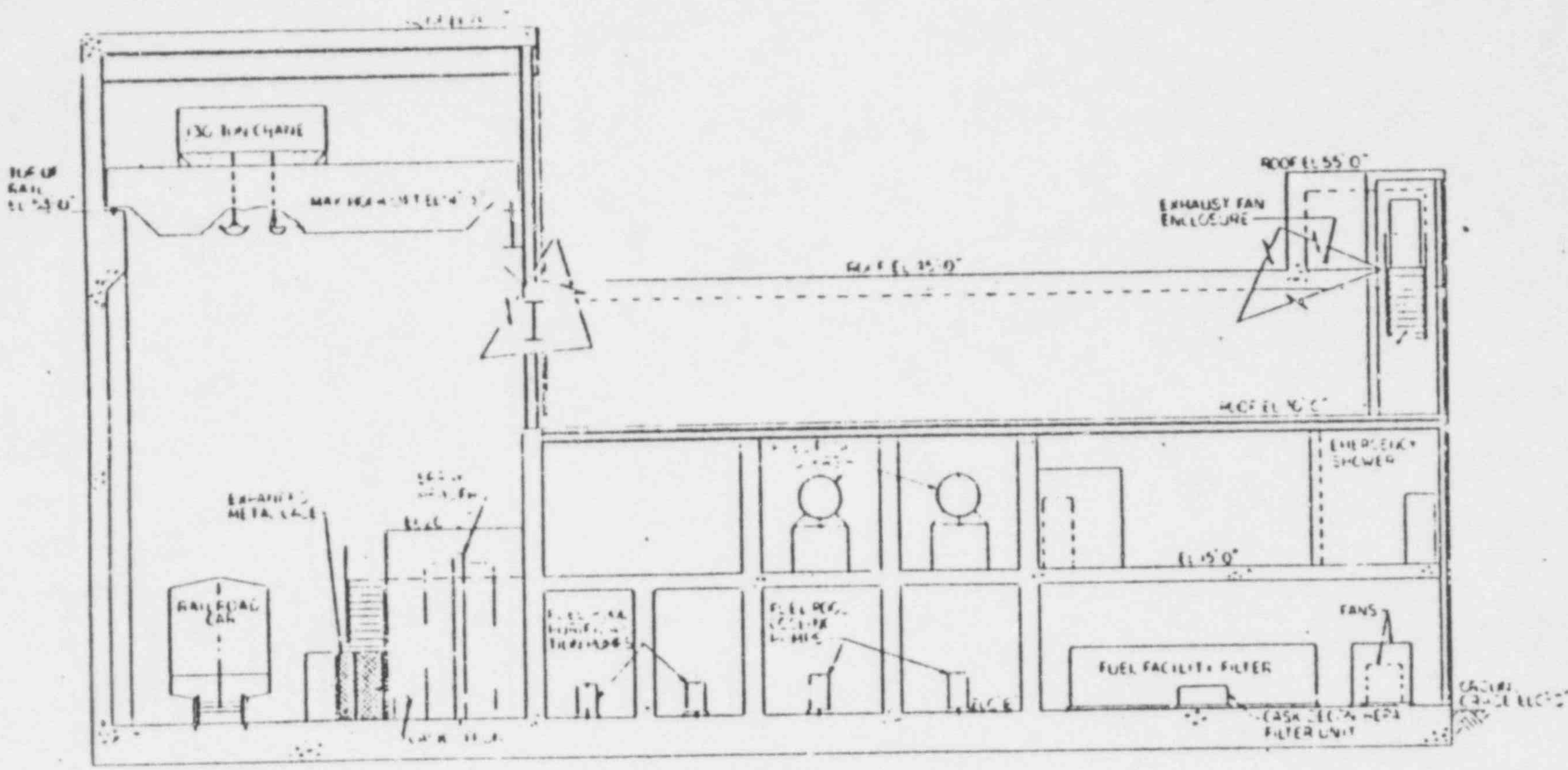
POOR ORIGINAL

INTERIM SPENT FUEL STORAGE FACILITY



SECTION 2-2

FIG. 13

567 170

FACILITY SYSTEMS

COOLING WATER

FUEL POOL COOLING

FUEL POOL PURIFICATION

SOLID RADWASTE

LIQUID RADWASTE

FLOOR & EQUIPMENT DRAINAGE

COMPRESSED AIR

FIRE PROTECTION

MAKE-UP WATER

HVAC

DEMINERALIZED WATER

FUEL HANDLING

ELECTRICAL

COMMUNICATIONS

SECURITY

567 171

T-8300

FIG.

PRINCIPAL INTERFACES BETWEEN FACILITY AND PARENT PLANT

SOLID RADWASTE

LIQUID RADWASTE

FIRE PROTECTION

MAKE-UP WATER

ELECTRICAL

COMMUNICATIONS

SECURITY

FIG. 15

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77-2307

NEWS

Stone & Webster Engineering Corporation
For further information contact: Carol S. Grigas 617-973-0051

FOR RELEASE: Immediate

Boston, July 26 -- Stone & Webster Engineering Corporation announced today that it has received a notification of acceptance from the Nuclear Regulatory Commission (NRC) for its standard design of an interim facility to store spent fuel from nuclear power plants. This is the first design of such a facility to be submitted to the NRC for pre-licensing. It can be utilized for installations at almost all existing nuclear sites.

The nation's utilities face a growing shortage of spent-fuel storage capacity because of the Administration's deferral of reprocessing of spent fuel from conventional light-water reactors. "Our standard facility could become an integral part of the Department of Energy's (DOE) proposed plans to buy and store spent fuel to prevent shutdowns of some nuclear plants whose storage pools will be filled to capacity in the mid-1980s," a Stone & Webster spokesman said. "Standardizing the facility and locating it on an existing nuclear site should enable the NRC to cut its licensing-review period by an estimated 12-18 months."

The Stone & Webster facility can store 1,300 metric tons of spent-fuel assemblies--the result of about thirty years of operation for a 1300 Mwe reactor--and can accommodate both pressurized-water-reactor and boiling-water-reactor fuel. It meets NRC guidelines for earthquakes and weather conditions for most areas of the country. Utilizing makeup-water, security power and other systems of the parent nuclear plant helps to minimize its costs.

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- more -

Stone & Webster Engineering Corporation, the largest subsidiary of Stone & Webster, Inc. of New York, engineers and constructs electric power, petrochemical, chemical, industrial, and civil works projects around the world. A leader in power plant standardization, Stone & Webster was the nation's first architect-engineer to have a standard (reference) plant approved by the NRC, and last year received a contract to design and construct the first such plant to be built by a utility company. The firm is headquartered in Boston and has operations centers in Cherry Hill, N.J.; Denver, Colo., and New York, N.Y.

7/78

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EXHIBIT C

Nuclear Assurance Corporation
24 Executive Park West
Atlanta, Georgia 30329
(404) 325-4200 Telex 549567

Weinbergstrasse 9
8001 Zurich, Switzerland
(01) 470844 Telex 57275

October 7, 1977

Pin storage option

Mr. H. T. Snead, Manager
Nuclear Fuel Services
Duke Power Company
422 South Church Street
Charlotte, North Carolina 28242

Dear Tom:

Please accept our thanks for the time and effort you, Dave and Steve gave Ralph and I last Wednesday. As discussed, I am enclosing a draft pin storage proposal which covers many of the points regarding the licensing and development of this concept. I fully recognize that your company has the in-house capability and talent to perform much of the safety analyses and the licensing work. When the appropriate time arrives, this can be worked out. In the meanwhile, I thought that the proposal spells out the tasks that we feel will have to be performed.

Best regards,

NUCLEAR ASSURANCE CORPORATION

John V. Houston, Jr.
Assistant General Manager
Sales and Marketing

JVH:mas

Enclosure

Capital Investment $400,000
Pin Storage Proposal

POOR ORIGINAL

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PROPOSAL TO

____

TO INCREASE SPENT FUEL STORAGE

AT THE

________ NUCLEAR GENERATING STATION

October 7, 1977

(Proposal Valid Through _________)

NUCLEAR ASSURANCE CORPORATION

24 Executive Park West
Atlanta, Georgia 30329
Telephone: (404) 325-4200
Telex: 549567

Weinbergstrasse 9
8001 Zurich, Switzerland
Telephone: (01) 47 08 44
Telex: 57275

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1.0 INTRODUCTION

NAC proposes to increase the storage capability of ______ ______ reactor spent fuel storage pool by up to 80%, utilizing NAC's pin storage plan and equipment.

The proposal is directed specifically to offering NAC's services in designing, manufacturing, installing and operating equipment to disassemble irradiated fuel bundles and repackage the fuel pins or rods for storage and eventual shipment. The non-fuel components of the assembly would be packaged for burial off-site. The existing pool and racks would be utilized. NAC would also provide technical support to assist you in the licensing of this equipment for use in your plant.

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2.0 SCOPE OF WORK

2.1 Program Objectives

2.1.1 To increase the storage capacity of your existing racks and pool by up to 75% by disassembling and repackaging irradiated fuel bundles.

2.1.2 To package and dispose of (through burial) the non-fuel components.

2.1.3 To increase the amount of fuel per shipment by approximately 80%.

2.2 Major Program Tasks

2.2.1 Task 1 - NRC Approvals

NAC will perform safety analyses, prepare documentation and provide support necessary for the utility to seek NRC approval for storage of fuel pins in a high density arrangement. This effort will be directed toward the use of existing storage racks and structures with only minor modifications, if any.

Nuclear criticality safety, structural, heat transfer, pool support systems, SNM accountability, ALARA and other regulatory issues will be addressed in these efforts.

NAC will also perform the necessary analyses, prepare documentation and seek NRC approval for shipment of a large number of individual fuel pins in the NAC-1 cask.

NAC has carefully analyzed one existing spent fuel pool and its stored fuel. NAC also has internally reviewed other LWR fuels. Criticality safety, heat removal, pool support systems, RAM inventory and accountability factors are all believed to be well within the acceptable range and should not be a major licensing concern. The structural analysis, including seismic, will probably require the major effort. However, structural problems can usually be "designed around".

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2.2.2 Task 2 - Safty Approvals for Fuel Disassembly

NAC will perform safety analyses, prepare documentation and seek necessary safety approvals from the Plant for disassembly of fuel, high density packaging of loose fuel pins and storage of the high density packages at the reactor pool.

Fuel disassembly operations have been performed at many reactor facilities. NAC partially disassembled irradiated fuel bundles at Maine Yankee using equipment designed and built by NAC. Fuel manufactured by all four U.S. reactor vendors has been disassembled in the past.

Necessary safety approvals for these activities are the responsibility of the reactor Plant Operation Review Committee (PORC), and do not require NRC review. PORC approvals are not obtained without careful and thorough evaluations of the procedures; but, such approvals are not unreasonably withheld. On the basis of these experiences, there is a high degree of confidence that approvals for fuel disassembly operations will be forthcoming.

Regarding the packaging of individual fuel pins for shipment, similar operations have also been performed at various reactor plants using procedures and packagings approved by the Plant Operations Review Committee. NAC casks with NRC approval have been used to transport many such individual pin packages. The proposed individual pin high density packaging differs from these past operations mostly in degree, thus NAC believes they will also be within the safety jurisdiction of PORC.

2.2.3 Task 3 - Equipment Fabrication and Test Operations

NAC will provide equipment and procedures necessary to disassemble fuel bundles and to repackage the individual pins in a high density arrangement (in a container for storage at the reactor site and for shipment in present generation casks), and package for disposal the remaining non-fuel parts of the reactor fuel assemblies. Equipment and procedures to be used for fuel disassembly will be similar to those which have been used by NAC to perform related operations at reactor sites. NAC will also disassemble and repackage the necessary number of assemblies to check out the equipment and procedures.

2.2.4 Task 4 - Disposal of Non-Fuel Bearing Components

NAC will provide disposal containers, shipping casks services and arrange for transportation and burial of non-fuel components generated in Task 3 above. (one shipment)

2.3 Customer Responsibilities

2.3.1 Provide data on fuel necessary for NAC to prepare safety analyses on criticality, heat load, RAM inventory, etc.

2.3.2 Provide drawings and engineering data on pool structure and spent fuel racks to permit NAC to make general structural and seismic evaluations.

2.3.3 Provide necessary data and drawings on pool support systems to enable NAC to analyze the water quality system, ventilation equipment, heat exchangers and cask handling equipment.

2.3.4 Provide crane service during installation and operation.

2.3.5 Provide health physics personnel as required.

2.3.6 Provide necessary utility connections and service.

2.3.7 Provide limited use of plant machine shop and personnel if required.

2.3.8 Prepare submittal to NRC for approval of pin storage.

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2.3.9 Review operations procedures and safety evaluations by Plant Operations Review Committee.

2.4 Program Phases

2.4.1 Phase 1

Preliminary analysis of pool loading, criticality, heat loads, etc. sufficient to determine if pin storage can probably be licensed. The completion of Phase 1 provides an active decision point for the utility to decide whether or not to continue. Includes 20% of Task 1 - 3 months to complete.

2.4.2 Phase 2

Encompasses the bulk of the detailed analyses and the support to enable the utility to seek approval by NRC of pin storage at the particular site. By end of Phase 2, NRC will have indicated whether pin storage is acceptable. Some additional Task 1 work, answers to questions, additional analyses, clarifications, etc. will be necessary for formal approval; but, the certainty is great enough that we can move into the equipment phase. Includes 60% of Task 1 - 4 months to complete.

2.4.3 Phase 3

Completion of licensing activities from Phase 2. Phase 3 is concerned with the development of operating procedures and the approval of these procedures and of the safety analyses by the Plant Operations Review Committee (PORC). Quality assurance requirements will be established for the equipment manufacturer, along with preliminary engineering drawings so that firm fabrication costs can be determined. Includes 20% of Task 1, 100% of Task 2, and 20% of Task 3 - 8 to 13 months to complete.

2.4.4 Phase 4

Completion of detailed engineering drawings, manufacture, acceptance and delivery followed by test operation of the equipment at the reactor pool. It includes all "de-bugging"

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operations sufficient to assure utility of a satisfactory working system. Phase 4 also includes the removal from site and burial of one shipment of non-fuel bearing components generated during the test operations. Includes 80% of Task 3, 100% of Task 4 - 6 months to complete.

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3.0 PRICE AND SCHEDULE

The preliminary total price and program schedule for each phase is shown below:

Phase	Scope	Est. (1) Time Cum.	Price
1	20% of Task 1	3 months	$ 40,000
2	60% of Task 1	7 months	110,000
3	20% of Task 1) 100% of Task 2) 20% of Task 3)	15-20 months	100,000
4	80% of Task 3) 100% of Task 4)	21-26 months	150,000 (est.)
	Estimated Total	21-26 months	$400,000

(1) After receipt of necessary engineering drawings and data from Customer.

The prices quoted for Phase 1, 2 and 3 are firm prices, except for increases resulting from changes in regulatory and PORC requirements. The preliminary price of Phase 4 will be subject to change based on the final design and on the fabrication costs estimated using engineering drawings.

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4.0 TERMS

4.1 Payments

Phase 1 $40,000

$20,000 due 30 days after commencement of program phase. $20,000 due 30 days after completion of program phase.

Phase 2 $110,000

$30,000 due 30 days after commencement of program phase. $40,000 due 90 days after commencement of program phase. $40,000 due 30 days after completion of program phase.

Phase 3 $100,000

$30,000 due 30 days after commencement of program phase. $40,000 due 90 days after commencement of program phase. $30,000 due 30 days after completion of program phase.

Phase 4 $150,000

$40,000 due 30 days after commencement of program phase. $40,000 due 90 days after commencement of program phase. $40,000 due 150 days after commencement of program phase. $30,000 due 30 days after completion of program phase.

4.2 Taxes

Customer shall be liable for and shall reimburse NAC for any sales and use taxes and any license or registration fees levied or based upon the provision of equipment and services by NAC hereunder. Such taxes and fees shall not include income taxes or franchise taxes required to be paid by NAC hereunder.

4.3 Termination

Customer has the option to cancel at any point in the program. Payment in full will be made for all completed phases. Customer will also be liable for all costs incurred by NAC including, but not limited to, engineering time (including overhead), material costs, contractor cancellation charges, travel expenses, etc., plus 20% to cover handling and administration.

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5.0 GENERAL TERMS AND CONDITIONS

5.1 Warranty

NAC warrants that all materials and equipment furnished pursuant to Section 2.2.3 shall be free from defects in materials and workmanship for a period of ninety (90) days following delivery. NAC shall, at its own expense, repair or replace any materials or equipment with exception of the consumable material which prove defective during the warranty period. Purchaser shall make available, at no charge to NAC, maintenance personnel and standard tools required to assist NAC in the repair or replacement of defective materials and equipment.

THE FOREGOING ARE IN LIEU OF ALL WARRANTIES, WHETHER STATUTORY, EXPRESSED OR IMPLIED. INCLUDING, WITHOUT LIMITATION, WARRANTIES OF MERCHANTABILITY AND FITNESS FOR A PARTICULAR PURPOSE AND WARRANTIES ARISING FROM A COURSE OF DEALING OR USAGE OF TRADE.

5.2 Codes and Standards

There are no generally accepted codes or standards applicable to the equipment provided hereunder. The equipment will be manufactured in accordance with NAC's Quality Assurance Procurement Prodecure and to quality standards to be established by NAC which represent good shop practice. NAC shall, upon request, following receipt of order, provide Purchaser with a copy of the NAC standards.

5.3 Demonstration at Plant Site

After set up of the equipment at the plant site, the operation of the equipment will be demonstrated.

5.4 Force Majeure

If, as a result of a force majeure, NAC is unable to carry out fully or in part its obligations hereunder, NAC shall give Purchaser prompt written notice of the force majeure describing the same in reasonable detail. Thereupon, the obligations of NAC, so far as they are affected by the force majeure, shall be suspended during, but no longer than, the continuance of the force majeure. NAC shall use all reasonable diligence to remove the force majeure as quickly as possilbe, but shall not be required to settle strikes or labor difficulties against its best judgment. The term "force majeure"

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as employed herein shall mean an act of God; strike or other labor disturbances; act of war; blockage; public riot; fire; storm; flood; explosion; action or inaction by government or other parties; unavailability of equipment; and any other cause, whether of the kind specifically enumerated or otherwise, which is not reasonably within the controls of NAC.

5.5 General Limitations of Liability

5.5.1 NAC's total liability for all claims of any kind, whether based upon contract, tort (including negligence) or otherwise, for any loss or damage arising out of, connected with, or resulting from the performance or breach of this agreement shall in no case exceed the amount of the price of the specific services or equipment supplied which give rise to the claim, or ten thousand dollars ($10,000.00) whichever is greater. In applying the monetary limitation of NAC's total liability, such liability shall be reduced by the sum of (1) any damages paid to Purchaser by NAC, and (2) any refund of the price for the services or equipment involved.

5.5.2 In no event, whether as a result of breach of contract, tort liability (including negligence) or otherwise, and whether arising before, during or after completion of NAC's obligations hereunder or any Purchase Order pursuant thereto, shall NAC be liable for losses or damages caused by reason of unavailability of Purchaser's equipment (including, but not limited to, loss of use, profits or revenue, inventory or use charges, interest charges or cost of capital, or claims of Purchaser's customers), or special, consequential or penal damages of any nature.

5.5.3 The liability of NAC for any claims, whether based upon contract, tort (including negligence) or otherwise, for any loss or damage arising out of, connected with, or resulting from, the performance or breach of this agreement shall be limited to specifically identified written claims submitted by Purchaser to NAC prior to the expiration of one (1) year after the occurrence of the event or events

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upon which the claim is based with respect to those claims which are unrelated to specific services or equipment.

5.5.4 The provision of this Section 5.5 and of the other Sections of this agreement providing for limitation of or protection against liability of NAC shall also protect its suppliers and shall apply to the full extent permitted by law and regardless of fault and shall survive either termination pursuant to this agreement or cancellation, as well as the completion of the services hereunder.

5.5.5 The provisions of this Section 5.5 shall apply notwithstanding any other provisions of this agreement.

5.6 Property Damage Waiver

Neither NAC nor its suppliers shall have any liability to Purchaser or its insurers for nuclear damage to any property located at the site. To the extent that Purchaser or its insurers recover damages from a third party for nuclear damage to which the foregoing waiver applies, Purchaser shall indemnify NAC and its suppliers against any liability for any damages which such third party recovers over from NAC or its suppliers for such nuclear damage. As used herein, "liability" means liability of any kind at any time whether in contract, tort (including negligence) or otherwise; "nuclear damage" means any loss, damage, or loss of use, which in whole or in part is caused by, arises out of, results from, or is in any way related, directly or indirectly, to the hazardous properties of source, special nuclear or byproduct material, as those materials are defined in the Atomic Energy Act of 1954; and "site" means the area identified as the "location" in either (1) the nuclear liability insurance policy, or (2) the governmental agreement of indemnity issued to Purchaser pursuant to the Act and applicable regulations t hereunder, or (3) both. At NAC's request, Purchaser will furnish any supplier with a statement of the protection available to the supplier.

5.7 Contract Changes and Extra Work

The terms of this agreement shall not be changed, superseded, or supplemented except by written contract change order duly executed by officers or

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designated representatives of NAC and Purchaser and no claim for extra equipment or services shall be valid unless authorized by written contract order fully executed by authorized officers or designated representatives of NAC and Purchaser.

5.8 Assignment and Subcontracting

5.8.1 Assignment - Any assignment by NAC of this agreement or any right hereunder without the prior written approval of Purchaser shall be void and not merely voidable.

5.8.2. Subcontracting - Should NAC desire to subcontract any portion of this contract to another party, NAC shall first secure Purchaser's approval of the proposed subcontractor. Such approval shall not be unreasonably withheld.

5.9 Non-Discrimination in Employment

NAC shall comply with the provisions of Paragraph 1 through 7 set forth in Section 202 of the United States Presidential Executive Order No. 11246 of September 24, 1965 as may be modified or substituted for from time to time.

5.10 Notices

All notices, requests, and approvals required under this agreement shall be in writing and shall be served personally or by certified mail upon Purchaser and upon NAC at 24 Executive Park West, Atlanta, Georgia 30329, ATTN: Mr. Jack D. Rollins, Vice President, or at such other address as any party may from time to time designate in writing.

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APPENDIX A

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NAC QUALIFICATIONS AND EXPERIENCE

Nuclear Assurance Corporation is a combination of information services, data analysis and field support organized to serve the nuclear energy industry: utilities, reactor vendors, equipment suppliers, uranium mining and milling companies, converters and reprocessors, government agencies, financial institutions, and research organizations.

Founded in 1968 in Atlanta, Georgia, NAC expanded to include a European Operations Office in Zurich, Switzerland in 1972 and a Uranium Operations Office in Grand Junction, Colorado in 1974. It now serves clients from virtually every country with an interest in the nuclear industry.

In addition to basic fuel cycle data and custom analyses, NAC provides uranium property management and a variety of on-site servies such as spent fuel shipping, fuel inspection, and non-fuel waste disposal. Sites where NAC hardware services have been used include Ft. Calhoun, Big Rock Point, Palisades, Oyster Creek, Turkey Point, Oconee, H. B. Robinson, Kewaunee, Point Beach, San Onofre, Indian Point, Battelle-Columbus, Aerojet-Idaho, B&W-Lynchburg, GE-Morris, NFS-West Valley, Dresden, Maine Yankee, and Quad Cities.

NAC will execute its portion of the indicated work scope using existing staff from its Engineering and Transportation Services (ETS) Division and its Fuel-Trac© Division.

NAC's ETS Division is responsible for the maintenance and operation of NAC's spent fuel shipping cask fleet. The division also provides specialized on-site services, such as fuel inspection; non-fuel waste compaction, packaging and disposal; and design and development of special-purpose underwater tools.

In the area of transportation of radioactive material, NAC's experience is comprehensive. NAC owns and operates four legal weight truck (NAC-1) casks, along with associated transport trailers and special auxiliary handling equipment. NAC is the most experienced shipper of irradiated fuel and components in the United States. In 1975 and 1976 alone, over 150 individual shipments were made; in 1977, over 200 are planned. The casks have interfaced at some 10 different nuclear facilities in the land transport of irradiated fuel from late-generation PWR and BWR nuclear reactors.

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NAC personnel have more than 30 years' cumulative experience in the design, certification and operation of radioactive material transportation packagings. They have been responsible under contract or in-house funding for:

- Fabrication and operation of the NAC-1 casks, including the implementation of a quality assurance program covering fabrication and operation. Work was internally funded and was performed by J. D. Rollins, C. C. Hoffman, and D. M. Collier.

- Conceptual design study of an underground plutonium storage facility in granite plutons. Work internally was funded at approximately $250,000 and was performed by J. D. Rollins and C. B. Woodhall, with support of outside engineers and scientists specializing in earth sciences.

- Conceptual design of a large-capacity (7 PWR/18 BWR elements) rail shipping cask incorporating innovative features such as redundant trunnions, detachable fins, and all-steel shielding. Work was internally funded and was performed by J. D. Rollins, R. E. Best, M. E. Mason, H. R. Panter, and R. A. Schreiber.

- Thermal analysis of a dry spent fuel storage facility. Work done in 1975 for Atlantic Richfield Company. Work performed by J. D. Rollins, M. E. Mason, and C. C. Hoffman.

- Cost-benefit analysis of alternative dispositions of plutonium on LWR fuel cycle operations, including spent fuel transportation, plutonium storage, spent fuel storage; and waste management for cases of prompt recycle deferred reprocessing, and no reprocessing. Considerations included environmental aspects, fuel cycle costs, and material and plant protection. Work done in 1974 for the AEC as part of GESMO. J. D. Rollins and D. M. Collier were key contributors to work.

- Study of an optimum irradiated fuel transportation system for Sweden, including compilation of worldwide cask systems, identification of future cask design and operating parameters, evaluation of operations requirements for handling casks and selection of optimum cask design. Work was done in 1976 for Swedish Nuclear Fuel Company. Work was performed by R. E. Best, M. E. Mason, J. D Rollins, and C. C. Hoffman.

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- Design, fabrication, and operation of equipment for the disassembly of irradiated PWR fuel. Work was done in 1977 for Maine Yankee. Work was performed by J. M. Viebrock, R. E. Best, M. E. Mason, H. R. Panter, and R. A. Schreiber.

- Analysis and conceptual design of hardware which would allow an increase in the storage capacity of a reactor spent fuel pool by approximately 75% over the capacity possible with high density fuel storage racks. Work was done in 1976. Work was performed by J. M. Viebrock, C. C. Hoffman, R. E. Best, H. R. Panter, M. E. Mason, J. D. Rollins, and R. A. Schreiber.

- Design, fabrication and operation of equipment to cut and package BWR fuel channels, LPRM's and poison curtains for shipment to a burial ground. Work was done in 1976/77 for Jersey Central Power and Light at a cost of $347,000. Similar services are also being provided to TVA at a cost of $116,000. Work was performed by J. M. Viebrock, R. E. Best, H. R. Panter, M. E. Mason, J. D. Rollins, and R. A. Schreiber.

- Design study for fuel storage pool modification, including criticality studies. Work was done in 1975 for Nuclear Fuel Services. Work was performed by J. D. Rollins.

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