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November 27, 1991

Mr. Steve Tribble, Director
Division of Records and Reporting
Florida Public Service Commission
101 East Gaines Street
Tallahassee, FL 32399

ORIGINAL FILE COPY

RE: DOCKET NO. 910981-EI

Dear Mr. Tribble:

Enclosed for filing please find the original and fifteen (15) copies of Florida Power & Light Company's site-specific economic cost study in the above referenced docket.

This filing is in accordance with Order No. 21928 in Docket 870098-EI which requires Florida Power & Light Company and Florida Power Corporation to file site-specific economic cost studies for each nuclear generating plant to determine if it is cost justified to retain the noncontaminated portion of the nuclear plant assets for use with a new generating station.

Respectfully submitted,

Matthew M. Childs, P.A.

MMC/eg

cc: All Parties of Record

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CERTIFICATE OF SERVICE

DOCKET NO. 910981-EI

I HEREBY CERTIFY that a true and correct copy of Florida Power & Light Company's Site-Specific Economic Cost Study has been furnished to the following persons by hand delivery or by U. S. Mail on this 27th day of November, 1991.

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MATTHEW M. CHILDS, P.A.

BEFORE THE

FLORIDA PUBLIC SERVICE COMMISSION

DOCKET NO. 910981-EI

FLORIDA POWER & LIGHT COMPANY

IN RE: NUCLEAR DECOMMISSIONING COST STUDY

ECONOMIC ANALYSIS OF REUSING NON-CONTAMINATED NUCLEAR PLANT ASSETS

Florida Power & Light Company
In Re: Nuclear Decommissioning Cost Study

Index of Documents

I. Post-Decommissioning Component Reuse Technical Feasibility Study for the St. Lucie and Turkey Point Sites -- prepared by ABB Combustion Engineering Nuclear Power, December 1990.

II. Decommissioning Cost Variations Considering the Re-use of Plant Components Off Site for the Turkey Point and St. Lucie Generating Stations -- prepared by TLG Engineering, Inc., October 1991.

III. Economic Analysis of the Reuse of Non-contaminated Nuclear Components -- prepared by Florida Power & Light Company, October 1991.

Summary of Study

On September 21, 1989, the Florida Public Service Commission (FPSC) issued Order No. 21928 in Docket No. 870098-EI, Petitions for approval of an increase in the accrual of nuclear decommissioning costs by Florida Power Corporation (FPC) and Florida Power & Light Company (FPL). Along with approving increases in the accrual of nuclear decommissioning costs for FPC and FPL, the Commission ordered the companies to file site-specific economic cost studies for each nuclear generating plant to determine if it is cost justified to retain the non-contaminated portion of the nuclear plant assets for use with a new generating station. On August 15, 1991, FPL requested an extension of time to file its studies from September 22, 1991 to November 30, 1991, and in Order No. 25050 issued on September 12, 1991, the Commission granted approval of the extension.

FPL owns and operates four nuclear units at two separate sites. The site for St. Lucie Units 1 and 2 consists of approximately 1,132 acres on Hutchinson Island in St. Lucie County about halfway between the cities of Fort Pierce and Stuart. The St. Lucie Unit 1 operating license will expire five years prior to the St. Lucie Unit 2 license expiration date. For the St. Lucie site, FPL selected to Mothball Unit 1 prior to the Integrated Prompt Removal/Dismantling of both units, in conjunction with the expiration of the Unit 2 license. This method allows for a one time mobilization of contractor personnel and equipment and therefore represents the lowest cost alternative.

The Turkey Point plant site (which includes 2 nuclear and 2 fossil units) consists of approximately 12,372 acres in Dade County on the shore of Biscayne Bay, 25 miles south of Miami and is adjacent to oil and gas fired Units 1 and 2. For the Turkey Point site, since the licenses for both units expire at the same time, FPL chose the Integrated Prompt Removal/Dismantling method which provides the lowest cost and utilizes individuals familiar with the facility to support the dismantling effort.

In order to complete this study, FPL engaged ABB Combustion Engineering Nuclear Power (CE) to provide appropriate technical assistance regarding potential reuse of non-contaminated components. CE categorized the identified components contained in the site-specific equipment lists as contaminated or non-contaminated and then into generic equipment categories. They then identified which equipment categories were technically feasible for potential reuse either on-site or off-site. After each equipment category was evaluated, eight were identified by CE as being technically feasible for reuse off-site. The eight equipment categories identified are: breathing air accumulators, cabinets, large cranes, diesel generators, ion exchangers, load centers/motor control centers, low voltage motors and safety/relief valves.

While CE's analysis identified components for potential reuse on-site and off-site, only those components identified for reuse off-site are included in this study. As presented in FPL Witness, Roberto Denis' testimony in Docket No. 870098-EI, "...without concluding whether there will be equipment and facilities at the Turkey Point and St. Lucie sites that are capable of being reused, there are significant uncertainties regarding the physical requirements of repowering an existing turbine-generator power block which prevent a final determination of whether or not there is any practical or economic use of equipment currently at those sites."

Mr. Denis continues that, "The location of both sites is such that the repowered facility would most likely be limited to a gaseous fuel which could be piped into the site. Solid fuels, such as coal would require extensive transportation systems which neither site currently has. Oil most certainly will not be an economical fuel. Repowering with new nuclear reactors at those sites presents a greater political uncertainty than it is today. Therefore, the only foreseeable means of repowering at this time, from a fuel and environmental requirements standpoint, is the use of combustion turbines with heat recovery steam generators (CT/HRSG) to produce steam to turn the existing turbine generators." As further stated in Mr. Denis' testimony, "another possibility would be to provide some of the steam using a new or existing boiler and provide only partial requirements from the CT/HRSG sets. This is known as partial repowering. Use of the existing steam generator is not a viable option, since it is part of the 'contaminated' system, and a new boiler as a practical matter, would probably not be economical since the partial repowering option results in reduced overall efficiencies compared to a full repowering. Partial repowering is, therefore, an unlikely option." In order to install sufficient CT/HRSG capacity necessary for a full repowering to supply the existing steam turbines at Turkey Point Units 3 and 4 and St. Lucie Units 1 and 2, some critical concerns arise concerning land availability, fuel availability and transmission requirements.

Based on current FPL advanced CT projects, it is assumed that a block of four CT/HRSG sets, including one control building, would require an area about 5 acres. Accordingly, a land area of 45 acres and 40 acres would be required at St. Lucie and Turkey Point, respectively, to site the CT/HRSG equipment. At St. Lucie, it appears that enough area may be available between the existing units and the intake canal. However, mangroves and wetlands abound in this area and would have to be removed. It is doubtful that permits could be obtained to fill this entire area. Space would also be scarce for ancillary equipment such as wastewater/stormwater treatment systems and emergency fuel oil storage tanks. At Turkey Point, the site is surrounded by mangroves on the north and west, cooling canals on the south, and Biscayne Bay on the east. Virtually all available space is occupied by plant related facilities, either fossil or nuclear. Based solely on land area requirement, St. Lucie would be very doubtful while Turkey Point is impossible.

Regarding fuel availability, there is currently no gas pipeline into either nuclear site to support the approximately 950 million standard cubic feet (SCF) per day of gas for Turkey Point and approximately 1,120 million SCF per day of gas for St. Lucie that the repowered units at each site would require. Additionally, these volumes respectively represent 100% and 120% of the currently planned Florida Gas Transmission capacity into the entire state of Florida. (At full load, Turkey Point would require 1,200 million SCF per day and St. Lucie 1,400 million SCF per day.)

As for transmission requirements, the installation of the CTs alone would add between 5,000 and 6,000 MW to each nuclear site or double the transmission capability at Turkey Point and triple the transmission capability at St. Lucie. Grid stability studies would need to be performed and right of way and permits would be required for the additional transmission lines. While the transmission upgrades are not impossible, when combined with the land availability and fuel constraints, full repowering of the 40 year old steam equipment at the nuclear site is not a viable technical nor economical option and, therefore, further analysis was limited to off-site use of equipment.

TLG Engineering (TLG), the firm that produced FPL's last decommissioning studies, developed a report on the decommissioning cost variations considering the re-use of plant components off-site. Using the information generated by CE, TLG modified the 1987 decommissioning cost estimates to reflect the additional effort necessary to remove certain components in a more controlled fashion than would be necessary to decommission and dispose of them as scrap.

Utilizing the CE and TLG studies, FPL evaluated the economic feasibility of reuse for the eight equipment categories of non-contaminated components identified by CE as being technically feasible for reuse off-site. The figures provided by TLG were escalated from 1987 to 1991 dollars and the economic feasibility of reuse was performed for each equipment category by comparing the current ($1991) total cost of reusing all the components in a category to the current ($1991) cost of purchasing new components in a category. The total cost of reuse is comprised of several cost components namely, refurbishment, storage and maintenance, transportation and incremental decommissioning. In the event the total cost of reusing a component category was lower than the total new equipment cost, the reuse of that category could be economically justifiable.

After the final analysis six categories were eliminated from the reuse category as not being economically justifiable for reuse compared to the cost of new equipment. The remaining two items, large cranes and emergency diesel generators could possibly be reused. Given the uncertainty of reuse and the minimal incremental dollar impact on FPL's total decommissioning costs, an adjustment at this time is inappropriate.

FPL's next decommissioning study, which is due for review no later than September 21, 1994, will also consider other factors since the 1987 timeframe when FPL's decommissioning studies were filed. In conclusion, FPL recommends that no action be taken at the current time to revise the current decommissioning study methodology. At the time of FPL's next decommissioning study, consideration will be given to the reuse of large cranes and diesel generators, and, if appropriate, a salvage value will be computed and included in the decommissioning study. This salvage value will serve to reduce overall decommissioning costs. However, there will be additional costs included for more controlled decommissioning, lay-up and maintenance costs as well as any additional costs not considered in previous decommissioning studies.

Document No. 849983-01
Revision 0

POST-DECOMMISSIONING COMPONENT REUSE TECHNICAL FEASIBILITY STUDY

FOR THE

ST. LUCIE and TURKEY POINT SITES

Prepared for

FLORIDA POWER and LIGHT

By:

ABB COMBUSTION ENGINEERING NUCLEAR POWER
JUNO BEACH ENGINEERING OFFICE

December 1990

Prepared by: [signature] / 2-4-91

Reviewed by: [signature] / 2-4-91

Approved by: [signature] / 2/4/91

TABLE OF CONTENTS

Page

ABSTRACT

ABSTRACT

The Florida Public Service Commission (FPSC) Order No. 10987 and 10CFR50.75 mandate that utilities operating nuclear power generating stations establish a separately funded reserve to cover the estimated costs for decommissioning the stations. The decommissioning cost estimates are reviewed and updated every five years. In April and June 1988 Florida Power and Light (FPL) filed updated nuclear decommissioning studies for Turkey Point Units 3 and 4 and St. Lucie Units 1 and 2, accompanied by a petition seeking approval of revised annual accruals to its nuclear decommissioning reserve.

The FPSC Order No. 21928, dated September 21, 1989, granted the petitions and approved the increase in the accrual of nuclear decommissioning costs by FPL. In addition, the FPSC ordered that site-specific economic studies be "performed by FPL and Florida Power Corporation (FPC) for each of their nuclear generating plants to determine if it is cost justified to retain the non-contaminated portion of the nuclear plant assets for use at a new generating station."

A two phase approach was adopted for identifying and providing the appropriate technical information to determine which non-contaminated components from decommissioned nuclear units may be used in other generating stations. Phase one - Equipment Identification and Reuse Feasibility identified the major component categories for analysis with respect to possible reuse. Also included in phase one was an assessment of the impact on the design, procurement and construction activities for a new generating unit by reusing components from a decommissioned plant. Phase two - Component Categorization involved the categorization of the components contained on the site-specific equipment lists into generic component categories determined in phase one and the subsequent compilation of a list of components which are technically feasible to be reused.

The results of this study are based on estimated component life cycles reported by the respective vendors as well as by industry experience data. The evaluation in this report assesses the feasibility of reusing the equipment on a component type basis. It should be noted that the actual condition of the components at the time of decommissioning may vary from that predicted in this report depending on in-service time and on preventive maintenance effectiveness. A more detailed reuse evaluation for each specific piece of equipment would be required near the time of plant decommissioning to ensure reuse represents the best option for the design of new generating facilities. At decommissioning, a better equipment performance history would be available to be factored into the actual technical feasibility assessment.

This evaluation determined that the component categories from the St. Lucie and Turkey Point units which could be reused at a new power generating facility include the following: breathing air accumulators, electrical cabinets, large cranes, diesel generators, ion exchangers, load and motor control centers, low voltage motors, moisture separator reheaters and safety/relief valves. Other components that could only be reused at the existing sites should conversion be utilized include: cable trays, cables, conduit, communications equipment, condenser, elevators and lighting equipment.

INTRODUCTION

INTRODUCTION

BACKGROUND

Florida Power and Light Company received its first decommissioning order on July 13, 1982 (Order no. 10987, Docket No. 810100-EU(CI)) in which the FPSC required the establishment of a separate funded reserve with the sole purpose of accumulating the estimated costs of decommissioning each nuclear unit operated by FPL. According to this order, the decommissioning cost estimate was to be reviewed and/or changed at least every five years thereafter.

To comply with this ruling, FPL filed updated decommissioning cost estimate studies with the FPSC in April, 1988 (St. Lucie, Ref. 1) and June, 1988 (Turkey Point, Ref. 2). The FPSC approved these updated decommissioning cost estimates and ordered an increase in the annual decommissioning accruals (Order No. 18627, Docket No. 870220-EI) to be effective January 1, 1989. Following this settlement and testimony presented by Mr. George W. Woerner (employed at the Auditing and Financial Analysis Division of the FPSC) on March 31, 1989 (Reference 3), the FPSC ordered (Order No. 21928, Docket No. 870098-EI) a site-specific economic study be performed for each FPL nuclear generating plant. This study was to determine if it was cost justified to retain the non-contaminated portion of the nuclear plant assets for use at a new generating station. (New generating stations planned to be built by FPL in the next ten years are assumed to include only fossil units as discussed in Reference 4.)

The decommissioning cost study submitted by FPL (as referenced above) also chose a site-specific approach for each plant site rather than a generic study to estimate the dollar amount necessary for decommissioning. A site-specific study inventories the physical plant, identifies radiological activities and applies Company experience and regionalized costs to estimate the total cost of decommissioning. A principal contributor to this site-specific study is the technical input for feasibility of component/equipment reuse which is provided by this report.

With regard to the decommissioning methods that Florida Power and Light Company has selected, a different method was utilized for each of its nuclear plants (Ref. 1 & 2). The Integrated Prompt Removal/Dismantling method was chosen for the Turkey Point units. This method provides the lowest cost and utilizes individuals familiar with the facility to support the dismantling effort. This method is recommended by the Nuclear Regulatory Commission (NRC) because it eliminates a potential long term safety hazard.

For the St. Lucie site, FPL has selected to Mothball Unit 1 prior to the Integrated Prompt Removal/Dismantling of both Units. St. Lucie Unit 1 is scheduled to complete its operating license five years prior to the St. Lucie Unit 2 termination date. This method allows for a one time mobilization of contractor personnel and equipment for decommissioning activities when the two plants have different scheduled shutdown dates and therefore represents the lowest cost alternative.

STUDY OBJECTIVE

The purpose of this engineering report is to document the cataloging and evaluation of non-contaminated plant equipment/components at the St. Lucie and Turkey Point nuclear units. The information provided by this report will form the basis for a plant decommissioning economic feasibility study that, among other items, will address the reuse of the non-contaminated components at power generating facilities. These plants include only fossil units that could be sited at the existing nuclear sites, or at other locations (Reference 4). However, no attempt was made to assess the technical feasibility of reusing equipment with any specific design parameters. The evaluation consisted of two major phases:

1) Categorization of equipment and components into generic component categories and an evaluation of their reuse feasibility and

2) Application of these evaluations to the site specific component lists.

The final product of this project is a site specific list of non-contaminated components and equipment which could be technically feasible for reuse in other power plants. The equipment/components identified would be those which would require minimal refurbishment and possibly could be installed in new fossil plants after removal following decommissioning of the St. Lucie and Turkey Point nuclear units.

For the component categories which are found to be reusable, the manpower, manhours and labor activities required to support reuse are provided in Table 1.

TABLE 1
OFFSITE COMPONENT REUSE DATA SHEET

COMPONENT TYPE	EST. REMOVAL (MANHOUR)	CRAFT TYPE IN % (SEE NOTE 6 FOR KEY) EL	PF	IN	MW	SB	OE	WH	STORAGE REQUIREMENTS	MAINTENANCE RECORDS REQUIRED	OTHER
BREATHING AIR ACCUMULATOR	60 EACH		85				10	5	NOTE 1	N/A	N/A
CABINETS CNTRL BRDS	80 EACH	85			10			5	NOTE 1	N/A	N/A
CRANES	750 EACH	21			42	8	21	8	NOTE 2	YES	NOTE 3
EDG'S	12000 EACH	10	30	2	40	5	10	3	NOTE 1	YES	NOTE 3
ION EXCHANGER	100 EACH	5	60		20		10	5	NOTE 4	NO	NOTE 5
LOAD CENTERS	50 EACH	92						8	NOTE 4	NO	N/A
LOW VOLTAGE MOTORS	36 EACH	66			22			12	NOTE 5	NO	N/A
MSR'S	424 EACH	4	75		15		4	2	NOTE 4	YES	NOTE 3
SAFETY RELIEF VALVES	53 EACH		85	5		8		2	NOTE 4	YES	NOTE 3

NOTES

1) ENVIRONMENTALLY CONTROLLED WAREHOUSE.
2) TO BE KEPT INSIDE OUT OF WEATHER.
3) TECHNICAL MANUAL REQUIRED.
4) REQUIRES DRY LAYUP.
5) REQUIRES THE INSTALLATION OF INTERNAL HEATER.
6) EL= ELECTRICIAN, PR= PIPEFITTER IN= INSULATOR, MW= MILLWRIGHT, SB= CARPENTER, OE=OPERATING ENGINEER, WH= WAREHOUSE PERSONNEL.

Information taken from Reference 10, and input from FPL plant estimators.

SITE DESCRIPTION

St. Lucie Site

The site for St. Lucie Units 1 and 2 consists of approximately 1,132 acres on Hutchinson Island in St. Lucie County about halfway between the cities of Fort Pierce and Stuart (Ref. 5). The plant site features two Combustion Engineering pressurized water reactors (PWR), two Westinghouse Electric Corporation 1,800 rpm; tandem-compound, 3-element, turbine generators and four moisture separator reheater units. The initial plant ratings of the nuclear steam supply system (NSSS) thermal power level was 2570 MWth, corresponding to a net electrical output of 802MWe. However, St. Lucie Unit 2 was granted a stretch power rating of 2700 MWth which corresponds to a net electrical output of 830 MWe. The Architect/Engineer and Constructor for the plant site was Ebasco, Inc.

The main St. Lucie site structures include two containment buildings, two separate control rooms housed in their respective auxiliary buildings, two fuel handling buildings, two turbine building structures and two intake structures.

Each Reactor Coolant System (RCS) is arranged as two closed loops connected in parallel to the reactor vessel, with an electrically heated pressurizer connected to the hot leg of one of the loops, one reactor coolant pump per cold leg (Total 4) and a safety injection line connected to each of the four cold legs. Power conversion is provided by two vertical shell and U-tube steam generators. All of these major components are housed in the reactor building which is comprised of a steel containment vessel surrounded by an annular space and enclosed by a reinforced concrete Shield Building.

The design of these two units includes separate and redundant safety and supporting systems. However, the following complete separate systems are interconnected and can be under certain conditions shared between the two units: condensate storage tanks, waste management system, station air system and startup transformers. The instrument air supply and diesel generator fuel oil systems for the units are interconnected but are not shared.

Turkey Point Site

The Turkey Point site includes twin Westinghouse PWRs (Units 3 and 4) each designed to produce initially 2200 MWth and expected to be capable of an ultimate output of 2300 MWth. The plants are designed to permit generation of 760 MW of gross electrical power. The complete separate site is in Dade County on the shore of Biscayne Bay, 25 miles south of Miami and adjacent to oil and gas fired Units 1 and 2 (Ref. 6). The turbine generator units were also supplied by Westinghouse and the Architect/Engineer and Constructor was Bechtel Power Corporation.

The major structures of the Turkey Point site include two containment buildings, one auxiliary building, one turbine building structure, one control building structure, two spent fuel pit buildings and one intake structure. Each NSSS consists of a pressurized water reactor, an electrically heated pressurizer, the RCS and associated auxiliary fluid systems. The RCS is arranged as three closed reactor coolant loops connected in parallel to the reactor vessel, each loop containing a reactor coolant pump and a vertical, u-tube steam generator.

All of these components are housed in the reactor building which is comprised of a reinforced concrete building with inner steel liner. The steam turbines are Westinghouse tandem-compound, 3-element, 1,800 rpm units with four moisture separator reheater units to dry and superheat the steam between the high and low pressure stages.

REUSE OF EQUIPMENT

AND COMPONENTS

REUSE OF EQUIPMENT AND COMPONENTS

METHODOLOGY

This report provides the technical information necessary to form the basis for an economic feasibility evaluation of the reuse of non-contaminated component categories from the decommissioning of the St. Lucie and Turkey Point nuclear facilities. This reuse evaluation includes component categories to be reused at new electrical power generating stations located in existing nuclear sites or elsewhere. The methodology to provide this technical input is summarized in this section and consists of the following phases and tasks:

Phase 1: The first phase of the report consists of classifying equipment and components into generic categories. Each category is evaluated for reuse in new generating facilities. Phase 1 is broken down into three tasks as follows:

- Task 1 - Identification of generic equipment and major components and classifying them into component categories.
- Task 2 - Technical feasibility of reuse of component categories in a power generation station.
- Task 3 - Summary of the impact on the new plant's design, procurement and construction activities.

Phase 2: The second phase of the project applies the evaluations of the generic component categories to the site specific component lists. The results are shown in tables provided at the end of this report.

Phase 1 - Task 1.

The work team reviewed all the site specific systems found in Tables 2 and 3, and categorized them as contaminated and non-contaminated. Some portions of a system considered to be contaminated required further component evaluation. A basic assumption for this evaluation was that all components located in the reactor containment building or connected to the Reactor Coolant System (RCS) were considered as contaminated. The final lists of non-contaminated and contaminated systems at St. Lucie and Turkey Point are shown in Tables 2 and 3. This task was necessary to identify and separate out only the non-contaminated equipment.

The next step in this task was to categorize all the components and equipment used in the nuclear power plants according to their type. This was done by grouping the items by their specific functions. This allows a single evaluation of similar components located in different systems. The result was a list of generic components and equipment categories as shown as in Table 4. The items included in each category are described in the Major Components and Equipment Categories section later in this report.

Phase 1 - Task 2.

The second task in Phase 1 included an exhaustive evaluation of each generic component category to identify those items which could be reused at new power generating facilities. The reuse evaluation is found in the Reuse of Equipment and Components section later in this report. Possible types of new generating facilities were obtained from FPL's Ten Year Power Plant Sites Plan (Ref. 4). They included coal fired, combined cycle, coal gasification, combustion turbine and diesel generator units.

Each component was evaluated according to the following criteria:

- ease of removal from current site (including the number and skills of personnel required),
- lifetime cycle and remaining life after 40 years of use,

- component unique features,
- replacement part availability,
- documentation requirements (such as vendor manuals, maintenance records, etc.) and
- storage requirements

The logic for this evaluation is shown in Figure 1. The final list of component categories to be reused in new power generating facilities is summarized in Table 5. In this table, the component reuse has been divided between onsite for those categories which could only be reused at the existing nuclear sites and onsite/offsite for those which could be reused at any site. Appendix B contains a listing of all the components and equipment which could be reused.

Phase 1 - Task 3.

Once the list of generically reusable items was generated, Task 3 was performed. This task consisted of evaluating each generic component category and identifying those concerns created by reusing decommissioned components in lieu of new items. During this evaluation, issues such as uncertainties in life remaining, equipment storage, maintenance activities, component documentation, potential economic benefit, procurement and design of new generating facilities were addressed to assess the impact of component reuse at the new generating facility.

Phase 2.

This phase consisted of categorizing all the specific components/equipment lists into the generic component categories developed in Phase 1-Task 1. A set of tables containing the categorized components was developed for each of the four units. These tables contain the tag number, system, generic category and reference to the reuse feasibility made in Phase 1-Tasks 2 and 3.

Appendix A contains a description of the computer manipulations and programs that were performed on the plant component data supplied by FPL.

TABLE 2.
St. Lucie Plant Systems

System Number	System	Status*
01	Reactor Coolant	C
02	Chemical & Volume Control	C
03	Safety Injection	C
04	Fuel Pool	C
05	Sampling	P
06	Waste Management	C
07	Containment Spray	C
08	Main Steam	NC
09	Feedwater	NC
10	Extraction Steam	NC
11	Heater Drains & Vents	NC
12	Condensate	NC
13	Turbine Cooling Water	NC
14	Component Cooling Water	P
15	Fire, Demin., Service & Primary	
	Makeup Water	P
16	Auxiliary Steam	NC
17	Turbine Lube Oil and Diesel Fuel Oil	NC
18	Service & Instrument Air	P
19	Condensate Polishing	NC
20	Chemical Feed	NC
21	Circulating Water - Intake Cooling	NC
22	Turbine	NC
23	Blowdown	NC
24	Miscellaneous Drains	P
25	HVAC - Plumbing & Drainage/Leak	P
	Protection	NC
26	Radiation Monitoring- Area	P
27	Hydrogen Sampling-Secondary Sampling	C
28	Condensate Recovery	NC
29	Gas Supply	NC
30	Instrument Racks	P
31	Processed Blowdown	NC
32	Sluice Water	NC
33	Spent Resin	C
34	Blowdown Cooling	NC
35	Air Blower	NC
36	Blowdown Waste Management	C
37	Emergency Cooling Canal	NC
38	Demineralized Makeup Water	NC
39	Wet Lay-up	NC
40	Hypochlorite	NC
41	Valve Stem Leakoff	P
42	Seismic Monitoring	NC
43	Neutralization Basin	NC
44	Demineralization	P
45	Radiation Monitoring-SGBTF	P
46	6.9kV Electrical	NC

TABLE 2.
St. Lucie Plant Systems (Cont.)

System Number	System	Status*
47	480 Volt Electrical	NC
48	120/208 Volt Electrical	NC
49	120V Vital AC	NC
50	125V DC	NC
51	Water Treatment Plant	NC
52	4.16kV Electrical	NC
53	Generation & Distribution	NC
54	Junction Box Details	P
55	Post Accident Sampling	C
56	Reactor Coolant Pump Oil Collection	C
57	Meteorological Monitoring	NC
59	Diesel Generator	NC
60	Station Grounding	NC
61	Communications	P
62	Reactor Regulating	NC
63	Reactor Protection	NC
64	Nuclear Instrumentation	P
65	Computer- Process & Reactivity	NC
66	Control Element Drive Mechanism	P
67	Fuel Handling	C
68	Containment Vessel	C
69	Panels & Control Boards	NC
70	Terminals	NC
71	Loose Parts Monitoring	P
72	Security	NC
73	Pipe & Support	P
74	Hoists, Cranes & Elevators	P
75	Cathodic Protection	NC
99	Miscellaneous Equipment	NC

* C = Contaminated System
NC = Non Contaminated System
P = Some portions of the system are considered to be contaminated according to Assumption 2 and therefore, further component evaluation was required.

TABLE 3.
Turkey Point Plant Systems

System Number	System	Status*
01	Communications	P
02	240 Kv Switchyard	NC
03	125 VAC & DC Instruments	P
04	Startup Transformers	NC
05	4.16 KV Busses and Cubicles	NC
06	480 V Switchgear	NC
07	480 V Motor Control Centers	NC
08	Turbine Plant Cooling Water	NC
09	Intake Structure	NC
10	Circulating Water	NC
11	Screen Wash & Chlorination	NC
12	Service Water	NC
13	Instrument Air	P
14	Condenser	NC
15	Amertap	NC
16	Fire Protection	NC
17	Transformer Deluge	NC
18	Condensate Storage	NC
19	Intake Cooling Water	NC
20	Primary Water Makeup	NC
21	Water Treatment Plant	NC
22	Emergency Diesel Engine & Lube Oil	NC
23	Emergency Diesel Generator	NC
24	Emergency Load Sequencer	NC
25	Control Building HVAC	NC
26	Radwaste Building HVAC	C
27	Control Rod Drive - Mechanical	C
28	Control Rod Drive - Electrical	P
29	Polar Crane	C
30	Component Cooling Water	P
33	Spent Fuel Cooling	C
34	Spent Fuel Storage	C
35	New Fuel Storage	NC
36	Sample System (NSSS)	C
37	Fuel Handling Building Ventilation	C
38	Spent Fuel Handling	C
39	New Fuel Handling	NC
40	Fuel Assemblies	C
41	Reactor Coolant System	C
43	Reactor Vessel	C
45	Inservice Inspection System	P
46	CVCS Boron Addition & Recycle	C
47	CVCS Charging & Letdown	C
48	Heat Trace	P
49	Reactor Protection	NC
50	Residual Heat Removal	C
51	Containment Building	C
53	Containment Purge	C

TABLE 3.
Turkey Point Plant Systems (Cont.)

System Number	System	Status*
55	Containment Emergency Coolers	C
56	Containment Emergency Filters	C
57	Containment Normal Coolers	C
58	Penetration Cooling	NC
59	Nuclear Instrumentation	P
60	Auxiliary Building	P
61	Liquid/Gaseous Waste Disposal	C
62	Safety Injection	C
63	Emergency Safeguards (ECCS)	NC
64	Safety Injection Accumulators	C
65	Nitrogen & Hydrogen (NSS)	P
66	Area Radiation Monitoring	P
67	Process Radiation Monitoring	P
68	Containment Spray	C
70	Turbine Building Ventilation	NC
71	Steam Generators	C
72	Main Steam	NC
73	Condensate	NC
74	Feedwater	NC
75	Emergency Feedwater	NC
76	Turbine Plant Chemical Addition	NC
77	Condensate Polishing	NC
78	Steam Generator Wet Layup	NC
80	Condensate Recovery	NC
81	Feedwater Heaters, Vents & Drains	NC
82	Secondary Wet Layup	NC
84	Auxiliary Steam	NC
85	Extraction Steam	NC
87	Turbine Lube Oil	NC
88	Gland Steam and Drains	NC
89	Main Turbine	NC
90	Main Generator	NC
91	Fire & Smoke Detection	P
92	Main and Auxiliary Transformers	NC
94	Containment Post Accident Evaluation	P
95	Data Logging	NC
96	Reactivity Computer	NC
97	Annunciators	NC
98	Underwater TV Cameras	C
99	Metal Impact Monitoring	P
100	Security	NC
101	Breathing Air	P
102	Miscellaneous Tools/Equipment	P
103	Environmental Monitoring	NC
104	Plant Lighting	P
105	Snubbers/Hangers	P

* C = Contaminated System
NC = Non Contaminated System
P = Some portions of the system are considered to be contaminated according to Assumption 2, and therefore, further component evaluation was required.

TABLE 4.
General Component/Equipment Categories

Equipment Category Number	Equipment Category Description
1	AIR RECEIVERS and ACCUMULATORS
2	BATTERIES, CHARGERS, INVERTERS, RECTIF.
3	(INTENTIONALLY LEFT BLANK)
4	CABLE TRAYS
5	CABLES and CONDUIT
6	COMMUNICATIONS (PHONES, PA, ETC.)
7	COMPRESSORS, GAS and AIR
8	COMPUTERS and MICROPROCESSOR
9	CONDENSER (INCLUDING PRIM & SCAVENGING)
10	CONTROL BOARDS, PANELS, CABINETS
11	CRANES and ELEVATORS
12	DEAREATOR and DRYERS
13	EMERGENCY DIESEL GENERATOR
14	FANS and BLOWERS
15	FIRE PROTECTION (DETECTORS & SUPPRESSOR)
16	HEAT EXCHANGERS and COOLERS
17	HEATERS
18	HVAC (DUCTWORK, DAMPERS and DOORS)
19	INSULATION (PIPING and EQUIPMENT)
20	ION EXCHANGERS
21	LIGHTING (FIXTURES)
22	LOAD CENTERS, MCC, SWITCHGEAR, DIST.PAN.
23	MOISTURE SEPARATOR REHEATER
24	MOTOR GENERATOR SET
25	MOTORS
26	PIPING
27	PROCESS INSTRUMENTATION
28	PUMPS
29	RACK, COMPRESSED GAS BOTTLE
30	RADIATION MONITORS
31	SAMPLE COLLECTING UNIT
32	SCREENS
33	SECURITY (MONITORS, CARD READERS)
34	SILENCER/MUFFLER
35	SNUBBERS
36	STRAINERS and FILTERS
37	SWITCHYARD
38	TANKS
39	TRANSFORMERS
40	TURBINE GENERATOR
41	VALVES

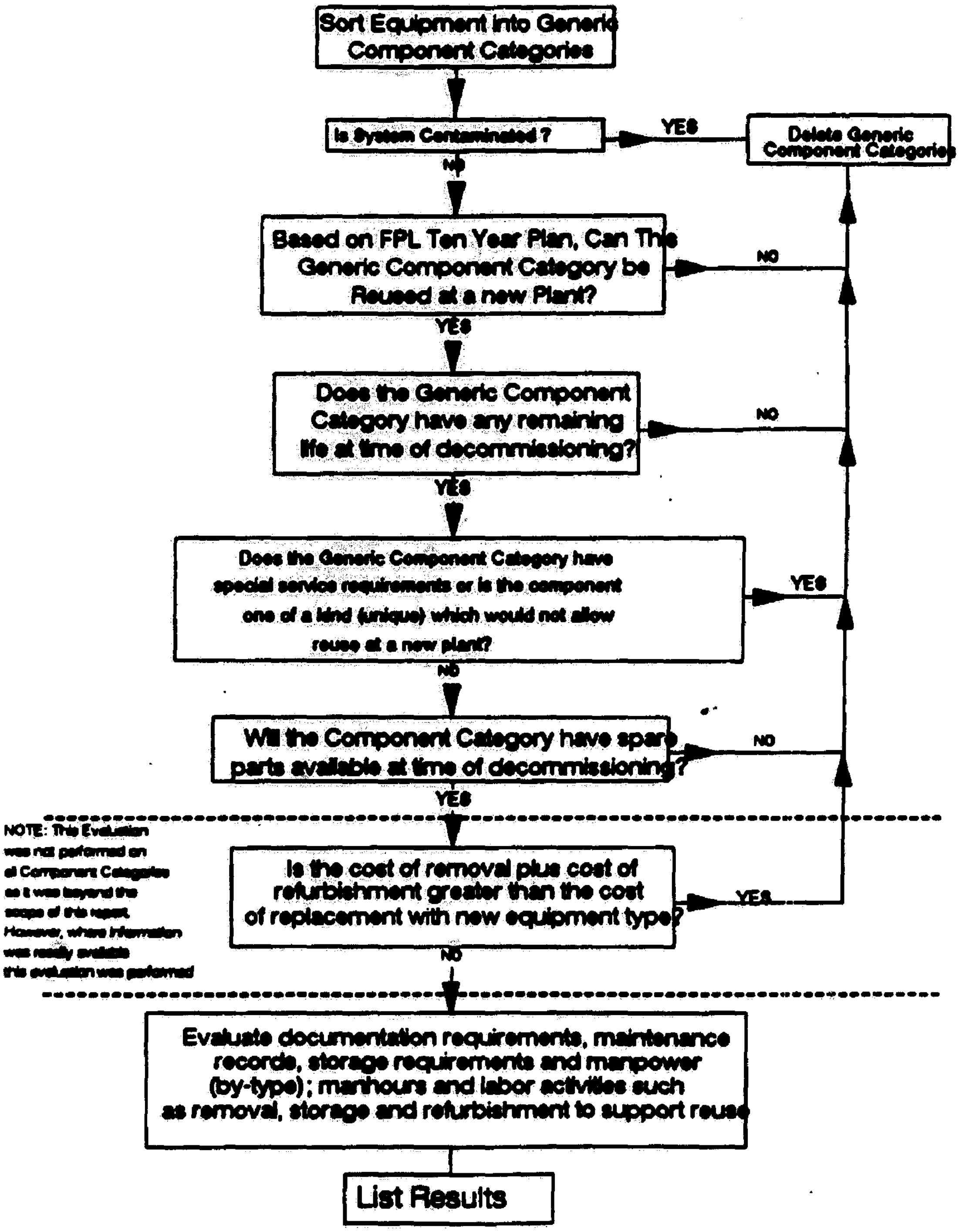
TABLE 5.
Reusable Components From the Decommissioning of the Turkey Point and St. Lucie Sites

Component	Only Onsite	Onsite/Offsite
Breathing Air Accumulator		X
Cable Trays	X	
Cables and Conduit	X	
Communications	X	
Condenser	X	
Cabinets		X
Large Cranes		X
Diesel Generators		X
Elevators	X	
Ion Exchanger		X
Load Centers, MCCs		X
Lighting	X	
Low Voltage Motors		X
Safety/Relief Valves		X

Onsite designates equipment/component that can only be reused at the existing nuclear facility.

Figure 1

COMPONENT REUSE DECISION METHODOLOGY



EVALUATION

Basic Assumptions

During the development of this evaluation, several assumptions were made. They are presented below:

1. The only electrical power generating facilities where the decommissioned equipment from the Turkey Point and St. Lucie sites could be reused are new plants similar to those described in the FPL Ten Year Plan (Ref. 4). This includes coal fired, coal gasification, combustion turbine, combined cycle and diesel generators to be built at existing nuclear sites or elsewhere.

2. The equipment and components inside the reactor containment building are considered contaminated and therefore, will not be reused after decommissioning. Also, those components connected to the Reactor Coolant System (RCS) are considered as potentially contaminated and will not be considered for reuse either. Therefore, all of these components will be excluded from this report.

3. Plant components that are shared by St. Lucie Units 1 and 2, and Turkey Point Units 3 and 4 will be included in the component listings (Appendix B) for St. Lucie Unit 2 and Turkey Point Unit 4 respectively.

4. The decommissioning of both FPL nuclear sites is expected to be performed by an outside contractor/architect engineer. To ensure that the components are reusable, skilled craft personnel will be utilized to perform component removal.

5. All equipment/component vendor manuals will be kept by FPL and moved to a safe location to ensure retrieval of necessary information is available during dismantlement and reinstallation.

6. Administrative, supervision, plant layup and the cost of scheduling efforts during the decommissioning and component removal for reuse processes will not be factored into this evaluation. These costs will be provided by others as part of an economic feasibility evaluation on the reuse of non-contaminated items from the decommissioning of FPL's nuclear units.

7. Plant components and equipment are assumed to be kept in proper layup and in ready to use condition up to the time when the components are removed from the plant site.

8. Decommissioning method and schedule used for each plant is taken from the TLG Engineering Inc. Decommissioning Cost Studies (Ref. 1 & 2). These decommissioning schedules do not have any influence on the results presented in this report. These studies recommend the following methods: for St. Lucie Unit 1, mothball with a 5 year dormancy period and subsequent dismantlement; for St. Lucie Unit 2, prompt dismantlement; and for Turkey Point Units 3 and 4, prompt dismantlement.

9. Items such as furniture, tools, mobile equipment (forklifts, trucks, bulldozers) and other FPL property which are easily removed without the use of special equipment, are not included in this component reuse evaluation.

10. All life expectancy and refurbishment estimates are derived assuming that the equipment in question has been used and maintained in accordance with vendor recommendations and proper maintenance/use practices as defined by plant policies and procedures. All plant components will be considered to have received proper and regular scheduled maintenance and replacement parts provided to the equipment in question when necessary (i.e., the component was installed, operated and maintained in a manner consistent with its design).

11. End of component life cycle (life expectancy) is defined as the point in time when the equipment begins to experience a higher frequency of random failures. At this point, the equipment may experience aging failures where replacement will be necessary. Repair may be more cost effective rather than replacement at the existing nuclear sites. Equipment and components which are used at a new location at the time of decommissioning will be more cost effective to replace with a new one. This is because it will be desirable to incur the installation cost only once.

12. The reported life cycles in this report are average values for each component category, since several items of similar design and function (but different manufacturers) are included in each category. While a specific component in actual use may have a different life cycle based on its operating and maintenance history, detailed projections on a component specific basis are beyond the scope required to address the FPSC query.

    Generally, equipment with a reported average life cycle of 20 years or less will not be reused at the new power generating facility. This is because at the end of the 40-year plant life, the component end of life cycle will also be reached. This assumption also applies for equipment with a reported life cycle of 40 years. Estimated life cycle times reported in the References section are given in five year increments through forty. However, additional feasibility assessment would be required based on actual life cycles at the time of decommissioning.

13. Equipment with a reported life cycle of 25 to 30 years will be considered as reusable if refurbishment is more cost effective than replacement. This is because at the end of plant life and with such component having been replaced at least once, the new component would not have reached the end of its life cycle. The component would still have 10 and 15 years of life remaining at the time of decommissioning.

14. The costs associated with the removal of certain components (HVAC ductwork and steel structures) are estimated to be approximately fifty percent of the initial installation costs as taken from Reference 10. This percentage is an arbitrary but conservative value provided by FPL estimators. These costs are used to compare new component replacement versus component removal. This comparison was done in the following way: Reference 10 provided the cost of a new component, installation man-hour rate and wages (in $/hr); from this, a cost to remove the component was obtained by multiplying the man-hour rate times the wage and applying the 50% assumption from above. The resultant removal cost was then compared to the new component cost. If the cost to remove the old component was greater than the cost of a new component, the old component was not considered for reuse at decommissioning.

15. The additional maintenance and reuse layup cost, rather than just the mothballing of St. Lucie Unit 1 were not factored into the evaluation presented in this report. These additional costs are incurred to ensure that the components are still reusable at the time of decommissioning.

16. Since plant dismantlement has been assumed to be the decommissioning method to be used at these sites (Assumption 8), it is assumed that the new power facilities could be constructed at the current nuclear locations.

17. When analyzing a component for reuse, it will be assumed that similar type components (i.e. same type of component with different vendors) would yield the same conclusions (see Assumption 12).

18. Component categories which have undergone significant design evolutions will not be reused. For instance, the reuse of 40-year old designs in lieu of state-of-the-art equipment may hinder the efficient or safe operation of a new plant.

19. The plant component data used in this project was the latest version of FPL's Total Equipment Database (TEDB) provided to ABB Combustion Engineering in November, 1990.

Major Components and Equipment Categories (Phase 1 - Task 1)

Phase 1-Task 1 requires the development of a generic list of component categories to ease the evaluation process. This generic list is shown in Table 3. Components/equipment included in each of these categories (provided by Ref. 11) are as follows:

1) Air Receiver/Accumulator

This category includes pressurized devices associated with the storage of compressed air or nitrogen. The systems where these devices can be found include: the main steam isolation system, instrument air, auxiliary feedwater, boric acid supply, condensate, breathing air and turbine control.

2) Station Batteries, Battery Chargers, Rectifiers and Inverters

This category includes installations associated with storage of direct current energy, conversion from DC to AC power and conversion from AC to DC power. This includes batteries, battery load test set, battery chargers, inverters, rectifiers and battery racks.

3) Cable Trays

This category includes all electrical raceway which is comprised of open tray or wireway components. These installations are designed to support and protect power, control and instrumentation cables throughout the plant and are composed of modular pieces which are bolted together to form specific cable routes required by the plant design.

4) Cables and Conduit

Electrical cables are assemblies consisting of one or more copper or aluminum conductors, surrounded by a combination of protective and insulating materials. A wide range of conductor sizes and designs are available for specific applications, as well as a variety of insulating and jacketing materials and compounds.

This category includes cables designed for the transmission of power to plant electrical loads and the wide variety of cable types designed for control and instrumentation applications. Such applications include the transmission of signals for equipment activation, control and status and alarm. Cable terminals and connectors are included in this category.

This category also includes pipe-type conduit enclosures installed to support and protect cable routed to plant equipment. These conduits are available in a range of sizes and materials and are typically screwed together by use of threaded fittings and couplings. Aluminum or galvanized steel are the most commonly used materials.

5) Communications Equipment

This category includes equipment and components used for the transmission and reception of voice or code communications, both interplant as well as between the plant and off site locations. Specific components and systems included are the meteorological tower, PBX panel and switchboard, mobile radio units, public address system (Gai-tronics), fire and evacuation alarms, page system, sound-powered communication system and the portion of the telephone system not owned by the local telephone utility.

The plant security system is excluded from this category.

6) Compressors

This category includes all gas and air compressors in the service air system, breathing air system, waste gas system and instrument air system.

7) Computer/Microprocessor

This category includes computer, word processor and related accessories which are required for processing, printing, storing, retrieving and displaying data and which is not included as part of a specific plant system. Mainframe, minicomputers and microcomputers are included.

The computers for the plant simulator are also included in this category.

8) Condenser

This category includes installations associated with the unit that condenses steam from the main turbine. This includes control instrumentation, foundation, condenser shell/casing, water boxes, tubes, supports, hotwell and neck assembly. This category also includes the priming system, whose function is to evacuate air from the tops of the inlet and outlet waterboxes during operation and the scavenging systems that remove non-condensible gases from the condenser during operation.

9) Control Boards, Panels, Cabinets

This category includes control boards, panels and cabinets which house instrument and control components. These items of equipment can be either floor or wall mounted and are commonly of modular construction with hinged sides or doors for access.

The control cabinets and boards of the plant simulator are also included in this category.

10) Cranes and Elevators

This category includes crane structures for the turbine and fuel cask areas. This includes the crane, motors, control and instrumentation, main hook, main hoist and auxiliary hoist for the 5 - 125 ton and greater than 125 ton categories. Excluded from this category are the associated load cables. Also included here are all elevators in the non-contaminated areas of the plant.

11) Deaerators and Dryers

This category includes all installations which extract free gas and/or air bubbles from liquid fluid systems. The system is comprised of vacuum pumps and associated tanks. Also included in this category are dryers which reduce the moisture level in the system to avoid harmful effects in the controlled atmosphere of the process.

12) Emergency Diesel Generators

This category includes diesel engine driven devices that provide emergency onsite power to the plant when preferred (offsite) power is interrupted. This includes: the principal system (engines, generators, governors, instrumentation, breakers and electrical equipment), the lube oil system, the fuel system, the starting air system, the cooling system and the engine exhaust system.

13) Fans and Blowers

This category includes equipment used to move air or gases for cooling or cleanup purposes, including those items in the Heating, Ventilation and Air Conditioning (HVAC) systems. Also included here are lube oil vapor exhausters.

14) **Fire Protection Equipment**

This category includes all installations that support the detection and extinguishing of fires, as well as the initiation of a fire alarm. Fire protection components located in contaminated areas are excluded from this category.

15) **Heat Exchangers and Coolers**

This category includes all devices designed to reject heat from a system in a controlled manner. Heat exchangers included here are: the heat exchanger for the control rod drive cooling system, steam generator blowdown, condensate system, condensate polisher, boric acid system, component cooling water, boron recovery system, service water system, hydrogen supply system, turbine control system, turbine gland seal, exciter, generator seal oil, generator cooling/purge system, generator liquid cooling system, turbine lube oil, turbine cooling water, emergency diesel generator cooling and generator bus cooling.

16) **Heaters**

This category includes all devices designated to heat process fluids. Included here are the feedwater heaters, gas/air heaters and space heaters. Excluded from this category are heat tracing heaters since these are wrapped around piping and components in the boric acid system and hydrogen monitoring system. As we will see in the next section, piping will not be considered for reuse along with insulation or anything wrapped around the piping.

17) **Heating, Ventilation and Air Conditioning**

This category includes only HVAC ductwork, dampers and duct access doors. Excluded from this category are fans, blowers, motors, compressors, chillers and condensing units which are included in other categories.

18) **Ion Exchangers**

This category includes those devices used to purify liquid systems. This includes cation and anion exchangers (excluding resin) in the demineralized water system, boric acid concentrator system, condensate system and boron recovery system.

19) **Insulation**

This category includes all thermal insulation installed or sprayed on equipment and piping.

20) **Lighting Fixtures**

This category includes all indoor and outdoor lighting fixtures, whether for normal operations or for emergency lighting.

Lamps, ballasts and batteries have been excluded from this category because they are periodically replaced as part of normal plant maintenance.

21) **Load Centers, Motor Control Centers (MCC), Switchgear**

This category includes 125 volt DC distribution load centers, 480 volt motor control centers (MCCs), circuit breakers and switchgear components. MCCs are defined as the electrical cabinets and equipment necessary to provide a means of starting, controlling and maintaining continuous electrical power to 480 volt motors and other plant system loads. This category also includes all distribution panels and boards in the following systems: 125 volt DC distribution, vital AC, 120/208 volt distribution and 480 volt distribution.

The circuit breakers include the mechanism that moves the contacts and the associated circuitry (such as relays). Included here are: the arc suppressor, bearings, bushings, casing, circuit boards, coils, contacts, converters, drive pawl, fuse, indicators, lockout device, latch, plungers, relays, solenoids, springs and switches.

The switchgear consists of one or more units which are mounted side by side and connected mechanically and electrically together to form a complete switching device.

22) Moisture Separator/Reheater

This category includes all components associated with the moisture separation and steam reheating of the high pressure turbine exhaust. The boundaries of this category extend from the extraction steam and drain piping welds of the moisture separator reheater to the first weld of the crossover piping at the low pressure turbine.

23) Motor Generator Set

This category includes the motor-generator sets in the Instrument AC Distribution, Vital AC Distribution and the Generator Voltage Regulation systems.

24) Motors

These devices are required to provide driving power to pumps, motor operated valves, compressors, fans, blowers and other equipment such as equipment positioners, cranes, dryers and deaerators.

The motors have been sub-divided among air and electric types. The electric motors are further identified by voltage level, as follows: up to 480 volts, or, greater than 480 volts. The electric motors include fractional and integral horsepower ratings.

25) Piping

This category includes all plant piping not included as part of specific equipment. The types of piping in this category include: pipe elbows, tees, junctions, unions (flanged or welded), other fittings and tubing.

26) Process Instrumentation

This category includes all installations associated with detecting system parameter conditions, processing the information (measurement subsystem) and issuance of an output. Included here are pressure, temperature, flow and level indicators and transmitters, along with controllers, switches, timers and thermowells.

27) Pumps

The pumps included in this category were divided among two subcategories based on motor voltage: 480 volt and 4.16 kV. In this category, the motors and drivers have been excluded and treated separately in the Motors section above. Included with the pump are the housing, bearings, impeller, shaft, seals, cooling and lubrication systems. Also, steam-driven pumps have been included in this category under the high voltage pumps due to the similarities with this type of pump.

28) Racks, Compressed Gas Bottles

This category includes all compressed gas bottles and associated rack supports. The gases contained in these bottles are hydrogen, oxygen, helium, argon, CO_2 and compressed air.

29) Radiation Monitors

This category includes equipment associated with the measurement, detection and annunciation of area/process radioactivity within the plant systems. Included here are the control panels, instrumentation, monitor/detectors, transmitters, air samplers and recorders.

30) Sample Collection Unit

This category includes installations associated with the collection of water and/or gas samples throughout different secondary system locations including the steam lines, feedwater and condensate systems. The RCS sampling system has been excluded due to contamination. Also, the post accident sampling system was excluded because it was also assumed to be contaminated. (See Assumption 2)

31) Travelling Screens

The main structures included in this category are installations associated with inhibiting the flow of debris into the circulating water pumps. Included here are the travelling screen assemblies, panels and housing, stationary screen panel, trash rakes and racks and trash grinder and pit.

32) Security Equipment

This category includes all installations associated with the site access control and surveillance. This includes fences, gates, turnstiles, closed circuit TV monitoring system, key card system, X-ray machine, bullet proof enclosures, metal and explosive detectors, fence monitoring system, guard towers and underwater intrusion system.

33) Silencer/Muffler

This category includes silencers for the main steam system and also those attached to certain pumps.

34) Snubbers

The items included in this category are all vibrational dampening devices, either constant support, pneumatic, hydraulic or spring loaded, including hangers and supports. Snubbers are restraining devices used to control the movement during abnormal dynamic conditions such as seismic activity, safety relief valve opening, turbine trips, reactor trips, etc. which may cause damage to piping or other components. The design of the snubber allows free movement of a component during normal operating conditions but restrains the component during off-normal events.

35) Strainers and Filters

This category includes devices dedicated to removing suspended impurities and foreign particles from liquid systems. They are included in the following systems: steam generator blowdown, condensate, main feedwater, heater vents and drains, nitrogen, wet layup, boric acid, component cooling water, screen wash and boron recovery. This category also includes all devices designed to remove impurities and foreign gaseous particulates from plant systems. Air filters in this category are mainly found in the instrument air and breathing air systems. Filters included in the HVAC system are not part of this category. Included in this category are the filter and strainer housing structures, which hold and support the filter material and also provides a pressure boundary. Associated heaters, valves, motors and pumps are considered part of this category since they are designed for this particular application.

36) Switchyard

Items in this category include all items located within the switchyard including control panels, circuit breakers, switchgear, towers and structures.

37) Tanks

Items in this category include tanks located in the following systems: auxiliary boiler, steam generator blowdown, condensate, chemical feed, nitrogen, wet layup, demineralized water, boric acid, component cooling, turbine and the emergency diesel fuel supplies.

38) Transformers

These components are used to convert alternating current (AC) power from one voltage level to another. Because of the variety of power level and voltage requirements throughout a generating station, many different types and sizes of transformers are used in plant systems.

Transformers are classified by cooling medium (air or liquid) and by capacity or size.

This category was divided into three basic size ranges:
Less than 100 KVA
100 KVA to 1000 KVA, and
Greater than 1000 KVA

Because of the large number of plant applications, virtually all systems employing the use of AC power at any plant voltage level will involve transformer applications.

A typical large transformer consists of the following components: high- and low-voltage bushings, case, coils, or windings, core, enclosure and cooling system.

39) Turbine-Generator

This category includes all installations associated with the conversion of kinetic energy produced by the steam generators into mechanical energy in the turbine and into electrical energy in the generator. The turbine is the driving mechanism for the main generator to produce electric power. The items included in this category are the turbine shell or casing, insulation, enclosures, bearing assembly, high/intermediate/low pressure shaft, turbine wheel and diaphragm, rotating/stationary blading, gland seal assembly, control panel, nozzle block, the turbine control system, the turbine drain system and the turning gear assembly. Also included are the generator components: stator housing, load controls, exciter, rotor shaft, bearing assembly, collector rings, end bell, sole/bearing plate, collector ring brush rigging, coupling, main lead connectors and box, rotor retaining rings and stator/rotor coils.

40) Valves

This category includes all swing, duo and piston types of check valves, all types of manual valves (globe, butterfly, gate, ball and diaphragm). Also included are all power operated valves that are operated either electrically or pneumatically and over-pressure protection valves (safety/relief valves). Excluded from this category are all valves with size of 2 inches or less, except for the safety/relief valves.

Reuse Feasibility (Phase 1 - Task 2)

The previous section described the items included in the generic equipment and component list (Table 3). This list was evaluated according to the criteria described in Phase 1 - Task 2 Section above. The results of this evaluation are now presented for each category, with the final list of components suitable for reuse shown in Table 4.

1) Air Receivers/Accumulators

The majority of the air receivers and accumulators contain wet air, which accelerates the corrosion of the tank material. These components have an estimated average life cycle of 15 years (Ref. 12). With the exception of the breathing air tanks, which are built of stainless steel, all the other items will most probably be in a deteriorated condition at the time of decommissioning. This makes air receivers and accumulators unsuitable for reuse at a new facility. The breathing air receivers could be reused, however, provided that testing and minor refurbishment are performed.

2) Station Batteries, Battery Chargers, Rectifiers and Inverters

The aging study of station battery chargers and inverters in nuclear plants (Ref. 13) suggests that the effects of battery charger failures have been less dramatic than inverter failures, although an increasing trend in their number is reported. Inverter failures due to aging have been recorded during the initial and final years of operating life for the component.

Reference 14 reports that station batteries rank among the top 8 components with the highest effect of aging and service wear on the component failure rate (aging sensitive).

Components in this category are serviced very regularly and replaced every 20 years (Ref. 15). Therefore, the items in this category will not be considered for reuse at the end of the 40-year power plant life.

3) Cable Trays

Cable trays are used to hold in place the instrumentation, power and control cables located throughout the plants. Their non-insulated sheet metal construction makes them inherently susceptible to damage during operation and even more so during removal. The removal of cable trays from the nuclear site is time consuming and requires the use of scaffolding for some areas of difficult access. Also, cable trays are low cost items readily available off the shelf. The high removal cost when compared to the inexpensive replacement expense makes cable trays unsuitable for removal and reuse at new power generation facilities. However, if the existing site will be used as a new facility, it may be cost effective to leave and reuse some of the trays in place along with the cables. The amount of cable trays and cables which could be reused at decommissioning were reported by TLG (Ref. 69) as follows:

Plant	Cable/Tray Length (Ft)
St. Lucie 1	23,462
St. Lucie 2	30,845
Turkey Point 3	27,175
Turkey Point 4	32,651

NOTE: TLG Engineering Inc. prepared FPL's Decommissioning Plans for St. Lucie and Turkey Point Plants.

4) Cables and Conduit

FPL has installed lead-sheathed single-conductor cables for most 5 kV applications at their nuclear plants (Ref. 16). This type of cable is noted for its long life when properly installed and its installation results in higher costs due to its high weight. Cables of this type are typically installed in routes which may include underground duct banks and manholes, exposed cable trays, and/or exposed, or embedded conduit.

Cables which have been installed for many years (more than 15) should not be considered for removal and re-installation. Those installed for this length of time will have become "set" in their installed configuration and are likely to be damaged when subjected to removal, re-spooling and re-installation in a new route (Ref. 16).

However, these cables can be assumed to have a considerably longer remaining useful life if left in their present configuration, assuming that they have not been subject to undue operating and service conditions. It is felt that cables which have been installed for up to forty years would likely have useful remaining life in their present configuration, assuming relatively mild operating and service conditions.

The same conditions apply for control cables and conduit. Due to the bends and turns in typical conduit installations, removal of cables is usually a problem unless the cables are to be scrapped (Ref. 17). Removal of cables in cable trays could be more feasible, but this requires cutting the cables and the lengths obtained are not usually sufficient to lend themselves to future re-installation.

Cable lubricating compounds applied during the installation process cannot be re-applied in order to remove the cables. Therefore, pulling tensions to remove the cable are much greater than those obtained during installation. Also, some of the older lubricating compounds usually solidify, making it more difficult to break the cable loose for removal.

Based on the above discussion, cables and conduit will not be considered for reuse at a new off-site facility at the time of decommissioning. However, they may be reused at the existing site if removal is not necessary.

5) Communications Equipment

Communications equipment (Gai-Tronics) has been reported to have a long life cycle (Ref. 18). As well, the equipment is designed so that old as well as new models can be easily refurbished by removing the old components and plugging in new ones. This retrofitting process eases the refurbishment of the communications equipment when reused at the existing site. When the equipment is removed from the present site and re-installed in a new site, the retrofitting method could be applied; however, the labor cost of removing the fixed equipment makes it more cost effective to replace the system with a new one (Ref. 18). Therefore, the components in this category will not be considered for offsite reuse at the time of decommissioning. However, onsite reuse of these components is feasible.

6) Compressors

Air and gas compressors have been reported to have average life expectancies of fifteen to twenty years (Ref. 19); at which time they are replaced. Therefore, these are not items considered for reuse upon decommissioning (according to Reference 12).

7) Computer/Microprocessor

This category includes all devices used for storing and processing plant data as well as printers and software. The plant computer and the simulator computer are also included in this category. None of these devices will be available for reuse at the end of plant life because, after years of operation, the hardware components become obsolete and replacement parts become harder to find. Also, software with a specific nuclear application does not have a similar application in a fossil plant.

8) Condenser

Condenser shells have generally lasted for long periods of time (Ref. 20) without experiencing damage. However, the tubing has always been the vulnerable part of the condenser. Retubing is usually needed because old tubes experience thinning with time due to erosion, corrosion, or other reasons producing frequent leakage, loss of cooling capability and eventually plant shutdowns. As a solution, operating management normally elects to plug the affected tubes. After years of operation the condenser develops an excess of plugged tubes and the tube failure rate is on an increasing curve causing expensive unscheduled shutdowns. A typical plant could expect a tube useful life of twenty to twenty five years (Ref. 21), with at least one retubing operation during the life of the nuclear plant. An increasingly popular and cost effective refurbishing method for the condenser has been the retrofit with complete new internals rather than the previously used tube for tube replacement method. This new technique has proven to be efficient and cost effective in at least six nuclear and two fossil units (Ref. 21).

Based on the previous observations, the condenser will be considered for reuse with proper retubing. However, this recommendation holds only for reuse at the existing sites.

9) Control Boards, Panels, Cabinets

The only components in this category which can be reused are the cabinets. Control boards and panels are custom designed for site-specific applications and installation; therefore, these will not be reused at new power generating facilities. In addition, human factor considerations and state-of-the-art design would result in significant design differences if the plants were to be built at time of decommissioning (see Assumption 18).

The cabinets are of universal design with long periods of use. Refurbishment only consists of paint stripping /repainting. Therefore, at the time of decommissioning, the cabinets could be considered for reuse.

10) Cranes and Elevators

The smaller rating cranes have life expectancies of twenty years and are not reusable. However, the large rating cranes have longer life expectancies with refurbishment every thirty years (Ref. 22). Assuming proper maintenance, the large rating cranes can be reused at new generating facilities.

Elevators have life expectancies of up to sixty-five years (Ref. 23). Spare part availability, however, begins to become a problem after thirty years. As well, industry technology is expected to surpass current levels and make them obsolete at the same thirty year point. Therefore, the elevator shall be usable at the same facility for the duration of plant life but will not be worthwhile for reuse elsewhere upon decommissioning.

11) Deaerators and Dryers

The typical life expectancy of deaerators and dryers is twenty years (Refs. 24, 25, 26). Refurbishment is not a normal option considered due to the susceptibility of these items to environmental corrosion and high salinity levels. On a twenty year replacement schedule, these items will not have any remaining useful life at the time of decommissioning and will not be considered for reuse.

12) Emergency Diesel Generators

Aging studies on diesel generators have determined that the components resulting in unit-loss, age-induced failures are primarily due to instrumentation & control and fuel system failures (Ref. 27). The failure rates increase as the age of the components increase. However, an analysis of the data shows that aging failures can be prevented with regular replacement of the aged parts, or by good maintenance practices including realignment or readjustment.

Furthermore, the diesel generator manufacturer recommends regular maintenance of the components in the system and indicates an expectancy life cycle of approximately 11 years of continuous operation (Ref. 28). The diesel generators, however, are operated from warm start averaging 25 times per year for approximately thirty minutes per start (Ref. 29). At the end of 40 years, this represents less than 1% (less than one year) of the expected continuous operation life. If a wear and tear factor of 50% is assumed and factored into this analysis, the diesel generators are expected to last at the time of decommissioning, with proper maintenance, for at least 5 more years of continuous operation in a diesel plant.

Therefore, it is considered to be feasible to refurbish the diesel generators at the time of decommissioning for reuse rather than replacing the existing units. Spare parts for this safety-related equipment are expected to be available even after the time of decommissioning. Furthermore, due to the extensive preventive maintenance performed on this equipment, very little refurbishment would be required at decommissioning.

FPL has started an emergency power upgrade program for the Turkey Point plants which includes an addition of two new dedicated diesel generators. This addition will increase the number of diesel generators on this nuclear site to four.

Also, since the Turkey Point site has five diesel generators used for power production, the four units in the nuclear site may be reused and added to increase power production at the time of decommissioning.

13) Fans and Blowers

The life expectancy for fans, blowers and extractors reported by the vendor is 40 years (Ref. 30). Therefore, the items included in this category are not expected to be reusable in a new power generating facility at the time of decommissioning.

14) Fire Protection Equipment

The life cycle for the detection and suppression components of the fire protection system have been estimated to be twenty years. The detectors at this point become obsolete and are not economically refurbishable (Ref. 31). The installed fire suppression systems are very site-specific and dependent on plant configuration. Therefore, the components in this category will not be considered for reuse (onsite or offsite) at the time of decommissioning.

15) Heat Exchangers and Coolers

Heat exchangers and coolers have standard life expectancies of five to fifteen years (Refs. 32, 33) depending on the component size and location in the plant (i.e. indoors, outdoors). The components are periodically refurbished in order to obtain the maximum years of service stated above. However, based on the replacement schedules of these items, they will not have any remaining useful life at the time of plant decommissioning. Therefore, heat exchanger and coolers will not be considered for reuse.

16) Heaters

The feedwater heaters at Turkey Point have been in operation for almost 20 years with a major refurbishment after operating for seven years (Ref. 34). The expected life cycle for these heaters has been reported to be a maximum of 40 years (Ref. 35). Therefore, at the time of plant decommissioning, these heaters will not have any remaining useful life and will not be considered for reuse.

The Control Room space heaters were selected as a typical type of heater used for different applications throughout the plant. These heaters are currently going through a plant modification process to be deleted at both sites. They have an estimated life expectancy of fifteen to thirty years (Ref. 36). However, corrosion starts to become a major problem at the fifteen year point with typical replacement occurring at twenty years (Ref. 36). Having undergone a second twenty-year operation cycle after replacement, the heaters will have reached their maximum beneficial life and shall not be considered for reuse.

17) Heating, Ventilation and Air Conditioning

Ductwork, dampers and doors are installed in a location specific configuration. Removal of these components in such a way as to allow reuse, is very labor intensive. As well, over a forty year period, parts become damaged or lost and replacement parts become difficult to locate. All these factors, including the low replacement costs (Ref. 10), negate any benefit from attempting to reuse these components in a new generating facility.

18) Ion Exchangers

The ion exchangers have been reported to have a long life expectancy if regular resin change-out, proper maintenance and refurbishment are performed (Ref. 37). Refurbishment has been recommended by the vendor to take place every 20 years. At Turkey Point, the ion exchangers were refurbished after approximately eighteen years of operation and they are expected to last throughout the life of the plant without another major refurbishment. The cost of refurbishing this item is very low, making its reuse a viable option.

19) Insulation

Insulation was divided into two different types in the Major Components and Equipment Categories section. Equipment insulation will generally be removed with its component. The whole unit, equipment and insulation, will be treated as a single item and the reuse of the insulation will depend on whether the equipment is reusable or not. Piping insulation is treated in a similar way, except that, as discussed later, piping will not be a reusable item and therefore, its insulation will not be considered for reuse either.

20) Lighting Fixtures

As previously discussed, lighting has been separated into two categories: normal and emergency. Normal lighting has an estimated life expectancy of ten to twenty years (Ref. 38) while emergency lighting has an estimated life expectancy of five to fifteen years (Ref. 39). Due to the low cost of replacement coupled with the high cost of removal and the refurbishment and reuse associated with these items after they have reached their maximum life cycle, these items will be left in place to aid in decommissioning and will not be reused at a new generating facility. However, this item could easily be reused at the existing site and without major incurred refurbishment costs.

21) Load Centers, Motor Control Centers, Switchgear

Assuming proper maintenance, MCCs have a long life expectancy. MCCs are not quickly outdated by emerging technology and spare parts are not difficult to find. Vendor recommendations include refurbishment every twenty years to ensure component integrity (Ref. 40). This lasting technology along with the relative low cost of removal / refurbishment will allow for the reuse of MCCs in a new power facility, except for those located within the Intake Structure. The MCCs located within the Intake Structure have been found not worthwhile to refurbish for reuse as they have severely shortened life spans due to the corrosivity of the saline environment (Ref. 41).

Load centers are very comparable to MCCs in life expectancy, maintenance requirements and refurbishment costs. Load centers can be easily reused at a new power facility (Ref. 42).

Switchgear (Ref. 43) has an estimated life expectancy of forty years with the exception of related timing relays which have expectancies of ten years and will be ready for replacement at the forty year point. Therefore, at the time of decommissioning, plant switchgear units, including timing relays, will have reached their maximum designed life and will not be reused.

Breakers typically used at the Turkey Point and St. Lucie plants have estimated life expectancies of twenty (Ref. 44) and forty years (Ref. 45). Breakers are not refurbishable items, exhibit one of the highest aging sensitivities (Ref. 14) and must be replaced at life's end. Therefore, breakers are not items considered reusable upon plant decommissioning.

22) Moisture Separator/Reheater

Although the Moisture Separator Reheaters estimated useful life is approximately thirty years these components are currently used only at nuclear power plants (Reference 46). Since new nuclear units are not included in FPL's Ten Year Power Plant Sites Plant (Reference 4), these items will not be considered for reuse at this time.

23) Motor Generator Set

Based on continuous operation, motor generator sets have an estimated life expectancy of twenty years (Ref. 47). A typical refurbishment consists of rewinding the stator, whose cost could approach sixty percent of the replacement cost (Ref. 47). Since this is a high refurbishment cost and the equipment may not last another twenty years, replacement at the time of decommissioning is a more viable alternative than reuse. Also, newer fossil plant designs have not required the use of this item because they have been replaced with alternate instrument bus protection equipment.

24) Motors

This category is divided between electric and air motors.

Electric motors of all types and sizes are used to continuously drive pumps, valves, fans and compressors. These components serve important roles for performing normal operations, during off-normal and accident conditions. The life expectancy of electric motors has been estimated (Ref. 35) at thirty years for low voltage (up to 550 volts) and fifty years for high voltage (4kV). Based on these estimates the low voltage motors (once replaced) will have a remaining useful life of twenty years at the time of decommissioning. This makes the low voltage electric motors suitable for reuse. The high voltage motors, should be replaced since they will be approaching their expected useful life at the time of decommissioning.

The life expectancy for air motors has been estimated to be between ten and fifty years (Ref. 48) depending on the application. The higher end of the range corresponds to clean environment applications similar to those of a nuclear plant. Therefore, at the time of decommissioning these items will not be considered for reuse because they will be close to their end of life cycle and the costs to maintain the component will be on the high side.

25) Piping

Piping systems may be susceptible to erosion/corrosion during their operational life cycle. Additionally, biofouling (Ref. 49) is a major concern to the power industry because of its effect on useful life of piping and components. Piping replacement is typically performed after failure due to fatigue or at a time when wall thinning reaches the unacceptable limit. Reuse of piping requires requalification and testing, since remaining life is difficult to predict at the end of the plant life. This testing (ultrasonic for min-wall thickness) and removal/requalification process expenses make this item unsuitable for reuse at a new power generating facility.

26) Process Instrumentation

The various components of the process instrumentation system, transmitters, controllers, indicators, recorders and signal conditioning modules, will not be considered for reuse at new power generating facilities. This equipment is usually replaced and/or upgraded on the basis of inspection and testing program results. Over the long run, modernization of these instruments will coincide with changes in the overall plant controls (Ref. 50). The currently installed components are of the analog technology. Modern equipment suitable for newer plants are of the digital processing technology with more accuracy and quick response. Manhour requirements for instrument and system range matching compatibility would be excessive. Therefore, this item will not be considered for reuse.

27) Pumps

Pumps were divided into two categories depending on their power rating. Smaller pumps which require smaller (480 v) motors have a life expectancy of 10 to 20 years (Ref. 51), larger pumps requiring large (4 kV) motors have an estimated 48 year life expectancy (Ref. 35). The smaller pumps will be at the replacement stage by the time of decommissioning and therefore, will not be considered for reuse.

Similarly, the larger (high voltage) pumps will be close to their expected life cycles and their operational reliability will be approaching the lowest levels. The low reliability would compromise plant operations because these pumps are heavily relied upon in plant operations (i.e., failure to operate when demanded would cause the plant to be shutdown). Also, the associated high maintenance cost at the 40-year point in the pump life along with the previously discussed facts make these pumps unsuitable for reuse at a new power generating facility.

28) Racks, Compressed Gas Bottles

Gas bottles used at the plant sites are usually rented from the gas suppliers to save on maintenance charges (Ref. 52). Therefore, this category will not be considered for reuse at a new generating facility.

29) Radiation Monitors

Radiation monitors will not be reused at any new power generating facility at the end of the nuclear plant life cycles because this item is only reusable at other nuclear sites. FPL is planning to build fossil power plants during the 1990-1999 time period according to their ten year plan document (Ref. 4). Therefore, this item will not be considered for reuse after decommissioning.

30) Sample Collecting Unit

Removal of sample collecting units is a labor intensive process. The location and complex arrangement of sample units makes it very difficult and costly to remove for reuse at a new facility. The units are usually composed of very small valves and tubing (3/4 inch and smaller) with numerous bends and turns. Also, since this component is considered as part of the piping and piping will not be considered for reuse, then the sample collecting units will not be considered for reuse at decommissioning.

31) Travelling Screens

Since both nuclear sites utilize saline circulating water systems, the travelling screens are susceptible to corrosion problems which shortens their life span. Most screens have an operating life expectancy of 20 to 30 years depending on the environment where they operate (Ref. 53). The low end of the range reflects conditions of high salinity such as those at the FPL plant sites. Therefore, screens will reach their end of life at the time of plant decommissioning. This fact, along with the low cost of procuring new screens, makes this item not considered for reuse.

32) Security Equipment

Fossil power plants do not have the rigorous security regulations required at nuclear power plants. Usually fossil plants require only minimal equipment (i.e. fence). Therefore, the security equipment at the nuclear plants in question will not be reused at the time of decommissioning, since fossil plants will likely be built.

33) Silencer/Muffler

The components in this category, mufflers and silencers, are usually found in piping or as a subcomponent of a major piece of equipment (i.e. diesel generators, pumps, etc.). Since they are part of piping, they will have the same reuse feasibility as piping. Also, for that equipment that includes this item as a subcomponent like the diesels, we will not separate the subcomponent from the main equipment. Reuse of these will depend on whether the equipment is reusable or not.

34) Snubbers

Snubbers are passive components used in a large scale in nuclear plants, more so than fossil. Their useful life has been estimated at 40 years (Ref. 54) and would have no remaining useful life at the time of decommissioning. Therefore, this item will not be considered for reuse at a new facility.

35) Strainers and Filters

Filters, screens and cartridges are periodically replaced so their reuse at new facilities will not be considered. However, the strainer and filter housing structures could be reused.

The life expectancy for the filter housing has been estimated to be 20 years (Ref. 55). By the time of decommissioning, this item replaced once, will be ready for disposal. Also, the strainer housings have a long life expectancy (Ref. 56). A long or short life span depends upon the degree of internal corrosion at the 40-year point due to, among other things, corrosion caused by process fluid. However, none of these two components will be suitable for reuse at a new facility since they are considered to be part of the piping and as discussed earlier piping will not be considered for reuse after decommissioning.

36) Switchyard

The Switchyard is outside the scope of evaluation since it is not part of the plant as are the transmission lines (part of the already existing FPL power grid). The switchyard is also used by the fossil units at the Turkey Point site. Therefore, this item will not be considered for reuse at a new facility.

37) Tanks

According to Reference 57, most tanks in the industry are designed to last a minimum of 20 years. Industry experience has shown that they could last up to forty years or longer with proper maintenance. Due to the uncertainty that exists for the expected life cycle, some tanks may have longer lives which can not be predicted at this time. Additionally, due to the large size of most tanks and the cost associated with removal and difficulties with transportation makes this item less desirable for reuse. Therefore, it will be assumed in this report that the expected life cycle for tanks will be forty years. In accordance with Assumption 12, this item will then be unsuitable for reuse at a new facility.

38) Transformers

Industry literature reports a range of estimated life expectancy between 30, 45 and 60 years of operation for main, auxiliary and start-up transformers respectively (Ref. 35). Reference 45 qualifies a typical smaller transformer for at least 45 years in a nuclear application. Based on these estimates, only the main and startup transformers will have a remaining life of approximately 20 years at the time of decommissioning. However, the larger transformers (i.e., main and startup transformers) are designed to match plant generation to the switchyard voltage. This would be difficult to match to a new plant and therefore will not be considered for reuse.

39) Turbine-Generator

The Turbine-Generator is one of the most critical components in the plant used in the production of electricity. This is due to the fact that the turbine-generator is not a redundant piece of equipment (i.e., most pumps and other major pieces of equipment will have a backup or alternate component). If the turbine-generator fails, the plant must shut down.

The most common cause of failure in the turbine-generator, is material degradation (Ref. 58). This can be caused by thermal fatigue, creep cracking, erosion, high cycle fatigue, flange ligament crack and stress corrosion cracking.

Based on discussions with a turbine representative of ABB Turbines (Ref. 59), who was involved in the turbine inspection during 1990 outages at St. Lucie Unit 1 & 2, the major concern with these turbines is stress corrosion cracking (SCC). The assessment of current conditions and useful life remaining revealed the units should have 20 years of life remaining. The turbine rotor has been changed once and might need to be replaced prior to the next 20 years. It was also discussed with the turbine representative (Ref. 59) that due to erosion on blades (1st stage), LP exhaust, piping and other associated equipment, current refurbishment cost would be estimated at 2 to 10 million dollars. Additionally, a new rotor would cost approximately 8 million dollars.

At the time of decommissioning the turbine generator would have only 5 years of useful life remaining and would require refurbishment if none is performed in the next 15 years (prior to decommissioning). Cost of a new turbine generator is approximately 50 million dollars (Ref. 60).

Based on the above, with only 5 years of useful life remaining at decommissioning and the current refurbishment cost as high as 18 million dollars, it is not logical to reuse this equipment. Additionally, at the end of useful life, the component requires additional maintenance and its reliability can be greatly reduced. Therefore, the turbine-generator will not be considered for reuse at decommissioning.

40) Valves

This category includes different types of valves. Valves with sizes between four and thirty inches were reviewed. Valves with sizes below four inches (except safety valves which were evaluated down to 2") were not considered due to the low replacement costs. No valves over 30 inches were found in these plants. The technical evaluation and conclusions for all of these valves were provided through input from ABB Combustion Engineering's Valve Services group which recently participated in valve inspections at the St. Lucie Site during the 1990 outage.

Swing check valves are relatively easy to repair. The extent of repair includes seat, hinge arm and hinge pin refurbishment, with occasional disc repair due to stud wear induced by the location of the valve in the system (i.e. downstream of a pump, or elbow). However, the cost of removal and refurbishment often exceeds the cost of replacing the valve. Therefore, these valves will not be considered for reuse at new power generating facilities.

Safety and relief valves typically do not experience much wear up to the time of decommissioning. These valves are not challenged (used) very often. In preparing these valves for reuse, the spring will have to be replaced and adjusted to obtain the correct pressure setpoint. This is because the steam pressure rating for these valves is generally lower for PWR nuclear plants such as St. Lucie and Turkey Point than for fossil plants. Additional engineering and design matching to the new facility will have to be performed for each valve to determine if it can be reused at the time of decommissioning. Therefore, these valves will be considered for reuse at this time. However, this item will have to be reevaluated on a case by case basis at the time of decommissioning.

Other valves that cannot not be reused are: duo-check valves, butterfly, gate, globe and all control valves.

Based on inspection during outages, it has been noted that the duo-check valves required refurbishment every other outage (approximately every three years). All valves inspected had worn hinge pins, bent stop pins, springs with no tension left or broken and rubber seats requiring repair. Therefore, this type of valve will not be considered for reuse at a new facility.

For gate and globe valves, in ninety percent of the previously disassembled 300 and 600 pound rated valves at both sites, the valve seats had to be replaced due to leakage behind the seat ring. This expense, along with removal costs, increase the refurbishment costs to a point where it is more economical to replace the valve. Therefore, reuse of these valves at the time of decommissioning is not a viable option.

With regard to the butterfly valves, they have been found with erosion problems at the St. Lucie site and refurbishment has been necessary for continued use. Likewise, the manufacturer, Henry Pratt, suggests that these valves will be in non-reusable condition by the time of decommissioning (Ref. 62) due to erosion and corrosion. These valves will not be considered for reuse at the end of plant life.

Control valves (pneumatic or motor operated) usually require major repairs before they can be reused. Some of the major repairs consist of replacing or rewelding/machining eroded seats and plugs. Here again it is concluded that it is more cost effective to replace the valve rather than refurbishing and reusing the old one.

REUSE OF PLANT

STRUCTURES

REUSE OF PLANT STRUCTURES (Phase 1 - Task 2)

The purpose of this section is to evaluate the reuse feasibility of all civil structures at the Turkey Point and St. Lucie sites. These structures have been divided among three different categories according to their physical characteristics: 1) Concrete, 2) Steel and 3) Prefabricated Structures. Components and equipment have been excluded from these structures because they are subject to periodic replacement during the 40-year plant life cycle. These components were described in the previous sections of this report.

The evaluation process for this task began with identifying the existing structures for the plant sites from civil drawings (Ref. 61 and 11). A questionnaire/checklist was developed to find out whether the structure was reusable at the end of plant life or not and also, if the structure could be reused at a different plant site. The questions for each of these categories can be found in Table 6 and the assessment for each structure category based on these questions follows.

CONCRETE STRUCTURES

The concrete structure category contains most Class I structures as well as administrative and auxiliary service buildings which are fixed to a concrete basemat and are not required to remain on site after decommissioning. A list of these structures for the Turkey Point and St. Lucie sites can be found in Tables 7 and 8 respectively.

Some concrete structures were excluded from the scope of this report. This includes the following: reactor containment building, shield building, radwaste building, the auxiliary building and the fuel handling building. These structures have been excluded because they contain radioactively contaminated systems (i.e. spent fuel pool) or equipment connected to contaminated systems (i.e. engineered safety feature components).

Most of the concrete structures could be used in place at the end of the plant life, provided that some refurbishment takes place. Refurbishment cost is relatively low when compared to replacement. The literature reports refurbishment costs of up to 1.2 million dollars for a 21-year old coal plant (Ref. 50) where 70% of the cost was due to structural problems. Generally, the age-related problems encountered for concrete structures include cracking, concrete voids, or low concrete strengths at early ages. Also, corrosion problems of the reinforcing bar have been found in structures exposed to seawater (Ref. 65). Remedial measures for repair of degraded concrete components are capable of completely restoring structural integrity when proper techniques and materials are used (Ref. 66). Concrete structures in civil and nuclear applications have exhibited excellent resistance to age-related degradation. Nuclear plant structures have been designed and constructed to rigorous industry standards, resulting in structures that have substantial safety margins (Ref. 65). Based on these statements, reuse of concrete structures at the current sites is feasible from a technical point of view.

However, the reuse of concrete structures at a different site would not be feasible since concrete structures would have to be cut into smaller pieces to be transported, compromising the integrity of the whole structure. Also, there is a high expense of removing these structures which would involve the use of heavy machinery and a large labor force. These problems along with the high transportation expenses makes concrete structures unfeasible for reuse at a different site.

STEEL STRUCTURES

Steel structures included in this report are generally the turbine area support structure at both plant sites which are not required to remain onsite after decommissioning. Those structures which consist of a small percentage of concrete and a larger amount of steel are also included in this category. For St. Lucie, the list of these structures is shown in Table 9. Since the turbine structure is the only steel structure at Turkey Point, no specific table is shown for this site.

Structural steel, like concrete, has an excellent record of resistance to age-related degradation. The main degradation mechanism is corrosion, usually associated with severe environmental exposure (Ref. 65). In the case of the nuclear sites in question, the high coastal salinity levels could have a high toll on these structures through the end of plant life. Refurbishment costs are also relatively low. Reference 50 reports refurbishment costs of up to 1.2 million dollars have been incurred in a 21-year old coal plant. The repairs included cleaning, painting, replacing missing bolts and bent members. However, the implementation of an adequate maintenance program could provide protection to these structures, bringing the refurbishment costs down and making their reuse at the existing site feasible.

Offsite reuse is technically feasible but not cost effective. The dismantling process requires a large labor force and disassembly of a large number of joints and attachments. Transportation to a new location is relatively easy compared to concrete structures and the integrity of the structure as a whole will not be affected upon disassembly. However, the high labor force for removing the structure when compared to replacement makes the latter more feasible (Ref. 10).

PREFABRICATED STRUCTURES

The prefabricated items that are included in this report are those sheet metal structures which are usually bolted to a concrete block floor or concrete slab. Also, those structures with a small portion of concrete and a larger amount of prefabricated material are included in this category. They are described in Table 10 for Turkey Point. For St. Lucie, the only prefabricated structure is the Lawn Mowing Equipment Building.

Removal of these structures and reuse at a different location is usually an inexpensive task and performed with a small work crew. The structures could be easily removed by crane and loaded onto a flatbed. However, the corrosion of this item progresses very rapidly with time given the saline environment, with most structures becoming non-reusable (if moved) after 10 years of use (Ref. 67). Therefore, the prefabricated structures will be considered for reuse onsite but will not be considered for offsite reuse at the end of plant life.

TABLE 6.
Questionnaire for Reuse Feasibility of Structures

	Question	Concrete	Steel	Prefab
1.	Structure required to remain on site after decommissioning ?	No	No	No
2.	Structure assembled using welded joints ?	No	Yes	Yes
3.	Numerous attachments to disassemble ?	No	Yes	Yes
4.	Columns easily removed from base ?	No	Yes	N/A
5.	Easy transportation to new site ?	No	Yes	Yes
6.	Structure moved as a unit by crane Onto flatbed ?	No	No	Yes
7.	Easy disassembly ?	No	No	Yes
8.	Any special considerations that would make disassembly difficult ?	Yes	Yes	No
9.	Building integrity compromised ?	Yes	No	Yes

TABLE 7.
Concrete Structures at the Turkey Point Site

Item	Structure
1	Control Room/Control Building
2	Diesel Generator Buildings
3	Simulator Training Building
4	Sewage Treatment Plant
5	Guard Houses (New, South)
6	Administration Building
7	Intake Structure
8	Maintenance Building
9	Waste Storage Building
10	Access Dress Facility
11	I&C Building
12	Technical Support Center Facility
13	Water Treatment Facility
14	Nuclear Entrance Building
15	Discharge Structure
16	New Transformer Vault Additions

TABLE 6.
Concrete Structures at the St. Lucie Site

Item	Structure
1.	Component Cooling Water Structure
2.	Diesel Generator Building
3.	Diesel Oil Storage Building
4.	Land Utilization Lab and Office
5.	Simulator Training Building
6.	Security Buildings
7.	Operating Stores
8.	Plant Personnel Lunch Building
9.	Lube oil/Paint Storage & Fire Brigade
10.	Gas Storage Building
11.	Sand Blasting Building
12.	Chemistry and NPO office
13.	Cold Chemistry Lab
14.	RCA Access Point
15.	Steam Generator Blowdown Treatment Facility
16.	Dry Storage Building
17.	Maintenance Training Building

TABLE 9.
Steel Structures at the St. Lucie Site

Item	Structure
1.	Turbine Generator Building
2.	Intake Structure
3.	North Security Building
4.	Unit 1 Operating Stores
5.	Maintenance Shop
6.	Electrical Maintenance
7.	Guard Station
8.	South Service Building
9.	Backfit Service Building
10.	Backfit Maintenance Shop
11.	Surplus Warehouse
12.	Backfit Outage Offices & Storage
13.	Maintenance Paint Shop Facility
14.	Bulk Storage
15.	Backfit Parts Storage
16.	Pipe Fabrication Shop
17.	Unit 2 Operating Stores
18.	Backfit Warehouse
19.	North Warehouse

TABLE 10.
Prefabricated Structures at the Turkey Point Site

Item	Structure
1	Construction Office Building
2	Health Physics Building
3	Fossil Dry Storage Warehouse
4	Construction Craft Buildings
5	Central Receiving Facility
6	New O.E. Shop
7	New Weld Test Shop
8	New Machine Shop

RE-ENGINEERING

FOR NEW PLANT

RE-ENGINEERING FOR NEW PLANT (Phase 1 – Task 3)

The engineering involved in reusing the components from the decommissioned plants for a new generating facility was divided into two basic categories. The first category analyzed reuse at the existing nuclear sites. This design would conform to the existing plant configuration for the components that could not be moved (i.e., circulating water intake structure). The second category was a new plant located offsite. This design would incorporate the reusable equipment available.

Reuse at the existing sites have both potential problems and positive attributes (Ref. 63).

The potential problems are as follows:

- Fuel delivery by ocean (i.e., coal delivered by ship/barge for St. Lucie site).
- The combustion byproduct storage and removal (i.e., fly ash and bottom ash from coal fired plants).
- Encroaching development near plants (i.e., noise, construction traffic and esthetics from construction of the new plants).
- Mangrove clearing problems (i.e., cutting down mangroves is against Florida law).
- State and local governments might not allow certain types of fossil fuel plants. Additionally, the Florida Electrical Power Plant Siting Act may not allow for new coal plants.

The positive attributes are as follows:

- Transmission and distribution are currently in place.
- The existing once through cooling from ocean at both sites could be reused.
- The existing nuclear plants are zoned for power production.
- Potential protection for sea turtles may continue.

DESIGN AT EXISTING SITES

The design to use the existing sites would need to consider existing heat load capabilities. This would be based on the type of plant (i.e. coal, combined cycle, gas turbine, etc.) being built and the analysis of the circulating water system and condenser capacity for heat loads when the plant heat balance is developed. Since fossil fuel plants run at higher temperatures and pressures (main steam), the existing systems would limit the plant power output capacity of electricity. Additionally, the cost of designing systems to conform to the existing structures and around the existing component configuration being reused would be substantial. However, this could not be quantified until new plant design was detailed.

The re-design to use the existing Diesel Generators would be relatively easy (requiring changes to the controls and to eliminate auto initiation). At the Turkey Point site, there is a five diesel generator peaking unit where the nuclear diesel generators could be utilized.

DESIGN AT NEW SITES

When designing a new plant, it would be possible to reuse the components and equipment without major design impact. However, the matching of reusable components to the new design would need to be considered. For instance, the reusable safety relief valves may require a change of orifice size to match the new system. This would be required to accommodate the design relief capacity. These types of activities would add to the scope and cost of the engineering effort.

ADDITIONAL DESIGN OPTION

A third design option which was not part of this specific study is to reuse components and equipment at existing fossil fuel plants as replacement parts. Since the useful remaining life of the component will be reduced at the time of decommissioning, the existing fossil fuel plants which have only 10 to 20 years of useful life at the time of the decommissioning of the nuclear unit could possibly use some of these components as spare parts. Since the reused component may only have a useful life that matches the remaining life of the fossil plants, this might be a more viable option than reuse at new sites. However, for this option, a large central warehouse staffed to supply parts to the fossil plants when needed and to provide maintenance while the components are in storage (i.e. rotation of rotating parts, ensure the heaters for motors are energized, etc.) would have to be established and that additional cost would need to be considered.

DESIGN CODES and STANDARDS

The existing nuclear plants were designed to codes and standards current at the time of construction. Over the years the mechanical codes (ASME & ANSI) have changed. Also, electrical standards (IEEE) and additional requirements have been imposed on the nuclear industry. That is to say that new nuclear plants would require equipment installation and design to conform to current design codes. However, this would have little affect on current fossil design. At the time of decommissioning the current design codes may prohibit the reuse of items for fossil as well. This would need to be evaluated at the time of decommissioning.

CONSTRUCTION and PROCUREMENT

The construction activities associated with removal of the reusable components and the scrapping of others would require a great deal of additional planning. This is to ensure that the proper components are removed to expedite the removal process. The plan would need to address the actual logistics as to which items will be removed first and removing scrap items in order to ensure ease of removal for the larger reusable items. The components which would be reused will require additional care and careful cataloging (bag and tag) as some of the components will not have part numbers or name plate tags. When the name plate information (i.e. with design temperature and pressure) is not on the part, additional information of the design parameters will need to be included in the logging process for some components. The additional information would require the construction engineers to find the information (i.e. design document or drawings), record it and provide copy with component. The above activities will also alleviate additional problems for the construction of the new plant. These type of activities need to be factored into the evaluation.

The procurement process for the new plants would not change. However, until all of the components are removed and refurbished, there is not assurance that all of the components are refurbishable. This might cause delays in construction activities since there may be long lead times for a replacement component that was to be reused and was not refurbishable if the dismantling coincided with construction of the new plant. If there was a long lag between the two, then additional storage time, space and maintenance while in storage would be required. As mentioned before, modification to equipment and refurbishment will require procurement of some sub-components which would need to be addressed during the engineering process.

MOTHBALL OF

ST. LUCIE 1

MOTHBALL OF ST. LUCIE 1

During the five year period that the St. Lucie Unit 1 will be in mothballing, some precautions will have to be taken to protect the equipment and components from corrosion, decay, mildew, mold, rats, etc. which are the main causes of deterioration of the equipment. Some useful long term layup techniques have already been applied in the fossil industry (Ref. 68) which could be used at any industrial facility with heavy machinery. A summary of these techniques follows.

Wet layup could be used for tanks, vessels and feedwater heaters. This technique consists of filling the component with demineralized water and a corrosion inhibitor. Also, nitrogen is used as a blanket to cover areas where water may not come in contact with the surfaces. The alternative option for layup of containers is dry layup. In this technique the vessel is filled with dry or dehumidified air or nitrogen.

Some systems could be kept in operation where the moving fluids provide natural protection. Examples include the turbine lube oil and fuel oil systems, diesel generator, or the component cooling water system with a corrosion inhibitor.

Components located indoors (mostly electrical components like the MCCs) as well as other equipment could also be protected by installing devices to keep the relative humidity below 30% at all times. The devices included here could be of refrigeration or desiccant type. On the other hand, equipment exposed to rain, heat, or humidity may be primed and painted to protect the exterior surfaces from corrosion.

Other equipment-specific techniques could also be used. For instance, a four-inch concrete partition could be placed in front of the travelling screens to protect the intake structure. Some fuel oil tanks may be emptied and left "as is". The heavy oil residues provides a protective coating for the inner walls of the tank. Some components may be left "as is", because the preservation costs may be so high that the reuse at the end of the dormancy period may not be feasible. Rotating machinery would require periodic rolling to prevent brinelling of bearings and to redistribute lubricants. Also, sacrificial anodes should be considered where applicable to prevent corrosion problems.

In order to perform these techniques, a minimal amount of plant personnel familiar with the facility will have to be employed not only to prepare the components but also, to perform the corrective and preventive maintenance program. The number of employees will depend on the amount of components to be serviced and maintained. These additional costs were not factored into the reuse feasibility of components and equipment in this study. Obviously, if these costs were to be factored into the study, in some instances, the equipment replacement costs may actually be lower than the cost of maintaining, refurbishing and reusing the equipment. If this was the case, additional items might not be considered for protection and reuse at the time of decommissioning.

SUMMARY & CONCLUSIONS

SUMMARY and CONCLUSIONS

The components and equipment that could be reused are shown in Table 5. Two columns are shown in this table: the onsite column, for components that can only be reused onsite and the onsite/offsite column for those components that could be reused at any location. Table 1? contains estimated man-hours for the work force to remove the component/equipment in question, as well as storage requirements and maintenance records required for the onsite/offsite reusable generic categories only. Those generic categories that could only be reused onsite are not included in this table since removal is not necessary or feasible. The list of components and equipment to be reused for each plant site are shown in Appendix B.

For those components to be reused only onsite, there is the chance that they will not be reused at all, since the turbine-generator will not be reused. This is because the removal of the turbine-generator will involve removal of a great deal of supporting equipment that could be reused on site. Also, the new turbine-generator design may require new components rather than the existing ones. These questions would need to be addressed when the specific replacement fossil plant design is specified.

With regard to the plant site structures, the concrete and steel structures could only be reused at the existing locations. Reuse at a different plant location is not feasible. Prefabricated structures are not reusable at any new plant location due to corrosion problems.

It should be noted that these conclusions should not be construed to reflect on any plant life extension (PLEX) initiatives in the future. Since this report utilizes average life times, PLEX will entail component specific evaluations of integrity and functional performance.

Based on these results, the most effective way to reuse a larger number of components and structures seems to be at the existing plant sites. However, questions about engineering design and equipment compatibility with the design of the new facility would have to be addressed to make a more conclusive determination about the reuse of items onsite in comparison to their reuse offsite.

The evaluation in this report assessed the feasibility of reusing the equipment on a component type basis. This information will serve as input to economic evaluations of decommissioning options. These evaluations will estimate the practicability of factoring reuse into decommissioning cost estimates. A more detailed reuse evaluation for each specific piece of equipment would be required near the time of plant decommissioning for more conclusive results. At decommissioning, a better equipment performance history would be available to be factored into this technical feasibility assessment.

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APPENDIX A
PLANT DATA MANIPULATION

PLANT DATA MANIPULATION

The data containing plant component information (i.e. tag number, system, description, etc.) for the St. Lucie (PSL) and Turkey Point (PTN) plants was obtained from the FPL Total Equipment Database (TEDB) in ASCII format. While the PSL data excluded all items in contaminated systems, the PTN data did not. Both units were uploaded into an IBM Personal Computer from the ASCII format flat files to a DBASE III+ format database. All PSL plant common equipment was placed with Unit 2 and PTN plant common equipment placed with Unit 4 due to the decommissioning schedule of the four plants (see Assumption 8 in the Evaluation Section).

After the data upload into the personal computer was successfully completed for both sites, the PTN contaminated systems/components were deleted from the databases (see Figure A1, Program 1). Then, after determining which component categories needed to be deleted due to the reuse feasibility evaluation, the FPL equipment codes were matched with this reports's component categories. The FPL equipment codes and associated components used in this step are listed in the Program / Equipment Codes Table A1. The appropriate component categories were then deleted by applying the algorithm shown in Figure A2, Program 2. Upon completing the above, the components were then given a generic category code consistent with the FPL equipment code (see Figure A3, Program 3). The databases were then ready for sorting into the generic component categories.

The next step in the process was to delete generic categories from the databases which were determined not to be reusable at decommissioning. This included the following categories: 02, 12, 14, 16, 17, 18, 36, 39 for all plants and 35 for PSL/28 for PTN. The corresponding categories are shown in Table 3. The procedure used here is shown in Figure A4, Program 4.

Since the databases included all valves in each plant, it was necessary to delete all but the safety/relief valves which were the only ones to be reused at decommissioning. The procedure for this deletion is shown in Figure A5, Program 5.

The databases included a large amount of components without an assigned component category code. These components were reviewed to determine which were considered reusable at decommissioning and which were not. Those not considered for decommissioning were assigned a code '99'. All others were assigned their respective codes per Table 3. Following this code assignment, all components with code '99' were deleted. The procedure for the previous steps is shown in Figure A6, Program 6.

The final step in deleting non-reusable components from the databases consisted of reviewing all databases very closely by looking at their descriptions and tag numbers. Components with identical descriptions, generic component codes and tag numbers indicated that the same component was duplicated. This duplication in the data was to accommodate multiple drawings listed for same equipment. Therefore only the first component in a group such as the one described was kept. All others were assigned a generic category code of '99' so that they could be easily deleted later. Other components deleted from the databases included large motors, subcomponents of the condenser and diesel generators and cables which are included with trays as discussed in the reuse feasibility - cables and conduit section. All these components were manually assigned a component code of '99' and then deleted using the command DELETE FOR GENCATEG='99' followed by the PACK command.

The final list of reusable components for each of the four plants is shown in Appendix B.

TABLE A1

AC	= ACCUMU	Accumulators and low pressure tanks.
AI	= AIRDRY	Dryers for removing moisture or oil vapor from a system.
AN	= ANNUNC	Alarm circuits and audiovisual devices used to indicate an alarm.
BA	= BATTRY	Station batteries and battery chargers of any type.
BL	= BLOWER	Components that move air or gas.
CK	= CKTBRK	Devises that open and close a circuit automatically and manual.
CO	= CONROD	Components used to control reactivity.
CR	= CRDRVE	Devices for controlled withdrawal or insertion of control rods.
DE	= DEMIN	Ion exchanger and demineralizers.
EL	= ELECON	Electrical buses, cable and wire.
EN	= ENGINE	Internal combustion engines. (Gas or Diesel)
FI	= FILTER	Devices to remove suspended particulate from process systems.
GE	= GENERA	Diesel driven, Motor driven and static generators.
HE	= HEATER	Heat tracing, engine jacket heaters and motor heaters.
HT	= HTEXCH	Devices designed to transfer heat from one medium to another.
IN	= INSTRU	Instrumentation, general.
IB	= IBISSW	Instrumentation, Process switches, Bistable switches.
IX	= IXMITR	Instrumentation, Transmitters, Sensors, Detectors and Elements.
IT	= INTCPM	Instrumentation, Square root extractor, Summer and Amplifiers.
IS	= ISODEV	Instrumentation, Devices whose "primary" function is to isolate one portion of an instrument loop from another.
IC	= ICNTRL	Instrumentation, Devices used to perform feedback control.
ID	= INDREC	Instrumentation, Indicators and Recorders.
IP	= IPWSUP	Instrumentation, Power supplies.
ME	= MECFUN	Devices used to transfer control mechanical force from one component to another.
MO	= MOTOR	Devices to provide mechanical power or torque.
PE	= PENETR	Penetrations of the primary containment.
PI	= PIPE	Passive devices used to carry or control moving fluids or gases.
PU	= PUMP	All classes of pumps that move fluid.
RE	= RECOMB	Devices used to maintain hydrogen concentrations.
RL	= RELAY	Electrical devices used for contact operation in control circuits.
SU	= SUPORT	Devices that hold piping and components in place.
TR	= TRANSF	Devices that introduce mutual coupling between electric circuits.
TU	= TURBINE	Devices for driving pumps or generators.
VL	= VALVE	Devices for starting, stopping or regulating flow.
VO	= VALVOP	Devices for positioning valves.
VE	= VESSEL	Devices for containing fluid pressure.
MS	= MISC	General or Miscellaneous equipment
CD	= CMPDEL	Components that have been previously deleted.
TC	= TAGCNG	Components whose tags have changed to other tag numbers.

DETAIL SCHEDULES

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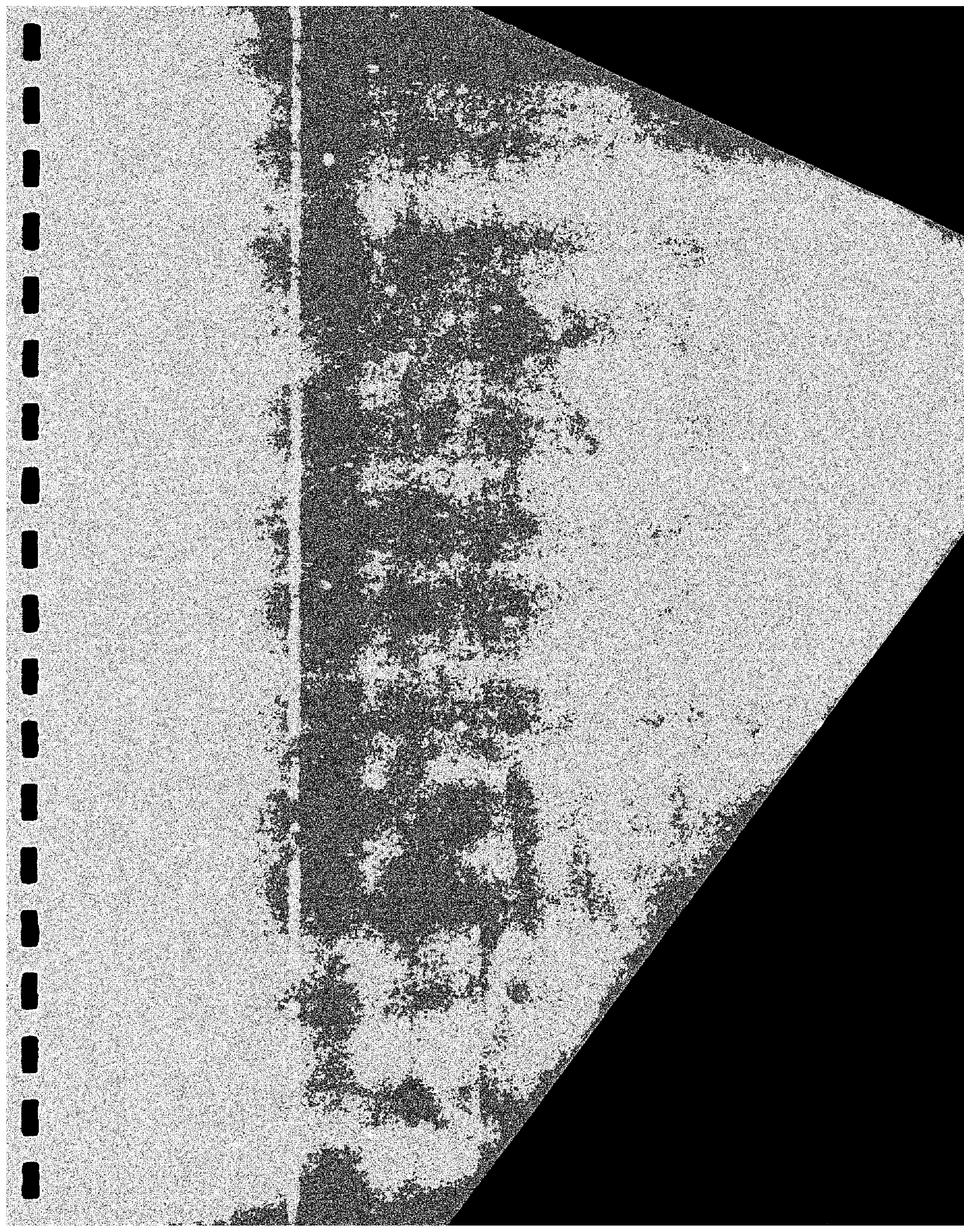

DECOMMISSIONING COST VARIATIONS CONSIDERING THE RE-USE OF PLANT COMPONENTS OFF SITE

for the

TURKEY POINT AND ST. LUCIE GENERATING STATIONS

Prepared for

FLORIDA POWER & LIGHT COMPANY

October 1991

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TABLE OF CONTENTS

APPENDIX

SUMMARY

As required by the Florida Public Service Commission, Florida Power and Light Company performed an analysis of the cost impact of potential reuse of some of the non-contaminated equipment at the Turkey Point and St. Lucie nuclear stations.

Florida Power & Light Company (FP&L) contracted with TLG Engineering, Inc., (TLG) of Bridgewater, Connecticut to develop the differential in decommissioning costs for the reuse of certain classes of clean (non-radioactive) equipment. ASEA Brown Boveri/Combustion Engineering (ABB/CE) performed an examination and classification of the equipment currently on site at the nuclear units and made estimates concerning which of these components may be reusable by FP&L after final shutdown of the nuclear units (Ref. 2). TLG used this ABB/CE inventory as input for its analysis and developed the change in decommissioning cost assuming that each component is removed in such a manner as to allow for reuse.

The results of the TLG analysis indicate that removal for potential off site reuse of the equipment identified by ABB/CE for the four nuclear units will incur an additional $15.022 million dollars in 1987 dollars, according to the following unit schedule:

	costs, $1,000
St. Lucie Unit 1	$4,577
St. Lucie Unit 2	$5,511
Turkey Point Unit 3	$1,659
Turkey Point Unit 4	$3,275
Total	$15,022

If it is determined to be economical to reuse all of this equipment these costs should be added to the 1987 decommissioning estimates to arrive at an adjusted decommissioning cost for each unit or station.

TERMS AND DEFINITIONS

DOC	Decommissioning Operations Contractor
P&ID's	Piping and Instrument Drawings
Inventory	Set of System Components
Period 1	The duration from final shutdown to receipt of a dismantling order from the NRC, typically 12 months
Period 2	The duration from receipt of dismantling order to termination of 10 CFR 50 license
UCF	Unit Cost Factors

1. PURPOSE

Pursuant to Florida Public Service Commission Order Number 21928 [Ref. 1], FP&L was asked to perform an analysis of the potential cost impact of reuse of some of the secondary side components at the Turkey Point and St. Lucie nuclear stations. TLG, of Bridgewater, Connecticut was separately contracted by FP&L to determine the additional costs to remove identified components for potential reuse offsite.

ABB/CE's Jupiter, Florida's engineering group was contracted by FP&L to identify, by tag number, the valves, heat exchangers, pump motors, etc., that might be useful elsewhere in the FP&L fossil energy production system, either at an existing plant or at a new plant to be built in the future (at the time of the nuclear unit's final shutdown date). ABB/CE also identified average number of manhours necessary to remove these components, as well as a monthly lay-up cost.

TLG used this inventory to modify its 1987 decommissioning cost estimates (Ref. 3&4) to reflect the changing levels of effort. As part of this work TLG also updated the 1987 systems inventory to early 1991 levels using the FP&L engineering database. Otherwise, the 1987 decommissioning analysis was identical to the current analysis. The TLG effort was intended to report the differences in costs of removal for each of the classifications of equipment in the non-contaminated plant systems; the results of this effort are reported in Section 4 of this report.

This report details the calculations performed to support and provide data for the changes in decommissioning costs for the Turkey Point and St. Lucie nuclear units operated by Florida Power & Light Company. These changes are induced by changes in the UCF manhours and consumable costs which estimate the removal costs for non-radioactively contaminated system components.

2. APPROACH

An analysis was performed by TLG on the inventories supplied by FP&L and ABB/CE. Based upon this analysis, three separate inventories were generated for use in this estimate. The first inventory is a complete list of components to be used in the base case scenario. The second set of components includes only those components that were not considered by ABB/CE for potential reuse offsite. The final inventory includes only those components that may be considered for possible reuse offsite and as such will require modified UCF's due to the extra care required to remove.

Once the base case inventory was established, a cost was determined to remove these components without any consideration for possible reuse. This would become the base case to which the cost to remove for reuse would be compared. A cost was then determined to remove only the components not considered for potential reuse offsite. A final cost was determined to remove the components considered for reuse offsite using the modified UCF's. These last two costs were added together in order to arrive at a modified total systems removal cost. The differential between this modified and the base case costs is the additional cost to remove the identified components for potential reuse.

Before a cost could be determined for removing these components, UCF's had to be revised to account for the increased effort to remove the components in reusable condition. The removal manhours used in the revised UCF's were taken from Table 1 of the Post-Decommissioning Component Reuse Technical Feasibility Study for the St. Lucie/Turkey Point Sites (Ref. 2). Another revision to UCF's is the methodology used to remove components from various size pipe. Normally, components are assumed to be cut free using torches, but because of the possible debilitating effects of the heat, they will now have to be disconnected using various types of saws. This change will effect the removal manhours assumed to be included in the total manhours used, and the consumables used in the removal process.

In addition to this cost there is also a cost incurred to maintain these components in a usable condition until such time as they can be removed from their original location and transferred to a storage location. The monthly cost for this lay up was taken from information supplied by FP&L (Ref. 5 & 6). TLG estimated these components would not be removed until approximately half way through Period 2 for a total layup duration of 30 months. These costs were then added to the additional removal costs to arrive at a total additional cost to remove various components for reuse off site.

3. ASSUMPTIONS

This study requires a set of assumptions that define the conditions of the plant at the time of final shutdown, and define the scope of the decommissioning efforts. In addition, specific assumptions are required for such activities as systems removal costs, inventory amounts, etc.

3.1 Global Assumptions

The additional costs to remove identified components for potential reuse off site will have no effect on the costs of any other decommissioning activity as reported in the 1987 decommissioning estimates for St. Lucie and Turkey Point. These additional costs can be added directly to the 1987 decommissioning estimates to arrive at a new cost that includes the removal of identified components for potential reuse off site. In particular, this leads to the following assumptions:

- All costs are in 1987 dollars.
- Only those components identified for potential reuse off-site by Combustion Engineering are considered in this study.
- The program schedule does not vary due to the more controlled removal of certain components. Therefore, staffing costs and time-dependent undistributed costs are not changed.
- Staffing levels for FP&L and the DOC are not changed.
- Additional engineering effort is not required to support the controlled removal of reused components.
- There are no modifications to structures to allow for more careful removal of reusable components.

3.2. Revised Unit Cost Factors

The primary effort in cost estimating for this study was the development of a set of UCF's that would consider the additional requirements for re-use of components. These new/revised UCF's were developed using the following assumptions:

- Adjusted manhours based on information supplied in Table 1 of Post-Decommissioning Component Reuse Technical Feasibility Study for the St. Lucie/Turkey Point Sites.
- The cutting times and consumables costs had to be revised to account for cutting pipe with saws instead of torches.
- Lay up costs - monthly craft manhours and consumables as supplied with FP&L Letter dated June 11, 1991 - duration of lay up taken to be all of Period 1 and 1/2 of Period 2.

- No refurbishment or storage costs were accounted for.
- All items for reuse were clean, i.e. not radioactively contaminated.
- No change in the durations of Period 1 or Period 2 due to complications in component removal were considered.

3.3 Costs

- Standard costs for clean components, by category, includes 0 to 2 inch diameter valves and other components which are not normally considered by TLG in estimating decommissioning costs, but were included due to the Combustion Engineering inventory for components to be reused. These components were estimated using TLG's normal UCF's.
- Standard costs for clean components to be scrapped only (using the normal UCF's).
- Costs for components to be reused only, based upon the C-E inventory (revised UCF's).

3.4 Systems

The system inventory was updated for this study, using an early 1991 database supplied by FP&L, as such, there may be some differences in component quantities with the 1987 system inventory. Appropriate comparisons were made between the 1987 TLG inventory, FP&L's database and ABB/CE's inventory.

- The base case inventory is a complete list of system components to be accounted for in a regular decommissioning cost estimate (no reuse considered).
- A second inventory was generated which included only the components that are not considered for potential reuse offsite.
- A third inventory was generated to include only those items identified by ABB/CE for potential reuse offsite.

4. COSTS

The costs presented in this report represent the additional costs, in 1987 dollars, to remove the components identified by Combustion Engineering as items for possible reuse off site and in no way represent total decommissioning costs. The additional costs by each nuclear unit are presented in the following tables. Each table lists the cost based on TLG's activity description with the corresponding Combustion Engineering category listed as well. The Combustion Engineering category numbers were taken from Table 4, General Component/Equipment Categories, of the Post-Decommissioning Component Reuse Technical Feasibility Study For the St. Lucie and Turkey Point Sites. These categories are at times spread out over several of TLG's categories, as can be seen in the tables, depending on the size and type of the component.

The inventory used in the base case may not match the original inventory from 1987 because it was generated from a late 1990 database as opposed to the 1987 inventory which was generated from P&ID's. This difference is due to several factors; one being the fact that new components were added to FPL's inventory, or some components in the 1990 database didn't show up on the P&ID's used in 1987. Another factor is that some components not included in the 1987 study were included in this estimate as they were identified as items to possibly be reused, although since these items are removed for reuse their costs to remove were included in the additional costs category.

TABLE 4.1
Turkey Point - Unit 3

(All costs are in thousands)

TLG Activity No.	Clean Component Removal	CE Category No.	Layup Costs	Additional Removal Cost	Total Additional Costs
27.4	Valves, 0 - 2 inch	41	17.24	7.93	25.18
27.5	Valves, 2.5 - 8 inch	41	105.19	89.98	195.17
27.6	Valves, > 8 inch	41	58.63	74.52	133.15
27.14	Tanks, 0 - 500 gals., filters, ion exchangers	20	9.37	1.54	10.90
27.17	Miscellaneous components, 0 - 300 lbs.	22	52.56	203.18	255.74
27.17	Miscellaneous components, 0 - 300 lbs.	25	352.45	75.39	427.84
27.18	Miscellaneous components, 300 - 1000 lbs.	10	20.61	4.50	25.11
27.18	Miscellaneous components, 300 - 1000 lbs.	22	68.25	322.61	390.87
27.18	Miscellaneous components, 300 - 1000 lbs.	25	124.65	32.60	157.24
27.19	Miscellaneous components, 1000 - 10000 lbs.	22	0.24	1.70	1.94
27.19	Miscellaneous components, 1000 - 10000 lbs.	25	25.79	10.23	36.01
	Total additional removal costs		834.97	824.18	1659.15

Totals may not add due to roundoff.

TABLE 4.2
Turkey Point - Unit 4

(All costs are in thousands)

TLG Activity No.	Clean Component Removal	CE Category No.	Layup Costs	Additional Removal Cost	Total Additional Costs
27.4	Valves, 0 - 2 inch	41	45.13	20.62	65.75
27.5	Valves, 2.5 - 8 inch	41	151.01	128.34	279.35
27.6	Valves, > 8 inch	41	67.69	85.48	153.17
27.14	Tanks, 0 - 500 gals., filters, ion exchangers	1	10.68	4.61	15.29
27.14	Tanks, 0 - 500 gals., filters, ion exchangers	20	4.06	10.75	14.81
27.15	Tanks, 500 - 3000 gallons	1	28.49	20.01	48.50
27.17	Miscellaneous components, 0 - 300 lbs.	20	11.60	18.39	29.99
27.17	Miscellaneous components, 0 - 300 lbs.	22	50.27	193.07	243.34
27.17	Miscellaneous components, 0 - 300 lbs.	25	624.42	156.29	780.72
27.18	Miscellaneous components, 300 - 1000 lbs.	22	104.12	490.61	594.73
27.18	Miscellaneous components, 300 - 1000 lbs.	25	44.08	13.53	57.61
27.19	Miscellaneous components, 1000 - 10000 lbs.	22	1.44	10.23	11.66
27.19	Miscellaneous components, 1000 - 10000 lbs.	25	73.46	34.08	107.55
27.26	Standby Diesel generators	13	112.44	708.26	820.70
28.1	Gantry Crane	11	41.22	10.67	51.89
	Total additional removal costs		1370.11	1904.94	3275.05

Totals may not add due to roundoff.

TABLE 4.3
St. Lucie - Unit 1

(All costs are in thousands)

TLG Activity No.	Clean Component Removal	CE Category No.	Layup Costs	Additional Removal Cost	Total Additional Costs
27.4	Valves, 0 - 2 inch	41	94.52	46.01	140.52
27.5	Valves, 2.5 - 8 inch	41	223.26	202.09	425.35
27.6	Valves, > 8 inch	41	102.67	138.08	240.75
27.17	Miscellaneous components, 0 - 300 lbs.	10	106.83	2.76	109.59
27.17	Miscellaneous components, 0 - 300 lbs.	25	1087.12	238.12	1325.24
27.18	Miscellaneous components, 300 - 1000 lbs.	22	369.34	676.70	1046.04
27.18	Miscellaneous components, 300 - 1000 lbs.	25	222.46	59.78	282.24
27.19	Miscellaneous components, 1000 - 10000 lbs.	10	35.61	1.70	37.31
27.19	Miscellaneous components, 1000 - 10000 lbs.	22	5.54	15.34	20.88
27.19	Miscellaneous components, 1000 - 10000 lbs.	25	46.17	18.75	64.92
27.26	Standby Diesel generators	13	123.66	708.26	831.92
28.1	Gantry Cranes	11	41.22	10.67	51.89
	Total costs for reuse items		2458.39	2118.25	4576.65

Totals may not add due to roundoff.

TABLE 4.4
St. Lucie - Unit 2

(All costs are in thousands)

TLG Activity No.	Clean Component Removal	CE Category No.	Layup Costs	Additional Removal Cost	Total Additional Costs
27.4	Valves, 0 - 2 inch	41	106.69	39.66	146.35
27.5	Valves, 2.5 - 8 inch	41	217.65	150.46	368.12
27.6	Valves, > 8 inch	41	98.16	100.82	198.98
27.14	Tanks, 0 - 500 gals., filters, ion exchangers	20	554.40	35.31	589.71
27.14	Tanks, 0 - 500 gals., filters, ion exchangers	1	5.81	1.54	7.34
27.17	Miscellaneous components, 0 - 300 lbs.	25	1518.91	335.57	1854.48
27.18	Miscellaneous components, 300 - 1000 lbs.	22	359.76	662.04	1021.80
27.18	Miscellaneous components, 300 - 1000 lbs.	25	291.30	78.95	370.25
27.19	Miscellaneous components, 1000 - 10000 lbs.	25	49.94	20.45	70.39
27.26	Standby Diesel generators	13	123.66	708.26	831.92
28.1	Gantry Crane	11	41.22	10.67	51.89
	Total costs for reuse items		3367.49	2143.74	5511.23

Totals may not add due to roundoff.

TABLE 4.5
Turkey Point - Unit 3

(All costs are in thousands)

CE Category No.	Activity Description	Layup Costs	Additional Removal Cost	Total Additional Costs
10	Control Boards, Panels, Cabinets	20.61	4.50	25.11
20	Ion Exchangers	9.37	1.54	10.90
22	Load Centers, MCC, Switchgear, Dist. Panels.	121.05	527.50	648.55
25	Motors	502.88	118.21	621.10
41	Valves	181.06	172.44	353.50
	Total costs for reuse items	834.97	824.18	1659.15

Totals may not add due to roundoff.

TABLE 4.6
Turkey Point - Unit 4

(All costs are in thousands)

CE Category No.	Activity Description	Layup Costs	Additional Removal Cost	Total Additional Costs
1	Air Receivers and Accumulators	39.17	24.62	63.79
11	Cranes and Elevators	41.22	10.67	51.89
13	Emergency Diesel Generators	112.44	708.26	820.70
20	Ion Exchangers	15.66	29.14	44.80
22	Load Centers, MCC, Switchgear, Dist. Panels.	155.83	693.91	849.73
25	Motors	741.96	203.91	945.87
41	Valves	263.83	234.44	498.27
	Total costs for reuse items	1370.11	1904.94	3275.05

Totals may not add due to roundoff.

TABLE 4.7
St. Lucie - Unit 1

(All costs are in thousands)

CE Category No.	Activity Description	Layup Costs	Additional Removal Cost	Total Additional Costs
10	Control Boards, Panels, Cabinets	142.44	4.46	146.90
11	Gantry Crane	41.22	10.67	51.89
13	Emergency Diesel Generators	123.66	708.26	831.92
22	Load Centers, MCC, Switchgear, Dist. Panels.	374.88	692.04	1066.92
25	Motors	1355.75	316.64	1672.39
41	Valves	420.44	386.18	806.62
	Total costs for reuse items	2458.39	2118.25	4576.65

Totals may not add due to roundoff.

TABLE 4.8
St. Lucie - Unit 2

(All costs are in thousands)

CE Category No.	Activity Description	Layup Costs	Additional Removal Cost	Total Additional Costs
1	Air Receivers and Accumulators	5.81	1.54	7.34
11	Gantry Crane	41.22	10.67	51.89
13	Emergency Diesel Generators	123.66	708.26	831.92
20	Ion Exchangers	554.40	35.31	589.71
22	Load Centers, MCC, Switchgear, Dist. Panels.	359.76	662.04	1021.80
25	Motors	1860.14	434.97	2295.12
41	Valves	422.51	290.95	713.45
	Total costs for reuse items	3367.49	2143.74	5511.23

Totals may not add due to roundoff.

5. CONCLUSIONS

The costs presented here represent TLG's estimate to determine the potential cost impact of reuse of some of the secondary side components at the Turkey Point and St. Lucie nuclear stations. To arrive at these costs TLG updated the 1987 systems inventory to early 1991 levels using the FP&L engineering database. The TLG effort was designed to report the differences in costs of removal for each of the classifications of equipment in the non-contaminated plant systems; the results of this effort are reported in Section 4 of this report. The additional costs for both sites is $15.022 million dollars, in 1987 dollars. If it is determined to be economical to reuse all of this equipment these costs should be added to the 1987 decommissioning estimates to arrive at an adjusted decommissioning cost for each unit or station.

6. REFERENCES

1. Florida Public Service Commission Final Order 21928, Docket 870098-EI, dated 9/21/89.

2. "Post-Decommissioning Component Reuse Technical Feasibility Study for the St. Lucie and Turkey Point Sites", ABB CE Nuclear Power, Juno Beach Engineering Office, December 1990.

3. Document F02-25-002, "Decommissioning Cost Study for the Turkey Point Station", TLG Engineering, Inc., June 1988.

4. Document F02-25-001, "Decommissioning Cost Study for the St. Lucie Station", TLG Engineering, Inc., March 1988.

5. "PSL Decommission Equipment Re-Used Cost Estimate", Layup costs dated June 14, 1991, supplied to TLG Engineering by Florida Power and Light

6. "Turkey Point Unit 3 & 4 Decommissioning Study: Equipment Reuse Cost Estimate", Layup costs dated June 17, 1991, supplied to TLG Engineering by Florida Power & Light.

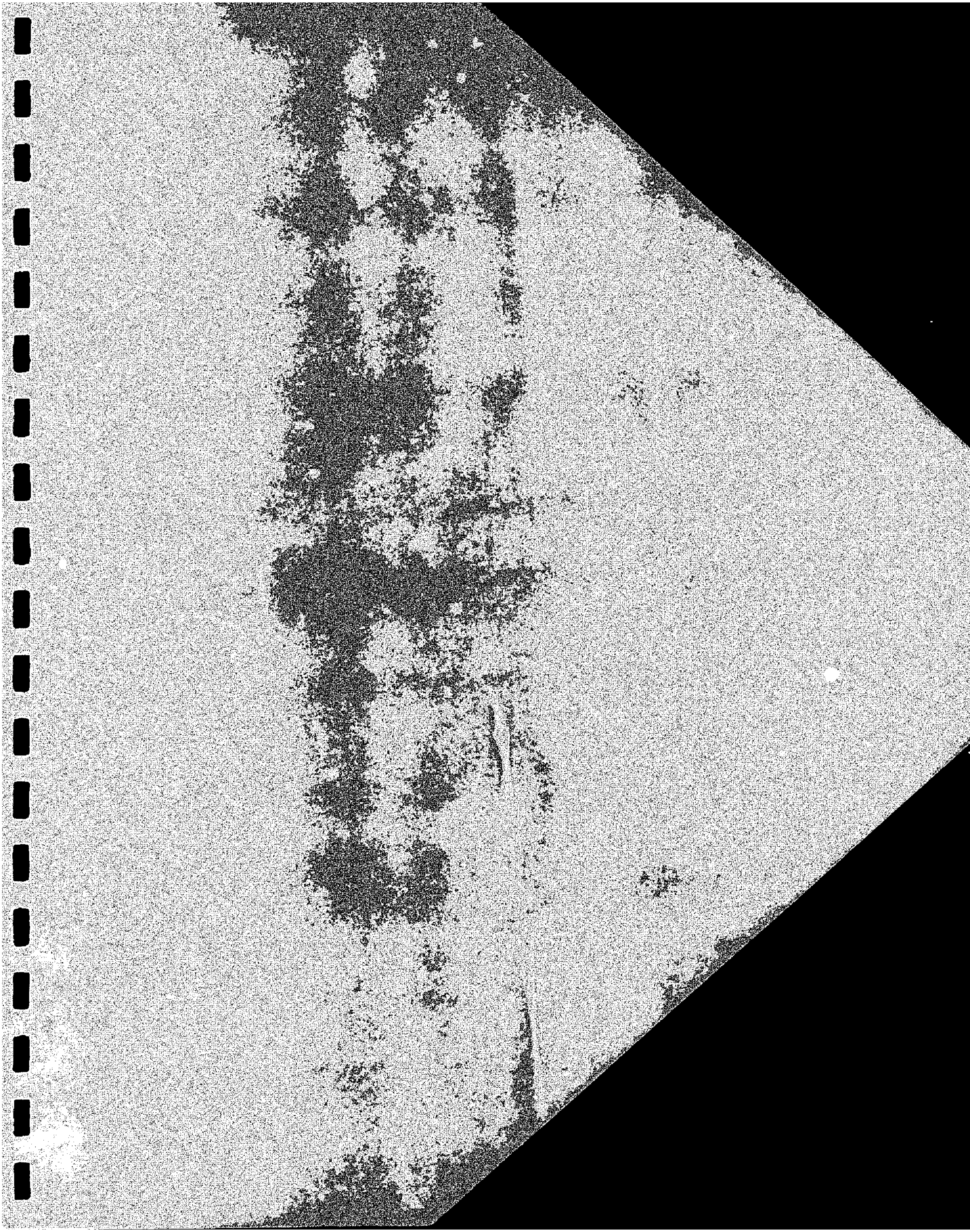
APPENDIX A

REVISED UNIT COST FACTORS

APPENDIX A

REVISED UNIT COST FACTORS
Non-contaminated Factors

Unit Cost Factor	Normal Value	Revised Value
Remove valves <2 inches	81.97	793.20
Remove valves 2.5-8 inches	108.74	1,583.88
Remove valves >8 inches	189.08	2,380.84
Remove moisture separator/reheater	9,044.82	12,698.77
Remove tanks, <300 gallons	247.51	1,782.88
Remove tanks, 300-3000 gallons	436.89	2,938.21
Remove misc. components, <300 lbs	117.47	1,036.85
Remove misc. components, 300-1000 lbs	330.88	1,485.72
Remove misc. components, 1000-10000 lbs	659.98	2,364.21
Remove misc. components, >10000 lbs	1,673.57	3,242.90
Removal of standby diesel-generator	3,291.39	357,422.10



ECONOMIC ANALYSIS OF THE REUSE OF NON-CONTAMINATED NUCLEAR COMPONENTS

ABB Combustion Engineering was retained to perform the Post-Decommissioning Component Reuse Technical Feasibility Study. That study identified 8 non-contaminated component categories which could potentially be reused in a new fossil generating unit at a location other than the existing nuclear plant sites. The component categories identified are as follows:

1) Breathing Air Accumulators
2) Cabinets
3) Large Cranes
4) Diesel Generators
5) Ion Exchangers
6) Load Centers, MCCs
7) Low Voltage Motors
8) Safety/Relief Valves

Methodology

The economic feasibility of reusing the above components was examined by category and was determined by comparing the current ($1991) total cost of reusing all the components in a category to the current ($1991) total cost of purchasing new components in a category. In the event the total cost of reusing a component category was lower than the total new equipment cost, the reuse of that category would be economically justifiable.

The total cost of reuse is comprised of several cost components namely, incremental decommissioning, storage and maintenance, refurbishment, and transportation. A detailed definition of each cost component along with a description of the new equipment cost is provided below.

Cost Components

Incremental Decommissioning Cost

This is the incremental cost, relative to FPL's current estimate of decommissioning costs, to remove the non-contaminated reusable component from the nuclear facility such that the component can be utilized at a new fossil generating facility.

The incremental decommissioning cost is comprised of the cost to remove the component for reuse along with the cost to maintain the non-contaminated reusable component in a usable condition until such time as it can be removed from the original location and transferred to a storage location.

The $1987 incremental decommissioning costs for each component category were determined by TLG Engineering in the Decommissioning Cost Variations Considering the Re-Use of Plant Components Off Site for the Turkey Point and St. Lucie Generating Stations study.

In order to appropriately incorporate the $1987 incremental decommissioning costs determined by TLG Engineering into the economic analysis, the costs must be escalated to $1991. The escalation rates used for each of the four nuclear units considered in this study are those which appear in the Florida Public Service Commission Order No. 21928 of September 21, 1989 (see Exhibit 1).

Storage and Maintenance Cost

This is the cost to store and maintain the non-contaminated component subsequent to its removal from the nuclear facility and prior to its transportation to a new fossil generating facility. The storage costs were based upon equivalent rental costs per square foot.

Due to the unavailability of adequate storage facilities at the St. Lucie site, the monthly storage and maintenance cost for the St. Lucie non-contaminated reusable components includes the cost to transport the components to a storage facility at FPL's Riviera site.

Because the operating license expiration date of the nuclear units is beyond FPL's generation expansion planning horizon (1999), the actual storage and maintenance period is unknown. As a proxy, the projected base case expansion plan provided in response to Staff's First Set of Interrogatories to FPL regarding the Nassau Power Corp., Docket No. 910816-EQ (see Exhibit 2) was utilized. According to that plan, FPL estimates a need for generating units occurring approximately once every two years subsequent to the year 1999. The average storage and maintenance period, therefore, would be one year or twelve months. Twelve months was utilized in this study for an estimation of the storage and maintenance period.

Refurbishment Cost

This is the cost to refurbish the non-contaminated reusable component to a condition in which the service provided by the component is equivalent to that provided by a new component.

Transportation Cost

This is the cost to transport the non-contaminated reusable component from the storage facility to the new fossil generating facility.

Because the operating license expiration date of the nuclear units is beyond FPL's generation expansion planning horizon (1999), the actual site of the new fossil generating facility is unknown. The FPL Ten Year Power Plant Site Plan for 1991-2000 was utilized in an attempt to identify a potential new fossil generating facility site. In that plan, DeSoto County possesses the largest number of potential sites and is the approximate geographical center of the remaining identified sites. DeSoto County, therefore, was used as the approximate location for the new fossil generating facility in which the non-contaminated reusable components would be incorporated.

New Equipment Cost

This is the capital cost to purchase an equivalent new component for use at the new fossil generating facility.

The prices are based on the St. Lucie and Turkey Point Final Cost Report, Richardson Cost Data, Means Cost Data, Purchase Orders and other miscellaneous sources.

Results

The economic feasibility of reusing the non-contaminated reusable component categories was examined by considering the cost information shown in Exhibit 3. The Net Benefit of Reuse reflects New Equipment Cost less the sum of the Refurbishment, 12 month Storage & Maintenance, Transportation to New Site and Incremental Decommissioning costs. A positive Net Benefit of Reuse for a specific component category indicates that it is economically justifiable to reuse the components in that category.

As shown in Exhibit 3, the following component categories were found to be economically reusable:

St. Lucie Unit 1:
- Diesel Generators
- Large Cranes

St. Lucie Unit 2:
- Diesel Generators
- Large Cranes

Turkey Point Unit 4:
- Diesel Generators
- Large Cranes

The particular items which comprise the Diesel Generator and Large Crane component categories shown above for Turkey Point Unit 4 are, in practice, shared between Turkey Point Unit 4 and Turkey Point Unit 3. This accounts for the apparent absence of such items at Turkey Point Unit 3.

EXHIBIT 1

amount given the complexity of nuclear decommissioning activities.

We find that the record does support a contingency factor of 25% and it is approved.

METHODOLOGY AND ESCALATION RATE

Both utilities use the same methodology to determine the escalation rate for converting the current estimated decommissioning cost to future estimated decommissioning cost. We find this method reasonable and approve its use. We are not accepting, however, in the aggregate, either the utilities' or the staff's escalation rates.

We agree with our Staff that the determination of escalation rates is subjective. We find the escalation rates FPL recommends for each of its nuclear plants to be reasonable and thereby approve them. We find the rate Staff has recommended for FPC's nuclear plant to be reasonable and therefore approve it. The approved escalation rates are as follows:

FPL:

Turkey Point No. 3	5.0%
Turkey Point No. 4	4.9%
St. Lucie No. 1	5.0%
St.Lucie No. 2	5.0%

FPC:

Crystal River No. 3	6.08%

INVESTMENT STRATEGY FOR TRUST FUND AND MINIMUM EARNINGS RATE

The fundamental objective of a decommissioning trust fund is to ensure the availability of adequate financial resources to pay for decommissioning at the lowest cost to utility rate payers. The management of the fund, therefore, must be concerned with not only the preservation of contributions, but with the purchasing power of those contributions as well. Therefore, we find that the appropriate investment strategy for

EXHIBIT 2

Base Case Expansion Plan Without Nassau Power

Year	Units Added	Capacity Addition (MW)
1991	Scherer Unit No. 4	180
1992	Putnam No. 1 Uprating	16
1993	Putnam No. 2 Uprating	16
	Riviera No. 2 Reactivated	80
	Scherer Unit No. 4	286
	Ft. Lauderdale No. 4 Repowering	286
	Ft. Lauderdale No. 5 Repowering	286
1994	Scherer Unit No. 4	140
	Martin Combined Cycle No. 3	416
1995	Scherer Unit No. 4	90
	Martin Combined Cycle No. 4	416
1996	—	—
1997	Standard Offer	125
1998	Martin Coal Gasification Combined Cycle Unit	907
1999	—	—
2000	Coal Gasification Combined Cycle	907
2001	—	—
2002	Coal Gasification Combined Cycle	907
2003	Coal Gasification Combined Cycle	907
2004	—	—
2005	Coal Gasification Combined Cycle	907
2006	—	—
2007	Coal Gasification Combined Cycle	907
2008	Coal Gasification Combined Cycle	907
2009	—	—
2010	Coal Gasification Combined Cycle	907

EXHIBIT 3

ECONOMIC ANALYSIS OF THE REUSE OF NON-CONTAMINATED NUCLEAR COMPONENTS
===
(all cost data in $1991)

A. ST. LUCIE UNIT 1 COMPONENT CATEGORY DATA

DESCRIPTION	REFURBISHMENT COST	12 MONTH STORAGE & MAINTENANCE	TRANSPORTATION TO NEW SITE	INCREMENTAL DECOMMISSIONING	NEW EQUIPMENT COST	NET BENEFIT OF REUSE
Diesel Generators	280,000	532,000	600,000	866,040	8,300,000	6,021,960
Large Cranes	200,000	18,000	150,000	63,070	1,000,000	568,930
Cabinets	2,000	26,000	3,000	15,700	14,000	(32,700)
Safety/Relief Valves	180,300	81,600	12,240	1,132,850	360,600	(1,046,390)
Low Voltage Motors	106,600	400,360	246,300	1,215,480	303,200	(1,665,540)
Load Centers	12,800	50,600	34,500	2,407,240	364,000	(2,141,140)

B. ST. LUCIE UNIT 2 COMPONENT CATEGORY DATA

DESCRIPTION	REFURBISHMENT COST	12 MONTH STORAGE & MAINTENANCE	TRANSPORTATION TO NEW SITE	INCREMENTAL DECOMMISSIONING	NEW EQUIPMENT COST	NET BENEFIT OF REUSE
Diesel Generators	280,000	532,000	600,000	867,770	8,300,000	6,020,230
Large Cranes	200,000	18,000	150,000	63,070	1,000,000	568,930
Air Accumulators	300	3,900	450	5,310	4,000	(5,960)
Ion Exchangers	84,000	328,000	168,000	122,090	620,000	(82,090)
Safety/Relief Valves	176,500	84,880	12,300	1,035,150	353,000	(955,830)
Load Centers	11,500	60,100	39,750	2,825,130	402,000	(2,534,480)
Low Voltage Motors	134,200	528,890	305,175	2,067,260	381,200	(2,654,325)

C. TURKEY POINT UNIT 3 COMPONENT CATEGORY DATA

DESCRIPTION	REFURBISHMENT COST	12 MONTH STORAGE & MAINTENANCE	TRANSPORTATION TO NEW SITE	INCREMENTAL DECOMMISSIONING	NEW EQUIPMENT COST	NET BENEFIT OF REUSE
Ion Exchangers	0	3,600	100	3,590	100	(7,190)
Cabinets	1,250	2,400	2,000	12,310	10,000	(7,960)
Safety/Relief Valves	400,000	75,600	100,000	389,160	800,000	(164,760)
Low Voltage Motors	141,750	102,480	250,000	343,760	621,000	(216,990)
Load Centers	171,100	43,008	250,000	1,511,590	1,526,780	(448,918)

D. TURKEY POINT UNIT 4 COMPONENT CATEGORY DATA

DESCRIPTION	REFURBISHMENT COST	12 MONTH STORAGE & MAINTENANCE	TRANSPORTATION TO NEW SITE	INCREMENTAL DECOMMISSIONING	NEW EQUIPMENT COST	NET BENEFIT OF REUSE
Diesel Generators	600,000	36,000	1,250,000	861,530	7,000,000	4,252,470
Large Cranes	200,000	18,000	150,000	62,830	1,000,000	569,170
Air Accumulators	2,300	5,940	10,000	51,320	16,000	(53,560)
Ion Exchangers	141,400	14,760	75,000	88,070	132,500	(186,730)
Safety/Relief Valves	555,750	110,160	125,000	581,010	1,111,500	(260,420)
Low Voltage Motors	204,900	151,200	400,000	641,770	1,095,300	(302,570)
Load Centers	229,300	55,440	350,000	2,112,800	2,152,980	(594,560)

BJM/FNG 11/91 C:RESULTS