FACSIMILE SERVICE REQUEST

UNITED STATES
NUCLEAR REGULATORY COMMISSION
ADVISORY COMMITTEE ON REACTOR SAFEGUARDS
WASHINGTON, D. C. 20555

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For: John Collins

I am looking for a complete copy of a document we received with pages missing. Attached is a copy of the cover page and first page of text. The original may have been printed on both sides of the sheets.

J C McKinley
ACRS Office

(pages 15 & 17 missing)

ENTRY AND DECONTAMINATION OF THE REACTOR CONTAINMENT BUILDING

AT THREE MILE ISLAND UNIT 2

Highlights of a "Planning Study"

conducted by

BECHTEL POWER CORPORATION

for

GPU SERVICE CORPORATION, INC.

August 13, 1979

THE PLAN: A PRELIMINARY STUDY

Following the March 28 accident at three Mile Island (TMI) Unit 2, GPU Service Corporation (GPUSC) retained Bechtel Power Corporation, a leading engineering and construction firm in the nuclear power industry, to prepare recovery plans for the re-entry and decontamination of the Unit 2 reactor containment building.

A top priority in developing the plan was to analyze, without benefit of building entry, the radioactive content in the water on the building floor (the sump water), in the air inside the building, and on the various surfaces. This analysis was required to plan for the decontamination of the building and equipment, a prerequisite to the eventual recovery of the plant.

The Bechtel study also describes:

* An assessment of the physical condition of the containment building and the degree of damage.
* Preliminary plans for entering the containment building for the first time since the accident and completing its decontamination.
* Conceptual design for new systems and modifications to existing systems that will be needed for re-entry and decontamination.

The re-entry and decontamination work will be directed by engineers and technicians, who have been appropriately trained in decontamination and in the practices that are essential to protect the public, themselves and those working with them.

The Bechtel study does not specifically address several areas related to Unit 2 recovery efforts such as removal of the water in the containment building, disposal of contaminated materials or removal of the fuel from the reactor vessel. These and other areas are or will be the subjects of other studies and evaluations. To the extent we may know the preliminary plans, some of these areas are covered in these summary highlights.

News Release

GPU

General Public Utilities Corporation
260 Cherry Hill Road
Parsippany New Jersey 07054
201 263-4900

Further information Kenneth C. McKee
263-4900 (ext. 605)

For release IMMEDIATE

Date July 16, 1979

PARSIPPANY, N.J., July 16 -- General Public Utilities Corporation (GPU) reported that Bechtel Power Corporation, one of the nation's leading engineer-constructors of nuclear power plants, is conducting a multi-faceted study which will assist GPU's management in rehabilitating Three Mile Island Unit-2 (TMI-2) and returning it to service. Bechtel has furnished to GPU an initial study report. The Bechtel report indicates that so far there has been no evidence uncovered which would indicate the Unit cannot be safely decontaminated and restored to service. Although a decontamination effort of this magnitude is a major undertaking, the technology and techniques are well known, have been previously demonstrated and can be safely accomplished.

Bechtel emphasized that the initial report establishes a general framework derived from the analysis of very limited data. Although based on the best professional engineering estimates, the situation will remain speculative until entry into the containment building can be achieved and the rehabilitation requirements can be determined with reasonable certainty.

A final determination of the costs cannot be made until better information is available concerning the extent of contamination, the level of damage to internal components of the facility and the possibilities for their reuse, and the extent of plant modifications and other restrictions on the recovery operation which might be required by the Nuclear Regulatory Commission or other government agencies.

The Bechtel study estimates that decontamination and reactivation of TMI-2 could cost approximately $320 million and take about four years to complete. Because of the number of unknowns and variables, the Bechtel study included a contingency of 33 per cent or $80 million.

This estimate does not include replacement of the core. The investment in the core at the time of the accident was about $35 million. With increases in uranium prices, enrichment and fabrication costs, a new core is to be installed before the unit resumes operation at an estimated cost of $60 to $85 million. GPU has added an additional $25 million to the Bechtel estimate (including the $80 million contingency item in the Bechtel estimate) to cover possible uncertainties between the Bechtel estimate and the cost to recommission Unit 2 of $400 million and a restart schedule of June 1983.

Bechtel also estimated that the time schedule could vary six months either way. The timetable does not consider extraordinary legal, political or regulatory delays, which could add to the cost estimates.

The Bechtel report outlines a three-phase approach to decontaminating the facility and returning it to operation.

The first phase would involve containment building entry and decontamination.

Most of the initial inside "washdown" and removal of waste water would be conducted by remote control through existing systems. A special auxiliary building with decontamination equipment would be constructed adjacent to the containment for the operation.

Some on-site facilities would have to be developed for temporary storage and processing of the material prior to transportation to a permanent disposal site. No radioactive waste would be stored permanently at the facility.

With the containment decontaminated, the second phase would call for removal of the fuel and reactor internal mechanisms, and decontamination of the reactor system.

The final phase involves replacement or repair of component parts, complete inspection and testing of the coolant and safety systems, fuel loading, and final testing prior to start-up.

The Bechtel study estimates cleanup and recovery could require a peak manning level of about 800-900 technical personnel, supervisors and manual craftsmen.

As the Company has noted before, the plant Unit is insured for property damage up to $300 million. To the extent that this coverage might be exceeded, GPU will be seeking assistance from the government and the industry in areas where the technical information obtained can be of wide value.

Amortization of any remaining excess costs for rate making purposes will also be sought. Some of the expenditures involved in returning the Unit to service are expected to constitute plant improvement and be capitalized and recovered over the life of the facility. The Company emphasized that the amount of loss, if any, resulting from the TMI accident is not presently determinable.

GPU Chairman William G. Kuhns also emphasized that, "Safety of the operation will be paramount. Strict safeguards will be established to contain the radiation and insure both public and worker safety."

According to the utility executive, GPU hopes to gain initial entrance to the containment building at some point toward the latter part of this year or early next year.

Bechtel began work in nuclear power more than 30 years ago and has participated in the design and/or construction of 40% of the nation's nuclear facilities.

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Met-Ed / GPU

FACT SHEET

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THREE MILE ISLAND NUCLEAR GENERATING STATION

Location

* Three Mile Island, in the Susquehanna River, Londonderry Township, Dauphin County, about 10 miles south of Harrisburg, Pennsylvania.

Facilities

* TMI Nuclear Unit 1, with a capacity of 800 megawatts, placed in operation in September, 1974.

  Commercial operation - September 2, 1974

* TMI Unit 2, dedicated September 19, 1978, with a capacity of 900 megawatts.

  Commercial operation - December 30, 1978

Ownership

* TMI Nuclear Station is owned jointly by GPU's three operating companies: Jersey Central Power & Light Company, 25 percent; Metropolitan Edison Company, 50 percent; and Pennsylvania Electric Company, 25 percent.

Operation

* TMI Units 1 and 2 are operated on behalf of the GPU System companies by Metropolitan Edison.

Investment

* The GPU System has invested more than $1 billion on Three Mile Island, excluding nuclear fuel.

Employment

* Some 9,500 man-years of craft labor were required to construct TMI Unit 2; another 8,500 man-years went into TMI Unit 1 -- a total of 18,000 man-years of craft employment to bring the TMI station to full-scale operation.

* The construction payroll for the Station totaled $350 million.

* In normal operation, TMI Nuclear Station provides regular employment for about 500 people.

Construction Facts

* It took 8 years to construct TMI Unit 2.

* It contains --

  * 190,000 cubic yards of concrete

  * 24,000 tons of steel (reinforcing and structural)

  * 740 miles of electrical wiring

* Comparable amounts of materials were used to construct TMI Unit 1.

Operation and Maintenance

* $35 million was forecast to operate and maintain both of the two TMI Units annually, excluding fuel costs.

  * With payroll accounting for the largest part of the total.

Generating Capacity

* The two TMI Units have a combined capacity of 1,700 megawatts.

* This is enough electricity to supply nearly one and a quarter million homes.

Energy Costs

* Nuclear energy is the cheapest fuel available in the GPU service area for the large-scale generation of electricity.

* The annual fuel cost at TMI Nuclear Station will be about $27 million.

    * If coal were burned instead of nuclear, the fuel cost would be $160 million.

    * With oil it would be $250 million.

* The fuel cost savings from the use of nuclear energy is passed on to customers through lower energy adjustment charges.

The TMI-1 Record

* TMI in the four years it has been in operation, has generated 21 billion kilowatt-hours of electricity. That is enough to supply New York City for six months.

* TMI-1 has a capacity factor since start-up -- the percentage of rated capacity actually turned out -- of 76 percent. This is well above the national average for nuclear-fueled electric generating plants.

FUEL USED BY TMI AND COMPARABLE EQUIVALENTS OF OIL

(Information from Bill Stanley, Licensing Dept., Generation)

TMI-1 use of uranium for one day's operation	6.07 lbs.
equivalent in standard barrels of oil for one day:	36,420 barrels
for one year at 75% capacity factor:	9,970,000 barrels
for 365 continuous days:	13,300,000 barrels
TMI-2 use of uranium for one day's operation:	6,88 lbs.
equivalent in standard barrels of oil for one day:	41,280 barrels
for one year at 75% capacity factor:	11,300,000 barrels
for 365 continuous days:	15,070,000 barrels

(These figures are assuming thermal efficiency of 33%, which is an average of oil and nuclear stations.)

Met-Ed / GPU

FACT SHEET

METROPOLITAN EDISON COMPANY

Metropolitan Edison Company serves about 352,000 customers in all or parts of 14 eastern and south central Pennsylvania counties. Customers live in a 3,274 square-mile area extending from near the New York line in Eastern Pennsylvania north of the famous Pocono Mountains and Lehigh Valley, through the heart of the Pennsylvania Dutchland in Berks and Lebanon Counties and the historic York and Adams Counties to a few miles west of Gettysburg along the Mason-Dixon Line.

This well-balanced mixture of industrial, urban, suburban and rural territory includes the cities of Easton, Lebanon, Reading, and York, 159 townships and 97 boroughs.

OPERATING DIVISIONS:

Central, headquartered in Reading

Lebanon, headquartered in Lebanon

Eastern, headquartered in Easton

Western, headquartered in York

GENERATING STATIONS:

*TMI - (2 units, Nuclear)	850 Mw	- (Met-Ed 50% Share of 1700 Mw)
Unit 1	400 Mw	- (Met-Ed 50% Share)
Unit 2	450 Mw	- (Met-Ed 50% Share)
Portland - (2 units, coal-fired)	404 Mw	
Titus - (3 units, coal-fired)	240 Mw	
Conemaugh - (coal-fired)	280 Mw	(Met-Ed 16.45% Share of 1700 Mw)
York Haven - (hydro)	19 Mw	
Combustion Turbines (oil, gas)	266 Mw	
TOTAL MET-ED INSTALLED CAPACITY	2059 Mw	
*Total Met-Ed Installed Capacity without TMI Unit 2	1619 Mw	System Peak Demand - 1483 Mw (Winter)
Total Met-Ed Installed Capacity without TMI Units 1 and 2	1209 Mw	

TMI Owners - Met-Ed (50%) Pennsylvania Electric Co. (25%) Jersey Central P&L Co. (25%), with Met-Ed as the operator. All are members of the GPU System.

Member - PJM (Pennsylvania-New Jersey-Maryland Interconnection) comprised of companies in Pennsylvania, New Jersey, Maryland, Delaware, Virginia, and the District of Columbia.

1978 - YEAR-END STATISTICS

Sales - 7,917,000 Megawatt Hours

Revenues - $310.5 Million

Operating Net Income - $58.6 Million

Utility Plant - $1.4 Billion

Investment Per Dollar of Revenue - $4.66

Employees - 2,784

GLOSSARY OF NUCLEAR TERMS

Background radiation	Radiation from natural sources (cosmic rays, rocks and from minerals inside the body). Normal background radiation for Americans is about 100 to 200 millirems per year, with the higher figure occurring at higher altitudes.
Cladding	The outer jacket of nuclear fuel rods. It prevents corrosion of the fuel by the coolant and the release of fission products into the coolant. The most common cladding material is a zirconium alloy.
Cold shut-down	Condition of a reactor when fission process has been halted and decayed heat in the core coolant has dropped below the boiling point of water.
Condenser	Apparatus where steam which turns the turbines is cooled, and condensed to liquid state for return to steam generator.
Containment vessel	Steel and reinforced concrete structure housing the nuclear reactor and steam generator.
Control rod	A rod containing a material such as boron or hafnium used to control the power of a nuclear reactor. By absorbing neutrons, a control rod, when dropped into the fuel core, halts the chain reaction by which the reactor generates heat.
Coolant	Liquid or gas circulated through a nuclear reactor to remove or transfer heat. Common coolants are water, heavy water, carbon dioxide, liquid sodium and sodium-potassium alloy.
Cooling tower	The structure where hot water in condenser coils is circulated for cooling and then return to the condenser. Cooling towers are now common to most power plants, whether they use coal, oil or nuclear fuel to make steam.
Core	The part of a nuclear reactor containing the fuel assemblies which generate heat by fission.
Decayed heat	Heat generated by decaying radioactive products of fission process when fission has been halted in the reactor core.
Fuel assemblies	Separate bundles of fuel rods. A nuclear reactor core contains scores of fuel assemblies and more than 100,000 fuel rods.

Fuel rods	Long hollow rods, usually of a zirconium alloy, into which are packed thimble-sized pellets of uranium.
Gamma rays	Penetrating electromagnetic radiation emitted in radioactive decay, similar to radiation produced by X-rays.
Half-life	Term used to describe the time rate at which radioactive materials decay into stable elements.
Melt-down	The overheating of a reactor core, usually as a result of loss of coolant, to the extent that uranium melts through the metal cladding on the fuel rod. It is believed in extreme cases that heat in the core could become so intense that the core would melt through the reactor vessel and down through the concrete floor of the containment vessel.
Millirem	A measure of radiation. A millirem is one-thousandth of a rem (Roentgen), the basic measure of radiation. A chest X-ray exposes a person to between 20 and 30 millirems.
Nuclear reactor	The device in which a fission chain reaction can be initiated, maintained and controlled. Heat from the fission process is used to turn generators for production of electricity.
Pressurizer	Vessel designed to control pressure level in the reactor vessel and main coolant system.
Pressurized water reactor	The most common type of commercial nuclear reactor in the United States. Coolant in the primary loop is kept under pressure to prevent its boiling. TMI Units 1 and 2 are pressurized water reactors.
Primary loop	The loop through which the reactor coolant circulates. Coolant is heated in the reactor and then pumped under pressure to the steam generator, where it heats water in the secondary loop (see below) into steam that turns the turbines.
Reactor vessel	Steel-walled (8-10 inches thick) container housing the nuclear reactor fuel core and control rods.
Relief valve	Designed to reduce excess pressure in the primary loop.
Secondary loop	The loop through which water circulates from steam generators to turbines, then through condenser and back through the steam generator.
Turbine	The device which [illegible]

PRINCIPAL FISSION-PRODUCT RADIOISOTOPES IN RADIOACTIVE WASTES

Radioisotope	Half-Life
Barium-140	12.8 days
Cerium-141	32.5 days
Cesium-137	33 years
Iodine-131	8 days
Krypton-85	4.4 hr
Lanthanum-140	40 hr
Strontium--89	54 days
Strontium-90	25 years
Tritium(H-3)	12.3 years
Xenon-133	2.3 days

Basic Types of Radiation:

Alpha - Electrically charged atoms which have little penetrating ability. They are readily stopped by the thinnest of materials (such as a sheet of paper or clothing). It is identical with the properties of the nucleus of a helium atom, an inert gas.

Sources: Natural radioactivity (uranium, thorium) in soils, rocks, minerals.

Beta - Consists of electrons, similar to those which carry electric current, but not moving in a wire, and traveling faster.

Sources: Natural radioactivity (potassium-40) in soils, rocks, minerals, television, luminous dial wrist watch, natural radioactivity in the air (tritium)

Gamma - High energy electromagnetic energy rays which are more penetrating than either alpha or beta.

Sources: Medical and dental x-rays, cosmic radiation.