STATE OF NEW YORK

PUBLIC SERVICE COMMISSION

Case #27869:

Consolidated Edison Co.

Indian Point #2 Outage

Testimony of

WALTER L. FLEISHER

WESTCHESTER PEOPLES ACTION COALITION
255 Grove Street
White Plains, N.Y.

April 17, 1980

WALTER L. FLEISHER

Q. Please give your name and address.

A. Walter L. Fleisher, I reside at 443 Buena Vista Road, New City, N.Y. 10956.

Q. For whom are you appearing?

A. I am appearing as a witness for Westchester Peoples Action Coalition.

Q. What is the scope of your testimony?

A. My testimony will cover the type of containment building cooling system installed; the materials selected for the fan cooling units (FCU); the design and workmanship of the FCU's and the associated external piping, the revised cooling coils and piping and the design and installation of the containment bulding sump pumps.

Q. First will you list your work experience related to your testimony.

A. I present a two page document entitled "Appendix A Walter L. Fleisher Resumé, dated March, 1980."

Q. Is there anything you wish to add to the resumé?

A. Yes, the resumé is general. I would like to stress my extensive involvement with piping and cooling systems and particularly with systems handling brackish water.

My earliest recollection is from 1934 about a project for Beechnut Packing Co. in the Bush Terminal building in Brooklyn. The project included the installation of three centrifugal water vapor refrigeration machines. The condensers were provided with Brooklyn well water, which, due to overpumping, was brackish. The condenser tubes lasted six months.

Q. Any other projects?

A. Yes, a job for Schaeffer Brewing Company at Kent Avenue, Brooklyn, replacing a stainless steel river water line that perforated in less than a year; work at Indian Point's former neighbor Standard Brands' river water cooling system; and finally, six years experience at Columbia University's Nevis Laboratory at Irvington, N.Y., with their primary Hudson River water cooling system, and the secondary high purity system used to cool the cyclotron components and the primary and secondary beam line magnets.

Q. What is your opinion of introducing river water inside the containment building?

A. From my experience with the extremely corrosive properties of brackish water, and the ensuing impossibility of maintaining the integrity of the piping system for an extended period of time; and the dangerous and destructive results of the brackish water coming in contact with the reactor vessel, components and electrical systems, it was utter folly to introduce the river water into the containment building. Without question there should have been a primary/ secondary system with complete isolation of the water inside the containment building.

Q. Is there another reason why brackish water should not be used in the FCU's?

A. Yes. Water that is exposed to ionizing radiation, which is the case inside the containment building, decomposes into hydrogen gas and a hydrogen peroxide radical. The hydrogen peroxide radical is extremely active and will cause extensive corrosion in a short period of time.

The only effective measure against the hydrogen peroxide problem is to use deaerated and deionized water with a specific resistance of better than 1.2 megohm centimeters. Even with this precaution copper and copper based alloys are not recommended. Thus the cupro-nickel tubing used as a protection against the brackish water is the least desirable material in the presence of ionizing radiation.

Q. Accepting the fact that the river water was introduced into the containment building, what are your observations on the design and construction of the circulating piping and the FCU's?

A. The piping is fabricated from cement lined steel pipe with arc welded joints. While cement lined pipe is a good material for the river water, the welded joints are not. For the cement lining to be effective it must be continuous without any breaks or imperfections. This is impossible with a butt weld joint. There is no way to get a perfect fit-up and the welding process will cause some damage to the lining.

The weld metal also is susceptible to corrosion due to the difference in composition, chemical inclusions and imperfections in the weld. The proof of the faults of the welded joints is in the leaks that developed, and an inspection of some sectioned joints which showed gaps in the lining of up to ¼ of an inch, and severe pitting of the welds.

To provide reasonable corrosion resistance, joints must be made by mechanical means, such as flanged joints with carefully finished cement lining and gaskets that will prevent any contact between the water and the base metal.

Q. What about the FCU's?

A. The cooling coils were fabricated from a cupro-nickel alloy with what appeared to be silver-containing brazing alloy. As explained above, the cupro-nickel is not a good material in the presence of ionizing radiation. I have not been provided with the radiation type or level at the tubes, but was not permitted to inspect the center section of the removed coils because of the radiation danger.

The design of the coils is what I would characterize as low grade commercial. Except for the material the construction and workmanship is what I might expect on a competitive air-conditioning job. The tube stubs were inserted into a drilled hole in the headers, not always perpendicular and extended into the the header random amounts. This makes for a poor fit-up and a source of erosion corrosion.

The stubs were swaged to receive the coil tubes. The fit of the swages was not good and the brazing was horrible with globs of brazing alloy instead of a neat fillet. The use of the stubs is unnecessary and doubles the number of joints and potential leaks.

There was no galvanic isolation between the coils and the steel pipe, and there was no type of cathodic protection.

Even the coil casings were made from galvanized steel, which was severely corroded, and in direct contact with the tubes where the tubes pressed through the casings, providing another likely source for corrosion and perforation of the tubes.

Q. How do the replacement coils differ from the original coils?

A. The new coils are provided with a water box with a flanged head and the tubes are rolled into the tube sheet, eliminating the stubs and all brazed joints and provide a smooth transition from the water box to the tubes. The coil casings appear to be of austenitic stainless steel.

The changes are a tacit admission of the shortcomings of the original design. While the new construction is an improvement, it will not cure the problem of the radiation induced corrosion.

Q. Have there been any changes in the piping?

A. No. The fabrication and materials appear to be the same although the workmanship appears appreciably improved. However, the corrosion at the welded joints is bound to recur.

Q. Is any of the information used in your testimony on corrosion novel or proprietary?

A. No. The problem is in handling sea water or brackish water for which engineering solutions have a long history, certainly dating back to World War II days, the early 1940's.

As for radiation induced problems, the answer was certainly recognized in the treatment of the reactor feed water in this and other nuclear gener ating plants.

Q. What is your opinion of the containment building sump pump installation?

A. The installation ignored the fundamentals for an essential piece of equipment located in an inaccessible location. First, there was no way of determining if it was functioning. Second, there was no way of operating it remotely. Third, there was no way of checking the performance remotely. Fourth, the pump float control is primitive. Fifth, the add on of another motor, after the branch fuses, is inexcusable.

Q. What would be the minimum requirements for an installation of this type?

A. There should be a power-available indicator, a pump running indicator, flow indicators both electrical and mechanically visual, and a displacer type level control designed to fail-safe, and two independent level indicators using different methods of detection.

It would not be unreasonable to provide two or more independent sumps and pumps considering the size of the building and the possibility of a cata-

strophic accident at one location.
Q. Are there any other obvious omissions?
A. I cannot imagine how level indicators and pumps were not provided for the reactor vessel pit. The critical nature of submersion of the reactor vessel in cold water could not reasonably be ignored. A late patch job is not going to be satisfactory considering the high operating temperature and high levels of radiation.
Q. Does that conclude your testimony?
A. Yes.

APPENDIX A

WALTER L. FLEISHER   Resumé   March, 1980
443 Buena Vista Road
New City, N.Y. 10956

Resident of New City since 1923

Professional background:

1934-1936 Cornell University, Ithaca, N.Y.
Sibley School of Mechanical Engineering

1936-1938 Polytechnic Institute of Brooklyn (N.Y.)
School of Mechanical Engineering

1938-1946 Air & Refrigeration Corp.,New York,N.Y.
Atlanta, Ga. Branch and Plant Manager
Design, manufacture and installation of industrial ventilation equipment and systems.
Customers: U.S.Rubber Co.; Fisher Body Division of General Motors; Defense Plant Corp., synthetic rubber plants; Oak Ridge National Laboratory, uranium separation; and many others.

1945-1946 On leave for service in the United States Navy, Aircraft Electronics Technician Mate

1946-1951 Mance Corp., New York, N.Y.
Project Engineer primarily for design/build projects for Alexander Stores; J.P.Morgan and Co.; National Biscuit Co.; Schaeffer Brewing Co.; E. R. Squibb & Co.; Sperry Gyroscope, etc., mostly inductrial HVAC and special process work.

1951-1955 James H. Merritt Corp., New York, N.Y.
Chief Engineer of Air Conditioning Div. and Chief Engineer of Environmental Test Equipment division. HVAC IBM first Watson Research Lab; altitude simulator and explosive decompression chambers for U.S. Air Force; altitude test chambers (100,000 feet altitudes and -100°F) for Arma Corp; Mergenthaler; General Electric; RCA; Fairchild; etc.

1955-1968 Rowland Tompkins Corp., Hawthorne, N.Y.
Chief Engineer Air Conditioning Division
Design/build and plan and specification projects for: Grumman Aircraft including Lunar Module egineering building, hangar building, simulator and computer center. Union Carbide (4) laboratory building and central power plant; laboratories for

North American Phillips, Stauffer Chemical, Boeing-Vertol Div; industrial plants for IBM, Avon Products, Anaconda Copper.

1968-1972 Self-employed as a mechanical consultant. Major project, mechanical coordinator of $30,000,000 research center for Union Carbide Corp., including office, specialized labs (Linde Div.), general laboratories, shops, central power plant, site uitlities, and special services such as liquid nitrogen, liquid oxygen and hydrogen gas.

1972-1978 Columbia University, Nevis Cyclotron Laboratory, Irvington, N.Y. Senior Engineer in charge of design and installation of primary and secondary high purity cooling water system for the cyclotron; beam lines and beam stop. Design of central extraction components; radio frequency power system; vacuum system; designed and built two computer rooms; design and installation of CO_2 and Halon fire protection system; and multi building fire alarm system.

1978- Segner and Dalton Consulting Engineers P.C. Valhalla, New York. Senior Engineer. Design of HVAC and various process services for Resource Recovery plants at Brockton, MA and Bridgeport, CT. Energy conservation Study and Implementation Plan for three major laboratories for Mass. Institute of Technology. Also projects for General Foods, Stauffer Chemical (3), and State University At Purchase.

1945- Member American Society of Heating, Refrigera- and Air Conditioning Engineers.