UNITED STATES OF AMERICA
NUCLEAR REGULATORY COMMISSION

ATOMIC SAFETY AND LICENSING BOARD
Before Administrative Judges:
Louis J. Carter, Chairman
Frederick J. Shon
Dr. Oscar H. Paris

In the Matter of	)	Docket Nos.
CONSOLIDATED EDISON COMPANY OF NEW YORK, INC. (INDIAN Point, Unit No. 2)	)	50-247 SP 50-286 SP
POWER AUTHORITY OF THE STATE OF NEW YORK (Indian Point, Unit No. 3)	)	

CON EDISON'S TESTIMONY OF MIN L. LEE ON LOW LEAKAGE LOADING PATTERN

ATTORNEY FILING THIS DOCUMENT:

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My name if Min L. Lee. Since 1978 I have been the Chief Nuclear Engineer at Consolidated Edison Company. A statement of my professional qualifications is attached.

The purpose of my testimony is to address the low leakage fuel loading pattern (LLLP) that is in place at Indian Point Unit No. 2 (IP2). This design mitigates conditions that might contribute to an increased likelihood of pressurized thermal shock (PTS). The concern over PTS derives from the fact that the reactor vessel materials lose some of their initial ductility due to neutron irradiation occurring during normal unit operation. The LLLP reduces neutron irradiation of vessel materials, and thus the likelihood of occurrence of PTS.

Indian Point Unit No. 2 started operation in May 1973 and is currently in its sixth fuel cycle of operation. During the first five fuel cycles, it was operated with a standard fuel loading pattern. The standard fuel loading pattern consisted of placing only new fuel assemblies at the core periphery during each refueling.

The LLLP program utilizes a fuel loading pattern which instead strategically places some irradiated (and therefore less reactive) fuel assemblies at the core periphery. This reduces the number of neutrons emitted from the core

periphery achieving lower neutron irradiation of the reactor vessel wall.

During 1979, a scoping study under the supervision of Professor D. R. Harris of Rensselaer Polytechnic Institute in Troy, New York, was initiated to evaluate various fuel cycle optimization configurations for IP2. Among the configurations found to be feasible was the low leakage arrangement described above. Subsequently, specific designs prepared by Westinghouse, the IP2 fuel supplier, were analyzed and conclusions reached favoring the LLLP. In July 1981, Con Edison directed Westinghouse to incorporate the LLLP into the core design for Cycle 6. Cycle 6 commenced operation in January, 1983. Present Company plans are to continue LLLP throughout the remaining service life of the plant, employing even more advanced programs when they are proven effective.

Based on an IP2 specific analysis performed by Westinghouse, the LLLP design as incorporated in Cycle 6 will reduce fast neutron flux at the point of peak vessel wall exposure by 44% compared to a standard fuel loading pattern. The LLLP design is projected to give approximately the same peak vessel wall exposure at the end of 32 Effective Full Power Years (EFPYs) of operation as

the standard loading design at the end of 20 EFPYs. Actual neutron flux measurements made at the beginning of Cycle 6 operation with the neutron detectors located outside the vessel wall were found consistent with the above analysis.

The reduction in vessel wall neutron fluence will result in a slower rate of increase of RT_{NDT}, the "reference temperature, nil-ductility transition." Using the NRC's prescribed method of calculating RT_{NDT}, Westinghouse calculated that the RT_{NDT} values at 32 EFPYs, for the IP2 LLLP design, will be 274°F and 250°F for the circumferential and the axial flaws, respectively. The NRC screening criteria (Ref: NRC Report SECY-82-465, Nov. 23, 1982 "Pressurized Thermal Shock") are 300°F for the circumferential flaw and 270°F for the axial flaw. Therefore, the NRC screening criteria will not be exceeded for the life of the IP2 plant, assumed to be 32 EFPYs, or 40 calendar years at an 80% capacity factor. IP2 has accumulated 5.2 EFPYs as of January, 1983.

ATTACHMENT

MIN L. LEE

Chief, Nuclear Engineer

SPECIAL QUALIFICATIONS:

Over twenty-five years in nuclear science and and nuclear power fields, including reactor core analysis, nuclear fuel management, nuclear safety, radiological protection and related research.

EDUCATION:

Bachelor of Science (Electrical Engineering), Manhattan College, New York, 1952.
Master of Science (Electrical Engineering), University of Illinois, 1953.
Graduate, International School of Nuclear Science and Engineering, Argonne National Laboratory, 1958.
Graduate, Oak Ridge School of Reactor Technology, Oak Ridge National Laboratory 1959.
Master of Science (Nuclear Engineering), Massachusetts Institute of Technology, 1965.
Doctor of Philosophy (Nuclear Engineering), Massachusetts Institute of Technology, 1968.
Graduate, Executive Program of Business Administration, Columbia University, 1982.

EXPERIENCE

1978 - Present	Chief Nuclear Engineer, Nuclear Engineering Department, Consolidated Edison Co. of New York, NY Responsibilities include all engineering aspects of nuclear fuel, nuclear systems evaluation, nuclear licensing and nuclear safety.
1969 - 1978	Reactor Fuel Engineer, Nuclear and Mechanical Engineering Department, Consolidated Edison Co. of New York, NY Responsibilities included fuel cycle analysis, reactor core engineering, fuel design safety evaluation, fuel performance evaluation and fuel cycle startup program.
1968 - 1969	Engineer, Mechanical Engineering Department, Consolidated Edison Co. of New York NY Responsibilities included nuclear fuel management, nuclear fuel cycle engineering, reactor analysis and commercial aspects of nuclear fuel cycle.

1964 - 1968 Teaching and Research Assistant, Nuclear Engineering Department, Massachusetts Institute of Technology. Assistant to Professors I. Kaplan, R. Evans G. Brownell and E. Mason.

1959 - 1964 Associate Professor, Institute of Nuclear Science, National Tsing Hua Univerisity, Taiwan. Responsibilities included Head of Health Physics Section and lectures on reactor control and nuclear instrumentation.

1954 - 1957 Engineer, Office of Steam Power Project, Taiwan Power Co. Taiwan. Responsibilities included Subsection Head, Generator and Switchgear Subsection, Nanipu and Shen-ao Steam Power Projects.

PROFESSIONAL ACTIVITIES:

American Nuclear Society
EPRI - Safety and Analysis Task Force
EEI - Nuclear Fuels Committee
Chinese Institute of Engineers, USA
SIGMA XI, National Honorary Society
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PUBLICATIONS:

Experience with Neutron Dose on Shipment of High Burnup Fuel,
ANS Transactions, Volume 14, No. 1, June, 1971

Nuclear Engineering Education from a Utility Viewpoint,
ANS Transactions, Volume 14, No. 2 October 1971

Fuel Performance of indian Point Unit No. 1,
ANS Transactions, Volume 16, June, 1973

Measurement and Analysis of Core Physics Parameters - A Utility Viewpoint,
ANS Transactions, Volume 17, November 1973

Performance of Indian Point Unit No. 2,
Utility Nuclear Fuel Performance Conference,
Atlanta, Georgia, October 1975

A Review of Physics Analysis of Indian Point Unit No. 2 Spent Fuel Storage Racks,
ANS Convention, Toronto, Canada, June 1976

An Overview of PWR Small Break LOCA Analysis and Its Application Since TMI -2,
Symposium on Nuclear Power, Chinese-American Engineering and Management Institute, October, 1980, New York, NY.

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CONSOLIDATED EDISON COMPANY OF NEW YORK, INC. (Indian Point, Unit No. 2)	:	Docket Nos. 50-247-SP 50-286-SP
POWER AUTHORITY OF THE STATE OF NEW YORK, (Indian Point, Unit No. 3)	:	April 1, 1983

CERTIFICATE OF SERVICE

I certify that I have served copies of Con Edison's Testimony of Min L. Lee on Low Leakage Loading Patterns by deposit in the United States mail, first class, postage prepaid this 1st day of April, 1983.

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