UNITED STATES OF AMERICA
NUCLEAR REGULATORY COMMISSION

ATOMIC SAFETY AND LICENSING BOARD

Before Administrative Judges:
James P. Gleason, Chairman
Frederick J. Shon
Dr. Oscar H. Paris

In the Matter of	
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 12, 1983

LICENSEES' TESTIMONY OF
WILLIAM J. WAGERS ON COMMISSION QUESTION 6

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TESTIMONY OF WILLIAM J. WAGERS
ON BEHALF OF
LICENSEES

Q. Please state your name, business address, educational background, work experience and present position.

A. My name is William J. Wagers. My business address is 4 Irving Place, New York, New York.

I graduated from The City College of New York in 1970 with a Bachelor's Degree in Mechanical Engineering. I received a Master's Degree in Business Administration from Adelphi University in 1977. In 1970, I joined Con Edison's System Planning Department and have held positions of increased responsibility since that date. In 1982, I assumed my current responsibility as Manager, Small Power Facilities Planning.

Q. What are your responsibilities as Manager, Small Power Planning Facilities Planning?

A. In my present position I am responsible for developing policies and plans for all forms of small power facilities, including cogeneration, in the Company's service area. The policies and plans must be developed considering the economic impacts on the small power producer, the Company and the Company's ratepayers, environmental impacts, tax impacts and national and local concerns regarding scarce energy resources.

Q. What is the purpose of your testimony?

A. The purpose of my testimony is to explain the Company's

position that contrary to contentions made by others in this proceeding, natural gas fired cogeneration facilities cannot be counted on to replace a large part of the capacity lost if the Indian Point plant is shutdown.

Q. Please explain what you mean by natural gas-fired cogeneration facilities.

A. My testimony covers two types of natural gas-fired cogeneration - natural gas diesel cogeneration and an experimental small scale facility called TOTEM.

Q. Please explain why you feel that these facilities cannot be counted on to replace Indian Point.

A. There are three reasons which make natural gas fired diesel cogeneration an unlikely replacement for Indian Point. First, estimates of diesel cogeneration potential in Con Edison's service area indicate that considerably smaller amounts of load reduction from cogeneration are economical than would be needed to replace Indian Point. Second, the potential will be limited by physical constraints, such as air pollution problems and natural gas supply problems which would occur if large numbers of customers convert to cogeneration. The air pollution problems are covered in the testimony of Con Edison witness Freudenthal and the gas supply problems are

covered in the testimony of witness Stewart. Third, there is uncertainty about when the estimated potential levels could be achieved since actual installations of cogeneration facilities have been well below the estimated levels.

With regard to TOTEM plants, these plants have not had widespread use and it is not clear what market, if any, these plants could economically serve.

Q. Please describe a natural gas-fired diesel cogeneration plant.

A. Diesel cogeneration utilizes a diesel engine (similar to a truck engine) modified to burn natural gas that drives an electric generator. Waste heat from the engine captured through the use of heat exchangers on the diesel exhaust; jacket water, and oil lubrication system can be used to provide heat and hot water requirements.

Q. Please describe a TOTEM plant.

A. TOTEM (Total Energy Module) is a small (0.9 liter) internal combustion engine more commonly known as the Fiat 127 engine coupled to an asynchronous electric motor which also serves as a generator. Waste heat is recovered through heat exchangers integrated into the primary cooling system.

Q. Has Con Edison previously submitted testimony before any regulatory body on the likely levels of natural gas fired

diesel cogeneration facilities which might be economical to build in its service area?

A. No. However, testimony was submitted to the New York State Public Service Commission on two occasions in conjunction with Case 27574 in which estimates of the economical potential for oil fired cogeneration were made. The economic potential for conversions to natural gas fired diesel cogeneration will likely be close to the estimate for oil fired cogeneration since both fuels currently have about the same cost and although a natural gas engine will have a slightly lower capital cost, it also has a somewhat lower efficiency.

Q. Please describe that testimony.

A. Testimony was first submitted in November, 1979 which presented the details of studies conducted by the Company to estimate the number of Con Edison customers that have the economic potential to convert to cogeneration. Additional testimony was submitted in November, 1980 to update the original studies.

Q. What was the economic potential for conversion to cogeneration found to be in these submittals?

A. The initial testimony submitted in 1979 estimated that 395 customers could have the economic potential to convert to cogeneration with an equivalent of 1086 Mw of coincident

peak load loss. The updated analysis, conducted approximately one year later, estimated an economic potential of 159 customers with 562 Mw of coincident peak load.

Q. Did any other parties in that case develop estimates of the potential for on-site generation.

A. Yes, the staff of the New York State Department of Public Service submitted testimony at the same time Con Edison submitted its updated testimony. In that submittal it concluded:

> "potential exposure to a loss of customers to on-site generation is low; less than 25 customers having a coincident peak load of less than 100 Mw."

Q. Has the Company conducted any recent studies of the economic potential to convert to diesel cogeneration?

A. The Company updates such estimates periodically. The most recent analysis conducted in July, 1982 indicated an economic potential of 72 customers with 296 Mw of coincident peak load. It should be noted that even though the 296 Mw of potential is considered to be significant to the Company, it only represents a small portion of the Indian Point capacity.

Q. Please explain the changes in the economic potential.

A. The original study was based on estimated capital, fuel

and operating costs which prevailed in 1979. The updated analysis presented to the Public Service Commission in November, 1980 reflected 1981 cost estimates and included a number of revised assumptions, some of which were suggested by the PSC Staff. Two of these revisions are worth noting. The first was to increase the capital cost of a cogeneration facility to reflect the difficulty in retrofitting a cogeneration plant into buildings with space limitations and tall flue requirements which could be required in some New York City office buildings. The second was to reflect the fact that earlier estimates of the potential assumed that New York City would not assess additional property taxes on these facilities. The updated estimate included higher estimates of assessed property taxes based upon statements made by New York City Taxation officials that they would

> "develop valuations for generating equipment at a level consistent with comparable installations owned by public utilities."

The most recent estimates also reflect updated assumptions, primarily with regard to the price of capital costs and operating expenses.

Q. Are you aware of any other recent studies where estimates were made of the economic potential for cogeneration in

the New York City area.

A. Yes. A draft report dated January, 1983 and entitled "On-Site Generation in New York City" has recently been prepared by Entek Research, Inc. for the New York City Energy Office. In it Entek has found:

> "The Moderate potential includes approximately 366 Mw of cogeneration capacity while the High potential includes approximately 1514 Mw."

I should also note that the New York City Energy Office requested that Con Edison review this report, and Con Edison suggested that several corrections to assumptions be made which would lower both the Moderate and High potential estimates.

Q. Are you aware of any other estimates of the potential for on-site generation?

A. Yes. The State Energy Office in its State Energy Master Plan issued March 1982 estimated the potential for cogeneration facilities in the New York City area to be 380 Mw. The Plan notes, however, that because of capital availability and fuel use problems, only 200 Mw is assumed to come on line through the 1996 time period.

Q. Have any estimates been made of the additional potential for conversions to cogeneration which could occur as a result of the shutdown of Indian Point?

A. No such estimates have been made. All estimates of potential have been developed assuming Indian Point remains in service. Any cogeneration which is assumed to replace Indian Point must only be that which occurs in addition to the existing cogeneration estimates which will occur independently of the proposed shutdown of Indian Point. Since existing levels of cogeneration are estimated to be on the order of several hundred Mw, it is unlikely that a substantial portion of the Indian Point capacity could be replaced by additional cogeneration.

It should be noted that both the proposed shutdown of Indian Point and conversions to cogeneration will cause rates to remaining consumers to increase. In case 27574 this increase was estimated to be 1-¾ for each 140 Mw of load lost to cogeneration. This concept was also contained in the draft cogeneration report prepared by ENTEK for the New York City Energy Office which stated: "The comparisons indicate that in all of the cases examined ratepayers will pay a higher rate for electricity as a consequence of the load losses brought about by other customers shifting to on-site generation."

Q. Aside from economics are there any other factors which will effect the potential for conversions?

A. Yes. Air pollution problems could severely limit the number of conversions to cogeneration as discussed in the testimony of Con Edison witness Dr. Freudenthal. Also gas supply constraints discussed in Mr. Stewart's testimony could limit the potential for conversions. In addition, other constraints such as lack of space, unavailability of capital, noise problems, or an unwillingness to assume the risk of operating and owning a cogeneration plant would also tend to limit the potential for conversions.

Q. What has been the Company's actual experience with conversions to cogeneration?

A. Actual levels of cogeneration conversions have been much lower than estimated levels.

Q. Do you have an exhibit which shows the actual conversions that have taken place?

A. Yes. Exhibit (WJW-1), entitled Actual Cogeneration Conversions, shows the actual number of conversions and Mw load loss that have occurred in each year over the last ten years.

Q. Please describe Exhibit (WJW-1).

A. Exhibit (WJW-1) shows the actual conversions to cogeneration which have taken place for each year from 1974 through 1983 based upon Company records. The exhibit

shows the number of customers who converted in each year and the total peak load reduction in each year.

Q. What conclusions have you reached based on the actual conversions?

A. Actual levels of converisons are far below the level of estimated economic potential. In 1979 for example the estimated potential was 395 customers with a peak load of 1086 Mw. The actual conversions in that year were four customers with a total peak load of 5.5 Mw. In 1982 the estimated potential was 72 customers with 296 Mw of load, while the actual experience was one customer with 0.1 Mw of load. This demonstrates that other factors may be involved such as uncertainty over future rates, and the other constraints previously mentioned, which make the task of estimating the time frame over which the conversions will occur difficult.

Q. What is the current application of TOTEM's within the United States?

A. Fiat of Italy manufactures three TOTEM Models i.e., Standard, Independent and Standby. The Independent and Standby models are not available in the United States at this time. Brooklyn Union Gas (BUG) markets the Standard TOTEM and three are currently in operation on an experimental basis within BUG's service territory. Con Edison

has been receiving data from BUG on these systems. Other states on the East Coast have reported some use of TOTEMS for application at dairy farms.

Q. Please describe the TOTEM system in greater detail.

A. As currently marketed the engine itself lacks a throttling valve; therefore, fuel consumption and engine speed (6000 RPM) must be kept constant. The engine has a nominal life of about 10,000 hours of operation before a major overhaul is required. Minor maintenance is required every 1500 hours.

The motor-generator is an asynchronous machine which requires excitation from a magnetic field obtained through a parallel interconnection with a utility or other alternators of which one must be synchronized (of common frequency). Such a machine has a number of drawbacks such as the inability to be completely isolated from the utility, a lack of voltage support and uncontrollable frequency.

Each TOTEM unit is capable of producing a maximum of 15 Kw of electricity and thermal energy of 134,000 Btu per hour.

Q. What is the installed cost of a TOTEM unit?

A. The installed cost is approximately $10,000 in 1983 dollars. An additional cost of $10,000 will be needed if

backup TOTEMS are required to operate when the primary unit is out of service.

Q. In your opinion, what applications are best suited for installation of TOTEM?

A. As with most applications of cogeneration systems, key factors are higher plant load factors that improve the potential for an economic application, and a high coincidence of electrical and thermal requirements. For these reasons TOTEM would be most applicable to the industrial and agricultural sectors when energy is needed day and night and in both the summer and winter.

Because of the Company's limited experience with TOTEM plants it is difficult to predict what market, if any, these plants will ultimately serve in the Company's service area. Until more data has been obtained on TOTEM plants and they have demonstrated their practicality, estimates of their market potential must be viewed with skepticism.

Q. What are your conclusions about the potential for natural gas-fired cogeneration to replace Indian Point?

A. Current estimates of the economic potential for cogeneration conversions are low, indicating that it is unlikely that Indian Point or a substantial portion of its capacity would be replaced by cogeneration.

With regard to the TOTEM plant, that plant should not be considered a proven technology, and until it demonstrates its applicability it should also not be relied upon as a replacement for Indian Point.

Q. Does that conclude your testimony?

A. Yes.

Exhibit (WJW 1)

CONSOLIDATED EDISON COMPANY OF NEW YORK INCORPORATED

ACTUAL COGENERATION CONVERSIONS

Year	Number of Conversions	Peak Load-Mw
1974	2	0.4
1975	0	0.0
1976	1	9.3
1977	4	5.4
1978	1	1.6
1979	4	5.5
1980	3	5.1
1981	1	0.3
1982	1	0.1
1983	0	0.0