UNITED STATES
NUCLEAR REGULATORY COMMISSION
WASHINGTON, D.C. 20555-0001

April 16, 1996

Ms. Rosemary Bassilakis
54 Old Turnpike Road
Haddam, CT 06438

Dear Ms. Bassilakis:

I am responding to your letter dated March 9, 1996, to Mr. Alan Wang.

You expressed concerns about the health of your family and your community. Similar concerns motivated me to study radiation safety and, subsequently, to devote my professional life to this discipline. Therefore, I want to offer a little more than the "legalistic" answers to your questions.

First, the simple answers. We are aware that the Haddam Neck plant releases more tritium than other plants; occasionally, another plant releases more tritium in a particular year, but generally, Haddam Neck has released more tritium than any other plant. The reason is that hydrogen, including tritium, penetrates the stainless steel reactor fuel cladding used at Haddam Neck and at some other older plants. This material is being replaced by a zirconium alloy. The tritium releases are expected to be much smaller in the future than they were in the past. We are also aware of the continuing controversy over the relative effectiveness of tritium irradiation. Still, the NRC did not actually require a reduction in the release of tritium from Haddam Neck for two reasons:

1. The tritium releases meet regulatory requirements, and

2. The preponderance of the evidence shows that the requirements are sufficient to protect the public.

Your comments indicate that the second of these statements needs further discussion. It is clear that you have some knowledge of radiological matters but, as I tell my graduate students, to make the story complete, I must start with the basics. The basic fact behind the radiation control program is that virtually every material thing is radioactive. Of course there are stable (non-radioactive) atoms but it would be a formidable task to collect a measurable amount of stable atoms without including some radioactive atoms, such as ^{14}C from the air, ^{3}H from water, ^{222}Rn from anything, etc. Thus, the control program cannot be based on the absence of radiation or radioactive material. Control must be based on quantity and the quantity, used almost universally, is dose.

Nature contributes most of the radiation dose we receive. For the average person, the dose from nature is about 300 units (millirem) annually. There is considerable variation (±10%) from place to place in a local area and a much greater variation between houses. These variations are readily

measurable but rarely does anyone bother. The Environmental Protection Agency (EPA) criterion of 25 units annually from regulated activities seems consistent with what people accept as safe. The NRC criteria for doses to the public from nuclear power plants includes another safety factor of five.

The criteria are based on a great deal more than public acceptance. Radiation and its biological effects have been studied for a century, because of scientific interest and the availability of financial support. Medicine supported much of the early work, which led to the identification of almost all known ill-effects by 1911. More recently, the Department of Energy and its predecessors funded more than a billion dollars worth of radiobiological research. There have been many radiation epidemiology studies, including a joint study by the United States and Japan of the survivors of the atomic bombs (which is continuing). Thus, radiation is better understood than most potentially hazardous substances.

The radiobiological data are regularly evaluated by several groups of scientists. These groups include (a) the United Nations Scientific Committee on Atomic Radiation, (b) the U.S. National Academy of Sciences, (c) The International Commission on Radiological Protection, and (d) the (U.S.) National Council on Radiation Protection and Measurements. The NRC's requirements are generally consistent with the recommendations of these groups. Furthermore, these authorities consistently recognize that no ill-effects are detectable in people where doses do not exceed 10,000 units.

The NRC dose criteria for nuclear power plant effluents are:

a. far below the levels at which ill-effects of radiation are seen in people;

b. well below the recommendations of the national and international authorities;

c. substantially below the EPA criteria; and

d. within the range of local variation in natural radiation.

In addition to the basic criteria, you expressed concern about the special features of tritium and local conditions that may invalidate the NRC dose models. While all the available evidence indicates that the NRC models are conservative (i.e., tend to overestimate doses) including areas such as Haddam, I performed an especially conservative analysis for the releases from the Haddam Neck Plant. This analysis is based on the fact that, once released, the effluent tritium is irrevocably mixed with the water either in the discharge canal or in the air. Consequently, the doses to the water will be higher than the doses to any person and the doses to the water are below the NRC criteria. Thus, local conditions that might have been different from those in the NRC models are not a cause for concern.

You state that in several instances there have been indications that a given dose may be more effective if it is the result of the low-energy beta radiation from tritium and the fact that tritium sometimes is a part of an organic molecule. The national and international authorities, however, have not found it appropriate to include in their recommendations a factor to account for this suspected difference. These decisions were based, in part, on the absence of observable ill-effects in the thousands of workers who have extensive exposure to large quantities of tritium. Furthermore, the factors that have been suggested to account for the low-energy radiation from tritium generally are about 1.3 and range up to about 2. Even if such a factor were included, the doses from the tritium in Haddam Neck effluents would meet the conservative NRC criteria.

I trust this reply responds to your concerns. If I can be of further assistance, you are invited to call me at (301) 415-1091 or Mr. Alan Wang at (301) 415-1445. Also, I am sure my remarks can be confirmed by a local radiation safety professional such as the "radiation safety officer" at Hartford Hospital or Yale.

Sincerely,

Charles A. Willis

Charles A. Willis
Senior Health Physicist

The Honorable Christopher J. Dodd
United States Senator
Attn: Barbara McCredie
100 Great Meadow Road
Wethersfield, CT 06109

Dear Senator Dodd:

I am responding to your letter of April 17, 1996, to Mr. Dennis Rathbun in which you forwarded a letter dated April 10, 1996, from your constituent, Ms. Rosemary Bassilakis of Haddam, Connecticut. Ms. Bassilakis expressed concerns about the level of tritium releases from the Haddam Neck Plant, operated by Connecticut Yankee Atomic Power Company (licensee). Since she is most concerned that large liquid tritium releases have had and will have adverse health effects on residents living along the effluent pathway, you requested the U.S. Nuclear Regulatory Commission (NRC) to advise you as to the reason why Haddam Neck has had high levels of tritium releases into the Connecticut River during its operating life.

On April 16, 1996, the NRC staff sent a letter to Ms. Bassilakis (enclosed) that answered her letter dated March 9, 1996, regarding the tritium releases from Haddam Neck. In this letter, the NRC stated that the levels of tritium from Haddam Neck were generally higher than from other plants because of the use of stainless steel fuel cladding rather than zirconium alloys. Stainless steel is more permeable to hydrogen, of which tritium is an isotope, than zirconium. However, the tritium releases have remained within NRC regulatory requirements under 10 CFR Part 20. The NRC staff also informed Ms. Bassilakis that the licensee is changing to fuel clad with a zirconium alloy. This change is occurring in one-third core increments that began with operating cycle 17 in March 1992. The plant is currently in operating cycle 19 that started in March 1995, and only 4 stainless steel clad fuel elements remain in the core. The NRC expects the effluent release statisics at Haddem Neck to show a decrease in tritium levels with the completion of this change.

I trust that this information responds to your request.

Sincerely,

James M. Taylor
Executive Director
for Operations

Enclosure: Letter dated April 16, 1996

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Assigned to: Thonkovan Wang

ACTION

EDO Principal Correspondence Control

FROM: DUE: 05/14/96

EDO CONTROL: GT96301
DOC DT: 04/17/96
FINAL REPLY:

Sen. Christopher J. Dodd

TO:

Dennis Rathbun, OCA

FOR SIGNATURE OF : ** GRN ** CRC NO: 96-0445

Executive Director

DESC:

ENCLOSES LTR FROM ROSEMARY BASSILAKIS RE THE HIGH LEVEL OF TRITIUM RELEASES FROM THE HADDAM NECK NUCLEAR POWER PLANT

ROUTING:

Taylor
Milhoan
Thompson
Blaha
Morrison, RES
TTMartin, RI

DATE: 05/01/96

ASSIGNED TO: CONTACT:

NRR Russell

SPECIAL INSTRUCTIONS OR REMARKS:

NRR RECEIVED: MAY 1, 1996
NRR ACTION: DRPE:VARGA

NRR ROUTING:
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MIRAGLIA
THADANI
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GRIMES
BOHRER

ACTION

DUE TO NRR DIRECTOR'S OFFICE

BY May 9, '96

OFFICE OF THE SECRETARY
CORRESPONDENCE CONTROL TICKET

PAPER NUMBER: CRC-96-0445 LOGGING DATE: Apr 30 96

ACTION OFFICE: EDO

AUTHOR: SEN CHRISTOPHER DODD
AFFILIATION: U.S. SENATE

ADDRESSEE: RATHBUN

LETTER DATE: Apr 17 96 FILE CODE: IDR-5 HADDAM NECK

SUBJECT: CONCERNS RE HIGH LEVEL OF TRITIUM RELEASES FM THE HADDAM NECK POWER PLANT

ACTION: Signature of EDO

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SPECIAL HANDLING: OCA TO ACK

CONSTITUENT: ROSEMARY BASSILAKIS

NOTES:

DATE DUE: May 14 96

SIGNATURE: DATE SIGNED:
AFFILIATION: