

LRC FOR



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

SEP 7 1979

Mrs. Vivian K. Bates  
Publicity Chairman  
Harmony with All Living Things (HALT)  
Post Office Box 5313  
Wrightsville Beach, North Carolina 28480

Dear Mrs. Bates:

We are pleased to have this opportunity to respond to your letter to President Carter dated August 5, 1979, concerning the operation of Brunswick Steam Electric Plant (BSEP) in Southport, North Carolina.

In your letter you expressed concern over radioactive xenon and krypton gases being released to the atmosphere from a leaking fuel rod, which developed at BSEP Unit No. 2 on June 28, 1979. In particular, you asked what amount of radiation would be significant and how this is determined. You also expressed concern over a leaking valve which reportedly could not be repaired until early 1980.

As you are aware, a control rod problem caused a local power excursion in at least one fuel bundle at BSEP Unit No. 2 on June 28, 1979. The power perturbation resulted in damage to the metal container housing the fuel, commonly referred to as cladding. Some contaminants from the fuel known as fission products then escaped through the cladding into the reactor coolant. Included in these fission products were the radioactive xenon and krypton gases which were released to the atmosphere through the plant stack from the reactor coolant system. Radiation level increases were noted in the plant off-gas monitors until power was reduced to slow the fission product release and return the off-gas to normal.

During this occurrence, the maximum release of radioactivity was roughly 30% of the allowable continuous off-gas release rate at the stack. If this elevated release were allowed to continue over the entire calendar year, the maximum exposure to an individual at the site boundary would not exceed a dose of 1.5 mrem to the total body. The dose to a person in Wrightsville Beach would be undetectable from this occurrence, primarily due to the quick decay of the isotopes released and the distance from the site.

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Mrs. Vivian K. Bates

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The leaking valve you referred to was responsible for releasing some of the radioactivity through a pipe into the turbine building. The leakage was secured by temporarily blocking off the pipe. The valve in question is scheduled to be permanently repaired during the next refueling outage in early 1980. Of course it is not desirable to have boiling water reactors operating with leaking fuel, but we recognize that fuel leaks can and do occur. While fuel designs have been improved to reduce the likelihood of failure, plant operation with small cladding perforations is allowable, providing that limits imposed on radiation releases are not exceeded.

In the enclosure to this letter, we have provided a discussion of the radioactivity release limits and how they are determined and applied at the BSEP facility.

We hope you will find this information responsive to your inquiry and if we can be of further assistance, please contact the Project Manager, John Hannon at (301) 492-7872.

Sincerely,



Original signed by  
E. G. Case

Harold R. Denton, Director  
Office of Nuclear Reactor Regulation

Enclosure:  
Radioactivity Release Limits

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## ENCLOSURE

To protect the public health and safety, upper limits have been imposed on the releases of radioactivity to the environment from all types of nuclear facilities. These maximum allowable releases are set forth as Federal Radiation Protection Standards in Title 10, Part 20 of the Code of Federal Regulations (10 CFR Part 20). These maximum allowable releases in simplified terms correspond to off-site maximum individual radiation doses of 500 mrem per year, total body or 1500 mrem per year, thyroid. It should be noted that the Federal Standards allow for averaging the releases over a year period in demonstrating compliance with the release limits. However, the NRC in keeping with the philosophy of maintaining releases of radioactivity to the environment "as low as is reasonably achievable" (ALARA) has imposed additional licensing conditions on nuclear power plants to further reduce the environmental doses.

The first such additional requirement is that the releases of radioactivity shall be limited on an instantaneous basis to less than the maximum allowable in the Federal Standards (i.e., no averaging of releases over the year is permitted). The second requirement, and by far the most limiting, calls for facility design and operation to routinely maintain annual radiation doses to the maximum exposed individual in the environment to less than 5 mrem, total body and less than 15 mrem, thyroid. These maximum doses are one-hundredth of the Federal Standards and approximately one-twentieth of the natural background radiation exposure.

It must be recognized that operating flexibility is necessary to assure a dependable source of electricity, but at the same time the public health and safety can not be jeopardized. To achieve the desired goal of providing a dependable source of electricity while also maintaining releases ALARA and protecting the public health and safety from excessive radiation exposure, nuclear power plant licensees are permitted to operate the facilities with releases up to the instantaneous limits described above. However, if these releases continue exceeding one-half of the annual ALARA criteria (i.e., one-half of 5 mrem, total body or 15 mrem, thyroid) in any single calendar quarter, the licensee must report to the NRC the cause of the elevated releases and corrective actions to bring releases back within the ALARA criteria.

A word for clarification, the maximum allowable releases (i.e., the 10 CFR 20 limits) are imposed on a per site basis, whereas the ALARA design and operational objectives are on a per reactor basis. In other words, a multi-unit site is limited as a whole to the 10 CFR 20 limits but each reactor separately is limited to the ALARA criteria. However, it is unlikely even with two or more reactors on a single site that the actual environmental doses would be at multiples of the ALARA doses. This fact is due to the conservative manner in which the radiation doses are predicted.

For the Brunswick facility, the NRC has imposed some additional operating restrictions on the licensee due to the design problems with the augmented off-gas treatment system (AOGS). The AOGS is designed to hold-up the radioactive gases that are to be released from the facility to allow for a radioactive decay, thereby reducing the actual release rate. The Brunswick AOGS is currently undergoing design modification by the licensee to correct the operational problems. Until these corrections are made, the NRC has placed more stringent restrictions on the releases of radioactivity to provide additional assurance that the maximum individual exposures in the environment are maintained within the ALARA criteria.

It should also be noted that the limits on releases of radioactivity are determined based on the maximum off-site concentrations. Actual radiation exposures will diminish rapidly as distance from the facility increases.

In establishing the allowable releases of radioactivity to the environment, the three items that you identified in your letter along with many other public health and safety concerns have been considered. The somatic and genetic effects of low-level radioactivity have been examined and evaluated in establishing the Federal Radioactive Protection Standards (10 CFR Part 20).

Under the President's Reorganization Plan of 1970, the Environmental Protection Agency is responsible for establishing the applicable environmental radiation protection standards for the general public. The NRC has the responsibility for implementing these standards. The recent EPA Uranium Fuel Cycle Standard (40 CFR 190) has established annual limits for radiation exposures to any member of the general public of 25 mrem, total body and all organs except the thyroid which is 75 mrem. This standard becomes effective December of this year. This standard will in effect replace the current Federal Standards for annual radiation exposures that were previously discussed. The NRC is in the process of reviewing the Brunswick facility for compliance with this EPA standard. However, it should be noted that the Brunswick current limits on releases of radioactivity to the environment are generally compatible with the EPA standard and no major changes are expected to the Brunswick limits.