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

CHAIRMAN

August 15, 2001

Dade W. Moeller Ph.D.
[redacted]

Dear Dr. Moeller:

I am responding to your letter dated July 19, 2001, to Commissioner Dicus regarding your concerns with the report from the "Tooth Fairy Project". In your letter you suggested that the Nuclear Regulatory Commission (NRC) should provide a response to the issues raised in this report.

NRC staff carefully reviewed the report earlier this year in response to a request from the State of New Jersey. I enclose a copy of the materials we generated at that time.

I appreciate your interest in this matter. If I can be of further assistance, please feel free to contact me.

Sincerely,

Richard A. Meserve

Enclosures: As stated

cc: Commissioner Dicus

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not available for transfer to a future fetus. The total amount of strontium in the developing skeleton increases about 20-fold in the course of pregnancy. During the last 4 weeks before birth, the fetal skeleton accumulates the same amount of strontium as during all the previous months of pregnancy. Although strontium follows the calcium pathways in the mother's body, the metabolic processes can discriminate against strontium in favor of calcium; however, the ability of placental membranes to discriminate against strontium decreases during pregnancy. By the end of the pregnancy, the ability to discriminate against strontium has almost disappeared and strontium is passed on to the fetus in the same concentration as that present in the maternal circulation. The estimated lifetime radiation dose to the infant skeleton from a single ingestion of 3.7×10^4 Bq (1 µCi) Sr-90 at six months and nine months of gestation is 600 6 milligray (mGy) [600 millirad(mrad)] and 18 mGy (1,800 mrad), respectively (NCRP Report No. 128).

Deposition of Sr-90 into deciduous teeth does not cease at birth. The dentine of the deciduous tooth continues to take up calcium, phosphorus, and strontium through the life of the tooth, typically 7 to 12 years depending on the type of tooth. Sr-90 will be deposited uniformly throughout the tooth if a constant dietary source is provided. Conversely, Sr-90 will be deposited in bands, in the dentine beneath the tooth enamel, if dietary Sr-90 is ingested as single acute doses. Dental mapping of the tooth can indicate when and how much dietary Sr-90 was ingested. American Dental Association staff are mapping Sr-90 deposition in exfoliated teeth obtained from Russian adults exposed to Sr-90 during the cold war.

3. ENVIRONMENTAL MONITORING

The concentrations of the radionuclides released into the environment from a nuclear facility are generally too low to be measurable except close to the nuclear facility and then for a limited number of radionuclides.

The only chance of detecting reactor-generated Sr-90 is in the nuclear power plant effluents themselves. Any Sr-90 detected in environmental samples can most likely be attributed to fallout from nuclear weapons testing. To differentiate reactor-generated fission products from those of nuclear weapons fallout, counting of strontium-containing environmental samples is required several times over a period of a week followed by fitting the counted data to Sr-89, Sr-90, and the ingrowth of yttrium-90 (Y-90). However, this methodology only works if there is sufficient Sr-89 relative to Sr-90 in the sample.

U.S. Nuclear Regulatory Commission (NRC)-licensed nuclear power plant operators are required to monitor gaseous and liquid emissions. Regulatory Guide 1.21 recommends that "...a quarterly analysis for strontium-89 and strontium-90 should be made on a composite of all filters from each sampling location collected during the quarter." The sensitivity is such that the analysis for radioactive material in particulate form should be sufficient to permit measurement of a small fraction of the activity which would result in annual exposures of 0.15 mSv (15 mrem) to any organ of an individual in an unrestricted area.

Each nuclear power plant in the United States is required to file an effluents report annually. In this report, information about the types and quantities of radionuclides that are released to the environment, as well as the dose impact on the environment, is reported. The licensee maintains an environmental monitoring program that is reviewed regularly by NRC. To keep track of these releases, the plants take frequent radiological samples. For example, a total of

1261 analyses on 981 environmental samples was taken in 1997 at Salem/Hope Creek. No strontium-90 was found in any samples acquired in 1997.

4. HEALTH EFFECTS OF Sr-90

Animal experiments indicate that bone sarcoma and tumors of the soft tissue near the bone may be important endpoints in the human exposure to radiostrontium at high doses [thousands of rads (tens of grays) average skeletal dose]. However, these same experiments also suggest that lifespan, cancer incidence, and genetic effects are unlikely to be influenced at the low doses expected from normal environmental exposures.

Although very small increases in cancer incidence attributable to internal deposition of Sr-90 from world-wide fallout is theoretically possible, no statistically significant excess of biological effects from Sr-90 exposures has been demonstrated. Whatever excess of incidence that could be present is masked by the variation in incidence among the population groups studied, the differences in methods of recording of data, and the normal statistical fluctuations of the data for such groups.

Studies from the United Kingdom have reported increases in mortality from leukemia among young persons, especially under age 10, living near certain nuclear facilities (Sellafield). The reasons for this pattern are not clear, although there were no corresponding increases in total cancer.

Risk estimates in humans from exposure to Sr-90 are 1 bone sarcoma per 10^4 person Gy (with lower and higher limits of 0 and 6) and 3 leukemias per 10^4 person Gy (with lower and higher limits of 0 and 8) for populations exposed to radiostrontium at low doses and dose rates (NCRP Report No. 110).

Chernobyl: Apart from the substantial increase in thyroid cancer after childhood exposure, there is no evidence of a major public health impact related to the ionizing radiation 14 years after the reactor accident at Chernobyl. 8 PBq (216,000 curies) of Sr-90 were released from Chernobyl reactor unit 4 in April 1986. No increases in overall cancer incidence or mortality that could be associated with radiation exposure have been observed. The risk of leukemia, one of the most sensitive indicators of radiation exposure, has not been found to be elevated even in the accident recovery workers or in children (UNSCEAR 2000, Annex J).

5. CANCER MORTALITY NEAR NRC-LICENSED NUCLEAR POWER REACTORS

A survey of cancer rates was conducted by the National Institutes of Health (NIH)(1990 NIH Survey) in populations living near nuclear facilities in the United States. This study encompassed all 62 nuclear facilities that went into service before 1982. Relative risk of mortality was compiled for 16 classes of cancer and five age groups for each county in which a nuclear power reactor resides (study county). Data also were compiled for two adjacent counties for comparative purposes (control counties). There is no evidence to suggest that the occurrence of leukemia or any other form of cancer was generally higher in the study counties than in the control counties. For childhood leukemia, the relative risk, comparing the study counties with their control counties, before plant startup, was 1.08, whereas after startup, it was 1.03. For leukemia all ages, the relative risks were 1.02 before startup and 0.98 after startup.

The observed comparisons provided no evidence of any cause-effect relationship between particular facilities and cancer occurrence in nearby populations. However, if any excess cancer risk was present in counties with nuclear facilities, it was too small to be detected by the methods employed in the 1990 NIH survey.

State of New Jersey

Christine Todd Whitman
Governor

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Robert C. Shinn, Jr.
Commissioner

November 1, 2000

Richard A. Meserve, Ph.D., J.D., Chairman
Nuclear Regulatory Commission
Washington, DC 20555

Dear Chairman Meserve:

It was a pleasure to meet with you during your site visit of the Salem/ Hope Creek nuclear generating stations. The thoughts that you expressed during the working lunch and during our meeting showed that we share many of the same concerns. I hope we will enjoy a good working relationship where we are free to openly and honestly discuss our opinions. We may not always agree, but we will at least foster communication between state and federal levels of government. As I mentioned, we already have a good working relationship with Region 1, through the leadership of Hub Miller.

As promised, enclosed is a copy of the article published in the International Journal of Health Services entitled "Strontium-90 in deciduous teeth as a factor in early childhood cancer." In Figure 3, nuclear reactor sites in New Jersey, New York, and Connecticut are implicated in the rise in breast cancer in Suffolk and Nassau Counties on Long Island. However, many other implications are discussed. On page 533, the statistical link between radioactivity and childhood cancer is used to explain the increases in a number of diseases among children. Low birth weight, congenital hypothyroidism, acute ear infections, asthma, and infant bronchiolitis are all discussed as they relate to damage to immune systems. A synergistic link of radiation with indoor pesticide use is postulated.

As we host public hearings and meetings to meet our respective statutory and regulatory obligations and to meet the public's expectations for open and effective government, both state and federal officials are asked to respond to these studies. In answer to various letters and emails, New Jersey's Bureau of Nuclear Engineering has developed some standard answers, but

our expertise is limited. It would be useful if the Nuclear Regulatory Commission could take the lead and produce some talking points that generically address some of the points raised by the Radiation and Public Health Project.

Again, thank you for meeting with me, and I look forward to our continued communication and cooperation.

Sincerely,

Jill Lipoti

Jill Lipoti, Ph.D.,
Assistant Director

Enclosure

c: Hub Miller, Region 1 Administrator

EP6

[redacted]
July 19, 2001

The Honorable Greta Joy Dicus
Commissioner
U.S. Nuclear Regulatory Commission
Washington, DC 20555-0001

Dear Greta:

On July 17, 2001, I attended the Hearings in Homestead, FL, that were being conducted by the NRC with respect to the Application for License Renewal for Turkey Point Units 3 and 4. To ensure that I could speak in a frank and open manner (and also to avoid any appearance of a conflict of interest), I bought my own airline ticket to Miami. My motivations in attending the hearings were two-fold. First, I was born and reared in Florida, and second, I had heard that Dr. Jerry Brown was going to be there. To prepare, I read the "Tooth Fairy Project Report" in detail and prepared a detailed critique of it for distribution at the meeting. I am sure that Chip Cameron will provide you a copy, if you desire.

At the last minute, Dr. Ernest Sternglass joined Dr. Brown. Both of them made presentations. Some of their statements can only be described as ludicrous. Prior to my appearance (which immediately followed Dr. Sternglass), I had decided that the only thing to do was to let them have it with both barrels! In fact, I began my presentation by stating that "The Tooth Fairy Project is aptly named. It is exactly what the name implies -- a Fairy Tale." I went on to say that the report issued by Drs. Sternglass and Brown "is unadulterated gobble-de-gook," and that "it is undoubtedly the worst example of junk science I have ever read in my 50 years in the radiation protection profession."

Later, I had an opportunity to discuss with Chris Grimes the possibility of assisting him and his staff in developing what might be called a generic response to the accusations being made by Dr. Sternglass. Although this is something for you and your associates to decide, I believe that such a document is urgently needed. Perhaps there is a better approach. In any event, I would respectfully suggest that something be done.

st regards,

Dade

ide W. Moeller, Ph.D.

Hill—
Grant response for this and letter to me for my signature. Enclose [illegible] J.ll [illegible] on Tooth Fairy project, indicating I share Moeller's views. cc: Dicus.
RAM