NEUTRON PRODUCTS inc

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March 12, 1989

TO THE RESIDENTS OF DICKERSON, MARYLAND:

Dear Neighbor:

I trust you are aware, from reports in the media, that the Maryland Department of the Environment has modified our license to restrict our ability to furnish cobalt-60 sources. Other operations are not affected.

Although we are convinced that this action was taken in error, the Department has modified its demands to make a remedy feasible; and we are working with them to define a course of action that will allow the supply of sources to be resumed without much delay. Nevertheless, citizen concerns have been aroused; and in order to satisfy your concerns in an efficient manner, we have decided to revive the "Dear Neighbor" letter after a lapse of nearly eight years.

The extent of this series of letters and accompanying Fact Sheets will depend upon the nature of further events and the durability of community interest. At this writing, we have the following agenda:

Fact Sheet # 2.1, which is enclosed, provides perspective on the releases of very low levels of radioactive material from our Plant by comparing them with the levels of radiation and radioactive material release to which you are exposed in the normal course of events in which Neutron is not involved.

Fact Sheet # 2.2, also enclosed, sets forth the sequence of events leading to the action taken by the State on March 3, 1989, and the draft remedy that we developed in the course of our meeting with them on March 8.

We will have at least one additional letter that will report on our progress and provide such additional information that we believe will contribute to your understanding of this episode. Meanwhile, we welcome your comments, and we'll be pleased to answer any questions you may care to raise. I have asked Mary Neal to serve as the coordinator of requests for additional information.

We have appreciated the community calm and cooperation of the past eight years, and trust that the information furnished in these letters will help you to resolve any concerns that may have been raised by the recent publicity.

Regards,

Neutron Products, Inc.

J. A. Ransohoff, President

A1151

Fact Sheet # 2.1 - A Perspective on the Recent Reports of Radioactive Material Release From Neutron Products' Dickerson Plant

During the past week, Neutron Products (hereinafter "Neutron") has been the subject of publicity regarding the release of very small quantities of radioactive material from the cobalt-60 source fabrication portion of its plant. Several media persons, interested citizens and employees have asked us to compare the releases currently at issue with levels of radiation and radioactive material release that they normally encounter in the course of events that do not derive from Neutron's activities.

Although there are several cases for comparison that we could use to establish perspective here, we have chosen to compare the releases at issue with those from a typical radon safe home to provide the requested comparison. As you will see, our analysis shows that the levels of release with which we are now concerned are trivial in comparison to those experienced and released by ordinary citizens from the decay of radon in the radon safe home, office or non-nuclear plant.

Definitions and Terms

Table I lists the relationships among the various terms describing the rate of decay of radioisotopes that have been used in the media, and will be used in this fact sheet and those that may follow:

TABLE I - Terms Describing the Rate and Nature of Decay

Media reports have referred to "dpm" (disintegrations per minute), a term used to describe very low levels of radioactivity. Levels of more substance are described in terms of "curies", usually with a prefix designating factors of one thousand.

1 curie of radioactivity is equal to	2,220,000,000,000	dpm;
1 millicurie of radioactivity is 0.001 curies, or	2,220,000,000	dpm.
1 microcurie is 0.001 millicuries, or	2,220,000	dpm.
1 nanocurie is 0.001 microcuries, or	2,220	dpm.
1 picocurie equals 0.001 nanocuries, or	2.2	dpm.

Some radionuclides decay but once - others in long chains of successive radionuclides. The successive nuclides are called "daughters" and "progeny".

Cobalt-60 decays to stable nickel-60 with the release of about 2.8 Mev - a unit of radiation energy.

Radon-222 decays through a chain of seven daughters to lead-206, in the course of which it releases about 35 Mev of radiation energy.

The average cancer therapy source contains about 6,000 curies.

Levels and Nature of Known and Prospective Releases From Neutron's Plant

The nature of the radioactive material releases with which the State is presently concerned is generally in the form of contaminated articles of

clothing and other personal effects. The radioactivity involved is very low and difficult to detect. Once found, it is usually removable by cleaning or washing, but it is not readily removed by wiping. The approximate level of each such release has been in the range of one to one hundred nanocuries; and the total of all such releases is reliably estimated to be less than 1 microcurie. In the context of our previous nomenclature, they can be fairly characterized as "cold spots"; but the State and the NRC refer to them as "hot particles" in reference to a phenomenon known and subsequently referred to as the "hot particle effect".

A Comparison With the Typical Radon Safe Home

In order to put these releases in perspective with levels of radiation and radioactive contamination encountered in every day living, it is useful to compare them with the radiation and radioactive contamination deriving from the decay of radon in what I shall refer to as a "typical radon safe home".

EPA has stated that no remedial action is recommended to ameliorate the effects of radon in homes or offices in which the radon concentration is less than 4 picocuries per liter. Our typical radon safe home is a 2,500 square foot house with 8 foot ceilings. Its air volume is 20,000 cubic feet, or 570,000 liters; and at 4 picocuries per liter, it contains about 2,300 nanocuries of radon gas that is decaying at a rate of about 5,000,000 dpm.

Radon decays through a chain of seven radioactive daughters, each of which releases high energy beta or alpha particles that are generally more difficult to detect than cobalt-60, and much more destructive of human tissue. Radon's first four daughters have short half-lives, and come to equilibrium quickly. When they are included in the analysis, the total household activity is 11.5 microcuries or about 25,000,000 dpm; and the concentration is about 20 picocuries (or 44 dpm) per liter.

A "standard person" inhales about 22,000 liters per day (± about 4%); and accordingly, the typical radon safe home resident inhales air containing about 440 nanocuries of radioactive nuclides per day. Radon is a noble gas; is probably exhaled quickly, and can probably be ignored. However, the other nuclides are isotopes of polonium, bismuth and lead all of which are chemically active, and capable of reacting with lung tissue and remaining for some period of time. Thus the daily breathing burden in the typical radon safe home totals about 350 nanocuries of nuclides, some fraction of which will actually stay and decay in the lung. The foregoing analysis is simplified and understated by neglecting the production, absorption and decay of lead-210 - fifth in the chain - and its daughters, bismuth-210 and polonium-210.

Lead-210, has a half-life of 21 years, and its absorption on dust, smoke particles or lung tissue constitutes the creation of, exposure to, and release of radioactive contamination of a nature similar to the cobalt-60 contamination generated at Neutron. The production rate of lead-210 in the typical radon safe home would be 5,000,000 atoms per minute, or about 215 billion atoms per month. Neglecting the additional contamination generated by its progeny, the monthly generation of lead-210 would be about 13,500 dpm (about 6 nanocuries).

At these levels of activity, the effect on radiation background is small; and the principal safety concern arises out of ingestion, particularly in the lung, or prolonged contact with the skin. Due to its longer biological half-life, and the high energy of its particle emissions and those of its progeny, lead-210 is much more radiotoxic than cobalt-60, and, considering insoluble particle ingestion only, the radiotoxic equivalent of 6 nanocuries of lead-210 would be about 225 nanocuries of cobalt-60. For air soluble ingestion, the equivalent cobalt-60 activity would be 15,000 nanocuries.

Our plant contains about 1,000,000 cubic feet of space; and if we were engaged in activities involving no radioactive material, our "radon safe" monthly generation of lead-210 contaminated dust (as an insoluble) would exceed the radiotoxic equivalent of 11,000 nanocuries of cobalt-60. Including lead-210 progeny, the cobalt-60 equivalent would exceed 25,000 nanocuries, or 55,000,000 dpm. Whether in the home, the office or the non-nuclear factory, most of the radioactive contamination generated by the production and collection of lead-210 and its progeny would be on air filters, vacuum cleaner bags and the like that would be legally sent by the occupant to the local land fill or dispersed in the soil.

Clearly, these common, and deemed safe, levels of radioactive contamination far exceed the contamination found at Rochester, and the total found as the result of extensive surveys of the homes, cars and clothes of all cobalt source facility employees. As a consequence, from technical considerations, we believe that you may reliably discount, and not be frightened by, the State's claim of a "public health and safety emergency."

Why the Fuss?

We're not certain that we have all the facts. However, we can share with you what we do know that we believe is germaine; and we do so in Fact Sheet # 2.2.

For further information, please contact Ms. Mary Neal at 301-349-5001

March 12, 1989

Fact Sheet # 2.2 Events Relating to The Department of the Environment's Action to Restrict Cobalt-60 Source Production at Neutron Products' Dickerson Plant

On March 3, 1989, without prior notice or opportunity to respond, the Maryland Department of the Environment (hereinafter the "Department") modified Neutron Products' (hereinafter "Neutron") by-product materials license to restrict the production and distribution of cobalt-60 sources. In order to do so legally, it had to find that there was a public health and safety emergency where, in fact, none existed. (See Fact Sheet # 2.1.)

In our view, the Department's action was taken out of frustration, born of misinformation and poor communications between Neutron and the Department. The point of this Fact Sheet is not to allocate blame - regulators do not make mistakes, and we'll take the responsibility. Rather, it is to provide an explanation of how Neutron and the Department, both presumably competent, can differ so markedly on the fact of whether or not a public interest is at stake in this matter.

A brief accounting of events (and non-events) leading to the Department's action of March 3 may be enlightening.

In partial response to the "hot spot" episode of 1980-1981, Neutron installed a portal monitor that was designed to detect cobalt-60 on persons and personal effects at the microcurie level.

At the time, the operators of nuclear power plants were being pushed to provide more sensitive detection apparatus; and some of the equipment we used for portal monitoring was acquired as used equipment that had been retired from nuclear power plants because of the tighter regulations imposed upon them. Both the State and the NRC were aware of this, but the standards we adopted were considered satisfactory at the time. Therefore, it was not surprising to us that, from time to time, the clothes of a Neutron employee might be found to be "contaminated" by nuclear power plant equipment.

As a result, we were surprised when so much was made of the first Rochester finding; and although we paid the fine (under protest), we did so because it was clearly less expensive than contesting it. We also agreed to procure and install a more sensitive portal monitor, not because we believed it was required for safety reasons, but because we accepted the premise that it was desirable from considerations of employee morale and public relations.

<u>The Development of an Impasse</u>

However, we were unwilling to purchase and install a portal monitor that would not satisfy the State's requirements, which we believed to be based on misinformation and misinterpretations, and could not physically be satisfied.

Years ago, we established a procedure for maintaining a sringent standard for cleanliness outside the limited access area (440 dpm of smearable, removable activity per 100 square centimeters). That procedure requires that periodic smears be taken, and that remedial action be taken in the event of smears reading in excess of the limit. In order to detect such low levels of activity with any reasonable

efficiency, the smears are counted by a large scintillation detector inside a chamber shielded by about 5 inches of lead.

Nevertheless, the State decided that our standard of 440 dpm for smearable, removable activity could and should be applied to persons and personal effects leaving the Plant. In fact, we have no basis for believing that any portal monitor now on the market can reliably assure against the release of less than 5,000 to 10,000 dpm.

Last summer, we asked for a meeting with the management of the Department to resolve our differences in this matter, and in several other matters relating to the disposition of materials having trivial levels of radioactivity. Such a meeting was scheduled, but then cancelled by the Department and continually postponed.

Finally, at the request of the Department, we suggested an appropriate standard in writing. That standard was rejected, in favor of the 440 dpm standard, by letter dated February 16 and hand delivered to us on February 21, 1989.

Convinced that we were stalling, the second Rochester incident apparently caused the Department to declare an emergency and modify our license.

Meanwhile, having been unable to reach agreement with the Department on a monitoring standard, we decided to change our operating procedures to substantially decrease the likelihood of such a release, and we forwarded same to the Department for its comments on March 3 before receiving its notice.

Probable Resolution

In our meeting with the Department on March 8, 1989, after several hours devoted to a heated exchange of views on the wisdom and legality of its action, we developed with them an apparently agreeable course of remedial action.

The Department agreed that if we purchased, installed and properly shielded the portal monitor they have recommended, it will accept, as a standard, the detection that actually results. That position resolves the impasse that had previously prevented us from proceeding.

We agreed that the establishment of a tighter standard for release is required, for reasons of employee and public relations if not for safety.

Finally, the Department has agreed that the change in operating procedure that we had suggested on March 3 is likely to be constructive.

It is our great hope and preference that the issue of justification will wane. Whether the "remedy" we agree to is required for cosmetics or safety is of much less consequence than arriving at a mutually agreeable course of action.

Please address comments or requests for more information to: Ms. Mary Neal
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