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NOTE TO: Files

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SUBJECT: LOST PLUTONIUM - 238 SOURCE

Background

On April 16, 1981, Region I acknowledged receipt of a written report from Coratomic, Inc. The report (Attachment 1) gave details surrounding the loss (in 1978) of a 4 CI Pu-238 source in a C-100 nuclear pacemaker. Coratomic (Indiana, Pa.) believes the source is buried at a sanitary landfill. The firm conducted a search for the source at the landfill but did not find it.

Because of the specific element, plutonium, and the source size, 4 CI, I began a brief review of the event.

The Coratomic C-100 Nuclear Pacemaker

The Coratomic C-100 nuclear pacemaker is a device 2.356" long x 0.760" wide x 1.85" high. The plutonium-238 source, as doubly incapsulated, is a sphere 0.336" diameter. The source contains a pellet of plutonium dioxide, surrounded by a primary spherical pressure vessel of tantalum-tungsten alloy. There is a second outer capsule of platinum-rhodium alloy. The maximum thermal output is 0.142 watts.

Design of the Plutonium-238 Heat Source

The plutonium-238 heat source encapsulations were designed to meet the criteria in the Interim Safety Guide for Design and Testing Nuclear-Powered Cardiac Pacemakers. These criteria include:

- initial leak tightness
- impact tests
- static stress tests
- temperature test (fire)
- temperature test (cremation)
- corrosion test

A catalog sheet (i.e., a document describing the nuclear source) written by the NRC licensing staff (August 23, 1974) indicates that the source meets all of the criteria except for corrosion test as written. The catalog sheet does state that sufficient information was submitted to indicate adequate corrosion resistance of the source.

Analysis

To provide some perspective on the possible corrective actions, I note the following:

- According to Pat Vacca of NMSS, five or six plutonium-238 sources implanted in humans have been buried. NRC has not required their recovery. (Note: these sources nees not have been Coratomic sources.)

- The GES on the Routine Use of Plutonium-Powered Cardiac Pacemakers anticipated that some number of pacemaker sources would be buried (i.e., not recovered from individuals).

- The chemical form of the plutonium, sintered plutonium dioxide, makes it relatively non-dispersible in the environment over the short term and non transportable in the body.

- A source containing a similar amount of plutonium-238 was lost in a gas well explosion. The source, doubly encapsulated with stainless steel, is probably about 55 feet from the surface. No determination has been reached on whether or not the licensee should be required to recover the source.

A recommendation that the licensee be required to attempt to recover the lost source does not appear to be supportable given the fact that several others have been "lost" (buried), and that the source encapsulation has been designed to withstand extremely severe conditions. (Considerations other than safety might impel NRC to recommend additional recovery efforts.)

Similarly, the only lesson to be fedback to other licensees would be not to lose sources. Such an obvious observation is not worth making.

One step I took was to send a copy of the Coratomic report to Wayne Kerr. There was no evidence that the State of Pennsylvania had been informed of the lost source. (See Attachment 2)

On the basis of the above reasoning, I have proposed no corrective actions or feedback of lessons learned.

Conclusions

No further evaluation of this incident will be made. If any change in status occurs, I will update my evaluation.

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Enclosure:
As stated

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