The Boeing Company
6633 Canoga Avenue
P.O. Box 7922
Canoga Park, CA 91309-7922

January 21, 2005
In reply refer to 2005RC0202

BOEING

Elizabeth Crawford
Administrative Assistant to Supervisor Linda Parks
Civic Arts Plaza
2100 East Thousand Oaks Blvd., Suite C
Thousand Oaks, CA 91362

Subject: Sodium Reactor Experiment (SRE) Original Accident Release Data

References: (1) Atomics International Inter-office Memo. G. Borg to W. L. Fisher. "Quarterly Report of Activity Released to Atmosphere." November 20, 1959.
(2) Letter from Phil Rutherford to Elizabeth Crawford, "Sodium Reactor Experiment (SRE) Accident Releases." September 29, 2004.

Dear Ms. Crawford:

I apologize for the delay in replying to your request for original release data for the SRE accident. The attached (Reference 1) is a quarterly memo written November 20, 1959, detailing a series of venting events (releases) from the SRE holdup tanks. As indicated, the tanks were sampled prior to each venting and analyzed for activity concentration (μc/cc = microcuries per cc). These activity concentrations are shown chronologically from July 1, 1959 through September 30, 1959. Measured activity concentration of the gases in the holdup tanks increased significantly on July 20, 1959 and remained higher than nominal until September 28, 1959. Total activity released (microcuries) in each of the venting events is shown in the right hand column and is calculated by multiplying the concentrations by the total volume vented. Summing the activities from each venting event gives approximately 28 curies of noble gases. Activity represents total β/γ (beta/gamma) activity and is dominated by Xe-133 and Kr-85. Based on decay-corrected isotopic measurements of the cover gas, approximately 19.3 curies of Xe-133 and 8.6 curies of Kr-85 were released. My prior letter (Reference 2 attached) described the dispersion calculations used to determine the off-site doses that resulted from these releases.

If you have any questions on the above material please call me at 818-586-6140.

Sincerely,

Phil Rutherford
Manager, Radiation Safety
Safety, Health & Environmental Affairs

PDR:je

Attachments:

(1) Atomics International Inter-office Memo. G. Borg to W. L. Fisher. "Quarterly Report of Activity Released to Atmosphere." November 20, 1959

(2) Letter from Phil Rutherford to Elizabeth Crawford, "Sodium Reactor Experiment (SRE) Accident Releases." September 29, 2004.

cc with attachments:

Mike Lopez, DOE-OAK
Judy Mikels, Ventura County Board of Supervisors
Mary Weisbrock, Save Open Space

SHEA-101161

ATOMICS INTERNATIONAL

A DIVISION OF NORTH AMERICAN AVIATION, INC.

INTER-OFFICE LETTERS ONLY

TO: W. L. Fisher

ADDRESS: 779 58

FROM: O. Borg

ADDRESS: 779 58

PHONE: X 74

DATE: November 20, 1959

SUBJECT: Quarterly report of activity released to atmosphere.

The following report is a tabulation of radioactive gases released to the atmosphere from SNR decay hold-up tanks. This report covers the period from July 1, 1959 to October 1, 1959.

Sample date	Activity $\mu c/cc$	Release Rate (CF/Hr)	Total Activity μc **
7/1/59	5.0×10^{-6}	145	3.8×10^{2}
7/1/59	7.0×10^{-6}	145	5.3×10^{2}
7/3/59	2.5×10^{-6}	145	1.9×10^{2}
7/9/59	2.0×10^{-6}	145	1.5×10^{2}
7/10/59	1.8×10^{-6}	145	1.4×10^{2}
7/11/59	2.2×10^{-6}	145	1.7×10^{2}
7/20/59	5.0×10^{-2}	4	3.8×10^{6}
7/25/59	1.4×10^{-2}	27	1.1×10^{6}
*7/25/59	8.0×10^{-2}	6	6.1×10^{6}
8/22/59	7.0×10^{-2}	4	5.3×10^{6}
9/16/59	6.5×10^{-2}	4	4.9×10^{6}
9/17/59	7.0×10^{-2}	12	5.3×10^{6}
9/18/59	2.0×10^{-3}	145	1.5×10^{5}
9/20/59	5.0×10^{-3}	145	3.8×10^{5}
9/21/59	1.3×10^{-3}	65	1.0×10^{5}
9/21/59	1.3×10^{-3}	145	1.0×10^{5}
9/21/59	1.1×10^{-3}	145	8.4×10^{4}
9/22/59	2.0×10^{-3}	145	1.5×10^{5}
9/27/59	1.8×10^{-3}	145	1.4×10^{5}
9/27/59	1.8×10^{-3}	145	1.4×10^{5}
9/28/59	1.8×10^{-3}	145	1.4×10^{5}
9/30/59	7.8×10^{-6}	15	5.8×10^{2}
9/30/59	6.0×10^{-6}	15	4.6×10^{2}

*Reason for gap between 7/25/59 to 8/22/59 to 9/16/59 is due to slow release rate.

**In each instance of venting the total volume released was approximately 7.6×10^{7} cc.

O. Borg

O. Borg
Health Physics Department - 88

OB:sb
cc: Lane. J. O.

September 29, 2004
In reply please refer to 2004RC02805

Elizabeth Crawford
Administrative Assistant to Supervisor Linda Parks
Civic Arts Plaza
2100 East Thousand Oaks Blvd., Suite C
Thousand Oaks, CA 91362

BOEING

Subject: Sodium Reactor Experiment (SRE) Accident Releases

Dear Ms. Crawford:

It was good meeting with you at the DOE Public Outreach Meeting on September 9th, 2004. At the meeting you requested additional information on the SRE accident releases.

In sodium cooled reactors such as the SRE, it was, and is routine practice to transfer radioactive gases from the cover gas system to a hold-up tank to allow short lived fission products to decay away. The remaining radioactive gases (principally xenon-133 (Xe-133) and krypton-85 (Kr-85)) would then be discharged to the atmosphere via HEPA filters to trap any entrained particulate radioactive material. This release was conducted in a controlled and documented fashion that ensured that federal dose limits for unrestricted areas were met.

Following the SRE accident, these same radioactive gases, Xe-133 and Kr-85, were vented from a hold-up tank over a two month period (from July 20th thru September 28th, 1959). Xenon and krypton are inert, noble gases that do not react with other chemicals. A total of 15 venting events occurred during this period. Before each venting event the activity concentration (microcuries/cc) of gas in the tank was measured. Since the total volume of the holdup tank was known, the total activity released could be calculated in terms of curies. According to contemporaneous company records, approximately 28 curies of radioactive gases were vented from the hold-up tank to the atmosphere through HEPA filters to trap any residual particulates[1]. The radioactive gases were mixed with large quantities of clean air to ensure that off-site doses remained below federal limits. We can utilize the activity released to perform a conservative calculation of the resultant maximum off-site

[1] Company records also indicate that two releases occurred through the stack for several hours on July 12th and again on July 15th, that may have bypassed the holdup tank. It is likely that the total activity of each release would have been similar to, or less than, each individual hold-up tank venting event.

radiation exposure and the exposure at the location of the nearest resident. We can then compare this dose to today's NRC and DOE annual dose limit for unrestricted areas surrounding nuclear facilities (100 millirem/year) or today's EPA limit for airborne releases (10 millirem/year).

We used Hotspot 2.05, a computer software program developed by Lawrence Livermore National Laboratory (LLNL), to calculate doses. Conservative assumptions were used. Each vent event was modeled as an instantaneous "puff" release. This eliminates the dilution effect of clean air mixing over longer periods of time. The wind was assumed to blow in the same direction for the whole two months. This maximizes the cumulative doses from the different venting events. The highest meteorological stability class F was assumed. This minimizes dispersion and turbulent dilution of more unstable classes. A low wind speed of 1 meter/second (2 miles/hour) was assumed. This minimizes dilution by wind turbulence.

Doses were calculated for venting events during the third quarter of 1959. During routine operations, each venting event resulted in only low off-site doses (< 0.000003 millirem). Commencing July 20th a series of venting events produced higher off-site doses. After September 30th the vent activities and doses decreased to pre-accident levels. During this period, from July 20th to September 29th, the total, maximum, cumulative, off-site dose was 0.099 millirem at approximately 500 meters from the SRE, and 0.018 millirem at the location of the nearest resident (2,320 meters from the SRE). These doses are a result of 19 curies of Xe-133 and 9 curies of Kr-85 being released.

These doses are small when compared to today's federal NRC and DOE exposure limits for nuclear facilities (100 millirem/year) and the federal EPA limit for airborne emissions (10 millirem/year). They are also a small fraction of the average naturally occurring radiation that we are exposed to in the U.S. (300 millirem/year).

If you have any questions on the above material please call me at 818-586-6140.

Sincerely,

Phil Rutherford
Manager, Radiation Safety
Safety, Health & Environmental Affairs

cc: Mike Lopez, DOE OAK
Judy Mikels, Ventura County Board of Supervisors

SHEA-100635