



THE UNIVERSITY OF ARIZONA
TUCSON, ARIZONA 85721

COLLEGE OF ENGINEERING
DEPARTMENT OF NUCLEAR ENGINEERING

CT-1119
PDR 7/3/79

May 30, 1979

DISTRIBUTED TO ACRS MEMBERS

Mr. Andy Bates
Staff Engineer
Advisory Committee on Reactor Safeguards
U. S. Nuclear Regulatory Commission
Washington, D.C. 20555

LI
ADVISORY COMMITTEE ON
REACTOR SAFEGUARDS U.S. N.R.C

JUN 4 1979

20000012120405

Dear Mr. Bates:

Attached are the writeups on the "class of event" subjects that I promised at the meeting of 25 May. These items are the result of an analysis of the LER's that were uncovered as a result of searches in the NSIC file conducted as follows:

<u>Subject</u>	<u>No. of Accessions</u>
Containment integrity	195
Containment leak rate	37
Containment isolation and valves	533
Containment isolation, excluding valves	157

A table showing the description of causes within each category is shown on the attached page. The selection of the headings for the various causes was purely arbitrary, but in general can be thought of as identifying the major sources of LER inducement and at least most of the unusual causes.

There are no real surprises in the distribution of failure cause. In general, personnel errors seem to be identified 20-25% of the time; degradation of performance to the extent for equipment to operate outside specific limits, another 20-25% of the time; and functional failure of the component 35-40% of the time. It is my general conclusion that the format for the LER's should allow considerable latitude in setting forth cause and, hopefully for the future, strong incentives should be developed for routine follow up as cause becomes better understood.

There were many items to be included in the general report that were brought up during the meeting and I will not attempt to restate those now. There is one area, however, where I feel a particularly strong recommendation is in order. The statistical analysis of LER's seems loaded with some very worthwhile information. Certainly the comparison between systems should go far in confirming this supposition

757 062
7 908170 306

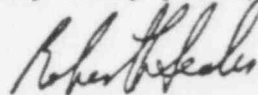
Mr. Andy Bates

Page 2

on my part. Moreover, the implied differences between vendors is certainly suggestive of the kind of information that could be most valuable. Other comparisons are equally possible. In particular, it would be very interesting to look at the various utilities, particularly those with relatively large numbers of nuclear installations. The other comparison that should be most helpful to the Commission would be one made on the basis of the various NRC Regional Offices. This kind of information could be particularly useful in their more general evaluations of the local Inspection and Enforcement apparatus. By the way, the special value of this latter kind of analysis makes a very strong case for divorcing the proposed LER audit group from I&E in particular, or NRR more generally.

Finally, the ACRS subcommittee on LER's is clearly the review group appropriate for the LER audit organization. Certainly the study of the problem by this subcommittee has shown a great deal of progress in turning what initially appeared to be a rather amorphous mass of information into a resource which, with some fine tuning, can be a literal gold mine of very useful data.

Very truly yours,



Robert L. Seale, Head
Department of Nuclear Engineering

RLS:dv

Enclosure

757 063

Search 1 - Containment Integrity (Total 195)

- 27 - Door Interlocks
- 36 - Excessive Leakage in Test
- 31 - Design Oversight or Construction Error
 - 4 - Panels Settling, Bulges, Deterioration of Sealants
 - 8 - Maintenance Error
 - 1 - Weather
- 56 - Personnel Error
- 1 - Shipping Cask Leaking
- 164

Search 2 - Containment Leak Rate (Total 37)

- 17 - Valve Leaks
- 9 - Ventilation Leaks
- 2 - Large Door Leaks
- 2 - Penetration Leaks
- 1 - Maintenance Error
- 4 - Test Hardware Leaks
- 1 - Air Monitoring Equipment Failure
- 36

Search 3 - Containment Isolation and Valves (Total 533)

- 248 - Valve Failures
- 20 - Valve Controller Failure
- 108 - Valve Leaks
 - 27 - Closure time out of specification
- 91 - Personnel Error (Operator, Designer, Maintenance, etc.)
- 500

Search 4 - Containment Isolation, Excluding Valves (Total 157)

- 50 - Set Point Drifts
- 23 - Equipment Damage, Corrosion
- 30 - Intermittent Failure
- 20 - Inadequate Design or Poor Review
- 25 - Personnel Error

757 064

Class of Event

Materials quality control.

General Description

Several instances of defective materials which were identified during fabrication. Systems and components involved included the pressure vessel at Callaway 2 (accession # 00Z 0119808); a flaw in the concrete dome structure in the containment building at Crystal River 3 (accession # 00Z 0113762); a run of leaky bellows on valves at Dresden 1 (accession # 00Z 0128111); as a few examples.

These items were listed during the LER search but in fact were not specifically LER's. The information is contained in the NSIC files. At Callaway 2 numerous small intrusions of MgS were found in the pressure vessel. During fabrication the actual identification occurred prior to location of nozzles in the vessel and the largest number of flaws were removed by the expeditious location of these nozzles. At Crystal River 3 a cavity was located in the building dome concrete while setting anchors in place during construction. The cavity was in several pours with voids 1-3/4" thick and up to 15" deep in the pour. A detailed acoustic examination was conducted of the entire dome. At Dresden 1, several valves from a common vendor were found to have leaks likely due to welding difficulties.

Frequency of Occurrence

These cases seem isolated as far as material type, vendor identification or kinds of systems involved.

Implications Regarding Safety

Possible failure of groups of similar equipment due to common flaws and, hence, possible common failure mode. Precise consequences would depend on the particular systems involved, but generally would result in degradation of containment integrity.

Corrective Action

- a. Where flaws were found, their possible occurrence in other similar components, pour sections, or whatever as appropriate, was examined. Appropriate QA methods were used and corrective action appears satisfactory.
- b. The extent to which subsequent follow up with vendors occurred on a generic basis was not clear.

757 065

Class of Event

Door interlocks defeated while performing maintenance, transferring material into the building, etc.

General Description

An apparent wide-spread occurrence of overt actions to defeat the integrity of various interlocked door arrangements. Cases included running air lines into restricted ventilation areas; the transfer of large objects into the building, etc. There were also numerous cases where interlocking linkages were out of adjustment or had failed.

Implications Regarding Safety

These activities generally violated the integrity of the containment.

Corrective Action

- a. The employees involved were reprimanded.
- b. Retraining of employees as to proper procedures was instituted.
- c. There is little indication of a decrease in the number of such occurrences with time. There appear to be many legitimate occasions when both doors on an interlock system might need to be opened. Procedures, including specific approval of operators and well understood methods for restoring containment integrity on short notice, should be examined.

157 066

Class of Event

Degradation of valve seat quality.

General Description

Eventually all kinds of valves can be expected to suffer a degradation in the quality of the seating surface at some time in their life. At least 125 such cases were found in a group of 570 LER's. Specific causes included erosion and pitting of surfaces; deposition of solids, including crystalline boric acid on the valve seats; the scoring of seats by entrained material in the flow; and the degradation of inflatable gaskets on large valves.

Implications Regarding Safety

Specific significance depends on the particular valves involved. This is one area where routine system inspection and maintenance appears to be an effective and much needed activity.

Corrective Action

Where seats have deteriorated in quality they are reground and restored to specified performance criteria. In other cases the appropriate corrective action, including possible replacement of the valves, is taken. Some examination of maintenance schedule rates and valve selection criteria in design would seem appropriate in view of the large data base that has now been accumulated.

757 067