

UNITED STATES
NUCLEAR REGULATORY COMMISSION
OFFICE OF INSPECTION AND ENFORCEMENT
WASHINGTON, D.C. 20555

December 19, 1983

IE INFORMATION NOTICE NO. 83-83: USE OF PORTABLE RADIO TRANSMITTERS
INSIDE NUCLEAR POWER PLANTS

Addressees:

All nuclear power reactor facilities holding an operating license (OL) or construction permit (CP).

Purpose:

This information notice is to apprise you of reported instances in which portable radio transmitters caused system malfunctions and spurious actuations in nuclear power plants. No specific action is required in response to this information notice, but it is expected that recipients will review the information for applicability to their facilities.

Description of Circumstances:

Events over the past few years have caused concern in the NRC staff regarding the potential of portable radio transmitters (commonly referred to as walkie-talkies) to cause system malfunctions and spurious actuations. The following four examples describe two events in which a safety-related system was affected and two in which a non-safety-related system was affected.

The first example occurred at Grand Gulf on July 25, 1983, in which shutdown cooling loop B was lost for 30 minutes because of a spurious isolation trip. The isolation was initiated by an RHR equipment area high temperature trip which immediately cleared. Rather than restart the loop immediately, the operators first verified that no leak was present and thus the area high temperature indication was false. Since shutdown cooling loop A was inoperable at the time, the reactor water clean up system was used as the alternate heat removal system.

The licensee conducted an investigation, including an after-the-fact interview with personnel who were in the vicinity of the trip circuitry. The licensee concluded that the most plausible cause was an accidental keying of a two-way FM radio near the trip unit. The licensee has and continues to forbid the use of the radios for transmission in the vicinity of the control room or near panels.

The walkie-talkie that was used has a power output of approximately 4 watts in the frequency range of 451-456 MHz. The walkie-talkie was accidentally keyed in the upper cable spreading room which is the location of the RHR equipment area high temperature trip unit (a Riley temperature switch model PTGF-EG.) This temperature switch is a solid state device that is connected by 16 AWG copper shielded cable to a thermocouple.

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The second example of a spurious actuation caused by a walkie-talkie occurred at Sequoyah 1 on May 31, 1979. A health physics technician who was in the in-core instrument room was attempting to communicate with the control room when he keyed his walkie-talkie resulting in a spurious signal to all four channels of pressurizer pressure initiating a safety injection. The incore instrument room is located inside containment. The event was duplicated intentionally with the same results.

The third example occurred at Three Mile Island on February 19, 1982. Workers were preparing to enter the containment for some cleanup work when combustible gas monitors they were carrying indicated the presence of hydrogen and low levels of oxygen. The workers became suspicious when the readings varied with the use of their face mask radios. Later gas sampling outside of containment verified that the face mask radios caused false readings on the combustible gas monitors.

The fourth example occurred at Farley in 1975. During initial energization of a 600-V load center, a false operation of the transformer differential relay was observed. The licensee determined that the Differential Relay Type 12 STD 15B5A is radio frequency sensitive and trips with an activated transceiver located within approximately five feet of the relay. A test revealed that the activated transceivers, having frequencies between 150 MHz and 470 MHz with power ratings of 5-watt input to the final radio frequency amplifier and placed within a radius of approximately 5 feet of the relay, caused the differential relay operation. As a further test, the relay was subjected to test currents of 0.5 amp and 5 amp applied to the restraint windings to determine if the relay was less sensitive to radio frequencies under simulated operating conditions. This test again resulted in a false operation of the relay.

This GE Type STD differential relay is a solid state device with certain parts mounted on a printed circuit board which apparently pick up a signal from a transceiver and feed it into the relay amplifier. This would result in the amplified signal passing into the operate section of the relay which causes the false operation.

Discussion:

To date, solid state devices installed in nuclear power plants have been responsible for all of the known cases of radio frequency interference (RFI) generated by portable radio transmitters. Three of the four examples cited in this information notice occurred during preoperational testing or early in plant operation.

Many of the older nuclear power plants have so few solid state devices that this explains their apparent invulnerability to RFI generated by portable radio transmitters. As newer plants are built that use more solid state equipment and as older plants retrofit solid state equipment, more cases of RFI by portable radio transmitters are likely to result.

The use of portable radio transmitters, e.g., walkie-talkies, has been common practice at many operating nuclear power plants, and for the most part, nuclear

power plants have shown themselves to be largely, although not entirely, invulnerable to the RFI that such radios generate. When such RFI has been demonstrated to be a problem, nuclear power plants have successfully dealt with the problem by prohibiting the use of portable radio transmitters in certain areas. Nevertheless, the vulnerability of safety systems and nonsafety systems to inadvertent actuation or malfunction poses a significant threat to safe operation of the plant if the measures to prevent use of radio transmitters fail under emergency situations.

Emergency situations in which posted restrictions on the use of portable radio transmitters are likely to break down include those instances in which individuals other than plant operating personnel may be present in the plant or in which operating personnel are performing non-routine functions. Such situations include but are not limited to firefighting, bomb searches, and local operation of equipment normally performed from the control room.

Plans for dealing with such emergency situations require consideration of the possibility for RFI if the nuclear power plant has a demonstrated or implied vulnerability. When solid state equipment is retrofitted into an existing plant, the potential for RFI vulnerability suggests that the licensee should evaluate the impact on plant operation and safety.

The use of the increasingly popular cordless telephones presents another possible source of RFI.

If plant operations make the use of portable radio transmitters near RFI-sensitive equipment either necessary or likely in an emergency, then administrative prohibitions are not adequate and the licensee should consider hardware fixes. Typically such fixes include use of filters, shielded cables, and modification of the affected equipment. Although there are many industrial standards regarding RFI protection techniques, the NRC has not formally adopted or endorsed any, nor are there any nuclear standards that specifically address RFI protection.

As part of a wider program, the NRC is conducting research in the area of electromagnetic interference (EMI), including RFI as one of its aspects.

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and Engineering Response
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Attachment:
List of Recently Issued IE Information Notices

Attachment
IN 83-83
December 19, 1983

LIST OF RECENTLY ISSUED
IE INFORMATION NOTICES

Information Notice No.	Subject	Date of Issue	Issued to
83-82	Failure of Safety/Relief Valves to Open at BWR - Final Report	12/16/83	All power reactor facilities holding an OL or CP
83-81	Entry Into High Radiation Areas From Areas Which Are Not Under Direct Surveillance	12/7/83	All licensees authorized to use portable radiography devices in radiography programs
83-80	Use of Specialized "Stiff" Pipe Clamps	11/23/83	All power reactor facilities holding an OL or CP; NSSS and AEs
83-79	Apparently Improper Use of Components in Safety-Related Systems	11/23/83	All power reactor facilities holding an OL or CP
83-78	Apparent Improper Modification of a Component Affecting Plant Safety	11/17/83	All power reactor facilities holding an OL or CP
83-77	Air/Gas Entrainment Events Resulting in System Failures	11/14/83	All power reactor facilities holding an OL or CP
83-76	Reactor Trip Breaker Malfunctions (Undervoltage Trip Devices on GE Type AK-2-25)	11/2/83	All power reactor facilities holding an OL or CP
83-75	Improper Control Rod Manipulation	11/03/83	All power reactor facilities holding an OL or CP
83-74	Rupture of Cesium-137 Source Used in Well-Logging Operations	11/03/83	All NRC licensees authorized to possess and use sealed sources containing byproduct or special nuclear material in well-logging operations.

OL = Operating License
CP = Construction Permit