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A partial list of major, unresolved issues that apply to some or all nuclear reactors:

Thermo-Lag

Thermo-Lag is a fire barrier used in more than three-quarters of the U.S. nuclear power reactors, primarily to protect safety-related electrical cables. The need for such protection was established by the **NRC** after a near-catastrophic fire at the Browns Ferry plant in Alabama in 1975. Utilities began seeking **NRC** permission to install Thermo-Lag, manufactured by Thermal Science Inc. of St.Louis, in 1981.

Although tests of Thermo-Lag had not been properly performed by Thermal Science, the **NRC** permitted utilities to use the tests as justification for installing the material. Subsequent tests performed by Gulf States Utilities at the River Bend plant and TU Electric at Comanche Peak indicated that Thermo-Lag might not survive as long as it is supposed to during a fire and might cause cables to age more quickly.

The **NRC's** Office of **Inspector General** determined last year that the **NRC** knew in 1982 of questions about Thermo-Lag's ability to "perform as claimed by the manufacturer. " The **NRC**, however, "did not effectively respond to these indicators. "

As an outgrowth of the **inspector general's** investigation, which is continuing, a federal grand jury in Baltimore issued subpoenas to utilities in February seeking documentation on Thermo-Lag. The grand jury is said to be looking at whether Thermal Science misrepresented the barrier's capabilities to utilities and whether utilities knew the barrier was unproven before they installed it.

At a March 3 hearing before a House subcommittee, **NRC** Chairman Ivan Selin said that his agency and utilities must share the blame for inaction on Thermo-Lag.

""There appears to have been a widespread failure" of utility quality-assurance programs ""with respect to fire protection," Selin said. ""The **NRC's** slowness in recognizing the situation has effectively delayed us in holding the utilities to their responsibilities or from applying timely enforcement. " Ashok Thadani, director of the **NRC's** Division of Systems Safety and Analysis, said that further tests of Thermo-Lag in a variety of configurations will be conducted this spring. Depending on the results, he said, some utilities may have to make modifications. In the meantime, utilities will continue to send roving fire patrols into areas where Thermo-Lag is present.

Michael Mariotte, executive director of the Nuclear Information and Resource Service, said that the **NRC** should force utilities to remove Thermo-Lag immediately.

""If there were a fire and this stuff melted through -- especially if it melted quickly -- a cable could burn or short-circuit," said Mariotte, whose group brought the issue to light last summer. ""You could lose control of the reactor and it could melt down. "

Steam generator tubes

A steam generator contains thousands of tubes, not unlike heating elements in an oven. Hot, radioactive water from the reactor core is pumped under great pressure into the tubes.

Non-radioactive water contacts the outside of the heated tubes and steam is created. The steam drives the turbines that produce electricity.

The tubes have shown a tendency to leak. If enough of them leak over an extended period, the reactor could lose coolant and the core could melt. The same thing could occur if tubes burst.

An internal **NRC** memorandum last September indicated that the risk of a meltdown from multiple tube leakage or rupture at the Trojan plant in Oregon was 300 times more likely than the **NRC's** safety goal. The memo had been written by an **NRC** staff member in opposition to an **NRC**-approved waiver that allowed Trojan to operate with 428 bad tubes.

Robert Pollard, a former **NRC** official and now a nuclear safety engineer with the Union of Concerned Scientists, obtained the memo and made it public in November.

In January, Portland General Electric Co., owner of Trojan, announced that it would close the plant rather than spend an estimated \$ 200 million to replace the steam generator.

Tube leakage is a potential problem in all pressurized water reactors, including South Texas and Comanche Peak. In a 1988

speech, **NRC** Commissioner Kenneth Rogers described the problem as a ""loaded gun, an accident waiting to happen. "

Rogers was prescient. On March 14 a steam generator tube burst at the Palo Verde plant in Arizona, sending an undetermined amount of radioactive gas into the environment and keeping the plant on alert for nearly 21 hours.

Some utilities, however, have asked the **NRC** to let them operate plants without plugging substandard tubes.

""It's an issue we are looking at very carefully," said the **NRC's** Thadani. ""We're analyzing different scenarios to see what kinds of leaks can lead to what kinds of consequences. "

Station blackout

This alarming phenomenon can occur at a nuclear plant when both the main and backup power sources fail.

""The concern," Thadani said, ""is that if you lose all offsite power and all onsite power for extended periods of time, you may not have the ability to cool the (reactor) core. If this goes on for many, many hours the potential exists for damage at the core. "

Perhaps the most dramatic example of station blackout occurred at Georgia Power Co.'s Plant Vogtle near Augusta, Ga., in March 1990.

A backup diesel generator failed after the plant's main power supply was knocked out by a truck that struck a pole.

A second backup generator was out of service for maintenance at the time. The result was a 36-minute blackout, during which the temperature of cooling water in the reactor rose 46 degrees.

A federal grand jury in Atlanta is investigating whether Georgia Power officials lied to the **NRC** about the reliability of the backup generator that failed.

The allegation was made by Allan Mosbaugh, a former manager and whistleblower at the plant who has a Department of Labor discrimination case pending against the utility.

Mosbaugh called the 1990 accident ""fairly serious. If they'd been unable to restore diesel power I'd say they would have had core damage in 10 hours. "

The South Texas plant, as it happens, has had problems with backup diesel generators.

The **NRC** issued a special rule in 1988 requiring utilities to show that they can cope with station blackout for certain periods

of time -- four hours, on average -- or if they couldn't, to show that they had an alternate source of power, Thadani said.

The **NRC** has since done safety evaluations of most plants.

Some will have to make minor modifications and some major ones, Thadani said. All of the modifications are expected to be completed by 1996, he said.

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