Sodium Reactor Experiment (SRE) Accident

The Sodium Reactor Experiment (SRE), also known as Building 4143, operated from April 1957 to February 1964. It was the highest power research reactor at Santa Susana at 20 megawatts (or less than 1% of the size of commercial power plants). It was the first facility to supply nuclear powered electricity to a commercial grid and supplied electricity to the city of Moorpark in the late 1950s.

The SRE accident occurred in July 1959 when there was an accidental partial blockage of sodium coolant in some of the reactor coolant channels. This resulted in the partial melting of 13 of the 43 reactor fuel assemblies and the release of some fission products that contaminated the primary reactor cooling system and some of the inside rooms of the facility. All of the reactor safety systems functioned properly, and the reactor was safely shut down. The primary pressure vessel, containing the reactor core and sodium coolant, remained intact. Under the oversight of the Atomic Energy Commission (AEC), contamination within the building was cleaned up; the reactor fuel assemblies were then removed, inspected, and stored at the Radioactive Material Disposal Facility. (They were later declad in the Hot Lab, and the fuel and cladding was shipped off-site to an AEC approved disposal facility). A second fuel loading was inserted, and operations continued until the reactor was shut down in February 1964 due to termination of the project.

Fission Gas Release

A major portion of the radioactivity released from the fuel as a result of the fuel melting was contained in the sodium coolant, but some of the radioactivity was collected in the cover gas in the volume above the sodium coolant inside the reactor vessel. This radioactivity in the cover gas consisted principally of krypton-85, xenon-135 and xenon-133 gas and was the same type of radioactivity that collected in smaller quantities during normal operation of the experimental power plant. Other fission products, including iodine-131 and cesium-137 were retained in the primary sodium coolant and were removed during cleanup operations.

During normal routine operations, the cover gas was transferred to large holdup tanks in the SRE facility for the specific purpose of collecting and retaining radioactive gases. After decay, the gas was normally exhausted to the atmosphere through a filtered ventilation system with large quantities of air for dilution of the radioactivity. The releases were always well below those permitted by regulations in existence both then and today. This was done with the approval and oversight of the AEC.

Following the accident, the contaminated reactor cover gas was again transferred to the holding tanks and held long enough for the xenon-135 to decay away (9.1 hour half-life). It was then released to the atmosphere through the stack in a controlled manner over a two month period, in low concentrations that met Federal requirements. This was done

with the approval and oversight of the AEC. Based on measurements of the cover gas concentration and volume, approximately 28 curies of krypton-85 (10.7 year half-life) and xenon-133 (5.25 day half-life) was released in this way. This release resulted in a maximum off-site radiation exposure of 0.099 millirem, and an exposure at the location of the nearest resident of 0.018 millirem. These doses are low compared to today's NRC and DOE annual dose limit for unrestricted areas surrounding nuclear facilities (100 millirem/year) and today's EPA limit for airborne releases (10 millirem/year). They are also low compared to the average annual background radiation exposure in the U.S. of 300 millirem/year. In 1959 the AEC limit for dose to the public in unrestricted areas was 500 millirem/year.

To summarize, 28 curies of fission gas were released to the environment. This was readily dispersed. No particulate fission products or fuel material (that could potentially "fall-out" onto the ground) were released.

Employee Safety

Personnel employed in operating the reactor and those employed during the post-accident recovery, cleanup and refurbishment were continually monitored for external and internal radiation exposure. No personnel exceeded annual exposure limits for radiation workers. The AEC reviewed these records closely. No fatalities or acute health impacts resulted from the accident.

Environmental Safety

Established routine monitoring of the environment, including soil/vegetation sampling, surface water sampling and air sampling, before, during, and after the accident, failed to detect any increase in the ambient levels of naturally occurring radioactivity.

Subsequent sampling in recent years has failed to detect any significant environmental contamination from the SRE accident that would result in any significant exposure or risk to our neighbors.