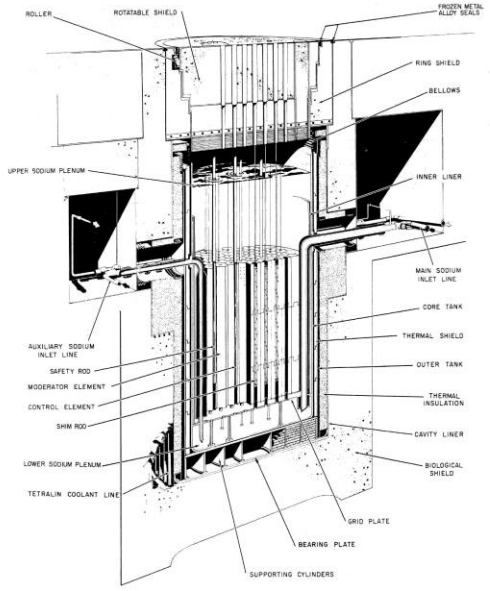
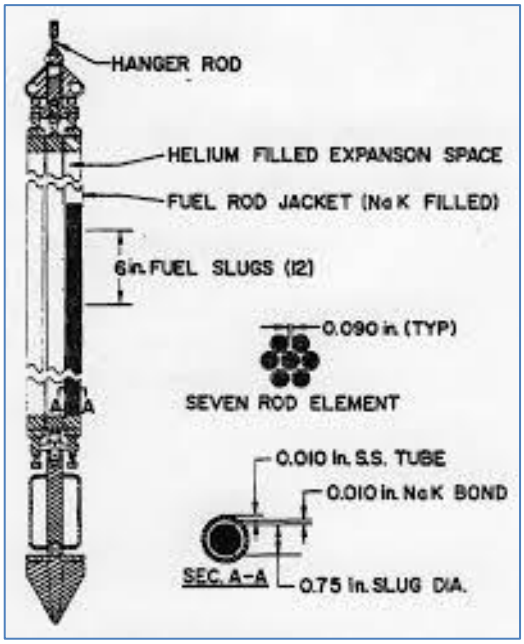
Was there a meltdown at the Santa Susana Field Lab (SSFL)?

DTSC does not believe the term provides a useful description of the events that occurred at SSFL in the summer of 1959. A meltdown is commonly understood to mean a catastrophic failure at a nuclear reactor. The term implies loss of cooling to the reactor core, uncontrolled fission and subsequent melting of a large portion of the nuclear fuel with potential containment failure and large-scale release of radioactive materials to the environment. Meltdown (or partial meltdown) is not typically used to communicate technical or regulatory information. The Nuclear Regulatory Commission uses the term core melt accident to describe "an event or sequence of events that result in the melting of part of the fuel in the reactor core."



Cutaway of SRE Core

The U.S. Department of Energy (DOE) describes the incident that occurred at SSFL's Sodium Reactor Experiment (SRE) during a two week period in July 1959 as a core damage accident. At that time the SRE, a small federally funded research reactor located in the Simi Hills about 30 miles northwest of downtown Los Angeles, suffered significant fuel damage as a result of overheating in the reactor's core. During that event 13 of 43 fuel elements were damaged as a result of localized overheating due to a carbonaceous material contaminating and restricting the flow of the molten sodium coolant circulating past fuel rods within the reactor core. For the SRE, a fuel rod typically consisted of a column of twelve, six inch long cylindrical slugs of slightly enriched uranium contained by a tube of closely fitted stainless steel cladding. The fuel elements were made up of seven, six foot long, 0.75 inch diameter fuel rods.



Typical Fuel Element Configuration

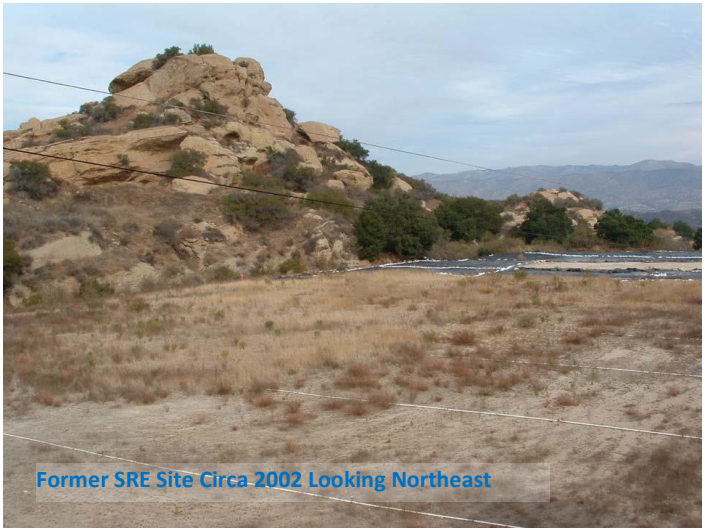
After the reactor was successfully shut down, inspection of the damaged elements revealed that excessive heat in areas of the core that experienced restricted coolant flow caused some of the uranium slugs to swell and, where there was metal to metal contact, diffuse into the stainless steel cladding, forming a low-melting point uranium/iron alloy. Rupture of the cladding and formation of the alloy resulted in migration of the radioactive noble gases krypton and xenon and potentially other volatile radioactive isotopes into the liquid sodium coolant, which continued to circulate in the reactor core.

When operators became aware of erratic temperature and power readings, the reactor was successfully shut down without loss of primary power. The sodium coolant, though restricted in some channels, continued to immerse and circulate through the reactor core. However, contrary to what is commonly inferred from the term "meltdown," molten uranium fuel **did not** pool in the bottom of the reactor vessel, and the integrity of the primary reactor vessel was never in jeopardy.

Through the years, numerous studies of this event have been conducted. Most can be found online at http://www.etec.energy.gov/Library/Historical_Docs.html. These reflect substantial agreement that relatively non-reactive and short-lived radioactive fission products, the noble gases xenon and krypton, did migrate to the helium gas used to blanket the pool of circulating liquid sodium within the reactor core. Following the incident, between July 20th and September 28th 1959, the helium cover gas, which had become contaminated during the accident, was transferred to shielded holding tanks and periodically vented into the atmosphere when levels of radioactivity were deemed safe according to the regulatory standards of the time.


SRE 1958 Looking West

Soon after the 1959 incident, the SRE was repaired and new fuel installed. The SRE continued to operate as a research reactor until 1965. Between 1967 and 1978, all nuclear fuel used during SRE operations was removed for reprocessing at DOE's Savanah River facility. The reactor vessel and all other contaminated structures and equipment were dismantled and removed for disposal as low level radioactive waste at a DOE facility in Beatty, Nevada. By 1985 all remaining SRE structures had been decommissioned, decontaminated and released for unrestricted use by DOE. In 1999 the last remaining SRE buildings were demolished.


Former SRE Site Circa 2002 Looking Northeast

Throughout the period of SRE operations, DOE and its predecessor agencies directed other nuclear research and energy development projects in Area IV, the 290 acre western portion of SSFL. Environmental sample results indicate that some of these activities resulted in both chemical and radionuclide contamination of soil within Area IV that will require cleanup. With respect to the history of nuclear research conducted at SSFL, DTSC's primary concern is not the terminology used to describe these undertakings but to understand and effectively characterize the nature and extent of any resulting contamination and then ensure implementation of fully protective and environmentally sound cleanup actions.