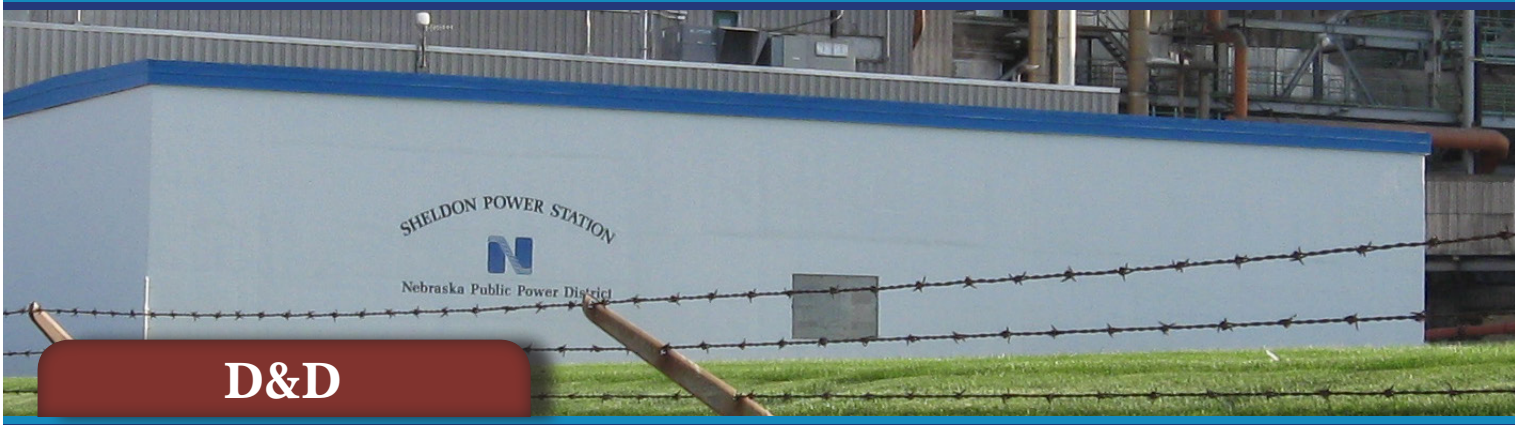
U.S. DEPARTMENT OF ENERGY | Legacy Management

Fact Sheet



D&D

Hallam, Nebraska, Decommissioned Reactor Site

This fact sheet provides information about the Hallam, Nebraska, Decommissioned Reactor Site. This site is managed by the U.S. Department of Energy Office of Legacy Management under the Defense Decontamination and Decommissioning (D&D) Program.

Site Description and History

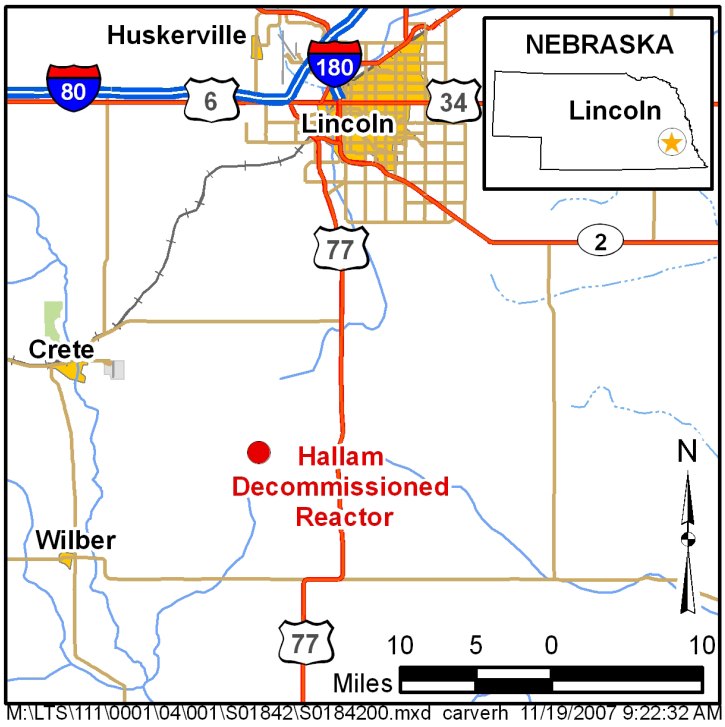
The Hallam decommissioned reactor site is in southeastern Nebraska, approximately 19 miles south of Lincoln. The 18-acre site is located on the 640-acre Sheldon Power Station, a coal-fired plant owned and operated by the Nebraska Public Power District.

The original nuclear power facility was a 240-megawatt (thermal), sodium-cooled, graphite-moderated, nuclear reactor. The U.S. Atomic Energy Commission (AEC), a predecessor agency of the U.S. Department of Energy (DOE), operated the reactor from 1962 to 1964 as part of AEC's Power Demonstration Reactor Program. Objectives for the reactor were fulfilled by 1966, and the Nebraska Public Power District decommissioned and dismantled the facility between 1967 and 1969. Since then, the DOE Office of Legacy Management's (LM) long-term stewardship interest lies with the entombed decommissioned reactor, which resides on 1.4 acres.

Facility Decommissioning

The reactor facility operated in a massive, reinforced concrete building. Except for the concrete structure that housed the intermediate heat exchanger, the aboveground portion of the facility was demolished during decommissioning, and all aboveground components of the reactor were removed and decontaminated or disposed of. All bulk sodium and most of the belowground radioactive materials were removed from the site, while some radioactive materials were entombed in place. Steam was used to deactivate residual sodium to prevent hydrogen from forming if water were to enter the structure.

Contaminants remaining at the site are contained in three areas of the belowground portion of the reactor building:



Location of the Hallam, Nebraska, Decommissioned Reactor Site

Area 1 (reactor vessel and vessel containment structures), Area 2 (Fuel Storage Pit 3 thimbles), and Area 3 (moderator element storage cells). Each of these areas is steel lined and surrounded by several feet of concrete and other structural materials, which provided shielding when the facility was operating. Activation products—materials that were formerly stable but became radioactive after being bombarded with high levels of radioactivity in the reactor core—make up the contamination remaining in these areas. Primary contaminants are cesium-137, cobalt-60, iron-55,

manganese-54, nickel-63, samarium-151, strontium-90, and tritium (a radioactive isotope of hydrogen).

Approximately 300,000 curies of radioactive material were entombed at the time of closure. Decay and dose calculations indicate that the decommissioned reactor can be released for unrestricted use around the year 2070.

Access points to the belowgrade portion of the facility and the Intermediate Heat Exchanger Building were sealed off using welded steel closures and reinforced expanding concrete. The Intermediate Heat Exchanger Building was coated with a layer of polyvinyl sheeting on all exterior surfaces, and then further protected by a concrete cover. The concrete ceiling of the belowground portion of the reactor building was weatherproofed with a sand, polyvinyl membrane, and soil cover. The cover forms a roughly rectangular, 1.4-acre, flat-topped, grass-covered mound with sides sloped to promote runoff.

White building is Intermediate Heat Exchanger Building; grassy area covers the belowground portion of the decommissioned reactor facility

Documents describing the layout and dimensions of the former reactor building, location of the buried reactor vessel, and detailed engineering information are sealed in stainless steel boxes that are secured in two locations at the site.

Groundwater Monitoring

The regional water table depth at the reactor site is about 150 feet below ground surface, although there are zones of perched groundwater at depths as shallow as 3 feet below ground surface.

In the early 1990s, the Nebraska Department of Health expressed concerns that shallow groundwater at the site could potentially come in contact with radioactive materials buried along the subsurface walls of the former reactor building. DOE conducted soil and groundwater investigations to characterize subsurface conditions at the site. Soil and groundwater samples were scanned for gamma activity and analyzed for gross alpha, gross beta, nickel-63, and tritium.

In 1997, DOE began collecting groundwater samples annually from 17 monitoring wells as a best management practice, assuring stakeholders no groundwater contamination was occurring. In 2008, sampling frequency changed from annual to once every two years. No radioactivity has been detected above background levels in any samples collected to date, and there is no evidence that the reactor facility has had any effect on site soil or groundwater. Following the 2016 sampling event, DOE has further reduced the sampling frequency to once every five years for the next 20 years (2021 through 2041), then once every 10 years from 2041 through 2071. It is estimated that by 2071 groundwater monitoring requirements will no longer be warranted and monitoring will be discontinued. Additionally, a total uranium analysis will be included in future sampling events so uranium results can be compared with the gross alpha results and the relationship between the two types of samples can be evaluated.

Regulatory Setting

DOE has possession of Hallam site radioactive material, under the authority of the Atomic Energy Act of 1954 (Title 42 *United States Code* [USC], Section 2011). Groundwater beneath the site complies with U.S. Environmental Protection Agency standards in the Clean Water Act (33 USC 1251, et seq.). The Nebraska Public Power District owns the 640-acre tract of land that the power station is located on and controls access to the reactor site.

Legacy Management Activities

LM manages the Hallam decommissioned reactor site according to a site-specific Long-Term Surveillance Plan (LTSP) to ensure that the massive concrete and steel entombment structure continues to prevent contaminants from being released to the environment. Under provisions of this plan, LM conducts annual inspections of the site to evaluate the condition of surface features, collects and analyzes groundwater samples, and maintains the turf on the grass-covered mound and the exterior of the Intermediate Heat Exchanger Building.

LM made a recommendation to the State of Nebraska in 2006 to discontinue groundwater monitoring because analytical results had demonstrated that the shallow perched groundwater was not being adversely affected, and because there were no current or anticipated unacceptable risk to human health and the environment. The state denied the request, and asked that monitoring continue as a best management practice. The state did agree to decrease the monitoring frequency from annual to biennial. In 2016, and again in 2017, LM advised the State of Nebraska that a revision to the LTSP was being issued in 2017 to reflect the change in sampling frequency and the addition of a total uranium analysis.

Contacts

Documents related to the Hallam decommissioned reactor site and groundwater monitoring results are available on the LM website at https://www.lm.doe.gov/hallam/Sites.aspx.

For more information about LM activities at the Hallam decommissioned reactor site, contact:

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