

Evaluations of Hanford Storage Options for K Basin Spent Nuclear Fuel

**Various facilities of the Hanford
Site have been evaluated for
storage of K Basin Spent Nuclear
Fuel**

**The attachments summarize the
results of the evaluations**

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FUEL & MATERIALS EXAMINATION FACILITY (FMEF)

FMEF is a large, modern hot cell facility that was designed and built primarily for examination of fuel assemblies irradiated at the nearby Fast Flux Test Facility. The primary FMEF mission ended as a result of national policy decisions and the DOE is now pursuing facility deactivation or facility transfer to the private sector for commercial applications. FMEF has been considered as a potential location for spent fuel storage and/or processing because FMEF has significant fuel receipt and handling capability, satisfies modern nuclear storage and processing facility design requirements, and has extensive hot cell capability. Additionally, because FMEF has not yet been contaminated, facility modifications would be more easily completed than at existing contaminated facilities. In 1994, attaching a new basin to FMEF for the expedited relocation and temporary storage of K Basins fuel was evaluated. The evaluation considered use of existing receipt and handling systems at FMEF to transfer overpacked K Basins fuel from shipping casks to the new basin. FMEF was evaluated because of potential subsequent use for stabilization and dry storage of the fuel without additional fuel shipments. Addition of a dry storage vault to FMEF was not evaluated, but such a facility could be attached to FMEF in a manner similar to the basin.

ADVANTAGES:

- FMEF is immediately available without detrimental impact to other site missions. The facility meets current seismic, safety and other requirements.
- Relocation of the K Basins fuel to a new basin attached to FMEF is the quickest and lowest risk alternative to exit K Basins on an expedited basins.
- FMEF could potentially be used to stabilize and dry store fuel without additional fuel shipments.

DISADVANTAGES:

- The schedule to implement the FMEF option is approximately one year longer than that to implement use of the Canister Storage Building, if a dry vault is built at FMEF. If a basin is built at FMEF, the total cost of a new vault would be incurred at a later date to implement dry storage.
- A relatively large unused facility in the 400 Area would be contaminated and future Decontamination & Decommissioning (D&D) expense obligated.

COST/SCHEDULE: The estimated cost to add a basin to FMEF is \$40 - \$45 million. The projected cost to provide a facility for dry storage after or without initial wet staging at FMEF is approximately \$83 million, based on the Canister Storage Building estimate. The schedule to complete addition of a basin at FMEF is estimated at 30 months from notice to proceed. The estimated duration to install a dry vault facility is 3 to 4 years.

NOTE(S): FMEF was evaluated for the path forward studies completed in November, 1994 and was not pursued further because of the availability of the Canister Storage Building, the location of FMEF and potential D&D cost impacts.

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WASHINGTON NUCLEAR POWER PLANT 4 (WNP-4) SPRAY POND

The WNP-4 Spray Pond is a 300 ft wide, 250 ft long, and 25 ft deep seismically qualified concrete structure that was built to store a 30 day supply of cooling water for emergency reactor use at WNP-4. The reactor was not completed and the spray pond is not being used.

In 1994, an alternative was evaluated for using the spray pond to store K Basins fuel. In this alternative, a wall would be built to use 1/3 of the basin. The fuel storage portion of the basin would be lined with 1/4" stainless steel plate and enclosed within a building equipped with required ventilation systems. Overhead cranes and cask handling facilities would be installed for fuel movement, and 900 ft of rail-line would be added to allow rail access to the facility.

ADVANTAGES:

- Uses existing seismically qualified basin with sufficient size to store K Basin fuel. Use of the existing facility enables accelerated fuel removal and reduces construction costs as compared to a new facility at a green field site.
- Utilities and rail services available at WNP site.

DISADVANTAGES:

- Not located within DOE boundary and siting less optimal than 200 Area.
- A relatively large unused facility south of the Wye Barricade would be contaminated and future Decontamination & Decommissioning (D&D) expense obligated.
- Potential regulatory, legal, and institutional complications arise from non-DOE ownership of the facility.
- Technical and economic viability of fuel stabilization and dry storage at WNP was not considered and would not likely be an option.

COST/SCHEDULE: Estimated cost is \$40 - 45 million and 30 months to complete design/construction for K Basins fuel wet storage. Additional costs to build a facility for subsequent dry storage would be incurred (i.e., \$83 million based on the Canister Storage Building estimate). The estimated duration to install a new dry storage vault is 3 to 4 years.

NOTE(S): WNP-1 Spray Pond and fuel storage pool were also evaluated. WNP-1 Spray Pond benefits equivalent to WNP-4 with additional institutional issues related to facility transfer to DOE. The WNP-1 fuel storage pool does not have sufficient capacity to store all of the K Basins fuel.

The WNP alternatives are not deemed as attractive as the Canister Storage Building alternative primarily because of relative implementation schedules, and risks associated with current non-DOE ownership of the facilities.

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PUREX OR OTHER 200 AREA CANYON FACILITY

The PUREX Plant and other 200 Area canyon facilities are large heavily shielded concrete structures that were constructed in the 1940's and 1950's. These facilities were used primarily for recovery of plutonium and uranium from spent nuclear fuel in support of the defense production mission. Most of these facilities are no longer in use because operations were terminated as the subsequent generation of processing facilities came on-line or, for newer generation facilities, because recovery of plutonium and uranium from Hanford spent nuclear fuel is no longer needed to support the defense production mission. The PUREX Plant is one of the newer facilities and is currently in the process of being deactivated. Operations at most of the other facilities were previously terminated, except for limited waste management operations at T Plant and B Plant.

In July 1994, an alternative was developed that would install a series of water filled storage tanks or troughs on the PUREX canyon deck or similarly within another 200 Area canyon facility. K Basins fuel would be shipped and temporarily stored in the tanks or troughs. Piping, water treatment, and control systems would be added to maintain water temperature and monitor contamination levels. Storage of fuel in drained multi-canister overpacks was not evaluated, but would result in similar trade-offs.

ADVANTAGES:

- Operation is compatible with future planned land use for the 200 Area.
- These facilities were designed to handle irradiated fuels.
- Facilities have been contaminated, so D&D obligations would not increase.
- Infrastructure, road and rail access, and trained staff exist.

DISADVANTAGES:

- The existing canyon facilities are aging, are not seismically qualified and would require extensive upgrading for the new mission.
- Alternative use would impact the deactivation mission at the PUREX Plant.
- Active operations, such as cooling and decontamination, would be complex and expensive.
- May require transport to a separate stabilization facility and subsequently to dry storage. Technical evaluation was not performed.

COST/SCHEDULE: Cost is estimated at up to \$140 million, assuming wet staging. Additionally, cost for subsequent compliant dry storage will be incurred (i.e., \$83 million based on the Canister Storage Building estimate). Schedule is estimated at 3 to 4 years and could not begin until mid-1996 at the earliest.

NOTE(S): Compliance with regulatory requirements will make spent fuel storage at the PUREX Plant or other 200 Area canyon facilities cost-prohibitive.

A new wet storage pool that satisfies modern storage criteria could be built on the 200 Area plateau. This alternative was considered during the path forward evaluation for fuel removal from the K Basins, which was completed in November, 1994.

ADVANTAGES:

- Located away from the Columbia River and is compatible with future land use planned for the 200 Area.
- Located closer to the K Basins than FMEF or WNP-4.
- Design of new pool is tailored for storage and current requirements.
- Stabilization and dry storage facilities can be built adjacent to new pool facility.

DISADVANTAGES:

- Higher cost (20-30%) than other pool options.
- No existing infrastructure, rail access, or trained staff. (Utilities, and rail access are both available near the facility).
- Since the facility is completely new, a longer schedule would result for site selection, design and construction.
- Separate fuel stabilization and dry storage facilities would be required to satisfy interim storage requirements.

COST/SCHEDULE:

The estimated cost for a new pool facility in the 200 Area is from \$50 - \$55 million. Additionally, a dry storage vault would be required at a later date at an estimated cost of \$83 million based on the Canister Storage Building estimate. Schedule estimates from notice to proceed with design/construction of a new pool facility to completion are from 30 - 36 months.

NOTE(S):

The path forward evaluation completed in November, 1994 identified that a dual purpose staging and storage facility was preferable to a new wet pool.

CANISTER STORAGE BUILDING

The canister storage building (CSB) was originally designed to store canisters of vitrified high-level waste. The building design and foundation were completed before construction in the 200 Area was halted. In this alternative, the canister storage building design is slightly modified for the receipt and storage of the K Basin fuel. The fuel containers are stored wet or drained and subsequently dry in storage tubes rather than being temporarily stored in a pool as in other alternatives. In this manner, the same facility serves two purposes.

ADVANTAGES:

- Located away from the Columbia River and in area planned for future use of this type.
- Allows same facility to be used for both wet staging and interim dry storage without significant modification.
- Stabilization facility can be built adjacent to CSB facility, which eliminates further fuel shipments to attain safe dry storage.
- Design and foundation are complete and only minor modifications to the building structure are required.
- Existing design, with modification, is flexible enough to allow for multiple storage missions, including spent fuel storage and storage of other highly radioactive materials (i.e., vitrified high-level waste, etc.).

DISADVANTAGES:

- Precludes use of first canister storage building site for future storage of vitrified tank waste (original purpose).
- Existing design, while satisfactory, is not optimized for fuel storage.
- Minimal existing infrastructure, rail access, and trained staff exist. (Utilities, and rail access are both available near the facility).

COST/SCHEDULE: The cost estimate for completion of the CSB for wet staging and dry SNF storage is \$83 million. The schedule estimate for completion of the CSB for SNF storage is 2 to 3 years.

NOTE(S): The Canister Storage Building concept is fundamentally different from the pool alternatives because the facility can be used for dry storage as well as for wet staging without significant facility upgrades. Although the cost is approximately twice as high as for FMEF or WNP-4 alternatives, dry storage, schedule and location make this the most favorable alternative of those evaluated.

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GREENFIELD STAGING AND STORAGE FACILITY

In this alternative a new fuel storage facility would be designed and built at a greenfield location at the 200 Area. The facility would be similar in concept to the canister storage building design, but optimized for wet/damp fuel staging and subsequent dry fuel storage. The fuel would be stored in tubes during both staging and storage.

ADVANTAGES:

- Located away from the Columbia River and in area planned for future use of this type.
- Allows same facility to be used for wet staging and subsequent interim dry storage without significant modification.
- Stabilization facility can be built adjacent to the facility, which eliminates further fuel shipments to attain safe dry storage.
- Design would be optimized for the facility mission.

DISADVANTAGES:

- Site selection for a new facility has not been completed.
- Minimal existing infrastructure, rail access, and trained staff exists. (Utilities, and rail access are both available near the facility).
- Since the facility is completely new, a longer schedule would result for design and construction than at the canister storage building.

COST/SCHEDULE: The cost estimate for completion of the new staging and storage facility at a greenfield site is \$142 million. The schedule estimate for completion of the new staging and storage facility at a greenfield site is 3 to 4 years.

NOTE(S): The staging and storage facility concept is fundamentally different from the pool alternatives because the facility would be designed to be used for dry storage as well as for wet staging without significant facility upgrades.