MODIFICATION OF AN EXISTING RADWASTE FACILITY

TO PROVIDE ONSITE LOW LEVEL WASTE STORAGE

G.M. Ault
Stearns Catalytic Corporation
2001 Spring Road
Oak Brook, Illinois 60521

J.F. Reiss
Commonwealth Edison Company
P.O. Box 767
Chicago, Illinois 60690

ABSTRACT

The decision of whether or not to install onsite storage capacity for low-level radioactive waste is dictated by individual utility circumstances. Commonwealth Edison has decided to construct facilities to store low-level radwaste onsite at each of their four operating nuclear stations, and they plan to have those facilities in operation by January, 1986. At Dresden, that onsite storage capacity is being provided by modifying an existing radwaste building which already has installed a remotely-operated precision-placement type crane. The purposes of this paper are to describe 1) how Commonwealth Edison arrived at the decision to construct onsite storage facilities as a hedge against possible disruption of burial site availability in January, 1986, 2) why the desire to minimize the capital investment for this protection led to selection of an uncomplicated design for their "standard" facility and to the decision to modify an existing building at Dresden rather than construct a new one, and 3) what is being done to adapt the Dresden 1 Decontamination/Radwaste Building for extended onsite storage.

RATIONALE BEHIND DECISION TO CONSTRUCT ONSITE STORAGE

There are many factors which can influence a decision of whether or not a given utility should provide extended facilities for the onsite storage of low-level radioactive waste. In addition to wide variations in annual waste volumes generated, and the average radiation levels of the containers produced, there are a number of other utility-specific considerations which must be addressed. Among these are:

- Availability of low-level waste storage areas in existing buildings
- Trending of waste generation rates and activity content
- Potential effectiveness and cost-benefit of volume reduction
- Importance of nuclear generation to a particular grid and particular system economics.

Excluding Dresden Unit 1 and the Carroll County Station, Commonwealth Edison has 12 nuclear units totalling about 12,000 MWe (gross) in operation or under construction with near-term completion schedules. These units represent about 50 percent of the installed capacity and about 70 percent of the total generation. With this dependence on nuclear energy, Commonwealth Edison simply cannot afford to have that generation curtailed or become unavailable as a result of waste disposal problems. With the promulgation of the Low-Level Waste Policy Act of 1980 which theoretically could result in midwestern utilities having no place to ship their wastes after 1/1/86, the company undertook development of a comprehensive low-level waste management strategy.

Setting aside for the moment the potential for total unavailability of offsite disposal, Commonwealth Edison found itself in a squeeze between an increasing number of nuclear units being on-line and relatively fixed burial site allocations. As originally designed, these generating stations have sufficient onsite storage to permit practical staging of waste shipments, but no provisions were made in those designs for extended onsite storage. Several actions were taken over a period of time to deal with the situation:

- Appropriate measures were taken to improve radwaste systems' performance and reduce waste generation rates.
- Possible areas within existing storage buildings were examined for potential use as interim onsite storage.
- Various volume reduction techniques were evaluated, and a development project for mobile incineration of dry active waste on a concentrated-service basis was initiated.

Besides the overriding question of burial site availability, there are numerous other uncertainties in the low-level waste disposal equation. No new regional disposal sites will be operating for several years, and there is only speculation as to what disposal charges and waste form criteria will be at those sites when they are developed. It is difficult -- if possible at all -- to assess the payback associated with major process system upgrades, such as many fixed volume reduction installations. These types of uncertainties can reasonably lead a utility to adopt a "wait and see" attitude towards many proposed changes in equipment and operating practices.

Given the uncertain nature of the low-level waste disposal situation, Commonwealth Edison weighed the risks of waiting for further developments in the legislative arena. Considering the pressure on existing onsite storage, it was decided reluctantly to provide additional intermediate-term onsite storage facilities at their Dresden, LaSalle County, Quad Cities and Zion nuclear stations. It was further decided that those facilities should be in operation by 1/1/86, as a positive measure to ensure plant availability should there be a halt to offsite shipping.

ONSITE STORAGE CONCEPT SELECTED BY COMMONWEALTH EDISON

Commonwealth Edison elected to follow the USNRC's informal position that onsite storage of wastes for periods of up to five years could be approved under the provisions of 10CFR50.59, and limit the nominal capacity of their onsite storage facilities to less than five years. Commonwealth Edison set forth several other key criteria for their onsite storage facility design. Among these were:

- A single "standardized" design was to be developed which would be suitable for all four station. That design would need to accommodate varying waste volumes, containers and compositions.
- The buildings would handle waste previously stabilized, packaged and prepared for shipment. No processing would be undertaken in the storage facilities.
- The design would require minimum capital investment consistent with functional and regulatory criteria, since their onsite storage is primarily an "insurance policy". For that reason, a modular design, which could be constructed in stages, was selected.
- The buildings were to be sized and shielded to accommodate solidified wastes only. DAW is to be handled separately.

The resulting design is a relatively low-cost concrete warehouse, not unlike various onsite storage designs that have been discussed in these meetings for several years. A plan view of the "standardized" design is shown on Fig. 1. The facility consists of a solidified waste storage vault, a truck bay and a control and auxiliary equipment wing. Construction of the storage vault and truck bay is cast-in-place concrete with a steel-supported concrete composite roof. The control and auxiliary equipment wing is conventional masonry construction with a steel-framed roof. The buildings are expandable in modular fashion, if that becomes necessary and assuming regulations permit. We have described the Commonwealth Edison "standardized" design to emphasize the simplicity of the design criteria and the resulting facility. That simplicity was important to being able to convert parts of the Dresden Unit 1 Decontamination/Radwaste Building to interim onsite storage.

HISTORY OF THE CHEMICAL CLEANING PROJECT

In the early 1970's, Dresden Unit 1 had been operating for over ten years. Radiation levels in primary coolant system and auxiliary system piping had increased to the point where maintenance procedures were complicated, USNRC-mandated inspections required substantial man-rem commitments, and personnel radiation exposure in general was higher than was desirable. Commonwealth Edison, with substantial funding from the United States DOE, undertook

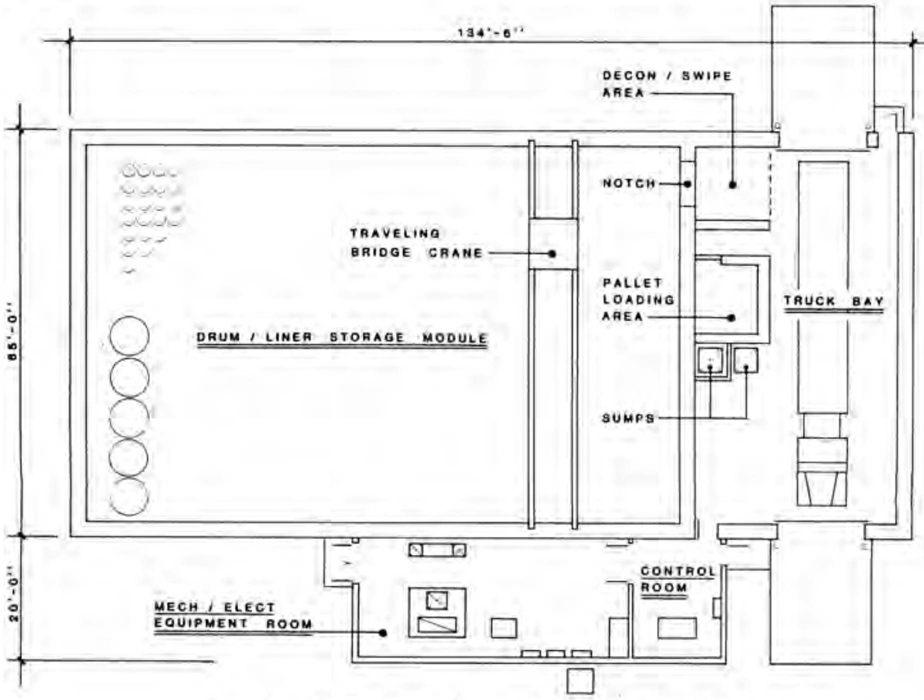

Fig. 1. Standardized Onsite Storage Facility.

construction of a facility to *chemically* clean the entire primary circuit (with fuel removed). The solvent chosen was Dow NS-1. This early attempt at full primary system decontamination was thought to be a prototype for chemical cleaning facilities at other plants. The state-of-the-art at the time involved draining the circuit to be cleaned, filling with solvent, forced circulation of the solvent for a period of days at elevated temperature, recovery of the solvent, processing for volume reduction of the spent solvent and dissolved corrosion products, and solidification of the resulting concentrates. The Decontamination/Radwaste Building (or Chemical Cleaning Building), is a self-contained facility with systems permanently installed to accomplish the above tasks.

The building also has a drummed waste storage area and truck bay, serviced by a Whiting remotely-operated radwaste crane. This storage area, which is shown in plan view on Fig. 2, was originally designed to hold about 500 drums containing up to a total of 3,000 curies of mixed fission and corrosion products. One can see from Fig. 2 that if the internal shield wall were removed, the remaining area is similar to the storage vaults of the "standardized" design described previously. It was this similarity, and the presence of the 35-foot span radwaste crane that made the conversion of this area to extended onsite storage a potentially attractive alternative to a new storage building.

There were several other considerations driving this alternative:

- In the intervening years between the early 70's and the early 80's, chemical decontamination technology had changed. Use of low-concentration solvents which are regenerated during the cleaning process is the norm today. This approach yields lower ultimate waste volumes. Thus the Dresden 1 Chemical Cleaning Building was not likely to be used more than once.
- There is little additional space for new buildings on the Dresden site, but there is space available adjacent to the Decontamination/Radwaste Building to enlarge that building.
- Subjectively, it is desirable to have the building manned and its utilities operational for maintenance purposes.

It was initially estimated that Commonwealth Edison could save about $1 million over the cost of a new building by converting the small storage area in the Decontamination/Radwaste Building to extended onsite storage.

MODIFICATIONS TO THE DECONTAMINATION/RADWASTE BUILDING

Because modifying the Decontamination/Radwaste Building in lieu of constructing a new onsite storage facility offered both cost and intangible benefits, Commonwealth Edison elected to proceed with the modification. A general arrangement plan view of the converted facility is shown on Fig. 3. As one can see, the original truck bay will be eliminated and the building will be extended about 50 feet to the north. The existing part-height south wall of the storage vault will be extended to roof height to eliminate roof-scattered radiation from other accessible areas of the building. A new truck bay will be part of the building addition. The rails and festooning of the existing crane will be extended to serve the enlarged storage vault and new truck bay. The existing internal shield walls will be retained to give the plant the flexibility to store components or waste containters with higher radiation levels than the design basis for the "standardized" onsite storage building.

Even though the drummed waste storage area of the Decontamination/Radwaste Building was designed to

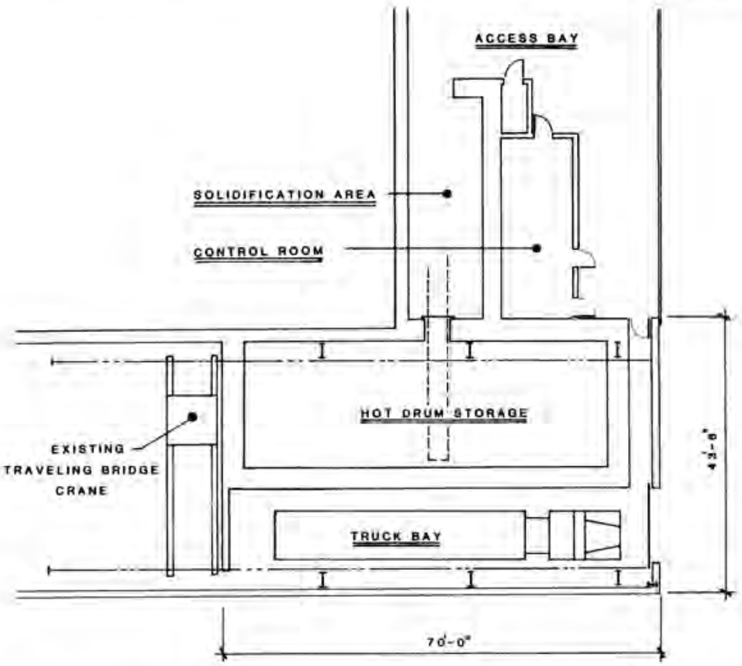

Fig. 2. Existing Drummed Waste Storage Area at Decontamination/Radwaste Building.

accommodate some 3,000 curies, it was not expected that the chemical cleaning waste would be stored for any length of time prior to shipment for burial. Therefore, 40CFR190 limitations for annual average exposure offsite were not a concern. Furthermore, since the original design provided internal shield walls for the waste, the outside (east) wall of the existing building requires additional shielding. The addition of substantial shielding to the roof (about 12 inches of new concrete) and to the original building walls (about 18 inches of new concrete) has a significant impact on the structural design of the building. These changes were anticipated when the concept was proposed, and an early determination was made that the foundation design is not adequate to handle all the new bearing loads. A design scheme was developed whereby the existing foundations only support the additional loads resulting from the new roof concrete. The loads resulting from the new wall concrete will be taken down to rock, bypassing the existing foundations by means of compressible joint fillers. Rock at Dresden is very shallow (less than 10 feet) over most of the site, and the original building is founded on rock.

To avoid the expense of removing the existing roof and walls, a construction sequence was developed for the new roof and wall shielding which will permit existing structures to be left in place. The existing roof will not support the additional 12 inches of concrete, so it will be strengthened by installing additional beams from the underside of the roof. This will allow the original roof to remain in place, and it will be used as formwork for the new concrete. Some bridging must be removed from the original roof to permit installation of the new beams. New bracing will be added to the columns to accept loads from the new roof steel. The new concrete roof will be cast in two lifts. The first lift will consist of six inches of structural concrete, and that lift will carry the load from placement of the balance of the new roof concrete.

There are several modifications to be made to the remote-operated crane system. Because a new wall is being added at the south end of the storage vault, the festooning will be reversed and the cable termination box will be relocated to the new truck bay. The trolley stop will be modified to allow a closer approach to the east wall, which will result in one additional row of drum storage capacity. The crane is being uprated from 7-1/2 to 10 tons capacity. Finally, the crane indexing system will be replaced. The crane manufacturer no longer offers the ceiling grid system employed in the original crane design, and thus the original system cannot be extended to serve the expanded building. The existing grid system will be removed entirely, and a new X-Y indexing system will be installed on the vault walls and crane bridge. Two new cameras will be added to the crane as part of the new indexing system.

Certain HVAC system changes are also required. The existing ductwork will be extended, and new duct heaters will be added. To maintain the pressure distribution which was part of the design basis for the original building, one exhaust fan motor was uprated from 10 hp to 25 hp.

Since the original storage area was intended for intermittent use only, design practices which are acceptable under those conditions become unacceptable when stored waste is expected to be present on a continuous basis. Smoke detectors will be removed from ductwork inside the vault area, and all other features of that ductwork which would require maintenance will be removed from the storage vault area and rerouted.

As of this writing, construction contracts for the modifications discussed above have been let, and field work is expected to begin in mid-1985. Despite the substantial structural and other modifications being made to the Decontamination/Radwaste Building to adapt it for extended onsite storage, the constructed cost is still expected to be nearly $1 million less than an equivalently-sized new building.

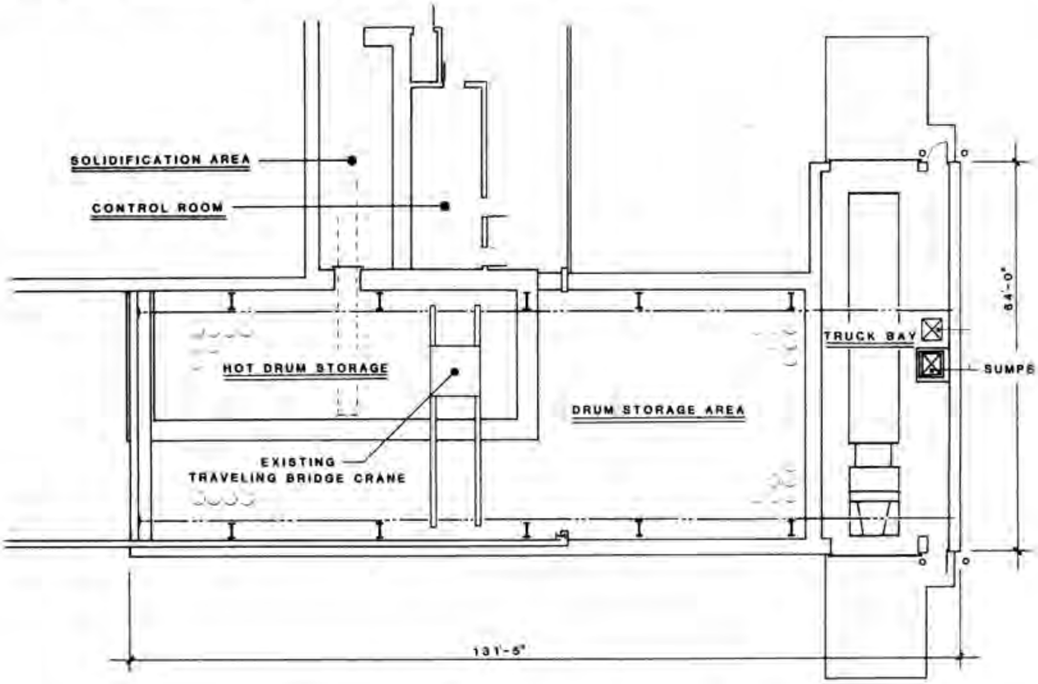

Fig. 3. Modified Drummed Waste Storage Area.