

Reuse of East Tennessee Technology Park (Former K-25 Site) on the Oak Ridge Reservation: Progress, Problems, and Prospects - 9346

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ABSTRACT

East Tennessee Technology Park (ETTP) is the former K-25 site on the Department of Energy's (DOE) Oak Ridge Reservation, Tennessee. ETTP is currently undergoing decontamination and decommissioning to support reuse by the private sector. The DOE initiated a reindustrialization program in 1996, forming the Community Reuse Organization of East Tennessee (CROET) to provide a means of leasing unused facilities at ETTP to private sector businesses. In 2003 under a changed policy direction, DOE implemented an Accelerated Cleanup Plan to remediate ETTP, as many of the buildings are contaminated with radiological constituents (including enriched uranium) and a variety of hazardous substances. In anticipation of transition of the site to a private sector industrial park and to support a nearby residential development, the City of Oak Ridge has taken title to the fire station and a portion of the utilities on site. Acquisition of the water and wastewater utilities by the city has been challenging. The city has embarked on a three-phase process that will enable it to provide electricity to the site and take ownership of on-site electric utilities. Title transfers of potentially contaminated property require an Environmental Baseline Survey and a Covenant Deferral. Two businesses that lease facilities from CROET desire to own the lightly contaminated buildings that they occupy. To date DOE has not enabled these transfers to take place due to indemnification questions and what company options are regarding the remnant contamination. There is significant potential for heritage tourism attractions at ETTP, including a railway station museum and commemoration of the U-shaped K-25 building. DOE is part of International Atomic Energy Agency's (IAEA) International Decommissioning Network. The site's successes are models for reutilization of nuclear facilities elsewhere in the world. The "lessons learned" at ETTP enhance IAEA's understanding of the difficulties encountered as nuclear facilities transition to private uses and the associated utilities are taken over by local governments to support redevelopment.

HISTORICAL BACKGROUND

East Tennessee Technology Park (ETTP) is the location of the former K-25 site, one of three major facilities on the Department of Energy's (DOE) 137-km² (33,750-acre) Oak Ridge Reservation (ORR), Tennessee (Fig. 1). ETTP plus the Y-12 National Security Complex and Oak Ridge National Laboratory (ORNL) occupy about 30 percent of the ORR. A substantial part of the undeveloped portion of the ORR has been designated a National Environmental Research Park for environmental science research and education. Nearly all of the ORR lies within the city limits of Oak Ridge. The ORR straddles two counties; ORNL and ETTP are located in Roane County, and Y-12 is located in Anderson County [1].

The K-25 site was the second facility constructed during the Manhattan Project, the U.S. government's crash program to develop the atomic bomb during World War II. The government chose Tennessee's Clinch River watershed for several reasons. The region was relatively isolated so that the plants could operate secretly, the river provided sufficient water for cooling and processing needs, and the Tennessee Valley Authority produced enough electricity to meet the enormous demands for uranium enrichment. The industrial plants were hidden and sheltered between steep ridges [1]. Residential communities for workers were built in conjunction with the enrichment plants; one of these survived to become the City of Oak Ridge.

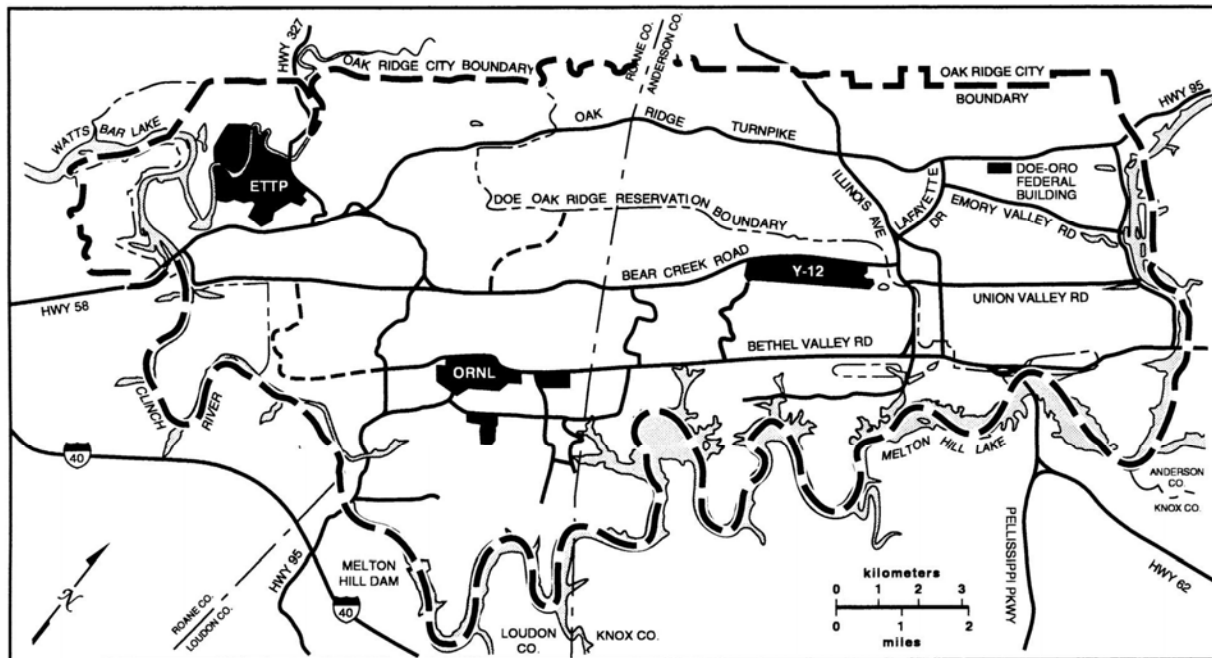


Fig. 1. Oak Ridge Reservation showing locations of major facilities.

The 6.1-km² (1,500-acre) K-25 site is located 16 km (10 miles) west of today's downtown Oak Ridge. Constructed in a mere 18 months from 1943-1945, the 1.6-km (mile-long) U-shaped K-25 building (Fig. 2) enriched a minor amount of the uranium used in the first atomic bomb. The K-25 plant produced enriched uranium using the gaseous diffusion process, which separates molecules of a lighter isotope from those of a heavier one by use of a porous barrier [1]. The bulk of its post-WWII production of highly enriched uranium, 490 metric tons, was in support of the Cold War. In 1964 the K-25 site ceased producing weapons-grade uranium and transitioned to production of low-enriched uranium for peacetime civilian reactors. Enriched uranium production in Oak Ridge ceased in 1985.



Fig. 2. The U-shaped K-25 Gaseous Diffusion Plant and supporting facilities.

The buildings at the K-25 site were used primarily to support the gaseous diffusion production mission. The site went through a number of cycles of demolition of obsolete support facilities to make way for new projects such as an experimental centrifuge complex, utilized from 1960 to 1985 [2]. In 1997 K-25 and the surrounding area were renamed ETTP, and in 2003 it became the focus of accelerated cleanup for transition to a private sector industrial park.

A significant treatment facility for the cleanup of the DOE complex is located at ETTP, the Toxic Substances Control Act (TSCA) Incinerator, which started operation in 1992. This is the only incinerator in the country that can burn mixed-waste contaminated with polychlorinated biphenyls (PCBs) [3]. The TSCA incinerator is scheduled to end operations in 2009 prior to decommissioning as part of the Accelerated Cleanup Plan.

After shutdown of enrichment operations, ETTP continued to store about 6,000 cylinders of uranium hexafluoride (primarily depleted uranium) until 2006, when this material was shipped to the Portsmouth Gaseous Diffusion Plant in Ohio for treatment [3]. Thousands of containers of legacy wastes and scrap were also stored on site, some outdoors and others inside various buildings [4] including vaults of the K-25 Building [2]. These have since been reclassified as CERCLA wastes and were disposed of in the CERCLA Waste Disposal Facility in nearby Bear Creek Valley.

During operations, the K-25 complex used many hazardous materials, including solvents (e.g., tetrachloroethylene, carbon tetrachloride, methylene chloride, benzene), metals (e.g., arsenic, mercury, lithium, chromium, nickel, beryllium), gases (fluorine, hydrogen fluoride, welding fumes, hydrogen cyanide, chlorine, chlorine trifluoride, ammonia), acids (e.g., nitric, hydrochloric), epoxy resins, fungicides, and PCBs [2]. Poor disposal practices and accidental releases resulted in environmental and facility contamination. Radioactive isotopes of uranium and its daughter products and minor amounts of transuranic and fission products from recycled nuclear fuel complicate the cleanup effort. Additional hazards are posed by obsolete construction materials, including asbestos insulation and tiles, and lead-based paint [4]. The primary contaminants of concern for the general public (including workers at private industries at ETTP) are uranium, technetium-99, and PCBs, although most accessible areas do not pose any significant risk of exposure.

REINDUSTRIALIZATION AND REMEDIATION

DOE introduced a reindustrialization program in 1996 to allow use of underutilized government facilities by private industries with the objective of diversifying the local economy. The Community Reuse Organization of East Tennessee (CROET) was formed to provide a vehicle to allow private sector businesses to utilize such facilities at ETTP. CROET leased buildings from DOE for a nominal fee, and then subleased them to companies. Rent went to run the organization and provide funds for utilities and maintenance. In some cases, companies could decontaminate facilities for a discount on their lease.

In 2002, quantity of leased space at ETTP peaked at approximately 67,510 m² (726,700 ft²) under roof with 39 companies. However, by then the focus had changed under an initiative from DOE Headquarters to accelerate cleanup of sites across the country by addressing the most contaminated and riskiest former nuclear facilities first, especially those that no longer had a mission within the DOE complex. As a result in 2003 DOE Environmental Management initiated a program of accelerated cleanup at ETTP. Many of the tenants with industrial operations were required to relocate as DOE's contractors began decommissioning and decontamination (D&D) of the contaminated gaseous diffusion plants and support facilities. After completion of remediation activities, the envisioned end state is that of a brownfield site suitable for a private sector-industrial park with uncontaminated or decontaminated buildings retained for reuse and acreage available for new industrial facilities.

ETTP is currently undergoing D&D. Nearly 500 facilities covering about 1.4 km² (15 million ft²) remained at ETTP after the shutdown of K-25. To date 220 have been demolished under the terms of an accelerated cleanup plan. Four of the five huge gaseous diffusion buildings (K-25, K-27, K-31, and K-33) remain standing; K-29 was demolished in 2006. Other facilities which have been demolished include decontamination and recovery facility (K-1420), laboratories, garages, machine and maintenance shops, transportation depots, substations, warehouses, changehouses, cooling towers, utility support buildings, treatment plants, and a cafeteria. Some offices, support facilities, and warehouses remain in use, while sediments and soils associated with holding ponds and disposal areas are slated for remediation.

CROET is rebuilding the reindustrialization program at ETTP with a much reduced inventory of buildings. The organization still leases several buildings and parcels of land at ETTP, and has attained ownership of the railroad lines, six buildings and about 0.2 km² (50 acres) of land. Of the six buildings acquired by CROET, four have been sold to businesses who manage them as rental properties, and acreage has been sold to the Southern Appalachian Railway Museum (SARM). Currently 16 tenants lease various buildings, facilities or acreage at ETTP. CROET has requested title to an additional four parcels totaling about 0.95 km² (235 acres) at or near ETTP. In addition, CROET expects to take title to several more buildings. The organization intends to build two spec buildings on one of its land parcels in order to attract new industrial clients.

THE THREE BUILDINGS PROJECT

BNFL was contracted by DOE in 1997 to decontaminate and ready three enormous buildings at ETTP in support of reindustrialization. This “Three Buildings Project” addressed the K-29, K-31, and K-33 buildings. These were the most modern of the gaseous diffusion buildings and the least contaminated ETTP process buildings.

The first building to be addressed was K-33 (seen in the upper left of Fig. 2), the world’s largest industrial building with 260,000 m² (2.8 million ft²) of floor space. BNFL’s fixed price contract specified that the company could recover, decontaminate, and recycle valuable metals from the process equipment within the three buildings. When then Secretary of Energy Bill Richardson declared a moratorium on recycling metals from the nuclear complex in 2000, the BNFL contract was renegotiated such that DOE was to pay market prices for the scrap and also dispose of it. This drove up project costs. In addition, BNFL lost money on a subsidiary it had acquired specifically to undertake the decontamination and metal management.

When it became clear that K-29 had significant structural and contamination problems, it was no longer considered suitable for reuse and instead was prepared for demolition [5], which occurred in 2006 under DOE’s Environmental Management contractor Bechtel Jacobs Company (BJC). The remaining two gaseous diffusion buildings, K-31 and K-33, underwent D&D at great expense with the hope that a major manufacturing company could be induced to lease them. Industrial recruitment efforts concentrating on K-31 have failed to date, and if a suitable tenant cannot be found, these buildings will likely be slated for demolition.

ACQUISITION OF UTILITIES BY THE CITY OF OAK RIDGE

To support the ultimate redevelopment of the site as a private sector industrial park, the City of Oak Ridge has taken title to the fire station, the water treatment plant, four existing and one new wastewater lift stations, segments of the water and wastewater systems on site, and a portion of the electrical system.. These transfers are governed by Memorandums of Agreement (MOAs) with DOE.

Acquisition of the water and wastewater utilities by the City of Oak Ridge has been much more complicated than expected. Negotiations included three decision makers and two contractors. Some issues needed to be raised to the attention of upper management within DOE. Title transfer of the wastewater treatment plant required review and approval by DOE headquarters in Washington, DC. Initially expected to be finalized in March 2008, the transfer agreement was ultimately completed in May 2008.

Complicating the transfer is that the water and sewer systems are owned by DOE but leased by CROET. CROET has contracted with OMI, a subsidiary of the engineering firm CH2MHill, to operate and maintain these systems. Consequently, OMI has all of the technical information necessary to facilitate inspection and transfer, but is unable to respond directly to Oak Ridge's requests for assistance because of their contractual relationship with CROET. Additionally, because the transfer is concurrent with the D&D work, the City of Oak Ridge also must interface with DOE's environmental cleanup contractor BJC. This is particularly important in that when a building is demolished, the water and sewer lines need to be properly terminated.

There have been extra costs associated with use of the Grassy Cove water plant (considered an "interim" source by the city) to supply ETTP, a variety of problems with the potable water lines on site, and difficulties evaluating the condition of the sewer lines. As buildings are demolished, termination of utility lines is required, in some cases interrupting electrical or water service to active facilities. In addition the City of Oak Ridge wants additional or wider easements in order to better access the underground utilities.

Fire Station

In conjunction with acquisition of the fire station, the city will provide emergency fire and first-responder services to lessees and contractors on site under a Municipal Service Agreement. Because of the unique activities at ETTP, DOE provided first responders with security clearances and specialized training in dealing with hazardous and radioactive materials.

Water System

Oak Ridge placed a high priority on acquiring the water treatment and distribution system which is to serve the nearby residential development of Rarity Ridge (to the west of ETTP across the Clinch River) as well as industrial clients at ETTP. This system's intake is in Grassy Cove within the backwater of Watts Bar Reservoir on the Clinch River. The city will use this as an interim source until a water line from the city-owned plant at Y-12 National Security Complex (previously transferred to the city from DOE) is completed to the site. The city will then switch sources but will continue to maintain the current intake permit. An additional cost for use of the interim source is that of staffing the Grassy Cove water plant. This requires adding three new city employees until the water supply is switched to the Y-12 plant and prior to generation of significant additional revenue from the enlarged distribution system.

The settling ponds next to the Grassy Cove water treatment plant were found to be contaminated. These ponds contain sediment routinely flushed from the flocculating tanks at the water treatment plant where solids are settled out of the raw water. Record keeping was poor, and it is likely that contamination resulted from radionuclides discharged upstream of the intake from historic operations at Oak Ridge National Laboratory. The settling ponds will not be transferred to the city.

Water line problems are typical of a plant expeditiously built under wartime conditions and later upgraded in a piecemeal manner. Because buildings were generally constructed hastily, water supply was connected in strange places, sometimes from other buildings instead of off of a water main.

Upon initial inspection by the City of Oak Ridge the site's water lines appeared to be oversized. It was later found that smaller lines run inside some of the larger lines. That has raised concern that the distribution system may be undersized for support of future industrial customers in that area.

At this time, the water flow substantially exceeds the quantity of sewage being treated. Some flows and/or leaks have not been identified. Much of the apparent loss can be attributed to make-up water for the fire-suppression water supply system, quantities used for dust suppression for demolition activities and on the haul road, and other industrial uses which bypass the sewer system.

Wastewater System

The existing sewage treatment plant for the ETTP sanitary sewer system is scheduled for D&D due to contamination concerns and obsolete equipment. A new pump station was installed to pump raw sewage over to the Rarity Ridge development for processing by a new package sewage treatment plant. The clean effluent will then be discharged to Watts Bar Reservoir under a National Pollutant Discharge Elimination System permit.

Many of the sewer lines at ETTP are of clay tile and date back to construction of the site in the 1940s. As part of the transfer, DOE agreed to pay the city's cost to clean and televise the lines in order to determine their condition. However, due to the OMI labor contract no one else was allowed to televise the lines, causing significant delays in accomplishing this action. Eventually the labor issues were resolved, and the City of Oak Ridge personnel performed the work. A further issue that arose with televising the lines was the possible presence of a "secret" situation in portions of the sewer line close to the buildings. Security requirements were such that the televising would have to stop at a specific point or the film would be confiscated. It took three or four meetings to determine how to televise the lines without possibly compromising secrets. Although radioactive contamination was a potential concern, none was found in the lines. BJC health physicists monitored the televising operations, but in one instance of suspected contamination only radon was reported.

Under the Accelerated Cleanup Plan the site is to be cleaned up to industrial risk standards, with cleanup accomplished to three meters (ten feet) below grade. To ensure this risk is not exceeded, there is an administrative control which states that no excavation or penetration can take place more than 3 m (10 ft) below ground surface without the prior written approval of DOE and the state and federal regulators. Some of the sewer lines are as deep as 7.6 m (25 ft). In order to do any deep excavation, DOE must first be called, and if radiological contamination above cleanup guidelines exists then DOE's contractor BJC will do the excavating. DOE has assured Oak Ridge that they are working to eliminate this requirement within the city's easements. The data collected to date indicate this will be possible. In addition, BJC is confident that the contaminant plumes of concern don't affect the utilities or roads.

Electrical Utilities

Several years ago the city installed meters for businesses leasing space from CROET under a three-party agreement between the city, DOE and the Tennessee Valley Authority (TVA). Although Oak Ridge doesn't actually put the electrons through the meters, this arrangement allows site tenants to pay a stable electric rate. Under this agreement, the city reimburses DOE for wheeling costs.

There are three phases that will enable the City of Oak Ridge to supply electricity to ETTP:

- Phase 1 – the city takes over all electric lines/facilities outside of the ETTP boundary. This phase was finalized in February 2009.

- Phase 2 – the city will supply sufficient power for site operations to the boundary area but not within ETTP, with service provided from the nearby city-owned Blair Road substation. DOE will connect to the city service, allowing the agency to demolish the plant switchyard and disconnect from TVA power. This phase is tied to the decommissioning of the TSCA Incinerator and likely will not be accomplished until 2010.
- Phase 3 – this will be a staged effort that will enable the city to take ownership of the electric utilities on site and provide power to site tenants, beginning with offices and adding the industrial facilities. The timeline for this phase has not yet been determined.

TRANSFER OF POTENTIALLY CONTAMINATED PROPERTY TO PRIVATE INDUSTRY

Because the Oak Ridge Reservation is on the National Priorities List, a Covenant Deferral is necessary for title transfer of potentially contaminated property, allowing liability associated with the pollution to remain with DOE. The Environmental Protection Agency (EPA) requires an Environmental Baseline Survey to document and investigate potential for exposure to radioactive or hazardous contamination. DOE Headquarters must also approve property transfers. To date, transfers of property from DOE have only taken place to CROET and the City of Oak Ridge. However, at least two businesses that lease facilities from CROET would like to acquire the buildings that they occupy. Complicating this potential transfer is the possibility of remnant alpha contamination in their buildings. DOE has been able to transfer free-release or uncontaminated buildings to CROET, but transferring a building with remnant contamination to a private entity is more challenging, largely due to restrictive requirements by both DOE and the EPA and indemnification concerns. To date pending transfer requests are still under negotiation.

Materials and Chemistry Laboratory, Inc.

Materials and Chemistry Laboratory, Inc. (MCLinc) leases 2,300 m² (25,000 ft²) in the Building K-1006 Development Laboratory, a radiological/chemical laboratory built to support the former K-25 Gaseous Diffusion Plant complex and later expanded to support the environmental restoration activities at ETTP. In 1997 when the laboratory was declared underutilized, it was made available for lease to the employee group who had operated it. It is now a commercial laboratory owned by former employees. The company undertook decontamination and removal of hoods and asbestos remediation in general use areas of the building as part of its lease agreement. MCLinc refurbished existing major equipment items, including advanced instrumentation necessary for analytical services, which were subsequently transferred to the company by DOE. MCLinc currently has a contract to perform analytical work on hazardous, radioactive, and classified materials in support of the accelerated cleanup. The facility was originally slated for demolition, which would have put MCLinc out of business as the specialized equipment cannot be moved without damage. The long-term fate of the facility remains a challenge that needs to be resolved because portions of the facility are radiologically contaminated. MCLinc has requested transfer of ownership of Building K-1006 under regulations detailed in 10 Code of Federal Regulations 770. If this request is not granted, the laboratory will be demolished.

East Tennessee Materials & Energy Corporation.

East Tennessee Materials & Energy Corporation (M&EC), a wholly owned subsidiary of Perma-Fix Environmental Services, Inc., has constructed a mixed-waste treatment facility within the former experimental centrifuge building complex (Fig. 3). M&EC has removed old centrifuge equipment, decontaminated much of the space, and constructed a clean “building within a building” to house its waste-treatment facilities, an investment of \$45 million. The M&EC treatment facility currently occupies approximately 10,200 m² (110,000 ft²) of the center and south bays of Building K-1200 and a portion of Building K-1023. M&EC also controls additional room for expansion in the K-1200 North Bay plus office space, staging areas, and support facilities. The company has contracts with DOE for waste

treatment as well as long-term contracts with industrial clients. Work being performed under the DOE contract for the K-1200 South Bay facility was classified at the “Secret Restricted” level, requiring an active Q clearance and an established “need-to-know” for all project personnel and a DOE-approved security plan.



Fig. 3. The former experimental centrifuge building complex that houses M&EC’s facilities at ETTP.

M&EC has encountered a number of obstacles in its reuse of the buildings; some were technical, others were bureaucratic.

- Because the facilities are located on a National Priorities List site, the EPA required that buildings slated for transfer must undergo vapor intrusion testing by drilling holes into the facility floor. To date M&EC has not been subject to the vapor-intrusion testing requirement which would compromise containment in the waste handling and processing areas.
- Due to the side-wide D&D, utilities are subject to interruption and removal. When the ETTP steam plant was decommissioned, package steam plants were substituted at the M&EC facility. The City of Oak Ridge abandoned use of the ETTP sewage treatment plant when it acquired the sanitary sewer system; sewage is now pumped to the Rarity Ridge package plant. However, Oak Ridge’s pretreatment standards are different from those of DOE, so M&EC had to ensure that their discharges are in compliance. Electrical service was provided by feeds from a variety of poorly documented sources. As other site buildings slated for demolition were taken off the grid, power was occasionally lost at M&EC because supply lines had been run from these facilities to the K-1200 complex. Maintaining sufficient electrical power to run the process equipment has been a continuing challenge for M&EC as it expands its operations. Currently lines run from three different sources.
- Continuity of operations remains a question, potentially affecting investment and contracting decisions. Upon implementation of the Accelerated Cleanup Plan, many of CROET’s industrial tenants had their leases terminated and were required to move out of their facilities, which were to be torn down by 2008. In light of Perma-Fix’s investment, M&EC was concerned that their lease might be terminated; however the 10-year lease was honored and has since been extended. In order to better control the future of its facility, since 2004 the company has been attempting to gain ownership of the

building. M&EC is continuing to negotiate the transfer process with DOE. To date DOE has agreed to perform some characterization activities, which were completed in 2006. Since then there have been discussions but the parties have not yet begun in earnest to work together toward a transfer.

HERITAGE TOURISM

There is significant potential for heritage tourism attractions at ETTP. One is already in operation. For several years now, SARM has operated periodic guided excursion rides. These transit 18 km (11 miles) of CROET-owned tracks through ETTP and nearby countryside to the main line. SARM recently acquired acreage from CROET to construct a railway station museum to complement its historic rolling stock and to be the origination point of its train trips.

The 0.18-km² (44-acre) U-shaped K-25 building was designated one of DOE's eight Manhattan Project Signature Facilities in 1999. When it was determined that the D&D undertaking at ETTP would affect this historic building and its support facilities, consulting parties were convened under Section 106 of the National Historic Preservation Act in 2003 to begin exploring options for preservation and/or interpretation of the structure. Despite a MOA signed in 2005 preserving the North Tower (the bottom of the "U", seen in the upper right of Fig. 2), DOE is reconsidering its options due new discoveries regarding the deteriorated state of the building and the costs associated with preservation in lieu of demolition. Support facilities—some of them having historic value—such as maintenance shops, change houses, laboratories, dispensary, cafeteria, old fire station and others have already succumbed to D&D under the terms of the MOA.

Concurrently, the "Manhattan Project National Historical Park Study Act of 2003" was signed into law. The legislation has authorized the National Park Service to study the addition of Manhattan Project sites, including the K-25 site, into the National Park system. Progress on this study has been slowed due to lack of funding, and it's likely that DOE will finalize a decision on the fate of the K-25 building before the study is completed.

To support DOE's decision-making regarding the K-25 building preservationists have proposed and estimated the costs of various options for retaining a small portion of the structure or interpreting the site by other means. Plans include retaining a demonstration cell to explain the gaseous diffusion process, creating museum space to display various artifacts (Fig. 4), and construction of a tower to view the footprint of the building, which is to be marked to delineate its height and extent.



Fig. 4. Artist's conception of a converter display for a museum commemorating the K-25 plant.

ROLE OF THE INTERNATIONAL ATOMIC ENERGY AGENCY

The International Atomic Energy Agency (IAEA) has taken a strong interest in the reuse activities at ETTP. ETTP's successes can be used as models for redevelopment of nuclear facilities elsewhere in the world. The "lessons learned" enhance IAEA's understanding of the difficulties encountered as nuclear facilities transition to other uses, and may be communicated via the International Decommissioning Network (IDN) [6] to assist other entities interested in reusing former nuclear sites. These are applicable to either the government jurisdictions or utility districts that will ultimately provide site services and to the industries and organizations that wish to reuse buildings and facilities at a site.

IAEA has featuring case studies from ETTP in recent and pending publications. In its 2006 publication *Redevelopment of Nuclear Facilities after Decommissioning (Technical Reports Series No. 444)*, Annex I.I "Reindustrialization of the Former K-25 Complex, Oak Ridge, Tennessee, USA" describes the state of reindustrialization a year after the Accelerated Cleanup Plan was conceived. [7]

The IAEA is expanding its focus on redevelopment of former nuclear sites with a publication in progress, titled *Redevelopment and Reuse of Nuclear Facilities and Sites: Case Histories and Lessons Learned*. The draft contains several case studies of reuse and redevelopment at ETTP. Two of these are expanded into annexes: (1) the experience of the City of Oak Ridge as it takes ownership of the utilities on site; and (2) the successful reuse of the experimental centrifuge building complex by M&EC as a state-of-the-art waste-treatment facility. Other annexes detail the examples discussed later in this section.

ETTP is an ideal site for information exchange through the IDN. DOE is a participant in this network, which is designed to disseminate information on successes—and difficulties—associated with decommissioning and reuse of former nuclear sites. DOE's Oak Ridge Office and its contractors have addressed many of the challenges of decommissioning an aging nuclear complex that had been largely shut down since 1985. Their experience can suggest "best practices" in decommissioning approach to deteriorating facilities and the management of wastes with a variety of radiological and hazardous contaminants. BJC has maintained an exemplary safety record, an important factor in community acceptance of D&D activities and ultimate reuse of the site. Finally, DOE's experience at ETTP can help inform the design of new nuclear facilities to decrease their lifecycle cost by planning for decommissioning.

Some examples of other sites elsewhere in the world that face issues similar to those encountered at ETTP and where information exchange could be beneficial include:

- United Kingdom Atomic Energy Authority (UKAEA) Harwell in the Thames Valley, UK. Comparable to the reindustrialization program at ETTP, Harwell had several former nuclear facilities that were reused prior to delicensing and/or demolition. The site is now being decommissioned and redeveloped in phases, with the most commercially desirable Eastern Zone being addressed first. Like ETTP, several uncontaminated buildings can be reused for office space. Reuse of others is hampered by either significant contamination of the facilities themselves or the presence of subsurface contamination which will require their demolition to achieve license termination criteria, freeing up the land for redevelopment.
- Laboratory for Transuranic Elements (LATRANSA) at VINCA Institute of Nuclear Sciences, Republic of Serbia. The LATRANSA facility was decontaminated for planned reuse as a waste processing facility. M&EC's experience at ETTP, particularly how it accomplished refurbishment of the K-1200 complex to accommodate a state-of-the-art waste processing facility, could provide beneficial information for the similar reuse of the LATRANSA facility.

- Kernkraftwerk Greifswald (KGR) site in northeast Germany. KGR has successfully implemented reuse of the large turbine hall of the decommissioned Greifswald nuclear power plant as a major manufacturing facility shared by MAB GmbH, a manufacturer of large ship components, and by Liebherr, which manufactures large cranes and other heavy equipment. There has been industrial redevelopment for energy purposes, including a biodiesel plant, a gas-pipeline delivery station, and a coal-fired power plant. Other remaining KGR facilities are available for reuse, and ETTP's experience with transitioning and updating utilities as well as decontamination of large buildings such as K-31 could assist planning for further reuse of the site. Similarly, KGR's experience could inform activities at ETTP if DOE chooses to site an Energy Park there.
- Nescsa site in the North West Province, South Africa. Nescsa was used as a uranium enrichment facility much as ETTP was. The enrichment building was delicensed and reutilized as a waste storage facility, as portions of the K-25 vaults were during site cleanup activities. To date South Africa's Nuclear Liability Management department has decommissioned several buildings that were made available for reuse by Nescsa and private tenants as chemical facilities, pharmaceutical plants, mechanical workshops, etc. Nescsa is in a stage similar to ETTP's initial reindustrialization program and can possibly benefit from the lessons learned during later D&D activities at the site, although Nescsa is planned largely for new nuclear projects, and thus will not require the degree of cleanup needed for delicensing the site.

SUMMARY

ETTP is undergoing transformation from a gaseous diffusion plant—with all of the problems posed by aging and potentially contaminated facilities—to a modern private industrial park. A snapshot of progress to date offers a variety of successes and problems. A large D&D effort is ridding the site of dilapidated facilities with a variety of contamination problems. With an eye to the future, the City of Oak Ridge has begun to acquire the site utilities, roadways, and essential support services. A proven system of transferring uncontaminated facilities into the private sector through CROET is in place.

These achievements have not been without problems and obstacles. DOE continues to struggle with how to transfer potentially contaminated facilities to companies that have substantial financial and business investments in their buildings. Heritage tourism proponents are dealing with the realities of whether it is possible to preserve a portion of the dilapidated K-25 building and how to address contaminated artifacts and equipment necessary to interpret the site's history. Perhaps the foremost challenge has proved to be DOE's changing priorities over time coupled with uncertain Environmental Management budgets. National priorities have deemphasized D&D of facilities and remediation of soils and groundwater, which has led to Oak Ridge's cleanup budget being drastically cut in recent years, setting back the projected ETTP completion date to 2016 [3] and similarly delaying subsequent private development.

The experiences at ETTP can provide information useful to other nuclear facilities via the IAEA's IDN. The "lessons learned" at ETTP enhance IAEA's understanding of the difficulties encountered as nuclear facilities transition to other uses, and the site's successes are models for reuse of nuclear facilities elsewhere in the world. Additionally, successful experiences at other sites could provide applicable models for transition of ETTP to an industrial park or for siting of energy-related facilities.

ACKNOWLEDGMENTS

My deep appreciation to the following people for providing information, documentation, photographs, and/or text review that greatly enhanced this article: Alison Arrowsmith, Director, Proposals & Marketing, Perma-Fix Environmental Services, Inc.; William Biloski, Reindustrialization Program, Bechtel Jacobs Corporation, Susan Cange, Reindustrialization Program, U.S. Department of Energy;

Scott Ellis, Business, Government & Legal Affairs Manager, Perma-Fix Environmental Services, Inc.; Michele Laraia, Nuclear Fuel Cycle and Waste Technology Division, International Atomic Energy Agency; Larry McNamara, Chief Operating Officer, Perma-Fix Environmental Services, Inc.; James O'Conner, City Manager, City of Oak Ridge; Barry Stephenson, President, Materials and Chemistry Laboratory, Inc.; Jack Suggs, Director, Electricity Department, City of Oak Ridge; and Bill Wilcox, City of Oak Ridge Historian.

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