EPRI

Decommissioning Handbook for Coal-Fired Power Plants

Technical Report

Decommissioning Handbook for Coal-Fired Power Plants

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Final Report, November 2004

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REPORT SUMMARY

This handbook lays out the steps necessary to fully decommission a coal-fired power plant. The handbook includes ways to handle permitting, environmental cleanup, site dismantlement, site remediation, and discusses overall decommissioning costs. It is based on three actual case studies of coal plants recently decommissioned: the Arkwright coal-fired plant of Georgia Power, the Watts Bar coal-fired plant of TVA, and the Port Washington coal-fired plant of Wisconsin Electric Power.

Background

The average age of fossil generating plants in the United States now exceeds 30 years, and, increasingly, new more productive generating facilities will assume the role of producing energy. Choices exist though for the deployment of older fossil plants. They can be kept operating, if economically competitive, or can be laid up for months or years until market needs justify reactivation. Alternatively, they can be decommissioned, if warranted, and the site reused. A fundamental need for owners of coal-fired plants is to understand the most expedient and cost effective approach to returning the site to a "brownfield" condition.

Objectives

- To compile the latest technologies in a step-by-step approach to fully decommissioning a coal-fired power plant.
- To define cost-effective methods to rehabilitate the plant site and deal with all relevant environmental and regulatory issues.
- To describe how to handle air and water discharges, transformer oils, ash piles and ponds, asbestos disposal, and other site impacts.
- To review actual costs for decommissioning, based on past successfully decommissioned plants.

Approach

The project team selected three recently decommissioned coal-fired power plants that featured different outcomes for the sites. At Arkwright, the plant was removed completely and the site no longer used for generating electricity. At Watts Bar, where nuclear and hydro facilities also exist, the coal-fired plant was partially demolished and the site cleaned up. At Port Washington, the coal-fired plant was demolished and a combined-cycle gas-fired plant built on the same site. In face-to-face meetings, the team reviewed the decommissioning procedures followed by each of the three utilities and then developed the handbook based on a compilation of the practices applied. Each of the three case studies was also documented separately.

Results

It was clear to the team that the strategies employed for decommissioning depended on the future site use, inherent value of the property, and financing of the project. The team divided all plant decommissioning projects into four basic options:

- Maintain the site at present condition with minimal cleanup to meet environmental compliance and ensure safety
- Perform minimal dismantling and demolition while maintaining the site to meet environmental compliance requirements and ensure safety
- Dismantle to the degree required to meet specific needs of a planned reuse of the site
- Full decommissioning

Dealing with waste disposal locations at the site often required a major investment of time and money.

EPRI Perspective

As described in this handbook, fully decommissioning a fossil plant requires proven and cost-effective methods to rehabilitate the plant site so as to ensure environmental compliance for its future use.

What is remarkable is the sheer volume of older units that appear to be headed in the direction of decommissioning, as documented in EPRI's report 1004410 on the outlook for capacity retirements. Such older units may be used seasonally at times of greater demand, or even kept as peaking capacity for use only when electricity prices soar – rather like peaking combustion turbines are deployed. Alternatively, they may be laid up for a short time or indefinitely, in case the market situation changes in the future. However, layup is often a strategic prelude to full retirement since it involves less initial capital expenditure, and allows time to plan for ultimate redevelopment of the site.

What is made clear in EPRI's Decommissioning Handbook for Coal-Fired Power Plants is that there are serious issues in plant site decommissioning, most of them environmental. The disposal of many years of waste products – ash, water, oils, chemicals – and the removal of asbestos, PCBs, lead products, etc., requires both an understanding of the extent of the contamination as well as the best methods of removing and disposing of the substances.

Following decommissioning, site reuse can often result in significant added value for the company and for the local community. This report represents a significant industry advance by laying out the key issues in decommissioning a coal-fired plant.

Keywords

Plant Decommissioning
Coal-Fired Power Plants
Site Environmental Issues
Site Reuse

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Watts Bar Decommissioning

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GLOSSARY OF ACRONYMS

ACM	asbestos-containing material
ACOE	Army Corp of Engineers
ANSI	American National Standards Institute
ASTM	American Society for Testing and Materials
BTEX	benzene, toluene, ethyl benzene, and xylene
C/D	construction/demolition
CEM	Continuous Emissions Monitor
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
CFC	Chlorofluorocarbon
CFR	Code of Federal Regulations
CT	combustion turbines
DSI	Dry Sorbent Injection
EPA	U.S. Environmental Protection Agency
EPRI	Electric Power Research Institute
ERT	Emergency Response Team
ESP	Electrostatic Precipitator
FAA	Federal Aviation Administration
HCFC	Hydrochlorofluorocarbon
HWSF	hazardous waste storage facility
IPP/IC	Integrated Pollution Prevention/Integrated Contingency
GPC	Georgia Power Company
GSU	generator step-up
kV	kilovolt
MW	megawatts
NEPA	National Environmental Policy Act
NFPA	National Fire Protection Agency
NIOSH	National Institute of Occupational Safety and Health

NPDES	National Pollutant Discharge Elimination System
O&M	operations and maintenance
OSHA	Occupational Safety and Health Administration
PCB	polychlorinated biphenyl
PEL	Permissible Exposure Limit
ppm	parts per million
RCRA	Resource Conservation and Recovery Act
RMPs	Risk Management Plans
SARA	Superfund Amendments and Reauthorization Act
SPCC	Spill Prevention, Control and Countermeasures
TCLP	toxicity characteristic leaching procedure
TDEC	Tennessee Department of Environment and Conservation
TSCA	Toxic Substances Control Act
TVA	Tennessee Valley Authority
USTs	underground storage tanks
WAC	Wisconsin Administrative Code
WBF	Watts Bar Fossil Plant
WDNR	Wisconsin Department of Natural Resources
We	Wisconsin Electric
WPDES	Waste Pollution Discharge Elimination System

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INTRODUCTION

The electric power industry projects that approximately 15,000 megawatts (MW) of coal-fired capacity will be retired from service during the period 2001 to 2010 with an additional 13,000 MW likely to be retired soon after 2010, amounting to a little under five percent of the total coal-fired generating capacity in the United States. The Electric Power Research Institute (EPRI) states in its publication, Outlook for Capacity Retirements Following U.S. Boom in New Supplies, that *"The principal reasons for the small amount of capacity currently facing retirement include lower cost of coal as a fuel source as compared to natural gas, lack of technology advancement in coal combustion, and the structure of the Clean Air Act, which did not impose as stringent requirements on existing coal-fired capacity as it did on new capacity" (1).*

Power plant retirement constitutes mothballing (or layup), as well as full decommissioning. In this publication, *retirement* will be used synonymously with full decommissioning. Retirement occurs when a plant is declared inoperable, meaning that it is either not economically or not technically feasible to restore the plant to operational status.

Most of the coal-fired power plants slated for retirement are older facilities with lower efficiency, higher emission rates, and lower capacity factors than their more modern counterparts. Retirement of these older plants would have a relatively small impact on the total U.S. coal-fired generation capacity, but conversely, their retirement would have a positive impact on emissions (**1**).

Drivers for plant retirements vary. Among the strongest of drivers are pollution prevention issues caused by current and projected environmental requirements recently announced. The retirement fate of many plants hinge on the future direction of environmental regulations and laws. Other drivers include: (1) overabundance of new capacity from other types of generation, especially the boom in gas-fired supplies; (2) replacement of older, less-efficient plants that have lower reliability and profitability; and (3) the unknowns associated with deregulation of the electric power industry.

Complete decommissioning requires that the plant site be cleaned or remediated to meet full environmental compliance to the extent that the site can be fully used in the future. Reuse of such sites can result in significant added value for the company and can be an asset for the local community as well. Some plant facilities are recognized by communities as being important landmarks. These communities may have a strong desire to preserve the physical facilities or parts of the facilities for posterity. The planned reuse of plant sites, following rehabilitation, can result in major advantages to the surrounding communities and lead to good collaborative efforts between the generating company, city councils, and other public agencies.

Early Examples of Decommissioning

In a white paper, EPRI briefly discussed the decommissioning and redevelopment of two utility sites that have become excellent landmark examples of site reuse: GPU Energy's Front Street Station and We Energies' Lakeside Station (**2**).

Figure 1-1
GPU donated the decommissioned station property to the Pennsylvania Historic and Museum Commission for the maritime museum and permanent berth of the U.S. Brig Niagara - an authentic replica of the U.S. flagship in the 1813 Battle of Lake Erie and Pennsylvania's official flagship.

GPU Energy's Front Street Station was a 118-MW coal-fired power plant located along Lake Erie on Presque Isle Bay. GPU Energy began planning the decommissioning of the plant in 1989. Because the plant was located in the Bayfront District, the city and county government, state agencies, business leaders, and the community became concerned about reuse of the plant site. GPU Energy and these entities coordinated the effort to dismantle and clean up the site so that buildings and infrastructure were preserved for future use. Decommissioning and redevelopment were completed in 1998. The Bayfront District is now a first-class tourist attraction and community cultural center complex that includes the Erie Maritime Museum, Erie County Public Library, and Liberty Park with walking and biking trails, playgrounds, and a dockside amphitheater.

We Energies' Lakeside Station on Lake Michigan, south of downtown Milwaukee, Wisconsin, in the village of St. Francis, was the world's first pulverized coal power plant. After We Energies decided to decommission the plant, Harnischfeger Industries, a major manufacturer of heavy machinery for the pulp/paper and mining industries, approached them with an interest in using the property for their corporate headquarters.

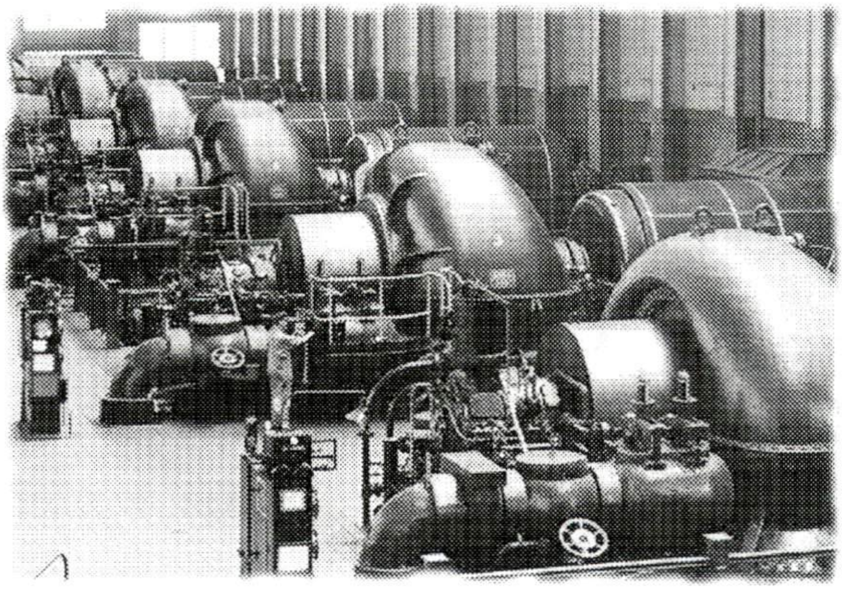


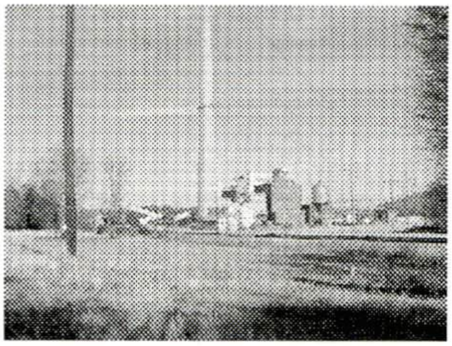
Figure 1-2
Lakeside Power Plant in Wisconsin, with an operating capacity of 40 MW became, in 1921, the world's first plant to burn pulverized coal exclusively.

This spurred interest in redevelopment of the site. We Energies and Harnischfeger Industries, working together, obtained approval from the state to develop the site, and the two entities shared the cost of the cleanup and stabilization of the property along the lake. Harnischfeger Industries then built its new corporate headquarters on the site and has remained there since 1996.

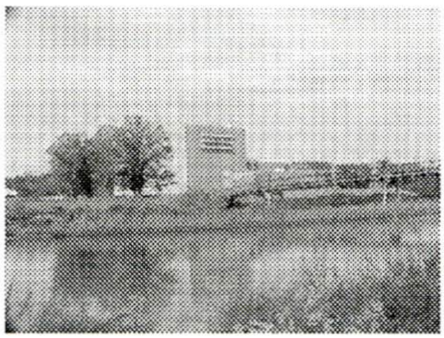
Examples of Decommissioning in this Handbook

The purpose of this report is to present the steps involved in the full decommissioning of older coal-fired power plants, including complete equipment removal and site cleanup.

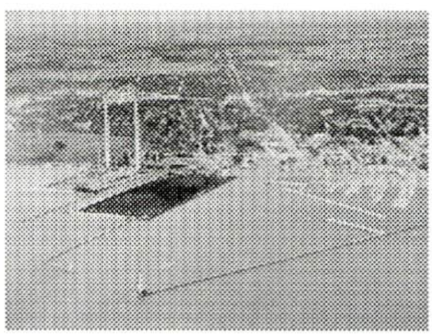
The report also includes the documented approaches taken to decommission three coal-fired power plants:



- Plant Arkwright in Macon, Georgia – Georgia Power Company (GPC). **See Appendix A.**



- Watts Bar Fossil Plant (WBF) in Rhea County, Tennessee – Tennessee Valley Authority (TVA). **See Appendix B.**



- Port Washington Power Plant in Port Washington, Wisconsin – Wisconsin Electric Power Company (We Energies). **See Appendix C.**

Figure 1-3
Plant Arkwright in Macon, Georgia (top); Watts Bar Fossil Plant (WBF) in Rhea County, Tennessee (middle); Port Washington Power Plant in Port Washington, Wisconsin (bottom)

Plant Arkwright is being fully decommissioned to a greenfield site but, as of mid-2004, no definite plans exist for site reuse. WBF decommissioning includes partial demolition and site cleanup, with TVA maintaining environmental compliance and safety at the plant site. Port Washington is in the process of contracting for full decommissioning; part of the site will be returned to the public for reuse, and part of the site will be converted by We Energies to a combined cycle power production facility that uses natural gas. The type of reuse by the public has not yet been defined.

2 OVERALL STRATEGY FOR DECOMMISSIONING A COAL-FIRED POWER PLANT

Preliminary Planning

Almost every utility is being faced with questions about what to do with older coal-fired power plants. Decisions must be made on whether to continue operations, to lay up to meet future demand, or to decommission. Decisions primarily are driven by plant operations and maintenance (O&M) costs, plant operability, cost/benefit analysis, projected environmental regulations, projected power demands, the utility's generation mix, public support, etc. As noted in the introduction of this publication, plant age and operability, along with environmental concerns and efficiencies, are resulting in more and more utilities choosing to decommission certain plants (**1**).

When a utility decides to decommission a plant, strategies for accomplishing this mission must be developed. No longer is it acceptable to lock the doors and walk away from an industrial facility. Laws, based on environmental and safety issues, as well as community concerns for appearance, make such action illegal. Facilities that are abandoned or not remediated properly can eventually become brownfield sites, with site remediation managed and regulated under the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) and, on a few occasions, the Resource Conservation and Recovery Act (RCRA). In today's marketplace, cost is always a major factor in determining the strategic process.

The extent of decommissioning and cleanup is also determined by the planned reuse of the plant site. The U.S. Environmental Protection Agency (EPA), state, and local remediation standards that must be met depend on whether the property reuse will be residential, commercial, or industrial. Predetermining the reuse of the site can reduce the costs of dismantling and cleanup when buildings and infrastructure are retained; environmental remediation methods can be chosen to meet specific needs; and cleanup standards to be attained may be less stringent (**3**).

The inherent value of property currently occupied by a utility is a significant factor in ultimate reuse opportunities. Lake front property in a metropolitan area will attract a lot of attention, whereas a former industrial site in a rural area may not have many parties interested in redevelopment. In some cases, the existing site has significant value to the utility because of security interests or because other suitable properties for re-powering are not available.

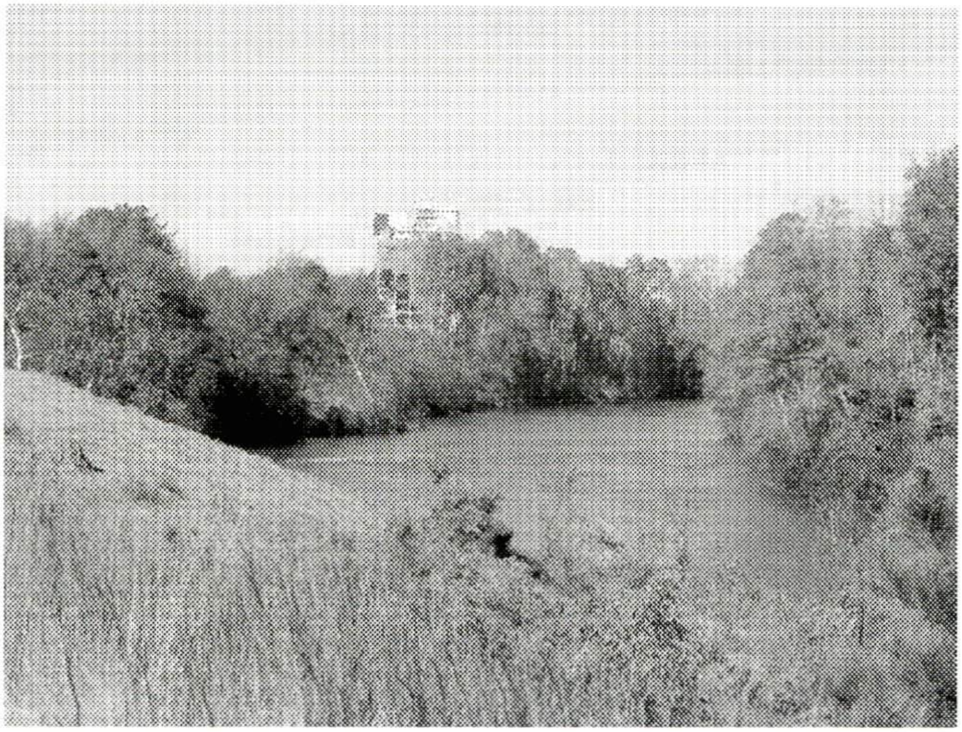


Figure 2-1
The Arkwright plant is on the Ocmulgee River, near Macon, GA, an area for potential re-development, or for open space and parkland.

Utilities usually approach decommissioning by adopting varying degrees of the following strategies:

- Maintain the site at present condition with minimal cleanup to meet environmental compliance and ensure safety (i.e., remove chemicals and oils, restrict access, etc.)
- Perform minimal dismantling and demolition in addition to maintaining the site to meet environmental compliance and ensure safety (i.e., remove salable and salvageable equipment, remove safety hazards, remove chemicals and oils, restrict access, etc.)
- Dismantle to the degree required to meet specific needs of a planned reuse of the site (i.e., remove internals of powerhouse or other buildings so that those structures can be remodeled inside and reused; remove some exterior structures or systems, such as coal handling systems; clean up coal yard; retain some foundations; meet residential, commercial, or industrial environmental standards regarding cleanups; etc.)
- Full decommissioning (i.e., dismantle all equipment; demolish all buildings and structures; clean up entire site, including wet and dry disposal areas, coal yards, etc., per required environmental standards.)

How to finance the decommissioning will strongly influence the strategy selected. If reuse of the site is planned, costs for the cleanup can be shared by the utility and the collaborating party. Sometimes, if reuse of the site will result in an economic advantage to the community, local and state governments may be willing to share in the costs through funding or tax incentives. Whatever strategy is chosen, close collaboration with affected local, state, and federal environmental agencies and public organizations must be pursued and maintained.

Once a decommissioning strategy is selected, the company must determine who will perform the decommissioning tasks. The following approaches may be taken:

- The utility manages the project and performs all dismantling, demolition, and clean-up tasks.
- The utility manages the project but contracts the decommissioning tasks to multiple contractors.
- The utility manages the project and contracts the decommissioning to a single contractor.
- The utility contracts for a turn-key operation.

General Environmental and Safety Regulatory Issues

Environmental regulations have had, and will continue to have, a profound influence on the design and operation of both new and existing power plants (**4**). Therefore, it is no surprise that one of the primary concerns in decommissioning a power plant is how to manage environmental issues. Existing permits must be modified, revised, or cancelled and/or new permits obtained.

Compliance with environmental statutes must be maintained throughout demolition and remediation. Compliance must also be maintained regarding any permits that have post-closure requirements, such as permits for coal ash ponds, hazardous waste storage or accumulation areas, or chemical cleaning ponds.

Planning should include an environmental assessment of the decommissioning process, with review of the draft plans by environmental leaders in the company. It is very important also to include state regulators (and, if applicable, EPA) early in the process, before actual decommissioning commences. Involving state and other regulatory officials should include a presentation of environmental plans. Different states will have different levels of authorization for permits in the various media (air, land, and water); therefore, plants may be regulated by both EPA and state environmental agencies, sometimes independently for the same environmental media.

Permitting

The types of permits applicable to a plant will depend on the various operations conducted, such as type of air emission controls, dry or wet disposal of ash, wastewater treatment, etc. Plants located in the middle of a coal field or in an urban setting may have additional environmental concerns that must be considered during decommissioning and that are not common to the general plant population. This permitting process may include canceling, revising, or maintaining old permits or applying for new permits.

Clean Air Act

Regulatory officials should be notified of the utility's intent to allow the plant air permit to expire. However, because decommissioning activities can result in visible emissions from demolition of buildings and disturbance of the soil, any changes due to expected increases/decreases in visible emissions should be communicated to regulators, and permit changes or new applications should be made. Risk Management Plans (RMPs) should be reviewed for required notifications when storage of onsite chemicals ceases. RMPs must be updated and resubmitted before changes are made at the site.

Figure 2-2
Cleanup of the coal yard (such as this one at Port Washington) will likely include an NPDES Stormwater Pollution Control Plan.

National Pollutant Discharge Elimination System (NPDES)

Shutdown of operations will result in the reduction or cessation of wastewater discharges to receiving waterbodies. However, stormwater discharges through NPDES points may continue during and/or after the demolition and remediation of the plant. Some of these discharges may even need to be re-routed. The NPDES permit must be revised to account for any changes in discharges of wastewater or stormwater. For remediation of the coal storage yard or other areas where greater than one acre is disturbed, a construction stormwater permit must be submitted to regulatory officials with a Stormwater Pollution Control plan and/or an Erosion Control plan. "Redwater" (low pH) conditions are not unusual in many of these settings where coal byproducts have been managed. Redwater conditions can lead to challenging treatment options.

Other permits that may require cancellation include water withdrawal permits for obtaining water from a river or permits maintained with the Coast Guard.

Waste Management

Coal-fired power plants typically maintain large volumes of various types of chemicals and materials essential to the operation of the plant. Fossil fuel power plants typically do not generate large quantities of hazardous wastes. In 1993, EPA determined that the large volume wastes, such as fly ash, boiler ash, boiler slag, and flue-gas emission control wastes, should not be regulated as Subtitle C wastes. These wastes were exempted from hazardous waste regulations and instead were addressed by Subtitle D of RCRA (for nonhazardous solid wastes). As a result, fossil fuel power generation waste management generally is addressed by state programs that vary considerably (**5**).

In addition to ash, slag, and flue-gas emission control wastes, typical wastes from coal-fired power plants are water treatment wastes, waste oils, oily refuse, wastewater treatment wastes, used SCR catalysts, degreasers, solvents, blowdown/metal-cleaning solutions, building sump wastes, and general refuse materials. Some of these are treated and disposed onsite in permitted facilities, and others are sent offsite for recycle/disposal. Well in advance of plant operations ceasing, plans should be made to stop orders and shipments of chemicals and other materials and to deplete onsite inventories, either through use or transfer to other facilities. Following shutdown, inventories of chemicals that cannot be recycled or reused, and thus have to be categorized as wastes, should be depleted in the manner already established for disposal during regular operation.

Solid Waste Landfills can be a Major Expense Item in Decommissioning

Some plants may have solid waste permits for dry stacking of fly ash, bottom ash, slag, and air pollution control residue. For other plants, the fly ash, bottom ash, slag, and air pollution control residue may be sent to surface impoundments that, in most states, do not need solid waste permits but must meet some solid waste regulatory design requirements. Also, plants may have surface impoundments for metal-cleaning wastes, boiler blowdown, or makeup water treatment sludge where the water overflow is recycled to the plant or discharged per the NPDES permit.

Closure of surface impoundments and landfills probably will be the most expensive tasks undertaken during a decommissioning process. In some states, surface impoundments may be included in the NPDES permit and not regulated under solid waste regulations until after operation of the impoundment has ceased for a specified number of days.

In a few cases, a plant may have an onsite RCRA hazardous waste storage facility (HWSF). If so, the HWSF must be closed per the post-closure plan included in the RCRA permit.

Permitted solid waste landfills or surface impoundments should be closed per the permit post-closure plans. Many permits and regulations require a prior notification of a set number of days before cessation of operation. Because many of the plants being decommissioned are very old, some of these permitted facilities may not be designed for proper containment per the latest regulations (i.e., clay or synthetic liners) and will require coordination with the regulatory officials to determine proper closure. Proper closure may require a dig and haul operation to transfer the waste to a new onsite permitted facility or to an offsite facility. Areas where the fly ash and bottom ash were temporarily stored before retrieval for beneficial reuse should be remediated per agreement with the regulatory officials. Surface impoundments permitted under NPDES may not have a specified post-closure plan on record with the pertinent regulatory office and may require negotiations for closure.

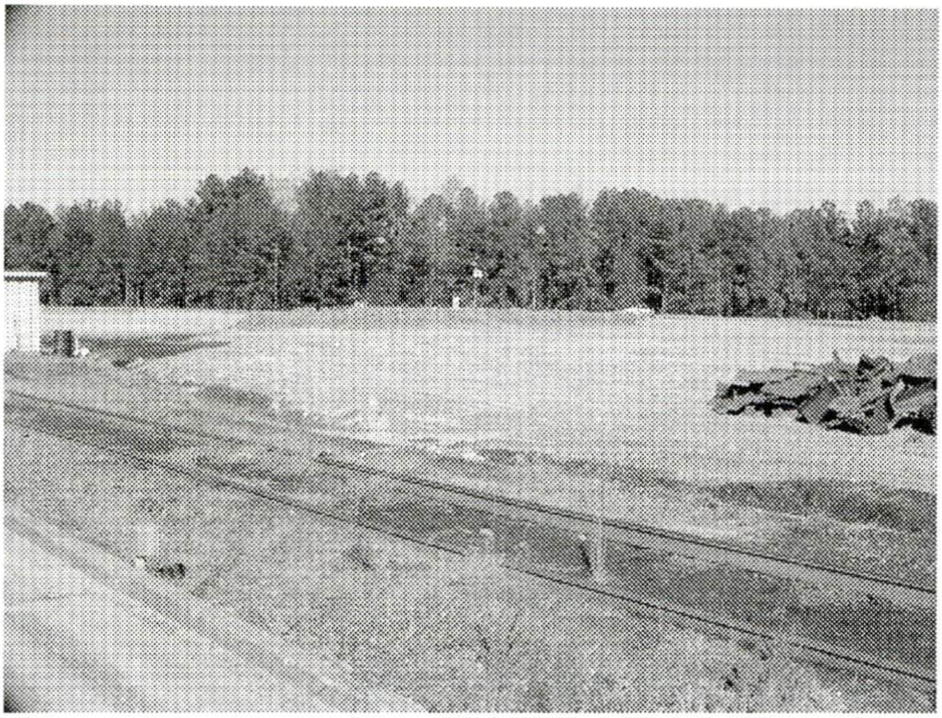


Figure 2-3
Storage of fly ash and other solids require closure according to the post-closure plans for the site. Where an impoundment is deployed, and if the site does not contain a liner, special arrangements may be needed with regulators before final closure can be effected.

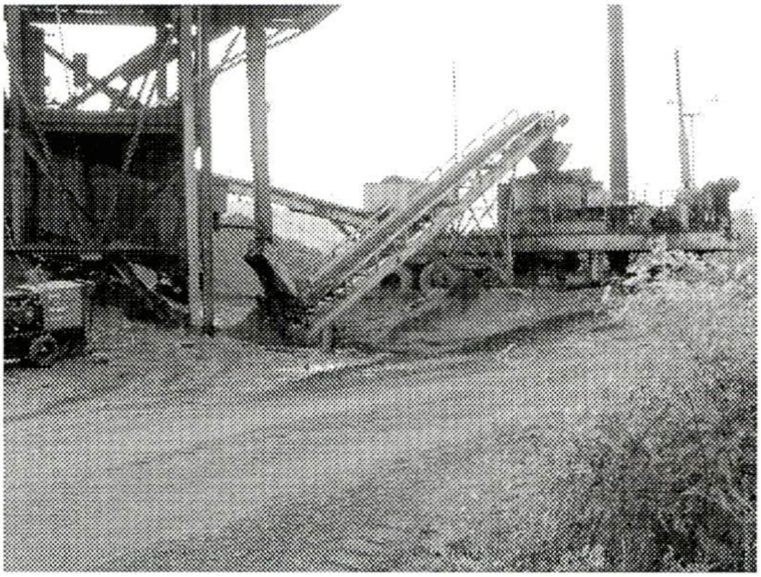


Figure 2-4
Slag and ash reclamation at Watts Bar. These actions may require removal of the materials to alternate facilities.

Capping Solid Waste Impoundments

Closure of most surface impoundments will require drainage, placement of an impermeable cap, and topping with soil and a vegetative cover. Proper placement of the cover and specified slopes will be required. Drainage should be consistent with the NPDES permit. The type and depth of cover required may vary based on the waste disposed in the impoundment. The caps for the impoundments will require continued maintenance to maintain the site contours, vegetative cover, and drainage. Some impoundments will require the installation and monitoring of groundwater wells. The waste in other surface impoundments may be excavated for disposal offsite, and the impoundment backfilled with clean material.

Some plants have permitted onsite construction/demolition (C/D), asbestos, or inert landfills. Because the volume of waste to be disposed may be drastically increased with a plant decommissioning, the permit should be reviewed for possible required notifications to regulatory officials regarding changes in amounts and types of wastes. Plants that do not have an existing C/D landfill must decide whether to seek a new onsite landfill permit or dispose of the C/D waste offsite. Much of the waste, such as brick and concrete, may be used as backfill in the basement of the power house or other recessed areas on the site. The C/D landfill will also require compliance with the permit's post-closure plan.

Asbestos

In older plants, the removal of asbestos-containing material (ACM) in some areas will be a major effort, involving significant expense and requiring completion before workers can safely begin equipment salvage and demolition activities. The ACM abatement effort should begin with a survey of ACM at the plant site to estimate the scope of the task. Asbestos regulations require proper notification before removal, good recordkeeping, and proper disposal techniques. ACM is one of the wastes that must be evaluated for onsite landfill or offsite disposal. ACM is difficult to identify in a survey, and some locations where ACM was used often are not discovered until the demolition process has begun. Therefore, contracts for second party ACM abatement should be carefully written and reviewed.

Chemicals and Materials Removal and Disposal

After stopping order and delivery of chemicals and other materials, disposal of wastes per normal operating procedures should be initiated. During dismantlement other chemicals and materials should be removed and periodically disposed or recycled. Any laboratory chemicals or inventories of metal-cleaning chemicals, which cannot be completely used before shutdown, should be sent for reuse at other company facilities, sold, or disposed properly. Freon, batteries, and residual oils (i.e., used lubricants, fuel, etc.) should be reused, recycled, or disposed of.

Mercury and PCBs

Older plants will have instrumentation and pressure-vapor lighting that contain mercury, or light ballasts and electrical equipment that contain polychlorinated biphenyls (PCBs) at regulated concentrations. The mercury and PCBs should be removed and disposed, or the equipment containing these compounds should be disposed properly. During dismantlement, light bulbs and florescent lighting should be removed and disposed per local and state regulatory requirements. The disposal procedures should be the same as those used during operation.

PCBs may also be present in electrical cables, wiring, fire retardant coatings, paint coatings, hydraulics, relays and controls inside the control room, lighting ballasts, and various items of switchyard equipment. All equipment or cables containing PCBs at concentrations greater that 50 parts per million (ppm) must be managed per regulations specified by the Toxic Substances Control Act (TSCA). Also, concentrations of PCBs between 2 to 49 ppm must be managed per the used oil regulation specified in 40 CFR 761.20 and 279.

Lead Paint

Lead paint is an issue for many older plants. Identification and removal of lead contamination may be required before workers can safely begin equipment salvage and demolition activities in some areas. Flakes of lead paint, which are produced during salvage and dismantlement, must be removed. Disposal or recycling facilities should be notified before shipping materials and equipment coated with lead paint.

If materials and chemicals are stored onsite in order to accumulate quantities for shipment, to await sampling results, or for some other reason, caution should be taken to maintain compliance with regulations for temporary storage of hazardous or special wastes. These requirements can include such things as time limits, container sizes, labeling/markings, inspections, or storage facility specifications.

Scrap Metal

Scrap metal that is being recycled is not subject to regulations under 40 CFR 262–266, 268, and 270, or to the notification requirements of RCRA. Hazardous materials contained in the piping and equipment being dismantled also may be exempted from RCRA. State regulations and the above federal regulations should be reviewed for application during decommissioning.

Coal Inventory

As much of the coal inventory as possible should be burned before plant operations are terminated. If this is not practical because operations cease as the result of equipment failure or a similar reason, the coal should be sent to another facility owned by the parent company or sold for reuse. Any coal residue that is mixed with the soil in the coal yard should be removed and disposed in the ash landfill or surface impoundment. Permission from regulatory officials may be required for this action, if it is not already covered by the solid waste and/or NPDES permits for the receiving facility. If excavation of the soil is required, the coal yard must be filled with clean material and contoured for stormwater runoff. Some regulators may require periodic sampling of monitoring wells.

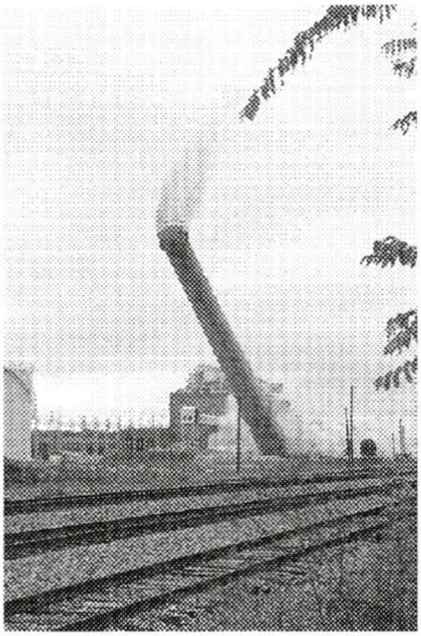


Figure 2-5
The stack is a landmark for airplanes, and for local citizens. Stack demolition is frequently a community event and observers should be kept at a safe distance. The dynamite charges must be placed so that the stack falls clear of any adjacent structures, as here at the Arkright plant.

Underground Storage Tanks (USTs)

If a plant still has USTs, the plant should already be registered with regulatory officials. Removal of the USTs should be performed in accordance with UST regulations. In some cases, monitoring wells may have to be installed, with periodic sampling required.

Federal Aviation Administration (FAA)

If a plant's flue-gas stack affects navigable airspace, the plant should already be registered with the FAA in order to meet obstruction lighting/marking requirements. Caution must be taken during decommissioning to ensure that the lighting for the stack is maintained until the stack is demolished. The FAA should be notified of the pending demolition, if not by requirement, then as a courtesy.

Superfund Amendments and Reauthorization Act (SARA)

Plants should keep a record of SARA-listed wastes, produced during demolition, for reporting on Form Rs. For example, the demolition actions of welding and cutting may cause the plant to exceed reporting limits of some compounds that did not previously require reporting. Local emergency management commissions also should be notified that chemicals will no longer be stored onsite.

National Environmental Policy Act (NEPA)

If the plant is a federally owned facility or if federal funds are being used for the decommissioning, the environmental impact of the planned action must be assessed before shutdown and dismantlement begin. Hopefully, this assessment need only be a supplement to NEPA evaluations performed for previous modifications to the plant.

National Historic Preservation Act

Before actual work on the decommissioning begins, important records and documents should be removed from the site. Because most of the plants to be decommissioned are older plants, care should be taken to evaluate whether any buildings, equipment, instruments, etc., should be preserved. Although many facilities may not be required to perform these evaluations by law, coordination with the state historic preservation officer is recommended to ensure a good neighbor policy.

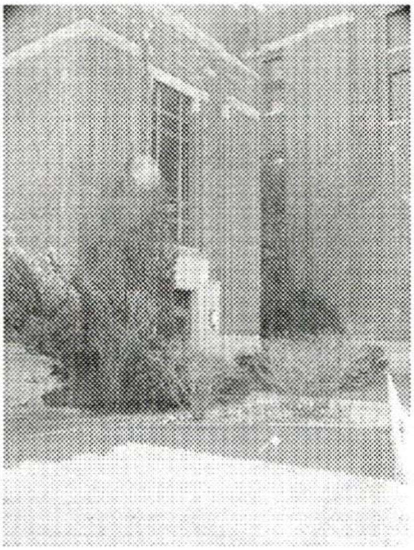


Figure 2-6
Some buildings of historical value, such as this service/administrative center at Port Washington, may be preserved in the demolition.

Occupational Safety and Health Administration (OSHA)

OSHA regulates demolition in 29 CFR 1926, Subpart T. Also, company and general OSHA rules and regulations should be followed at all times for training, planning, personal protective equipment, markings, tools, electrical equipment, scaffolds, hoisting equipment, excavation, blasting, etc. In accordance with 29 CFR 1926.850 (a), prior to permitting employees to begin demolition operations, an engineering survey of the structure must be made by a competent person.

Proper blasting permits must be obtained before explosives are used during the demolition. Local and state construction permits or licenses may be required for other activities. A licensed and competent contractor who is familiar with these requirements is of utmost importance in these situations.

Notification for Deed to Property

When site remediation is completed, a notation on the deed should be made for any environmental remedial actions required by respective state laws.

Decommissioning Tasks

Utilities may decide on varying degrees of power plant decommissioning of a power plant (i.e., leaving some buildings, the switchyard, etc.) and different property reuses (i.e., residential, commercial, or industrial). The following process assumes the plant is still operating and that decommissioning will require complete dismantlement of buildings and removal of equipment with associated site cleanup to brownfield condition. After the overall strategy for the project is determined, decommissioning will normally consist of the following major tasks:

- Project planning
- Administrative actions
- Plant shutdown
- Site preparation for dismantlement
- Dismantlement of buildings and equipment
- Site remediation and restoration

Project Planning

Once the overall decommissioning strategy has been decided, more-detailed project planning should begin. The initial task will include information gathering essential to planning, such as site and building drawings, environmental assessment, safety engineering survey, and asset inventory. This information will be used to prepare preliminary scheduling and cost estimates.

The environmental assessment should include a review of existing permits, a projection of the need for permit revisions and for new permits, an inventory of chemicals, an ACM survey, and lead paint survey. If federal funds are received, the environmental assessment must include the appropriate NEPA documentation with proper approvals before work commences. The assessment should project environmental solutions and schedules for closure of RCRA sites and final site remediation. The safety engineering survey should identify potential situations that, during dismantlement, might require special preparations to prevent accidents. The survey also should identify any specialized training that might be required. The survey should be the basis of a site Health and Safety Plan. The asset inventory should include materials and equipment that can be salvaged for use at other parent company plants or sold for reuse or scrap. The inventory should include recommendations as to the condition of the materials or equipment to be reused, scrapped, or sold.

Based on these preliminary evaluations, decisions can be made as to the need for temporary storage of salvaged materials and equipment and whether temporary storage of hazardous materials will be required before shipment for offsite disposal.

The environmental assessment, safety engineering survey, and asset inventory should include sufficient detail to (1) prepare a preliminary project cost estimate that includes credit for salvage sales, (2) identify tasks in the preparation of bid proposals for work to be performed, and (3) prepare a preliminary project schedule.

Listing of Specific Tasks to be Accomplished

The end result of the project planning (i.e., cost estimate and schedule) should be a listing and order of tasks required to decommission the plant. Preliminary discussions with experienced demolition contractors would be helpful in determining the best order of events to follow for the dismantlement of equipment and buildings. Among the important decisions to ensure project progress and safety will be the determination of when and how to disconnect portions of the electrical and utility supplies. Although the decision to decommission the plant already will have been made, information from these preliminary evaluations should assist in making the decision as to when plant operations will cease.

During project planning, there might be a tendency to overlook or underestimate the long-term tasks that often occur toward the end of decommissioning. For example, the cleanup of the ash ponds can cost more than the sum of all the earlier tasks. The final tasks for turning property over to a local government or other new tenant may not be fully accounted for during project planning because the ultimate disposition of the property was not clear at that time.

The preliminary contracting strategy and list of tasks can be used to outline the type and number of contracts needed to accomplish decommissioning.

Administrative Actions

The major administrative task is the establishment of contracts for the actions to be taken in decommissioning. The types and number of contracts will be determined by the contracting strategy established by management and project planners.

Another administrative task is coordinating the cleanup of the plant offices, including the selection of existing plant records to be retained and their proper storage. Of particular importance is the retaining of environmental records for the regulated period of time. Some records also must be retained for historical significance.

A decision must be made as to where to establish the temporary offices required for overseeing the dismantlement of the plant and remediation of the site. The offices could be established in an existing building or in mobile offices. Site areas also should be set aside for establishment of temporary contractor offices and a materials and equipment laydown area. Setup would include coordinating installation of necessary utilities.

Plant Shutdown

The date for plant shutdown should be determined during the project planning phase. Electrical grid and economic factors will enter into this decision as well as decommission planning. A primary cost-savings concern for decommissioning is the depletion of fuels and chemicals used during operation. The more of these materials that are depleted, the less the expense incurred will be for transferring them to other plants for use or to other sites for sale or disposal. Routine orders of materials, chemicals, and office supplies should be stopped.

Environmental and other permits should be reviewed to determine their impact on the cessation of operations. For example, some permits specify that, if no activity occurs within a specified period of time, closure of the RCRA facility should begin.

Preparation for decommissioning also should include the flushing of all piping and appropriate equipment, especially chemical lines and the ash disposal lines. This is important for safety concerns during demolition and also to accommodate resale or recycling of the items.

Site Preparation for Dismantlement

Areas of concern in preparation for entering the buildings for dismantlement include:

- Safety training
- Utility supplies
- ACM abatement
- Lead abatement
- Materials and chemical removal

Based on the safety engineering survey and the tasks involved in the approach to be taken in dismantling the facilities (i.e., torching, blasting, entering confined space, rigging, etc.), training of all personnel on the site (utility and contractor) should be performed and documented. Also, appropriate personnel should be trained on applicable environmental permits and regulations.

One of the major safety and demolition concerns is the use of electricity. Major power sources must be deactivated for demolition, but at the same time, power may be needed in other areas of the site for activities. Also, the supplies of water and natural gas utilities must be scheduled and monitored. Because the plant emergency fire protection system will be disturbed during decommissioning, a temporary system should be established. This could be as simple as contracting with a local fire department for temporary support. Minimal auxiliary power may be required for area and building lighting, communications, stack lighting, etc.

Asbestos, Paint, and Chemicals Cautions

ACM should be removed based on the ACM survey. For worker safety and to comply with regulations, ACM must be removed from appropriate facilities and equipment prior to dismantlement activities that could break up, dislodge, or disturb the ACM. However, abatement performance can be scheduled ahead of separate site activities rather than completing abatement for the entire site before dismantlement begins. A majority of the ACM should be found on the equipment, ductwork, piping, and cable. Many plants will have ACM siding on older buildings, most commonly as transite. Plants that have undergone decommissioning report that new sources of ACM were found throughout the dismantlement, even though thorough surveys and prior abatement had been performed. It is beneficial to have a qualified asbestos inspector onsite throughout dismantling to make sure that asbestos-containing wastes are not introduced into the non-hazardous scrap pile.

For worker safety, any flakes of lead paint must be removed prior to worker activities, and the area should be monitored periodically for new accumulations during dismantlement. Lead paint removal also can be scheduled to occur prior to dismantling activities in affected areas rather than being completed at one time for the entire facility.

Before beginning dismantlement, materials and chemicals should be removed from the buildings and tanks. This would include fuel oils, metal-cleaning chemicals, laboratory chemicals, mercury, PCB-containing equipment, batteries, etc. Removal of lighting should be coordinated with the need for lighting for other activities within the buildings or areas.

Dismantlement of Buildings and Equipment

Dismantlement includes stripping all materials and equipment from the buildings and site and tearing down the buildings and separate support facilities.

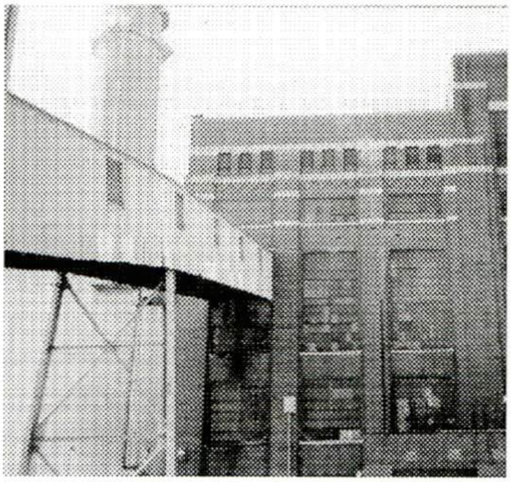


Figure 2-7
Demolition of the stack, coal conveyer, and powerhouse at Port Washington was done in conjunction with the construction of a new gas-fired unit on the same site.

Because there are various coal-fired power plant configurations, the types of equipment, buildings, and support structures will vary. Dismantlement typically will include the following:

- Salvage of materials and equipment
- Demolition of support buildings and structures
- Demolition of powerhouse
- Excavation of foundations and underground piping. Closure of surface impoundments and/or landfills
- Cleanup of coal storage yard.

Material and Equipment Salvage

Using the asset inventory, materials and equipment should be removed and offered to other internal utility sites for reuse, placed in the salvage sale for recycle or reuse, or disposed per regulations. The order of removal will be site dependant and scheduled by the demolition contractor. Removed items will be sorted in a laydown area by condition for reuse. Some items may contain ACM or PCBs, requiring disposal per regulations.

Typical salvageable items that could be reused include pumps, fans, compressors, tanks, electrical equipment, piping, and conveyor components. Because the plants usually are very old, precipitators, scrubbers, boiler components, tubes, economizers, reheaters, ductwork, etc., probably will be salvaged for scrap.

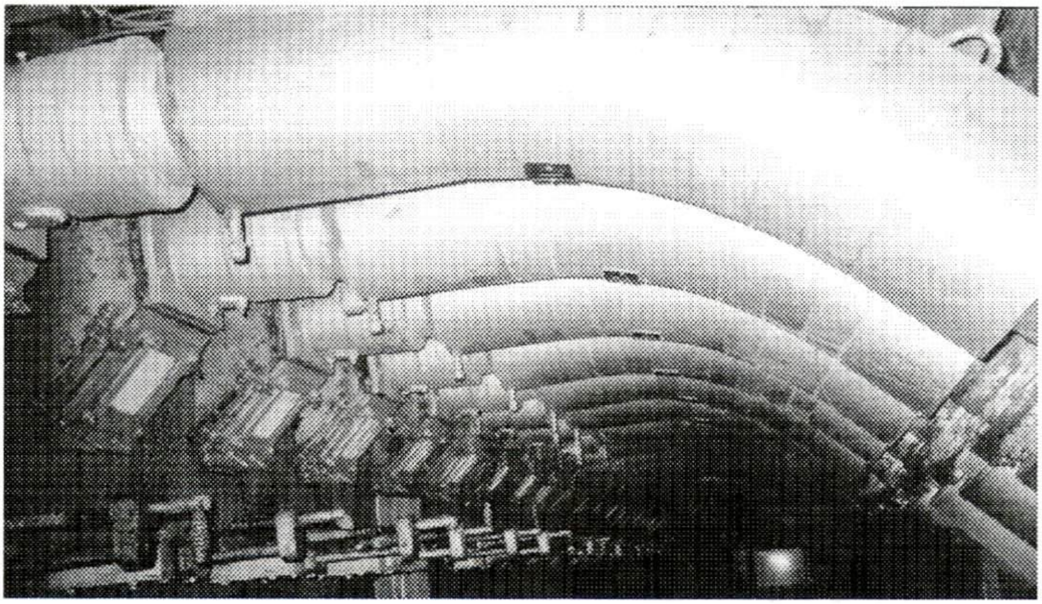


Figure 2-8
Burners, coal/air ducts, and other components from this 1930s vintage CE boiler at Port Washington will likely be sold for scrap. Any asbestos in the insulation must be carefully removed before full dismantling.

The reuse or scrapping of the turbines and generators will depend on the market at that time. Office furniture and electronic equipment should be returned to the leaser, offered to other internal utility sites, or salvaged for resale. Vehicles and heavy equipment used for site transportation and moving of materials and equipment, as needed for operations and coal handling, should be offered to other internal utility sites or for resale. Some of these can be used during decommissioning.

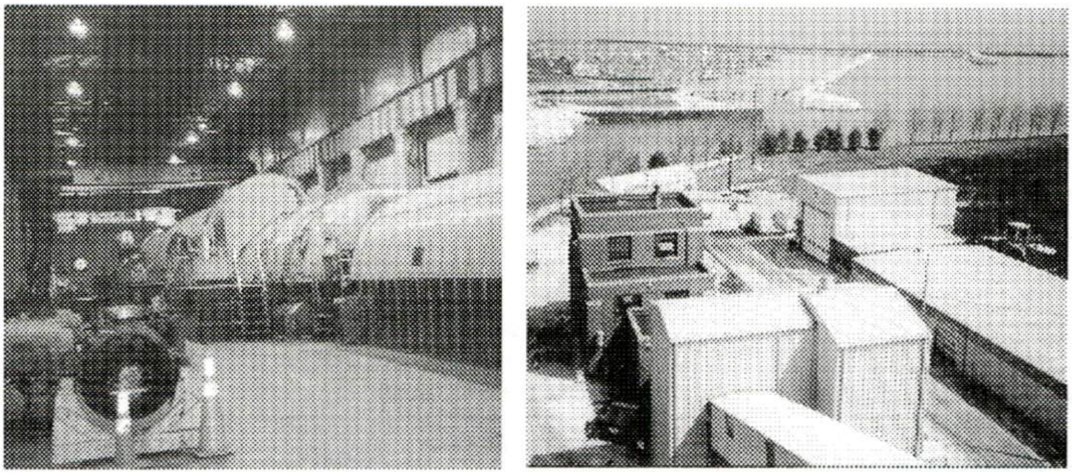


Figure 2-9
The turbine-generator building and the crushing house and conveyers at Port Washington will be removed once all salvageable material has been extracted.

Once the decision has been made as to the possible future use of support buildings, such as laboratories, offices, maintenance, etc., the remaining buildings should be demolished. After salvageable materials and equipment have been removed, support structures, such as pumping stations; coal preparation and handling facilities; rail, truck, or barge coal unloading facilities; railroad tracks; etc., should be demolished. Recyclable materials, such as metal beams, should be separated to be sold for scrap.

Use of Fill Debris

Demolition debris, such as brick and concrete, could be used for fill material for sumps or basements. Some plants will have metal flue-gas stacks on the powerhouse roofs, and others will have brick or concrete stacks on the ground. The demolition contractor will determine whether to let the roof stacks fall when the building structure is imploded and then remove them, or to remove them with a crane. The ground stacks probably will have to be felled with explosives. The deposition on the inside of the stacks should be analyzed for hazardous flue-gas components to determine what may be done with the stack materials. Hopefully, the metal stacks can be recycled and the brick and concrete debris used as backfill in the powerhouse basement or other depressions.

Figure 2-10
The turbine hall at Arkwright will use fill to bring the site up to grade level. A ramp was constructed at one end to permit dump trucks to enter the space.

Once the internal equipment and components are removed, demolition of the powerhouse should begin. Some of the internal items associated with the boiler floor structures may be too large or inaccessible to safely or economically remove before imploding the powerhouse. This also may be true of items located on the roofs of some plants, such as tanks, stacks, and fans. The demolition contractor must decide the best way to deal with the powerhouse basement. If the building is imploded before the basement is filled with inert material, it will be difficult to separate and remove recyclable and non-inert material from a deep basement. Also, it will be difficult to partially fill the basement before imploding the building structure. For many sites, obtaining clean, inert fill material is a problem. If the future use of the site or the future condition of the site is decided before decommissioning, some of the road bed material at the site may be used.

Most plants will have many concrete foundations and underground piping throughout the site. Although it depends on the future plans for the site, most of these should be removed. The rule-of-thumb used for most sites is to remove the foundations to two feet below future grade. Future contouring of the site must be considered in determining grade. Although the foundations will contain metal reinforcing, most regulatory agencies allow their use as backfill material. Some plants may be allowed to plug underground piping and leave it in place. Others may have to remove the underground piping for salvage or disposal.

Closing Surface Landfills

Figure 2-11
Ash ponds such as this one at Arkwright, often take a significant time for remediation. The extent of the clean up might depend on the future re-development plans.

Closure of the surface impoundments and/or landfills may begin any time after they are taken out of service. As stated earlier, closure must be in compliance with existing permits or regulations and coordinated with regulatory officials. These disposal areas include ash ponds, slag ponds, metal-cleaning ponds (chemical ponds), ash piles (used for accumulation before hauling for industrial use), C/D landfills, etc. Closure of these areas usually will take the longest remediation time and may be the most-expensive tasks associated with decommissioning.

After surplus coal is removed, any coal residue that is mixed with the soil in the coal yard should be removed and disposed in the onsite ash landfill or surface impoundment or hauled to an offsite permitted facility. Permission from regulatory officials will be required for this action unless it is already covered by the RCRA and/or NPDES permits for the receiving facility. After the coal and soil mixture is removed, the coal yard should be backfilled with clean material and contoured as needed for stormwater runoff.

Site Remediation and Restoration

To determine the extent of the site remediation and restoration needed, it is important to understand the redevelopment plans for a site. Knowledge of future plans for a site helps to identify existing structures that may be beneficial for reuse and what level of site investigation and clean-up standards will be required. Most sites can follow the EPA guidance and information presented for brownfield sites (**6**). EPA has defined brownfield sites as "abandoned, idled, or under-used industrial and commercial facilities where expansion or redevelopment is complicated by real or perceived environmental contamination." Power plant decommissioning sites can be classified as brownfields because they generally are under-used industrial facilities where redevelopment is complicated by real or perceived environmental contamination. Typically, coal-fired power plants have few hazardous waste sites; therefore, contamination would be mostly perceived. As noted in the environmental assessment section of this report, clean-up standards will depend on whether the anticipated redevelopment is residential, commercial, or industrial. Also, the applicable regulations, laws, and guidelines will vary from site to site and depend on the regulatory authority that oversees the site.

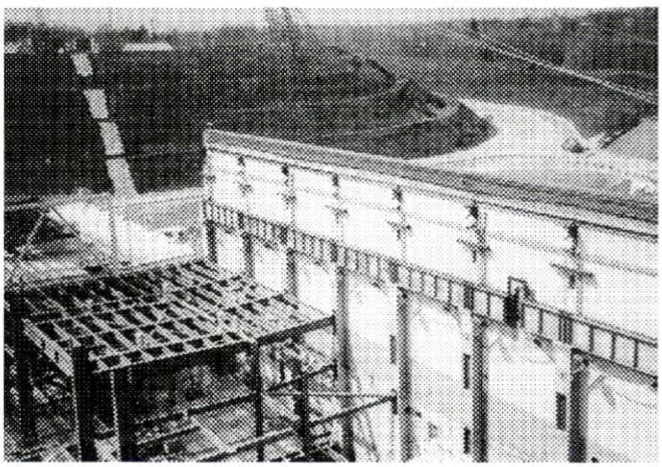


Figure 2-12
Part of the Port Washington site will be used for a new gas-fired combined cycle, shown under construction. The original wall will be retained.

Cleanup of Brownfield Sites

EPA provides information on cleanup of brownfield sites. This information may be accessed at the Web sites: http://www.epa.gov/ and http://www.clu-in.com/. EPA also has published a brownfields guide entitled "Road Map to Understanding Innovative Technology Options for Brownfields Investigation and Cleanup, Third Edition." The road map includes an outline of the steps involved in the cleanup of a site slated for redevelopment and a range of innovative technology options and resources available. The steps to be taken in a clean-up project include:

- Site assessment (American Society for Testing and Materials [ASTM] Phase I environmental site assessment)

- Site investigation (ASTM Phase II environmental site assessment)
- Clean-up options
- Clean-up design and implementation

The purpose of the site assessment is to evaluate the potential for contamination at a particular site. Any further environmental investigation and cleanup depends on whether potential environmental concerns are identified in the site assessment. The site assessment relies mostly on the collection and review of historical documents and on interviews about past and current uses and environmental conditions of the site. An important reference will be the spill history and records required by some environmental permits and documents. The environmental assessments performed in preparation for decommissioning should include this historical search and projection of contaminated sites.

Generating units generally are characterized as having several contamination problems that are relatively immobile but that often occupy large sites. When the contamination is relatively immobile, utilities commonly do not face groundwater remediation problems.

Figure 2-13
Removal of relatively immobile contamination might include fly ash and bottom ash piles, coal piles, rail facilities, substations, and transmission towers.

Such areas for coal-fired power plants might include the coal yard, electrical substations, chemical and metal-cleaning ponds, ash piles or ponds, tank areas, rail facilities, and petroleum-use equipment locations.

Site Investigations

The site investigation phase should focus on confirming whether or not contamination exists at a site, locating any existing contamination, and characterizing the nature and extent of that contamination. Based on the site assessment, sampling of potentially contaminated areas should be performed following established protocols. If predicted by the site assessment or by results from sampling during this phase, migration pathways of contaminants should be evaluated. Historically, contaminants of concern for coal-fired power plants include: (1) arsenic, cadmium, chromium, iron, lead, mercury, nickel, selenium, manganese, and zinc from the fly ash and coal pile areas; (2) polychlorinated biphenyls, polycyclic aromatic hydrocarbon, BTEX (benzene, toluene, ethyl benzene, xylene), and other petroleum hydrocarbons from oil storage and mechanical and electrical equipment; and (3) copper, iron, nickel, chromium, and zinc from metal cleaning and cooling tower blowdown wastewaters.

Special circumstances, such as historical spills, may require investigation for other contaminants. The results of the site investigation can be used to perform a baseline risk assessment to calculate risk to human health or the environment and the concentration levels of contaminants that will require cleanup. In some cases, regulatory action levels of contaminant concentration will be used to determine the appropriate and feasible levels of cleanup. Most entities support the use of risk-based clean-up standards that are specific to the end use of the property rather than "one number fits all" scenarios. Less stringent action levels may be negotiated with regulatory officials if the reuse of the property is known or if deed-record or restrictions are acceptable to redevelopment entities. Projection of the particular clean-up method to be used also can help in designing sampling and analytical plans.

Monitoring and Sampling

Relying on the data collected from the site assessment and investigation phases, clean-up alternatives are evaluated. The technologies should be evaluated for their capability to meet specific clean-up levels and redevelopment objectives, such as schedules, costs, and compatibility with the surrounding environment, area (urban, rural, etc.), and demographics. The need for future monitoring or controls also should be considered when evaluating the various technologies. For example, dig-and-haul with no future maintenance and monitoring may be preferred to a technology that requires the installation of monitoring wells because concentrations of contaminants remain after treatment.

After the areas of contamination are identified and the clean-up technologies are selected, the clean-up plan can be designed and implemented. Following cleanup of the site area, confirmatory sampling should be performed using specific sampling and analytical protocols. Successful confirmatory sampling results are a prerequisite for owners and/or regulatory officials who certify that the property is clean and can be accepted for transfer. It is important to realize that this clean-up phase can be performed concurrently with some of the demolition activities.

Costs for Decommissioning

The costs for decommissioning a power plant will vary considerably depending on the plant and on its location. **Cost information is provided for each of the three reference projects shown in Appendices A, B, and C**. Breakdown of costs as presented by the various utilities are shown in these Appendices.

- Plant Arkwright had four coal-fired units with a 160 MW capacity located outside of Macon, Georgia in a rural area. The units were built in the 1940's and the **estimated cost of decommissioning is $19M**. Plant operations ceased in September 2002 and demolition was completed in March 2004. Cleanup of the site and closure of the ash ponds is anticipated to be complete in 2006.
- Watts Bar Fossil Plant had four coal-fired units with a 240 MW capacity located in Rhea County, Tennessee in a rural area. It is collocated with Watts Bar Hydroelectric Plant and Watts Bar Nuclear Plant. The units were also built in the 1940's. **The estimated cost of decommissioning is $17M - $25M.** The facility was in and out of standby mode from 1983 to 2000 when the decision was made to retire the facility. Contracts for reclaim of boiler slag and ash from the ash ponds for commercial use as a low-duct blasting abrasive are in place through 2007. This plant is a state of partial demolition while maintaining environmental compliance and safe conditions.
- Port Washington Power Plant had six coal-fired units with a 341 MW capacity located in the City of Port Washington, Wisconsin in a scenic part of the city on the banks of Lake Michigan. The units were built in the 1930's and 1940's. **The decommissioning of Units 4-6 was completed in 2003 at a cost of approximately $12.4M. The decommissioning of Units 1-3 are scheduled to begin in November 2004 and be completed in December 2006 at a cost of $17M - $22M.** We Energies is replacing the coal-fired units with two natural gas-fired combined cycle units with a total capacity of 1000 MW. We Energies is providing the former coal dock and 45 acres of land for future development by the community.

3
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A
DECOMMISSIONING PLANT ARKWRIGHT, MACON, GEORGIA, GEORGIA POWER COMPANY

Introduction

Georgia Power Company (GPC) retired Plant Arkwright in December 2002. Plant Arkwright was one of two power plants to be retired and dismantled by GPC. Decommissioning of the plant is anticipated to be completed in 2006.

Plant Description

The Arkwright Steam Plant was designed as a four-unit coal-fired electric generating plant located on the Ocmulgee River near Macon, Georgia (Figure A-1). The four coal units had nameplate ratings of 40 MW each. Unit 1 was completed in 1941, Unit 2 in 1942, Unit 3 in 1943, and Unit 4 in 1948. Units 1 and 2 had Westinghouse turbine generators with Combustion Engineering manufactured boilers. Units 3 and 4 had General Electric turbine generators coupled with Babcock and Wilcox boilers. The boilers for all four units were 800-psi and were rated at 400,000 pounds of steam per hour with 850-degree-Fahrenheit steam temperature.

All units were served by one 564-foot concrete stack with one brick liner. Air quality control was achieved using a cold-side precipitator on each unit. The once-through cooling system was served by intake and discharge structures. Fuel-handling facilities included a coal yard, unloading system, conveyors, a crusher house, and a transfer house. The ash system included a 4,000-linear-foot ash disposal pipe trench and two active ash ponds, Number 2 (6 acres) and Number 3 (20 acres). There was one retired ash pond on the site (11 acres). The plant has one 115-kV switchyard which served all generating units.

Other site structures included a water treatment building, warehouse, lighter oil storage facility, natural gas metering station, and retaining wall on the river. Also located on this site were two 15 MW combustion turbines (CT) that were installed in 1969.

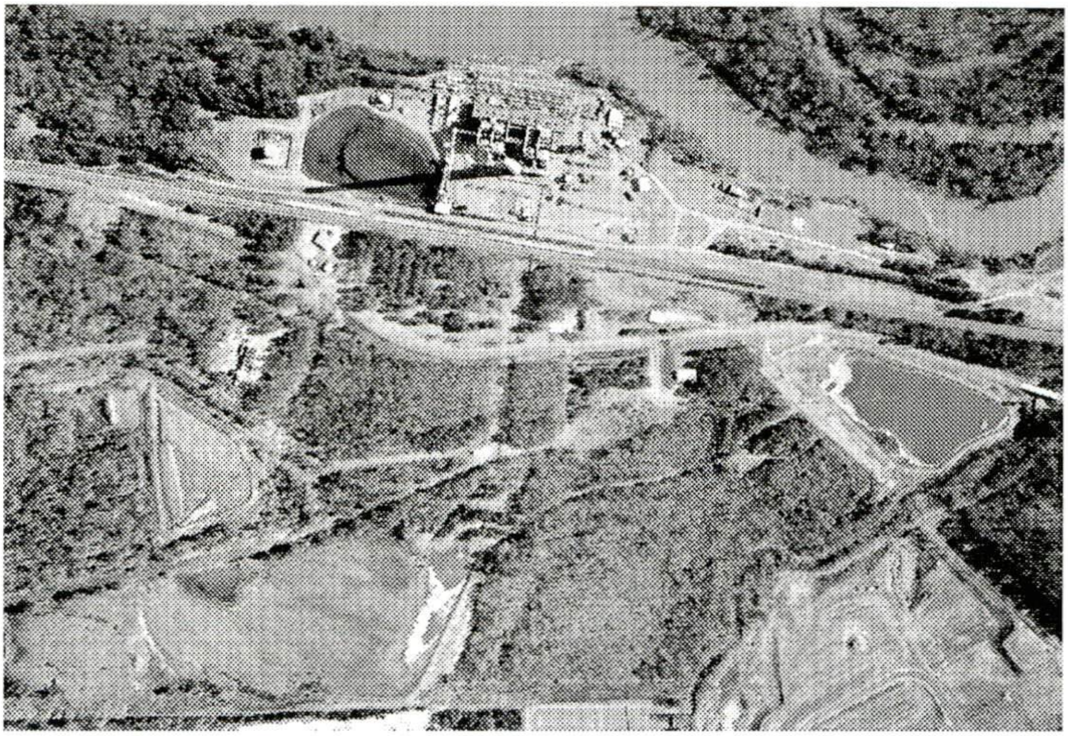

Figure A-1
Aerial View of Plant Arkwright Before Decommissioning. Located on the Ocmulgee River the site included three ash ponds. The switchyard seen behind the boilers was not decommissioned.

Decommissioning Strategy

When GPC made the decision to decommission the plant and restore the site to a condition suitable for future development, it planned to accomplish the decommissioning in two major phases. Phase I consisted of the dismantlement and demolition of the major plant equipment and structures (Figures A-2 thru A-4). Phase II consisted of the ash pond closures, environmental assessment, and any necessary clean-up of the plant site.

The first activity was to develop a dismantling plan. The strategy to achieve Phase I included: (1) evaluation of environmental and permit changes/requirements, (2) asset disposition involving the transfer of materials and equipment to other plants in the system and the salvage and resale of materials and equipment, and (3) dismantlement of the powerhouse and associated structures not slated to remain. The strategy for Phase II included the closing of the three ash ponds and an ash monofill, the preparation of the site for reuse by completing a comprehensive environmental assessment, remediating any environmentally impacted areas, and final site restoration consisting of filling and grading.

GPC personnel were responsible for the environmental evaluation, asset deposition, and closure of the ash ponds. Most of the dismantling work, including asbestos containing material (ACM) abatement and plant site preparation, was performed by a general contractor.

To obtain a general contractor, GPC started with a list of approximately 32 potential contractors. Through a questionnaire, the list was reduced to ten bidders. Bid packages were issued to these contractors for proposals and a pre-bid meeting was held. A sealed bid system with reverse auction on the actual scope of work was used. Bids were evaluated with consideration for exceptions given in determining pricing shown on the bid board. The final bid process included seven contractors. The contract was awarded based upon best value for GPC.

The decommissioning strategy included a plan to keep electrical power to the essential systems during dismantling while deactivating power to non-essential systems. The essential systems included plant lighting, turbine crane, switchyard station service, stack lighting, powerhouse elevators and batteries. Decommissioning also required prior planning for electrical disconnects to insure safety and power when needed. Essential plant records were stored for preservation before decommissioning commenced.

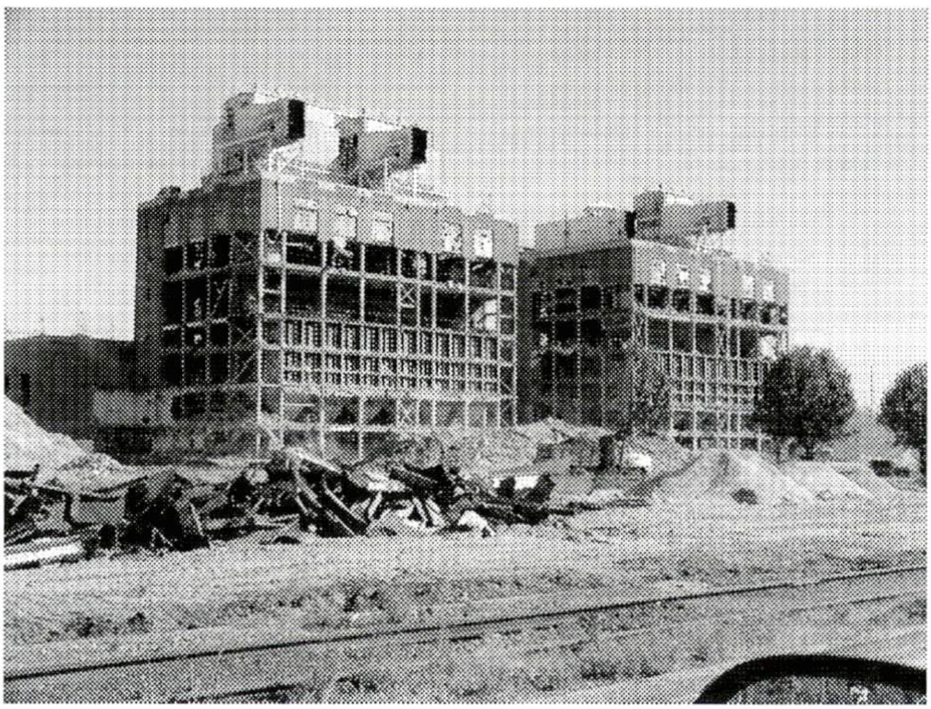

Figure A-2
Plant Arkwright During Dismantling of Powerhouses. The four 40 MW units date from 1941 to 1948. There was one stack.

Figure A-3
Plant Arkwright During Dismantling of Powerhouses. Handling asbestos prior to building demolition was a key activity.

Figure A-4
Plant Arkwright During Dismantling of Powerhouses. No land disturbances were conducted in a 25-foot stream buffer along the Ocmulgee River.

Environmental Evaluation

The planning process for Plant Arkwright included an environmental evaluation to determine the effects of decommissioning on the environment. The evaluation included decisions on handling remaining chemicals and materials, and the need for new permits or changes in existing permits to comply with regulations.

GPC included the state regulators at the beginning of the decommissioning process. Different environmental media experts in the company were assembled to discuss the environmental evaluation. In compliance with the Clean Air Act permit, GPC notified regulatory officials of the last day of generation and set the official permit closure date at December 31, 2002.

The surface water withdrawal permit was retained in the event new generation is constructed at the site. The National Pollutant Discharge Elimination System (NPDES) industrial wastewater permit comes up for renewal every five years. At the time of renewal, the NPDES industrial wastewater permit will be revised to delete all of the discharge points except the overflow stormwater discharged through ash pond number 2 to the creek.

Notifications for demolition were made including asbestos removal notification and blasting permits. Since stormwater discharges from the demolition area were determined to be via sheetflow to the Ocmulgee River, coverage of the demolition activities under the NPDES Construction Stormwater Discharge permit was not required. In addition, no land disturbing activities were conducted in the 25-foot stream buffer along the Ocmulgee River during the demolition activities.

For ash pond number 1, application for a Dredge and Fill Permit from the U.S. Army Corps of Engineers was made for work on the stream banks next to the river. Stream bank repairs on Ash Pond No. 1 were not required to be covered by the NPDES Construction Stormwater Discharge Permit (GAR 100001) since stormwater from this area enters the Ocmulgee River via sheetflow. However, construction activity on top of Ash Pond No. 1 and adjacent to the Norfolk-Southern railroad tracks was permitted under the NPDES Construction Stormwater Discharge permit since stormwater from these areas discharges to Beaver Dam Creek via a point source (dry drainage ditch). No stream buffer variances were required since no land disturbing activity was performed within the 25-foot buffer along Beaver Dam Creek.

The Federal Aviation Administration (FAA) required that lights on the stack be maintained until the stack came down and then written notification of the stack removal was required.

The biggest issues identified were the abatement of ACM throughout the plant site and the closures of the ash ponds which included the resulting effect on the NPDES industrial wastewater permit.

Closing Ash Ponds

A permit modification was sought for the ash monofill site. This modification was to allow construction, demolition, and asbestos wastes to be disposed in two separate trenches in the permitted ash monofill. Because most of the equipment/materials were reused and the debris (i.e., concrete, brick, etc.) was used as fill material onsite, very little solid waste was generated from the decommissioning of the plant.

There are three ash ponds located on the site. There is no chemical pond (which is often associated with coal-fired plants) at the site. Ash pond number 1 has not been used for several years. Ash ponds numbers 2 and 3 were active until Plant Arkwright was retired. Ash pond number 2 was used as a polishing pond and received discharges from the plant's basement sump. Water from pond number 3 overflowed to pond number 2 before being recycled to the plant for reuse. Pond number 2 will not be closed but will be the stormwater discharge point for the revised NPDES industrial wastewater permit. The NPDES industrial wastewater permit was revised because the water from the ash ponds was no longer recycled to the plant but was discharged to a creek. Ash from pond number 2 will be removed to pond number 3.

After the plant is retired and the ash ponds are no longer used for ash disposal, they are considered in Georgia to be essentially solid waste landfills which require permitting or closure. Permitting and planning is expected to take 1 to 2 years with actual closure expected to take 6 months to a year. In agreement with the state regulators, pond number 1 was closed with a cap under 1988 regulations which were in effect when the pond was retired. Pond number 3 will be closed under the new regulations after ash is brought from pond number 2. A soil and geotechnical evaluation will be performed and ash pond number 3 will be closed with a cap as a subtitle D facility with monitoring. Problems encountered included the fact that some ash was found outside the ash pond footprint and none of the ponds were lined when installed. The cost of closing the ash ponds is greater than the combined cost of the other decommissioning activities for the plant site.

Dealing with Asbestos and Other Wastes

An asbestos survey was performed in preparation for ACM abatement. ACM abatement was planned in stages with some areas requiring abatement before actual equipment/materials removal and demolition could begin. ACM not included in the initial survey was found throughout demolition. Proper notification to regulatory officials and proper recordkeeping was required and upheld during decommissioning.

GPC decided to burn the remaining coal supply before shutdown. GPC personnel removed lube oils from equipment and fuel oil from the tanks for reuse or disposal. Residual used oils were recycled during operations. The dismantlement contractor was responsible for the removal and disposal of Freon and batteries. The contractor was responsible for the removal and disposal of light bulbs, florescent lighting and high pressure mercury vapor lighting. GPC was responsible for the removal and disposal or recycle of mercury obtained from instrumentation. Even with these initial removals, chemicals, materials, and oils had to be removed and disposed or recycled periodically during dismantlement. GPC disposed of PCB containing materials and light ballasts as was done during operation.

Because Plant Arkwright was an older plant, lead paint was an issue. The biggest problem with lead paint is exposure to workers from flaking or cutting of painted materials. Disposal in a Subtitle D landfill is allowed in Georgia if the material passes the toxicity characteristic leaching procedure (TCLP) test. Most of the metal which was removed was sent to a smelter without removing the paint.

Site Cleanup Following Dismantlement

Assessment and remediation of the switchyard and other plant areas started as soon as dismantlement was completed. The environmental assessment and remediation are being performed under State Superfund requirements and the Hazardous Site Response Act. This includes an environmental assessment phase and a cleanup phase. The assessment includes testing of the soil and groundwater, evaluation, planning, and plan approval. The non-residential or industrial standards were used to develop the assessment and remediation plan. Cleanup and preparation of the site will be performed in accordance with the remediation plan. GPC will perform the environmental sampling, testing and reporting that will continue to be required for the site after Plant Arkwright is retired.

Asset disposition

Disposition of the current warehouse inventory valued at $2.2 million was accomplished in three ways: (1) usable parts were sent to other GPC plants upon request, (2) common materials were sent to a central company stores, and (3) the remaining parts and materials were sold or scrapped.

Automatic re-orders of parts and materials were stopped and service agreements terminated at the announcement of the plant's retirement. All leased office equipment was returned and remaining equipment sold or transferred to other plants. Plant Arkwright was responsible for the distribution or disposal of portable test equipment, tools, and other furnishing.

Major plant equipment was advertised for sale and buyers were sought for the steam turbines and other major plant equipment. Major equipment was sold as a whole rather than as parts. Plant equipment that had to be scrapped was disposed by the dismantlement contractor. The CTs and the steam units were removed from dispatch availability in 2002 after the peak season.

Dismantlement Tasks

Asbestos Abatement

Handling of ACM was performed according to applicable local, state, and federal regulations, as well as GPC Environmental, Health and Safety Control Documents and Asbestos Abatement Procedures. A qualified contractor was hired to conduct all asbestos removal from the site. Asbestos abatement activities were carried out in enclosed containments by trained personnel. All asbestos was thoroughly wetted, bagged, labeled and placed in dumpsters for disposal at a permitted solid waste landfill. Oversight of asbestos abatement compliance was the contractor's responsibilities. Area air monitoring was conducted by a third party. GPC periodically reviewed asbestos activities, records and qualifications, and conducted inspections of abatement activities.

Switchyard

The switchyard remained in-service during decommissioning and continues to operate as part of the GPC grid (Figure A-5). The demolition contractor did not perform any work in the switchyard. All switchyard work was handled by GPC. Dismantlement of the plant required that the switchyard controls be moved from the plant to a new building in the switchyard.

GPC removed all generator step-up (GSU) transformers, other transformers, breakers, and other generating equipment that was above ground between the high side of the GSU and the turbine building wall inside the switchyard. GPC also removed the structures and cabling associated with the generating equipment in this same area. The GSUs had to remain energized to provide a reliable source of power to the switchyard controls. Once the new switchyard control power source was installed the GSUs were de-energized and removed.

The demolition contractor was responsible for the disposal of the removed structural steel and cabling from the switchyard and removal of the foundations of the removed equipment.

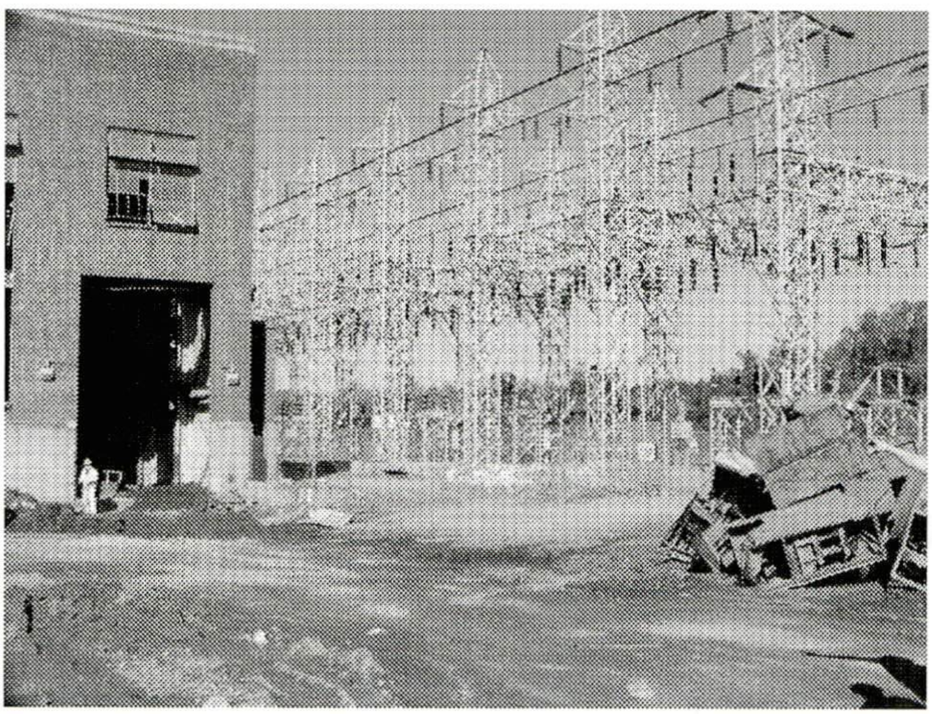

Figure A-5
Plant Arkwright Switchyard Which Remains In Service. Electrical power to essential systems (such as plant lighting, turbine crane, and power house elevators) was retained while power was deactivated to all non-essential systems.

Disposition of the Plant Structures

Structures which were demolished and all associated equipment dismantled included:

- Administration Building
- Potable Water System
- Project Services Shed
- Club House
- Ash Silo
- Water Treatment Building
- Old Maintenance Building
- Emergency Response Team (ERT) Building
- Turbine Building
- Both Boiler Houses
- Natural Gas House
- Used Oil Storage Building
- Shaker House
- Fossil Fuel Building
- Chlorinator Shed
- Compressed Gas Shed
- Air Compressor House
- Fire House
- Yard Lighting
- Fire Protection System
- Circulating Water Intake and Discharge
- Oil and Water Storage Tanks
- Stack
- Precipitators
- Hay Barn

Structures which remain include:

- Roadways, Curbs and Gutters
- Sidewalks

- Parking Lots
- Fences
- Railroad Track System
- Warehouse
- Training Building

Use of Fill below Grade Level

Buildings and structures other than the powerhouse were demolished to the concrete slab, or to grade, if not on a slab. After the interior equipment was removed, the powerhouse basement cavities were partially filled with uncontaminated brick and concrete debris and the powerhouse structure imploded (Figure A-6). In filling the cavities, larger pieces of material were placed at the bottom. As the compaction need increased toward the top, the size of the fill material decreased. The powerhouse was cleared to the base slab after demolition. All foundations were removed to one foot below grade. The area was filled to one foot from grade and covered with dirt up to grade.

Explosives were used to lay the chimney to the ground and the debris was used as fill material (Figures A-7 and A-8). The chimney foundation and other sub-surface foundations were either punctured to provide drainage as needed, or removed.

The intake and discharge bulkhead structures were left in place. All screens, pumps, hoists and other equipment were removed from the structures. The gates were put in place to limit access to the tunnels. The bulkhead structures (intake and discharge) were filled with rip-rap to a level above the tunnels to prevent access. All open drains, piping or other penetrations were plugged with concrete to prevent any fluid from entering or exiting the drains, piping or penetrations before covering.

All piping and pipe supports were removed and scrapped or properly disposed. All above ground tanks were cleaned and demolished to base slab. All slabs and containment structures were removed. The water tanks on top of the powerhouse remained until the powerhouse structure was imploded and then the tank debris was removed. The open hopper pit and all of the other open pits created by the demolition of buildings or structures were filled with uncontaminated brick and concrete debris up to one foot of grade level and covered with dirt up to grade.

The above ground portion of the plant natural gas system was removed and salvaged including the heaters, filters, pig launcher and pig receiver. The piping was removed to three feet below ground. All gas piping three feet or more below ground was purged with nitrogen and capped.

Figure A-6
Plant Arkwright During Filling of Powerhouse Basement Cavities. A ramp was contructed to fill the basement to grade level.

Figure A-7
Explosives Were Used to Lay the Plant Arkwright Chimney to the Ground (View 1). Clearly the direction of stack fall was critical.

Figure A-8
Explosives Were Used to Lay the Plant Arkwright Chimney to the Ground (View 2).

Schedule and Costs

Plant Arkwright ceased generation on September 15, 2002. Demolition of the plant structures was completed on March 24, 2004. The environmental assessment for remediation of the site will be completed by December 31, 2004. Cleanup of the site including closure of the ash pond numbers 1 and 3 and the onsite landfill will be completed in 2006.

The total cost incurred for the decommissioning of the Arkwright plant is estimated to be approximately $19,000,000. Estimated costs for separate tasks are as follows:

TASK	COST, $
Indirect Project Support	3,700,000
Dismantlement	2,000,000
Asbestos Removal & Other Environmental	3,300,000
Ash Pond Closures	10,700,000
Salvage	(700,000)
Total	19,000,000

B
DECOMMISSIONING WATTS BAR FOSSIL PLANT, RHEA COUNTY, TENNESSEE, TENNESSEE VALLEY AUTHORITY

Introduction

The Watts Bar Fossil Plant (WBF) was the first steam plant constructed by the Tennessee Valley Authority (TVA) to help meet the growing demand for electricity due, in great part, to World War II production efforts (Figures B-1 through B-3). Construction began on July 31, 1940. The first of four 60-MW units was placed in commercial operation on February 15, 1943, and the last unit on April 8, 1945. After 15 years of operation, the plant was placed in an extended shutdown mode in 1957. Because of rapid load growth, the plant was returned to service in 1970. But with WBF's relatively high cost of power production, the plant was again shut down and then placed in extended shutdown mode in 1983. Much of the plant equipment was laid up for potential future operation. In the ensuing years, several restart studies were performed. None indicated that returning WBF to service would economically benefit TVA. In 1997, as a cost saving measure, TVA terminated air permits for the plant. Until July 14, 2000, the turbines were turned on a weekly basis to prevent bowing of the turbine shaft. At that time, the turning operation was terminated. At present, WBF is in decommissioning status.

Figure B-1
Watts Bar Fossil Plant Powerhouse Entrance.This 240 MW, 4-unit coal fired plant was built from 1943-1945 in Rhea County, Tennessee.

Figure B-2
Watts Bar Fossil Plant Powerhouse. Coal conveyor with Transite Panels Removed is Shown on the Right. The coal-fired plant used 82 acres of the 1067 acre site. Also on the site are a nuclear and a hydro plant.

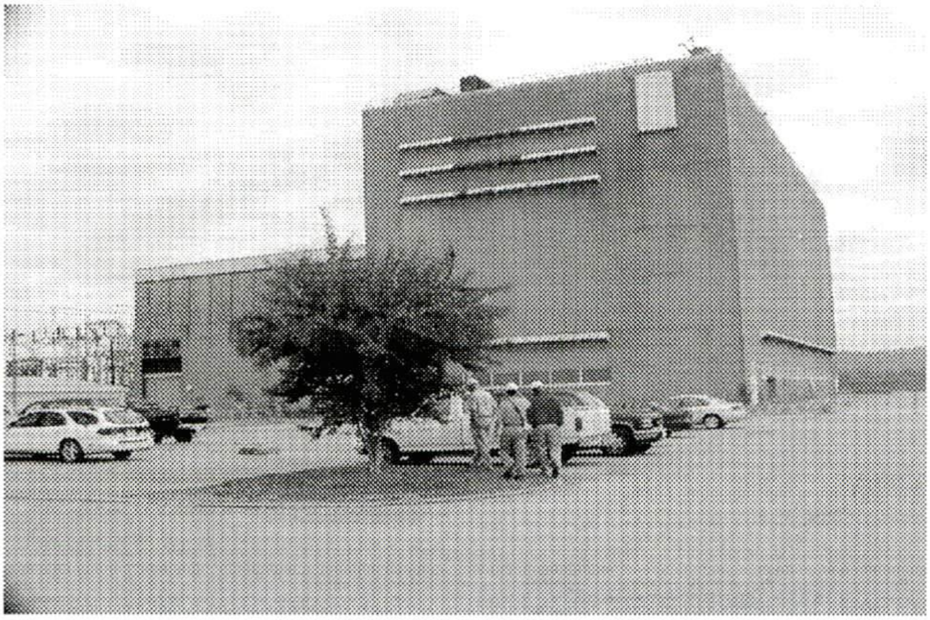

Figure B-3
Watts Bar Fossil Plant Powerhouse, Turbine Room, and Switchyard. The coal-fired plant was selected for partial decommission and for site cleanup, while retaining the need for environmental compliance and safety.

Plant Description

WBF is located in Rhea County, Tennessee, just downstream from the Watts Bar Dam on the western side of the Tennessee River. WBF uses 82 acres of the 1,067 acres of the Watts Bar Reservation. Also located on this reservation are the two-unit Watts Bar Nuclear Plant and the Watts Bar Hydroelectric Plant.

When constructed, the WBF units were considered to be on the leading edge of design. The turbines are horizontal-cylinder, single casing, impulse design, with 17 stages. The first stage is 2-row construction, and the remaining rows are single-row construction. The turbine is designed for steam conditions at 850 pounds per square inch, 900°F, and 2-inch mercury condenser backpressure. The direct-connected generator was 60,000-kilowatt rated capacity, air cooled, and turned at 1,800 revolutions per minute rated speed. The total nameplate capacity of the plant was 240 MW.

Decommissioning Strategy

After the plant was placed in extended shutdown mode in 1983, several investigations were conducted to study plant restart. The last two formal studies were performed in 1992 and 1994. The 1992 assessment was undertaken to determine the minimum restart requirements as part of a long-term plan for maintaining and upgrading the facility for extended operation. The assessment determined that no "fatal flaws" existed to prevent the plant from being restarted. However, this assessment did not include diagnostic or functional tests that would have taken about nine months and would cost approximately $2 million. The study projected that the engineering and construction phases would require 35 months to complete and would cost $74 million.

WBF was included as part of a multiphase repowering study conducted in 1994 that considered 10 repowering alternatives. The decision was to continue on course for WBF and not convert the plant to municipal waste and biomass, natural gas, or other alternatives. The various restart options considered in the 1994 study were again evaluated in 2000. Neither the 1992 nor 1994 studies were updated in light of the new source performance standards that would be applicable because the air permits had been terminated. Considering the rehabilitation expense and the termination of the air permits in 1997, TVA determined that operating the plant was no longer a viable option and the plant should be retired.

During the restart evaluation in 2000, TVA also considered three decommissioning options: (1) take no action and maintain the site in present condition, (2) partial demolition and site cleanup, and (3) total demolition and site closure. The final decision was to perform partial demolition and site cleanup and to maintain environmental compliance and safety at the site.

Environmental Evaluation

An Environmental Site Assessment was completed for WBF in August, 2000. The objective of the site assessment was to determine the plant's environmental status and to specify environmental compliance liabilities and issues. This report identified existing and potential environmental issues and prioritized those posing risks. Recommendations were made on how to remedy current and future liabilities that had been identified.

Potential environmental issues identified during inspection were:

- Asbestos
- Lead paint
- Mercury
- PCBs

Additional areas of concern included:

- Solid waste
- Switchyard remediation
- Chemicals of concern
- Safety

The identified environmental risks were considered to have the potential to be in violation of federal, state, or local environmental laws, regulations, or permits.

Asbestos

Numerous areas both inside and outside the powerhouse were identified where ACM had become dilapidated or water damaged and had fallen to the floor. Additional areas were noted where the intact ACM did not demonstrate cohesive characteristics, resulting in a high potential for additional releases with little or no disturbance. Transite panels (non-friable asbestos mixed with concrete) on the buildings and conveyer belt systems generally were in good condition. However, paint was peeling from the panels. Thus, it was determined that the panels were beginning to weather, causing some of the asbestos to become friable and increasing the risk of employee exposure as well as the inconvenience of having a reportable release of asbestos. No evidence inside the building of airborne friable asbestos being released to the outside environment existed. However, the building had to be sealed and closed to ensure that no future releases escape to the outside. Another consideration was to prevent asbestos from falling off equipment and contaminating water discharges from the powerhouse.

Lead Paint

Numerous areas, both inside and outside the powerhouse, were identified where lead paint had fallen to the floor, becoming a hazardous waste. Of greatest concern was the possibility that the lead paint could be swept up and disposed in a regular solid waste container, thus resulting in the illegal disposal of a hazardous waste. Also identified were areas where intact lead paint was peeling and where additional releases were a high probability. Examples of areas of concern were the deteriorating and flaking paint on the exteriors of the buildings and coal-handling structures.

Mercury

More than 330 items of mercury-filled equipment, including manometers, switches, thermometers, etc., were found in the powerhouse. Some of the pieces were not intact and had to be evaluated for mercury spills.

PCB

The assessment identified 14 PCB-contaminated transformers onsite that would require proper management and removal. A review of available records, from 1982 to the time of the assessment, revealed spills of PCB oil from transformers. These spills required further cleanup.

Solid/Hazardous Waste

Several ponds on the WBF reservation were observed during the site assessment, including the ash pond, chemical treatment pond, slag pond, settling pond, and coal-yard pond. Between the slag pond and the ash pond is the redwater ditch that is high in iron content. The ditch collects acidic runoff from the slag pile and dry storage area. The water in the ditch normally flows to an accumulation area, is pumped to the redwater pond, and then overflows to the ash pond. Potential for unintended bypass of the redwater ditch was of concern because of the ditch design. The coal yard no longer stores coal.

Through a competitive bidding process, TVA, in March 1996, awarded to Grangrit, Incorporated, and Stan-Blast Abrasive Company a contract for the removal of boiler slag and ash from the storage areas for use as low-dust blasting abrasives. Removal of the slag and ash is still in progress (Figure B-4 through B-6). WBF has a National Pollutant Discharge Elimination System (NPDES) permit that authorizes the discharge from the ash pond and the stormwater outfalls. The outfalls are monitored as required by the permit. Because of actions by Stan-Blast, control of pH in the ponds gets special attention. The state regulatory agencies were notified that an air permit was not required for the Stan-Blast operations.

Figure B-4
Watts Bar Fossil Plant Slag and Ash Reclamation (View 1). While the slag and ash is being removed, that will continue until 2007, the ponds will not be re-mediated. Then final clean-up requirements will be negotiated with the Tennessee Department of Environment and Conservation.

Figure B-5
Watts Bar Fossil Plant Slag and Ash Reclamation (View 2). Several ponds were studied in the environmental site assessment completed in August 2000, including ash pond, chemical treatment pond, slag pond, settling pond, and coal year pond. The Watts Bar National Pollutant Discharge Elimination System (NPDES) will be maintained and the outfalls monitored.

Figure B-6
Watts Bar Fossil Plant Slag and Ash Reclamation (View 3). The contract for this work, begun in 1996, continues through 2007.

Switchyard Remediation

The WBF switchyard provides power to the plant, utility building via the station service transformers, and the Watts Bar Nuclear Plant engineering office complex. Within the switchyard is a main transformer and a station service transformer for each of the four units. Banks A, B, and C are out-of-service. Only the main transformers in Bank D are in service. The transformers were tested and were found to contain less than 50 ppm PCB. During the site assessment, oil stains from spills were observed in the switchyard, requiring cleanup and monitoring.

Chemicals and Oils of Concern

Chemicals, used for plant operations, that required reuse or disposal as a waste were identified. Because the plant had not been operated for quite some time, many of the chemicals already had been sent to other sites for reuse. Approximately 200 gallons of hydrazine, stored in 55-gallon drums in the turbine bay, and other chemicals in the laboratories were identified. Several oil tanks in the powerhouse contained oil and were included in the Spill Prevention, Control and Countermeasures (SPCC) inspections. Although the oil in the tanks (i.e., turbine oil tank, dirty/clean oil tank, turbine lube oil tank) was not being used, the age of the tanks presented a liability of releasing oil to the environment.

Safety

In addition to environmental issues, the assessment identified the following safety concerns:

- Exterior transite asbestos paneling was coming off the hopper building.
- A side roof structure of the hopper building, which is covered with asphalt roll roofing, was deteriorating, thus resulting in decay of the wood supports. The roof is at ground level and posed a safety hazard of someone falling through the structure.
- The powerhouse roof precipitator steel frame was corroding because it was uncoated, and metal plate panels had the potential to fall off and cause damage to the roof or blow into the switchyard.
- The roofs of the office building and turbine room were leaking, resulting in interior damage.
- The exterior brick on the powerhouse had significant cracking. The brick on a parapet wall on the boiler roof showed signs of being pushed out.

Decommissioning Tasks

As stated earlier, TVA's decommissioning strategy was to perform partial demolition and site cleanup. A priority was to clean up and stabilize immediate environmental and safety hazards and provide sufficient O&M to maintain compliance. TVA now has restricted access to the powerhouse and other areas at WBF because of concerns with asbestos and lead paint exposure and injury from unstable equipment or structures. TVA continues to monitor the plant area for environmental and safety concerns and to meet regulatory control and reporting requirements. The environmental and safety clean-up and remediation tasks began immediately following the risk identification in the August 2000 Environmental Site Assessment.

WBF has an NPDES permit that authorizes the discharge from the ash pond and the stormwater outfalls. The permit requires routine monitoring of the outfalls and routine inspections in accordance with the Integrated Pollution Prevention/Integrated Contingency Plan (IPP/ICP).

The following three options to address mitigation were evaluated in the August 2000 Environmental Site Assessment for each of the environmental liabilities or risks identified:

1. Do not remediate or remove areas of environmental concern, but implement management procedures to clean up any future releases or spills on a periodic or as-needed basis (i.e., remove asbestos lying on the floor and lead-based paint from the floor area; clean up mercury, PCB oil, or other spills upon discovery; etc.).
2. Fully characterize, clean, and remove released hazards, and stabilize environmental liabilities (i.e., encapsulate friable asbestos, install oil water separator for switchyard, remove low-cost issues such as mercury-filled equipment, etc.).
3. Remove and abate all environmental issues in preparation for complete facility demolition.

The level of mitigation prescribed for each of the identified risks varied and was based on liability potential, regulations, assigned priority, and costs. A discussion of mitigations performed follows.

Asbestos

Approximately 420 cubic yards of ACM was removed and disposed in the Chestnut Ridge Landfill in Heiskell, Tennessee. This included asbestos-containing transite panels from portions of the coal conveyor system. An asbestos O&M plan was developed and implemented. Access to the asbestos areas is restricted and controlled. The powerhouse building was prepared to be airtight. The practice is to inspect for ACM periodically, block off areas where ACM has fallen, and clean up the fallen materials annually or more frequently, if volume dictates. Asbestos assessments are performed annually under contract.

Lead Paint

Lead-based paint flakes were collected and disposed as a hazardous waste. The blue transite panels were removed because, in addition to containing ACM, they had been painted with lead-based paint. The restricted and controlled access to the asbestos areas also serves to prevent access to the areas where lead-based paint is flaking and falling. Areas at the plant are monitored periodically, and flakes that accumulate on the floor are cleaned up, as needed.

Mercury

The more than 330 mercury-filled devices from within the powerhouse and car dumper building have been scheduled for removal and disposal.

PCB

Seven areas contaminated with PCBs were encapsulated, and 14 transformers were removed.

Solid/Hazardous Waste

TVA has decided not to remediate the coal yard at this time. TVA also has decided not to remediate the ponds while the recovery of slag and ash is continuing. Improvements were made to the redwater ditch and its equipment. The caustic drip system for controlling the pH to the ash pond continues to be managed and maintained.

The ash removal contract continues until 2007. TVA expects to continue ash removal until all the ash is recovered. TVA developed a sediment and erosion control plan for the bottom-ash washing and screening operation and for other ash removal activities, and ensures compliance with the plan. Once the ash is removed, or if the operation is discontinued, TVA will negotiate clean-up requirements with the Tennessee Department of Environment and Conservation (TDEC).

WBF recycled 1,011 tons of structural metal.

Switchyard Remediation

TVA removed some of the transformers and installed a secondary containment downstream from the switchyard. The risk of an oil spill was reduced by draining and recycling 21,050 gallons of oil from transformers located in the switchyard.

Chemicals and Oils of Concern

Six 55-gallon drums of hydrazine were transported to a recycling facility. A 28,000-gallon propane tank was sold through TVA's Investment Recovery group. Chemicals used for plant operations were transported to other TVA sites for reuse. Some remaining chemicals are being used as needed onsite (e.g., floor cleaners, "Current Issue" cleaner). Oil was drained from the powerhouse lube oil tanks and the drains blank flanged. Approximately 38,300 gallons of oil was recycled.

Safety

In addition to installing a security fence to restrict and control access to the WFB site, TVA provided additional lighting for critical areas of the powerhouse to ensure safety. TVA, in addition to taking 4 precipitators and 2 stacks from the powerhouse roof, removed 2 conveyor structures and a hopper building to improve safety. A new powerhouse roof was installed with new roof flashings and drains. The exterior parapet wall was repaired to ensure safety and to maintain building integrity by preventing internal damage and release of asbestos and lead-based paint.

TVA will continue to provide sufficient O&M funds to maintain regulatory environmental and safety compliance.

Costs

Preliminary TVA estimates project the cost of taking the WBF site to greenfield conditions to be $17 million to $25 million (values are in calendar year 2000 dollars). This includes minimal estimates of $4.5 million for lead and ACM removal, $0.5 million for switchyard removal (not including resulting improvements required for service to other areas), $2.8 million for dry solid waste area remediation, and $6.2 million for wet solid waste area remediation. Estimates for remediation of dry solid waste areas are based on approximately $80 per acre, and for remediation of wet solid waste areas, approximately $170 per acre.

TVA began the decommissioning tasks to reduce environmental and safety risk in fiscal year 2001. Since then, TVA has spent approximately $2.34 million. And, TVA is budgeting $200,000 per year for O&M costs to monitor and maintain compliance and safety at WBF.

C
DECOMMISSIONING PORT WASHINGTON POWER PLANT, PORT WASHINGTON, WISCONSIN, WISCONSIN ELECTRIC POWER COMPANY

Introduction

Wisconsin Electric Power Company, a Wisconsin corporation, doing business as We Energies, completed the demolition of coal-fired power Units 4, 5, and 6 and the south chimney in 2003. Decommissioning of Units 1, 2, and 3 and the north chimney will begin in October 2004 with completion anticipated by January 31, 2006 (Figure C-1). The coal-fueled units are being replaced by two 500-megawatts (1,000 megawatts total) natural gas units (Figure C-2).

This report describes the planned decommissioning of the remaining coal-fired Units 1-3 with associated support facilities and the north chimney. We Energies is coordinating the decommissioning of the coal-fired power plant and redevelopment of the 243-acre site with the City of Port Washington, the Wisconsin Public Service Commission, and other state agencies. Redevelopment of the site includes the installation of the natural gas power facility, preservation of historical aspects of the coal-fired power plant, and donation to the city of the 1,000-foot long coal dock and over 45 acres of land south of the plant for future development. The historical structures which will be preserved are shown in Figures C-3 through C-6.

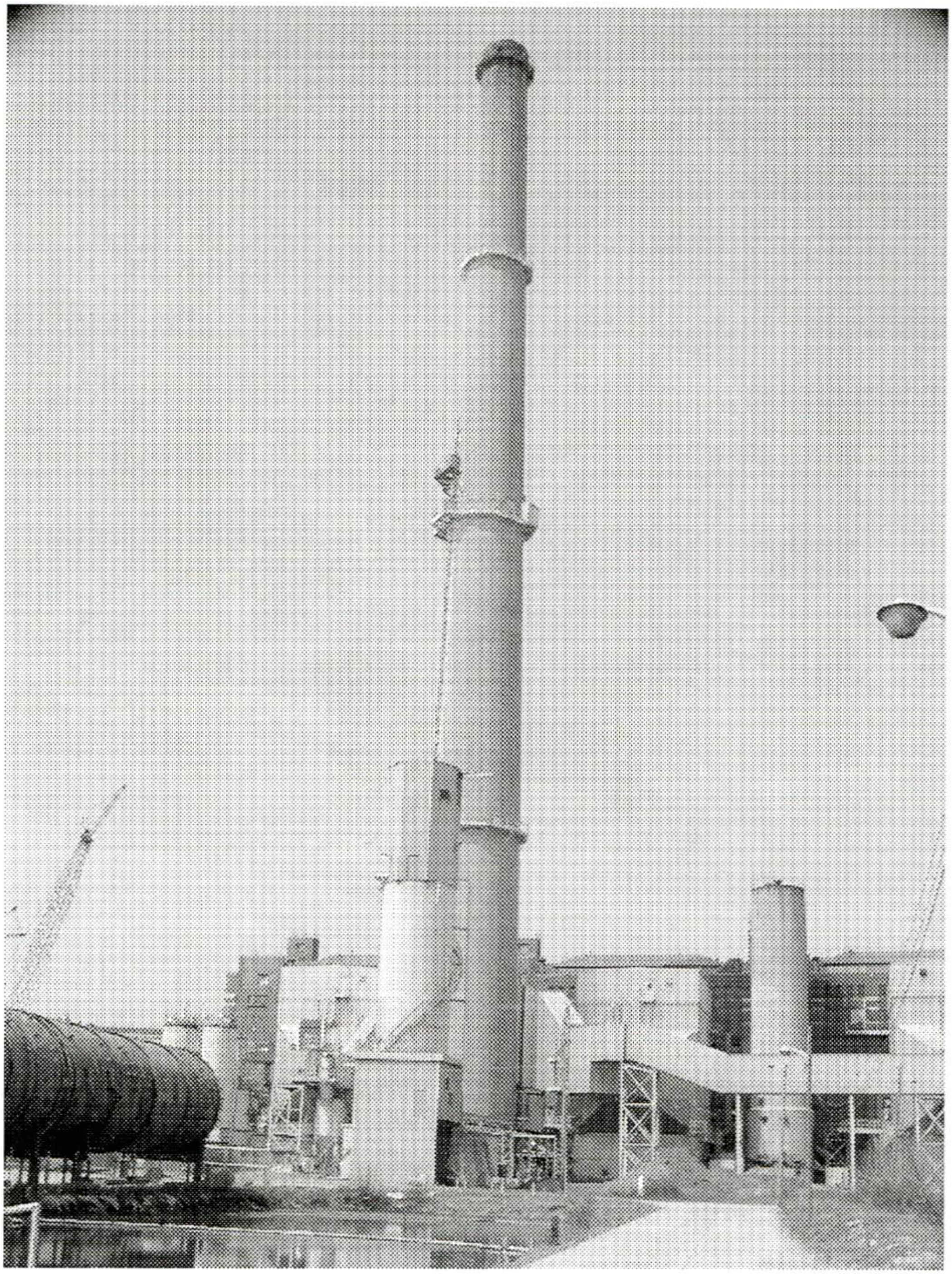

Figure C-1
Port Washington Power Plant with Stack. The coal-fired plant was a six-unit, 341 MW plant installed from 1935 to 1950. It is being replaced by a gas-fired combined cycle on the same site.

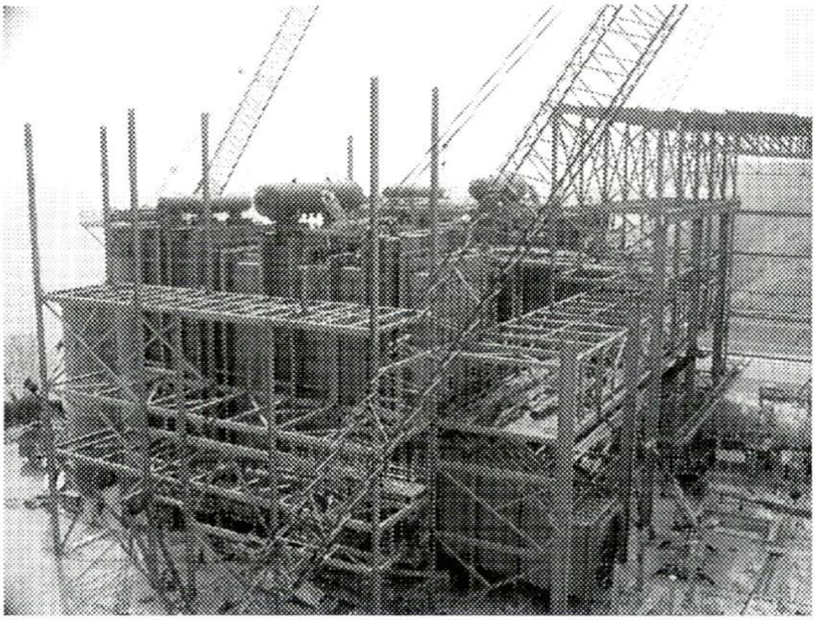

Figure C-2
Construction of Natural Gas Units Which are Replacing the Coal-Fired Units at the Port Washington Power Plant. Construction of the new plant proceeds at the same time as final coal plant demolition.

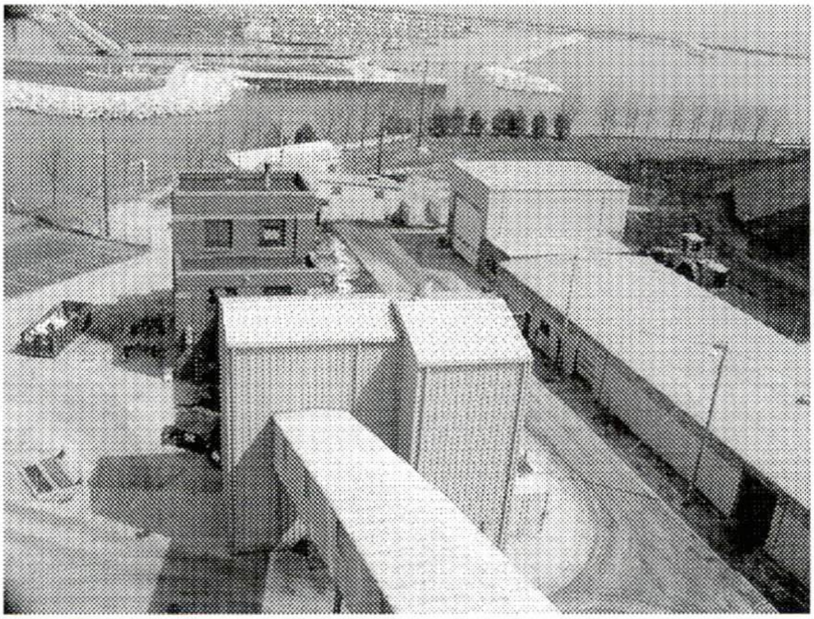

Figure C-3
Port Washington Power Plant Coal Crusher Building. The coal crusher building and coal conveyers will be removed, permitting a recreational path and public access to the beach south of the plan0074

Figure C-4
Port Washington Power Plant Historical Admin/Service Building. The building will be retained, along with the auxiliary boiler building and supporting equipment.

C

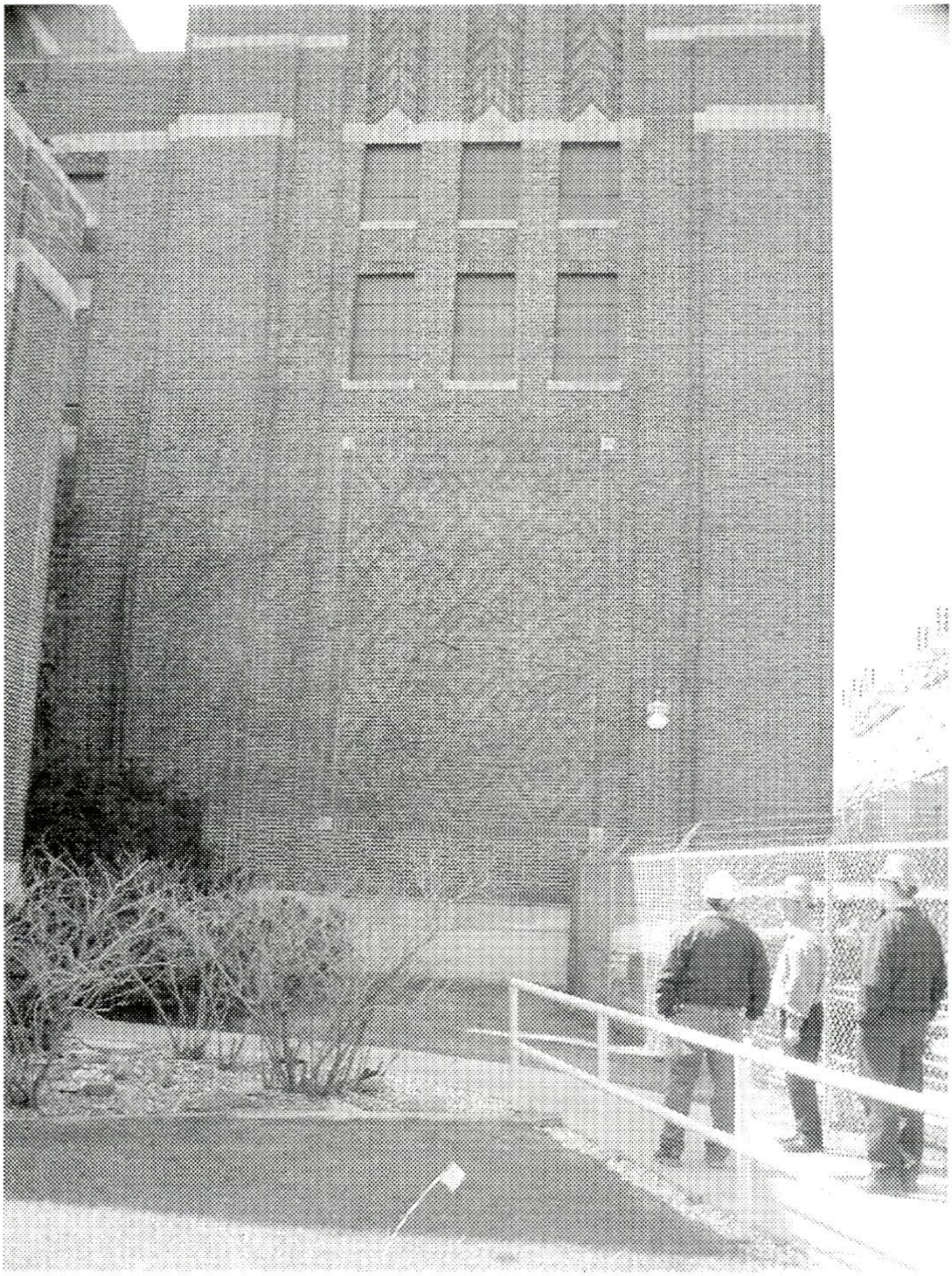

Figure C-5
Port Washington Power Plant Historical North Wall of Powerhouse. This wall will be retained alongside the new gas-fired power plant.

Figure C-6
Port Washington Power Plant Historical West Wall of Powerhouse. This wall is being preserved next to the new natural gas units. Also seen here is new land and roadway construction for access to the new gas-fired plant.

Plant Description

The Port Washington Power Plant is located in the City of Port Washington, Wisconsin on the shores of Lake Michigan. The Port Washington Power Plant was constructed during the height of the Depression in the early 1930s providing employment for hundreds of people at the plant site. It took more than five years and about $7.5 million to build Unit 1 of the Port Washington Power Plant. Earth-moving equipment scooped 275,000 cubic yards of dirt out of a bluff on the Lake Michigan shoreline to make room for the plant. The dirt was used to form the fill for the plant's 1,000-foot-long coal dock (Figure C-7). The first generating unit was placed in service on September 1, 1935, the 100th anniversary of the founding of the City of Port Washington. An old photograph of the Port Washington Power Plant prior to demolition of any of the units is shown in Figure C-8.

The performance of the plant's Allis-Chalmer's 80,000-kilowatt turbine-generators and Combustion Engineering's boilers was a major part of the reason Port Washington was the world's most-efficient power plant for its first 13 years of operation. After the initial generating unit was placed in service in 1935, new generating units were added in 1943, 1948, 1949, and 1950 for a total of 341-megawatts of power. Each unit required its own chimney. In the mid 1960s, two 500-foot stacks replaced the shorter ones.

Figure C-7
Port Washington Power Plant Coal Dock. The 1000 ft long coal dock was originally constructed in 1935 from 275,000 cubic yards of dirt from a bluff on the Lake Michigan shoreline that made room for the plant.

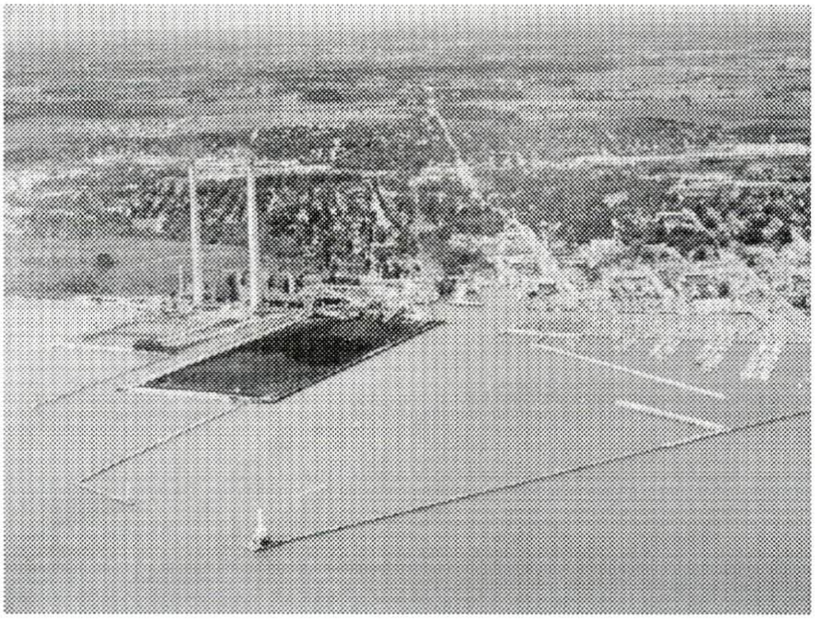

Figure C-8
Port Washington Power Plant on Lake Michigan in Wisconsin Prior to Demolition of Any Coal-Fired Units. The 1000 ft coal dock and 45 acres of land south of the plant will be made available for future development.

Decommissioning Strategy

Once We Energies made the decision to complete the decommissioning of the Port Washington coal-fired power plant and replace it with a natural gas power generation plant, they began developing a strategy to accomplish the tasks. The initial task was to include the City of Port Washington and the state of Wisconsin in the decision process. Based on negotiations with the city and state, We Energies decided to preserve the architectural integrity of the existing buildings with historical significance while improving the overall look of the plant site with the installation of the new natural gas power plant. The conversion frees up land for public use, including a recreational path and public access to the beach south of the plant. The 1,000-foot long coal dock and over 45 acres of land south of the plant are being made available for future development.

To complete the dismantlement of the selected coal-fired facilities, We Energies decided to contract for a turn key operation with a few exceptions. We Energies began soliciting bid proposals in February 2004. The Contractor's base bid proposals were to be on a firm, lump sum basis. Contractors were also encouraged to offer other arrangements; i.e., fixed fee, shared cost savings, cost reduction incentives, etc., if the alternative pricing would be advantageous to We Energies.

The Contractor will be responsible for complete demolition of the Port Washington Power Plant Unit 1, 2, and 3 facilities as defined in the specification and drawings provided by We Energies. The work will include the abatement, removal, and disposal of all asbestos containing and hazardous materials on the project site. The Contractor will demolish and remove from site all power plant equipment, electrical gear, controls, piping, and all structural steel and concrete pedestals from Unit 1, Unit 2, and Unit 3 at the Port Washington Power Plant. Removal and demolition also includes the east yard buildings (including equipment, foundations, and basins), #7 stack, and north coal handling area buildings, foundations, and equipment. The work will include the supply of all necessary labor, materials, equipment, storage facilities, permits and fees, and temporary facilities as required for completion of the work.

We Energies or others by contract will perform additional tasks such as the following:

- Isolation of all systems and equipment for removal purposes.
- Draining and disposal of lubricants within equipment lubrication sumps and reservoirs.
- Relocation of spare parts and salvaged equipment from the work site not included in the work scope.
- Removal of the liquid propane storage tanks currently located on the north side of the facility.
- Removal of CO_2 from the Unit 2 and Unit 3 generator purge systems, the Unit 1 auxiliary and spare transformers, and the Unit 3 auxiliary transformer.
- Removal of bulk hydrogen from the Unit 2 and Unit 3 turbine-generators.
- Removal of Halon from the fire suppression system in the Unit 2 Satellite room and Unit 3 Terminal Room.

- Removal of Dry Sorbent Injection (DSI -sodium bicarbonate) material from the storage tanks.
- Removal of any fuel oil from within the underground fuel oil storage tanks.
- Isolation of the main transformers from the switchyard bus system.
- Draining and disposal of the main and auxiliary transformers coolant.
- The development of abandonment plans for concrete settling basins, east coal pile runoff pond, and tertiary settling pond.
- The design and installation of a temporary storm water treatment system for the coal dock and north yard areas during the demolition of the existing facility.
- Asbestos abatement of the concrete stack (with the exception of residual asbestos under fasteners and attachments such as platform supports, conduits, elevator rails, and enclosure abutments).

Environmental Evaluation

We Energies will require the Contractor to comply with the requirements of applicable laws and regulations, the noncompliance with which would materially and adversely affect We Energies' business or it financial condition. As a minimum, applicable codes and regulations included:

- Wisconsin Administrative Code (WAC).
- Occupational Safety and Health Administration (OSHA).
- Environmental Protection Agency (EPA).
- Wisconsin Department of Natural Resources (WDNR).
- National Fire Protection Agency (NFPA).
- American National Standards Institute (ANSI).
- National Institute of Occupational Safety and Health (NIOSH).
- Wisconsin Department of Health and Family Services for Asbestos and Lead Paint Certifications.

The Demolition Contractor will be required by We Energies to obtain all necessary federal, state and local permits for the stated work (i.e., ACM abatement, lead abatement, WDNR demolition notification, etc.).

We Energies has applied for the following permits to decommission and demolish the facilities:

- Chapter 30 – Wetland permit
- WPDES (Wastewater Pollution Discharge Elimination System) discharge permit
- NR-216 Temporary stormwater runoff permit
- EPA Title V permit

- ACOE (Army Corps of Engineers) Army General GP/LOP-98-WI permit
- Ozaukee County Department of Environmental Health zoning permit

We Energies will retain a third party environmental inspector to observe and report on contractor's performance to the Company. We Energies will provide full-time site support during demolition for environmental and safety monitoring and contract compliance. The contractor will be required to have a full-time Department of Health and Family Services certified asbestos supervisor available throughout the entire demolition work as well as a Safety Supervisor.

We Energies contracted to have a Hazardous Materials Survey (including ACM inventory and characterization) performed, and provided copies to the contractors for their use in the bidding process and completion of the work.

Environmental and safety requirements included in the bid requests by We Energies for the contractor included:

- Follow work procedures that ensure no spills during contract activities and shall have a written plan to mitigate if a spill were to occur.
- Notify We Energies immediately if contaminated or hazardous materials are encountered during the demolition process.
- Proceed with demolition of a building and its contents only after Pre-Cleaning, ACM Abatement, Lead Abatement, Removal of Other Regulated Materials, and Equipment Decontamination and Removal have been completed within that building, and physical separation of all piping, cabling, and conduits from the remaining portions of the building have been completed.
- Verify, by walkdown that the conduit, cables, and piping have been physically disconnected to the area undergoing demolition.
- Observe and verify that all applicable We Energies' environmental, safety and plant operating rules, including protective tag procedures, and all security procedures are followed.
- Maintain documentation of all training provided to contractor employees and subcontractors.
- Maintain all records and documentation required by the work including laboratory, shipment and sales records and make them available for We Energies review and copying for five (5) years.
- Maintain and update its environmental management activities as required by legal permits, regulations or internal requirements. The contractor will allow Environmental Management Services audits on at least an annual basis during the duration of this Agreement. The ISO 14001 EMS standard will be used as the audit protocol.
- Must successfully pass an environmental certification audit conducted by We Energies.
- Take boring samples to verify the extent and type of contamination when dealing with possible ground contamination

During operation the fly ash is removed through an electrostatic precipitator (ESP), collected by a vacuum operated system, and stored in a silo. The fly ash is transferred into enclosed trucks for disposition to a company owned and operated landfill or transported to other company facilities to be reburned. The bottom ash and boiler slag is removed from the boilers via water blasting or air lancing. This material is collected and stored in a bottom ash de-watering pit for later transfer to a We Energies owned and operated landfill. For decommissioning purposes, the fly ash silo shall be emptied and vacuumed clean prior to turnover to the demolition contractor. The bottom ash de-watering pit shall be dredged as thoroughly as possible prior to turnover to the demolition contractor. Soil borings will be collected to measure the extent of remediation necessary.

Remediation and filling will be necessary for the coal pile runoff pond, bottom ash de-watering pit, tertiary pond, and the coal dock area. During the Units 1-3 demolition, the only area to be addressed by the contractor is the de-watering pit as the other areas are to be kept in service or used as lay down for the construction phase. When construction is complete, closure, remediation, and filling will be performed on these remaining areas.

All hazardous material including asbestos, lead, mercury, petroleum hydrocarbons, and PCB contaminates will be abated and removed from the pre-specified demolition areas prior to the start of demolition and equipment removal within such area. All Regulated Materials that are found or generated during abatement and demolition will be appropriately handled and disposed in accordance with all federal, state, and local requirements. Additional materials of concern include light ballasts, computer equipment with monitors, lead acid batteries, radioactive type exit signs, smoke detectors, CFC and HCFC containing equipment, halon fire protection systems, etc. Disposal sites and associated organizations to be contacted for removal of all materials were outlined by We Energies. All disposal options for any regulated materials must be approved by We Energies.

ACM is expected to be found in electrical and control wiring, electrical transite panels, lighting, insulation, gaskets and window glazing.

A "no visible emission" standard will be strictly held during the project for all contractor activities.

The Port Washington Power Plant's close proximity to the downtown area of the City of Port Washington and its marina, make it essential that any noise due to the Work be minimized. A noise curfew for the hours between 7 p.m. and 7 a.m. will be enforced.

The contractor will implement and coordinate a Project Safety and Health Program applicable to all employees and subcontractors at the project site. The Project Safety and Health Program will be an administrative process that generally follows the requirements of the Occupational Safety and Health Act (OSHA) of 1970. The contractor will need to develop an Emergency Action Response Plan. This plan will require interface with the appropriate civil parties involved (e.g. Port Washington Police and Fire Departments).

The building or enclosure foundations, footings, and sills will be removed or excavated, then cleaned and crushed on site for use as designed fill. Any excavation requires clean fill to return the excavation to grade. Fill will be screened so as to not include any rebar, structural steel, equipment, organic material, or demolition debris. No rebar, reinforcing steel or demolition debris will remain in crushed concrete.

Waste oils and hydraulic fluids may be present in process equipment, machinery, and oil sumps or reservoirs associated with machinery. The contractor will remove all waste oils and fluids before disassembly or removal of any equipment. If waste oil or other liquids are spilled during the equipment removal, the excess liquid will be recovered and any impacted surfaces cleaned by steam cleaning, pressure washing or other methods as approved by We Energies. Special care is required in the old turbine hall and boiler room footprints as there are drains and openings directly into the circulating water intake and discharge tunnels. No oil or other liquids will be permitted to enter these waterways.

Polychlorinated biphenyls (PCBs) in oil have been identified in each of the transformers at concentrations less than 50 parts per million (ppm). The contractor is responsible for proper disposal of PCBs. The contractor will be responsible for testing the transformer containment basin concrete for PCB contamination and for disposing of the concrete as required. The contractor should assume that below ground concrete is contaminated and that above ground concrete can be recycled.

Mercury has been identified in various electrical switches, light sources, gauges, and gauge reservoirs.

Lead has been identified in the paint coatings on the structural steel. Loose paints and paint chips should be removed and collected for disposal as hazardous waste. Areas on structural steel where torching will occur will be abated prior to torching. The contractor will not perform activities that will generate lead dust above the OSHA Permissible Exposure Limit (PEL) without proper engineering controls. Lead roof drain rings will also be collected for proper disposal.

Asset Disposition

Any spare parts for use elsewhere will be removed by We Energies. Also, We Energies will remove the temporary waste water facility and auxiliary equipment. Any spare parts or equipment remaining on site at the start of the contract work shall be included as part of the lump sum base bid and disposed of by the demolition contractor.

The following items will be removed from the project site by We Energies prior to the initiation of the demolition scope of work.

- Quincy Air Compressors #21 and #31.
- Ingersoll-Rand Outside Air Compressor.
- Unit 1, Unit 2 & Unit 3 Continuous Emissions Monitor (CEM) buildings.
- CEM Computer.
- Coal Sampler Equipment and Controls SLC 500.
- Precipitator monitoring equipment.

- Flyash Unloader.
- Unit 3 Low Pressure Turbine Spindle.
- Liquid propane tanks.

Dismantlement Tasks

Demolition and equipment removal at the Port Washington Power Plant will include the removal of all equipment, piping, structures, foundations, electrical and control equipment on Units 1, 2 and 3, and demolition of the building enclosure and foundations except where We Energies has specified items to remain.

The external walls and roofing of the switch house are to remain intact and undamaged. The admin/service building, north of the remaining north wall, will remain and not be demolished. The auxiliary boiler building will remain along with the supporting equipment required.

All drain lines extending beyond the footprint of any roadway, slab, foundation or footing below excavation elevation will remain, provided they are below el. +4.0'. The existing roof drains from the switchhouse that flow directly into the circulating water tunnel inside the west turbine hall building wall will not be removed or damaged. The circulating water tunnels both inside and outside the generation building are to remain and be protected by the contractor from damage during the entire project.

Asbestos abatement and demolition will be proceeding together for some time and coordination and cooperation will be required. Both activities will be monitored.

Removal and demolition also includes the generation building structural east walls, south walls, a portion of the Unit 1 boiler room north wall, boiler and turbine rooms, roof, east yard buildings (including equipment and basins), #7 stack, and north coal handling area buildings and equipment. Controlled blasting will not be permitted as a means of dropping the stack.

Various internal areas of the switch house and selected areas of the switchyard will be demolished. The Generator Step-up transformers (GSUs) and other designated equipment in the switchyard area will be removed . Contaminated soil as well as any other underground materials and tanks will be removed from the switchyard area.

The area outside and east of the Units 1, 2, and 3 will have equipment removed. The precipitators, stacks, silos, DSI building, DSI systems, settling basins, ash handling equipment and buildings, WPDES System, various storage and tractor sheds, and coal handling equipment and enclosures will be demolished.

Equipment removal includes removal of all electrical devices, conduit, wire, etc. (much of which will contain asbestos) related to the operation of the equipment being removed, back to the main disconnects for that equipment. The contractor will be responsible for determining that all equipment has been de-energized prior to removal.

Building shell demolition includes the complete removal of all building elements located above its underlying concrete slab and/or foundation, including roofs, sidewalls, building columns, and all other structures currently located within the building interior unless otherwise indicated in the specification. As noted previously, demolition of Units 4, 5, and 6 was completed in 2003. Photographs which chronicle the demolition of the building shells for Unit 4 and Unit 5 are shown in Figures C-9 through C-17.

The building or enclosure foundations, footings, and sills will be removed or excavated, then cleaned and crushed on site for use as designed fill. Filling with clean fill and grading will be required. Any excavation requires clean fill to return the excavation to grade. Fill shall be screened and shall not include any rebar, structural steel, equipment, organic material, or demolition debris.

Plant decommissioning efforts will include items such as electrical and mechanical isolations, draining of bulk oils and fuels, and removal of bulk controlled materials. The asbestos abatement will proceed first and demolition will start as soon as the specified areas have been abated and all regulated materials removed in order to meet the schedule for erection of the new power plant. Asbestos abatement may begin simultaneously in the north and east yard areas, the switch house, switchyard, and inside the power plant. The timing of these abatements efforts will depend on the contractor's overall schedule. The demolition contractor will coordinate accordingly with the asbestos abatement subcontractor to expedite the demolition activities. After the outside yard asbestos abatement is complete, the demolition contractor will start outside the plant and proceed to follow the asbestos contractor through the powerhouse and switchyard.

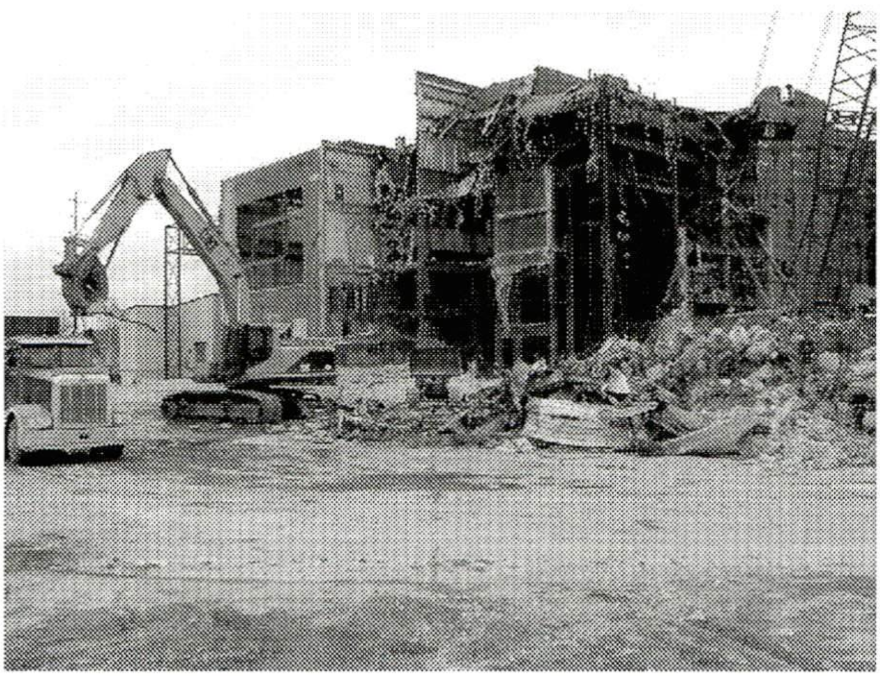

Figure C-9
Port Washington Power Plant – Demolition by February 2003, with Remaining North Wall of Unit 5 Coal Bunker

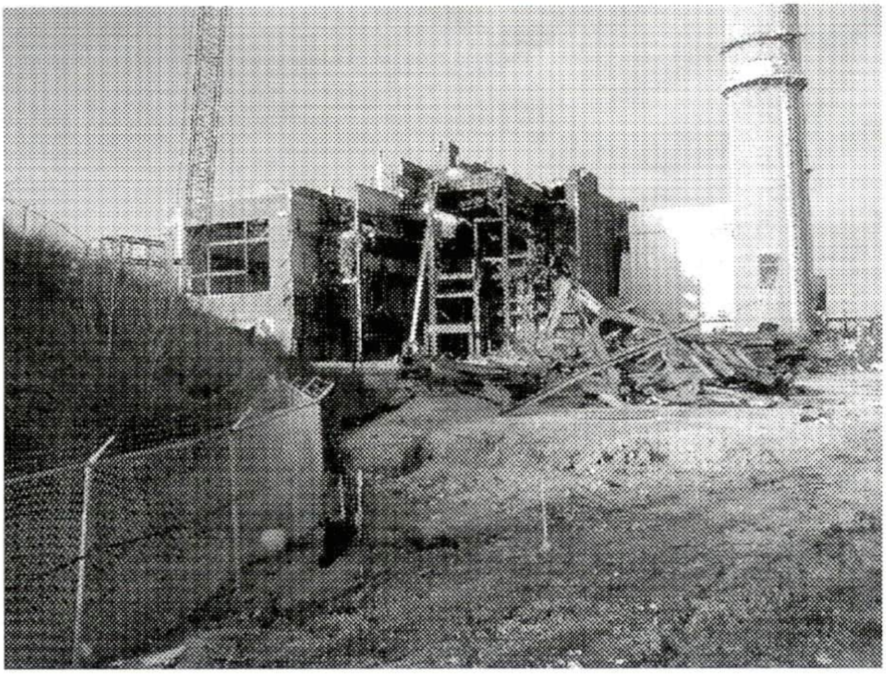

Figure C-10
Port Washington Power Plant - Demolition of Unit 5 Boiler House

Figure C-11
Port Washington Power Plant - Demolition of Unit 5 South Wall Brick with Wrecking Ball

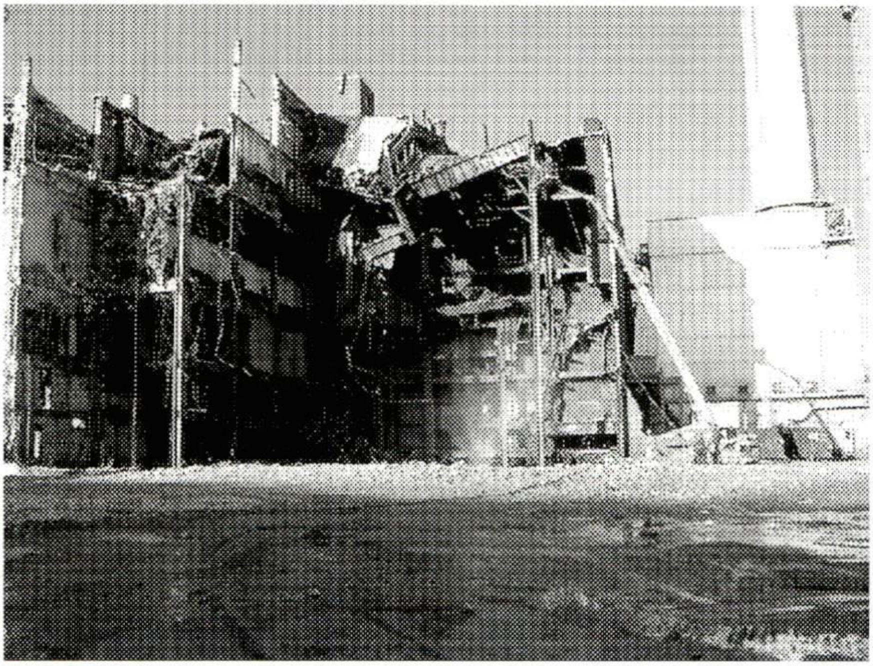

Figure C-12
Port Washington Power Plant - Removal of Structural Steel from Unit 5 Boiler House

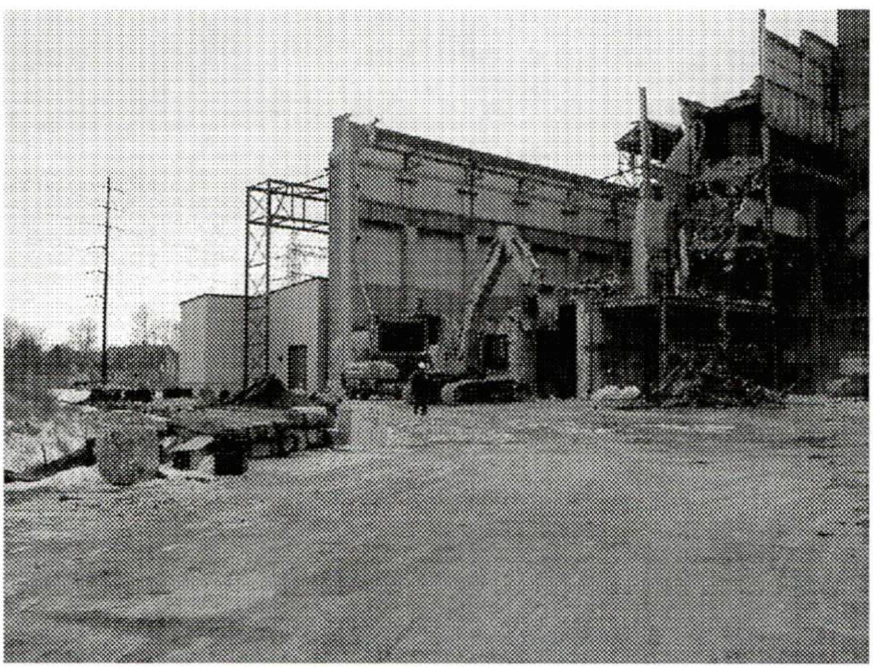

Figure C-13
Port Washington Power Plant - Demolition of Unit 5 Turbine Hall. Clean fill will be used to return any excavation to grade. No rebar, reinforcing steel, or demolition debris will remain in crushed concrete.

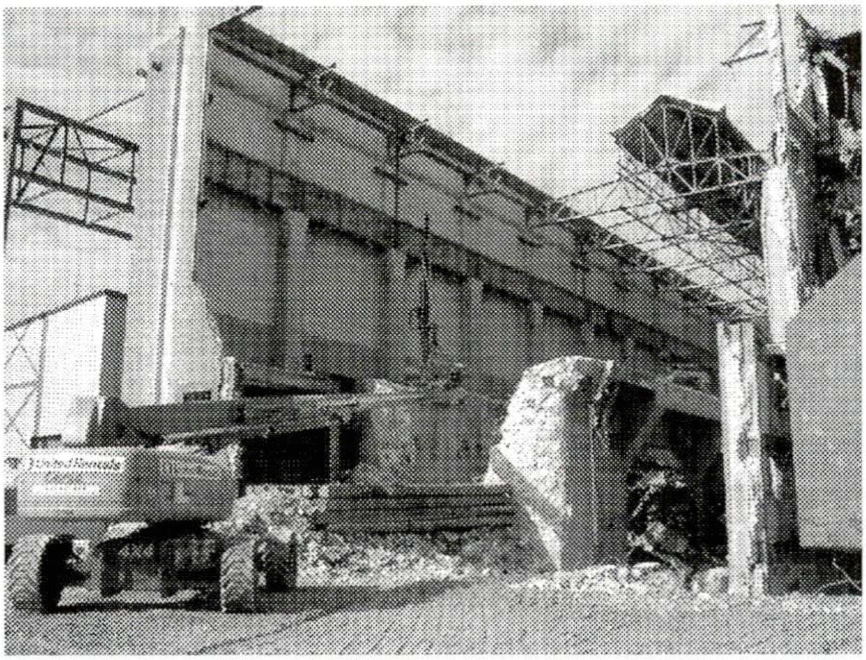

Figure C-14
Port Washington Power Plant – Drilling, in March 2003, of Southwest Turbine Pedestal for Demolition with Dynamite

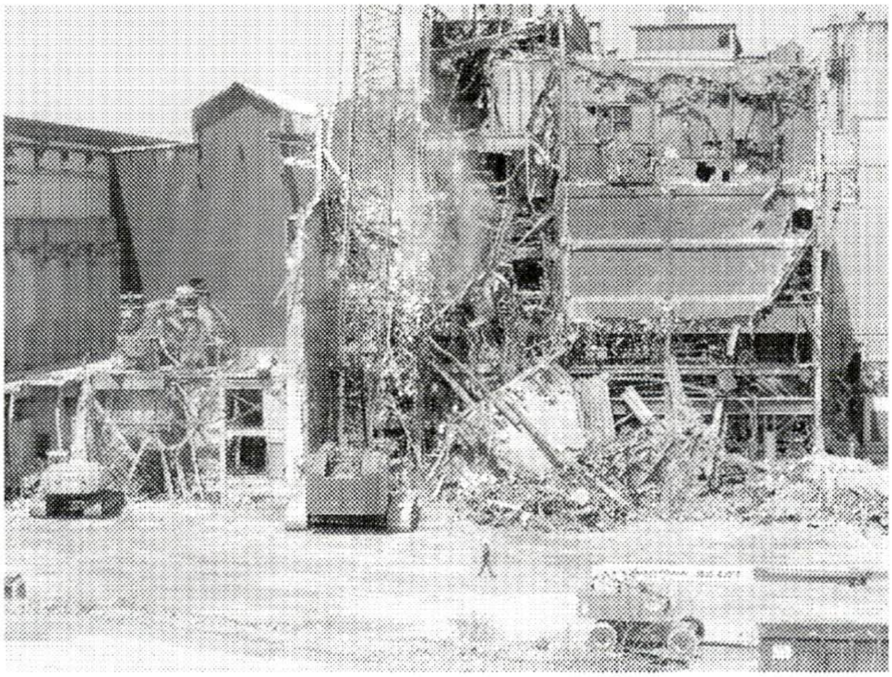

Figure C-15
Port Washington Power Plant - Demolition of Unit 4 Using the Wrecking Ball. Historical walls on the left will be retained.

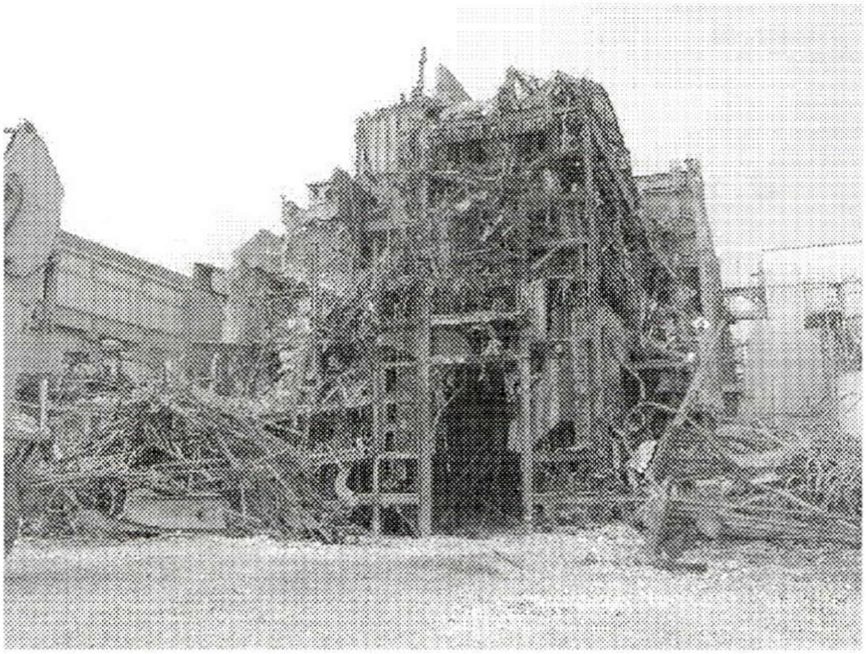

Figure C-16
Port Washington Power Plant – Demolition, in May 2003, of Unit 4 Boiler House

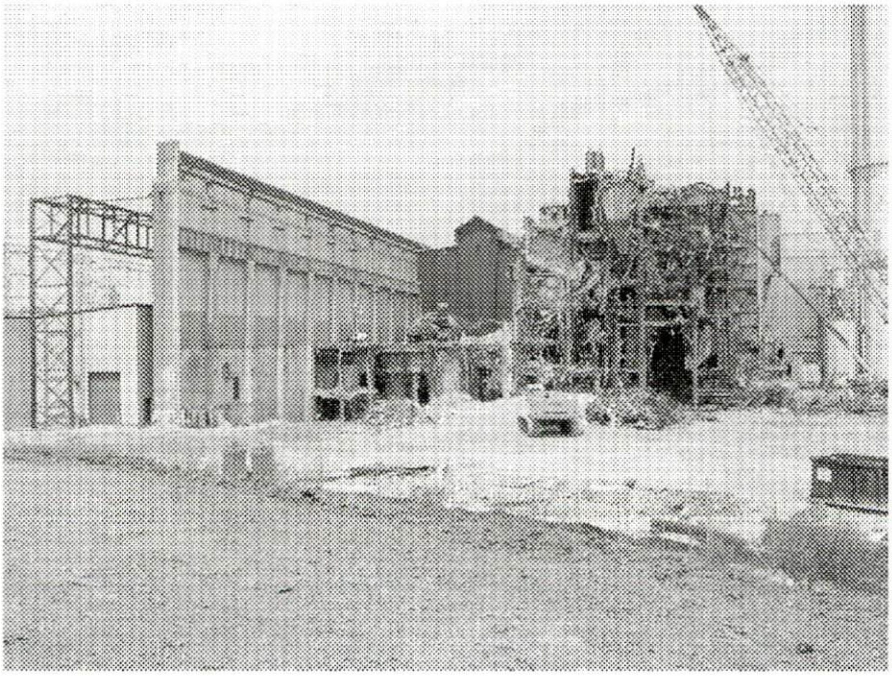

Figure C-17
Port Washington Power Plant - Wide Angle View, in May 2003, of Demolition Site

C

Schedule and Costs

We Energies requested the contractors to submit cost and schedule information in response to the bid proposals. The contractors were to provide a base schedule for completion of the work with a start date of November 1, 2004 and the latest date for completion being January 31, 2006.

The total cost for decommissioning Units 4, 5, and 6 was $12,400,000. Costs for separate tasks were as follows:

TASK	COST, $
Demolition	7,100,000
Asbestos & lead abatement	2,100,000
Asbestos disposal	75,000
Contaminated soil disposal	1,000,000
Decommissioning internal labor	800,000
System modifications & isolations	725,000
Environmental consulting	400,000
Engineering consulting	200,000
Total	12,400,000

The total cost for decommissioning Units 1, 2, and 3 and the balance of the plant (BOP) is estimated to be $17,000,000 to $22,000,000. Estimated costs for separate tasks are as follows:

TASK	COST, $
Demolition	6,000,000
Asbestos & lead abatement	3,000,000 - 5,900,000
Asbestos disposal	200,000 - 300,000
Hazardous material abatement	600,000
Hazardous material disposal	150,000
Demo debris disposal	750,000
Contaminated soil disposal	3,600,000
Decommissioning internal labor	900,000
System modifications & isolations	900,000
Temporary power requirements	300,000
Temporary WPDES	800,000
Environmental consulting	500,000
Engineering consulting	200,000
Contingency	3,000,000

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Duke Energy Carolinas
Response to
Attorney General's Office Data Request
Data Request No. AGO 6

Docket No. E-7, Sub 1214

Date of Request: January 9, 2020
Date of Response: January 17, 2020

[ ] **CONFIDENTIAL**

[X] **NOT CONFIDENTIAL**

Confidential Responses are provided pursuant to Confidentiality Agreement

The attached response to AGO Data Request No. 6-1, was provided to me by the following individual(s): Trudy H. Morris, Project Manager II, and was provided to AGO under my supervision.

Camal O. Robinson
Senior Counsel
Duke Energy Carolinas

AGO
Data Request No. 6
DEC Docket No. E-7, Sub 1214
Item No. 6-1
Page 1 of 1

Request:

In response to Public Staff Data Request No. 2-1, the attached response and embedded Excel file was provided that lists locations where the Company has disposed of CCR for all current and former coal generating stations. In columns I through N of the Excel spread sheet, the response shows the amounts of CCR disposed of annually at each CCR storage area in tons and in cubic yards for 2017 (may-dec), 2018, and 2019 (through 7/31/19). Please provide the like information for all of 2017 and 2019 and for all prior years, i.e., the amount of CCR disposed of during each year in which the CCR storage area was in operation (receiving or storing CCR), listing the amounts in cubic yards and tonnage in separate columns for each year as was done for 2017, 2018, and 2019.

Response:

Please see the attached file.

DEC_AGO_DR_6-1.xlsx

AGO Data Request No. 6 — AGO Exhibit 38

Question 1

Please list all locations where the Company has disposed of CCR, including both original locations, and where applicable, new or relocation sites if CCR has been moved from its original location. For each location provide:

Duke Energy Carolinas

State	Site	Physical address	Facility Type	Facility Name	Years during which CCR storage area was in operation (receiving or storing CCR)	Amount of CCR disposed of cumulatively (tons)	See Note below	Amount of CCR disposed of cumulatively (cubic yards)
NC	Allen	253 Plant Allen Rd., Belmont, NC 28012	Pond	Retired Ash Basin	1957-1973	6,152,310		5,126,925
			Pond	Active Ash Basin	1972-2018	10,479,837		8,733,198
			Fill	Ash Fill 1	2004-2009	428,400		357,000
			Fill	Ash Fill 2	2004-2009	562,800		469,000
			Fill	Subgrade for Landfill	2010-2010	600,000		500,000
			Landfill	RAB Landfill	2010 - present	1,194,986		995,822
	Belews Creek	3195 Pine Hall Rd., Belews Creek, NC 27009	Pond	Active Ash Basin	1972-2018	11,971,315		9,976,096
			Fill	Structural Fill	2004-2009	986,400		822,000
			Landfill	Pine Hall Rd. Landfill	1984-2014	3,616,800		3,014,000
			Landfill	Craig Road Landfill	2007 - present	2,087,123		1,739,269
			Landfill	Gypsum (FGD) Landfill	2008 - present	919,742		766,452
	Buck	1385 Dukeville Rd., Salisbury, NC 28146	Pond	Ash Basin 1 (additional primary pond)	1982-2013	3,550,800		2,959,000
			Pond	Ash Basin 2 (Primary Pond)	1957-2013	1,998,000		1,665,000
			Pond	Ash Basin 3 (Secondary pond	1977-2013	864,000		720,000
			Fill	Ash fill area	2009-2010	235,200		196,000
	Cliffside	573 Duke Power Rd., Mooresboro, NC 28114	Pond	Units 1-4 Inactive Ash Basin	1957-1977	(455,259)		(379,383)
			Pond	Unit 5 Inactive Ash Basin	1970-1980	2,352,000		1,960,000
			Pond	Active Ash Basin	1980-2018	5,038,467		4,198,723
			Fill	Ash Storage 1 (considered part of active ash basin)	early 1980's	204,000		170,000
			Landfill	CCP Landfill	2010 - present	2,759,432		2,299,527
	Dan River	864 S Edgewood Rd., Eden, NC 27288	Pond	Primary Ash Basin	1956 - 2012	(1,288,292)		(1,073,577)
			Pond	Secondary Ash Basin	1977 - 2012	(494,360)		(411,967)
			Fill	Ash Fill 1	1980 - unknown	(954,500)		(795,417)
			Fill	Ash Fill 2	1980 - unknown	(573,780)		(478,150)
			Landfill	Dan River Landfill	2017-present	2,280,022		1,900,018
	Marshall	8320 NC Hwy. 150 E, Terrell, NC 28682	Pond	Active Ash Basin	1965 - 2018	16,835,839		14,029,866
			Fill	Structural Fill (solar panels)	2000 - 2013	6,492,000		5,410,000
			Fill	Subgrade fill (Cells 1&2)	2010 - 2011	462,000		385,000
			Fill	Subgrade fill (Cells 3&4)	2011 - 2012	409,200		341,000
			Landfill	Old Ash Fill (part of retired landfill)	1984 - 1986	626,400		522,000
			Landfill	Retired Landfill (permit 18-04)	1986 - 1999	4,876,800		4,064,000
			Landfill	Industrial Landfill (Permit 18-12)	2011 - present	2,259,606		1,883,005
			Landfill	FGD Landfill (permit 18-09)	2006 - 2019	1,068,728		890,607
	Riverbend	175 Steam Plant Road, Mt. Holly, NC 28120	Pond	Primary Ash Basin	1957-2014	(2,619,350)	*	(2,182,792)
			Pond	Secondary Ash Basin	1957-2014	(995,400)	*	(829,500)
			Fill	Ash fill area	1979 - 2007	(1,449,200)	*	(1,207,667)
			Fill	Cinder Pit	1929-1957	(290,500)	*	(242,083)
SC	WS Lee	205 Lee Steam Plant Rd., Belton, SC 29627	Pond	Primary Ash Basin	1974-2014	2,247,003		1,872,503
			Pond	Secondary Ash Basin	1978-2014	(46,203)		(38,503)
			Fill	Ash Fill Area (Old ash fill area)	1951 - 1974	(378,989)		(315,824)
			Pond	1951/1959 Inactive Ash Basin	1951-1974	(1,178,337)		(981,948)
			Fill	Structural Fill	2000 - 2007	859,200		716,000

CCR Disposed Annually (tons)

Site	Facility Name	2010 (July-Dec for LFs)	2011	2012	2013	2014	2015	2016	2017 (May -Dec for LFs)	2017	See Note below	2018	See Note below	2019	See Notes below	2019 (through 7/31/19)
Allen	Retired Ash Basin								-	-		-		-		-
	Active Ash Basin				19,265	23,565	15,748	15,929	9,715	9,715		4,412		-		-
	Ash Fill 1								-	-		-		-		-
	Ash Fill 2								-	-		-		-		-
	Subgrade for Landfill								-	-		-		-		-
	RAB Landfill	161,978	252,215	70,256	203,260	163,023	122,334	103,888	48,992	64,220		51,164		88,184		33,706
Belews Creek	Active Ash Basin				49,459	47,702	45,258	43,016	39,151	39,151		12,726		-		
	Structural Fill								-	-		-		-		-
	Pine Hall Rd. Landfill								-	-		-				
	Craig Road Landfill	184,102	371,397	187,505	112,672	223,578	151,546	123,725	50,931	113,836		102,205		175,094		83,624
	Gypsum (FGD) Landfill	135,827	276,093	133,749	105,182	198,709	140,571	4,714	20,043	23,407	**	36,253		32,779	^	(7,087)
Buck	Ash Basin 1 (additional primary pond)				911				-	-		-		-		-
	Ash Basin 2 (Primary Pond)								-	-		-		-		-
	Ash Basin 3 (Secondary pond								-	-		-		-		-
	Ash fill area								-	-		-		-		-
Cliffside	Units 1-4 Inactive Ash Basin								-	-		-		-		-
	Unit 5 Inactive Ash Basin								-	-		-		-		-
	Active Ash Basin				31,759	53,481	32,828	46,985	-	-		1,454		-		-
	Ash Storage 1 (considered part of active ash basin)								-	-		-		-		
	CCP Landfill	12,183	52,821	56,773	401,429	366,236	330,052	677,088	257,014	488,585		308,248		305,726		170,852
Dan River	Primary Ash Basin								-	-		-		-		-
	Secondary Ash Basin								-	-		-		-		-
	Ash Fill 1								-	-		-		-		-
	Ash Fill 2								-	-		-		-		-
	Dan River Landfill									528,667		796,757		1,165,828		
Marshall	Active Ash Basin				45,528	52,544	42,078	50,655	47,216	47,216		25,754	***	-		-
	Structural Fill (solar panels)								-	-		-		-		-
	Subgrade fill (Cells 1&2)								-	-		-		-		-
	Subgrade fill (Cells 3&4)								-	-		-		-		-
	Old Ash Fill (part of retired landfill)								-	-		-		-		-
	Retired Landfill (permit 18-04)								-	-		-		-		-
	Industrial Landfill (Permit 18-12)	-	286,943	74,715	44,755	43,009	89,027	456,203	321,759	445,695		384,095		412,536		206,920
	FGD Landfill (permit 18-09)	43,619	73,115	28,841	177,583	382,475	401,170	-	-	-		-		-		-
Riverbend	Primary Ash Basin				1,063				-	-		-		-		-
	Secondary Ash Basin								-	-		-		-		-
	Ash fill area								-	-		-		-		-
	Cinder Pit								-	-		-		-		-
WS Lee	Primary Ash Basin								-	-		-		46,203	^^	-
	Secondary Ash Basin								-	-		-		-		-
	Ash Fill Area (Old ash fill area)								-	-		-		-		-
	1951/1959 Inactive Ash Basin								-	-		-		-		-
	Structural Fill								-	-		-		-		-

CCR Disposed Annually (cubic yards) / A description of the engineering features and construction of the storage areas including storage volume

Site	Facility Name	2010	2011	2012	2013	2014	2015	2016	2017 (May - Dec for LFs)	2017	2018	2019	2019 (through 7/31/19)	Initial Construction	Expansion dates	Capacity (tons)	Capacity (cubic yards)	Liner
Allen	Retired Ash Basin	-	-	-	-	-	-	-	-	-	-	-	-	1957	1965, 1968	Not available	Not available	None
	Active Ash Basin	-	-	-	16,054	19,638	13,123	13,274	8,096	8,096	3,677	-	-	1973	-	Not available	Not available	None
	Ash Fill 1	-	-	-	-	-	-	-	-	-	-	-	-	2004	-	428,400	357,000	None
	Ash Fill 2	-	-	-	-	-	-	-	-	-	-	-	-	2004	-	562,800	469,000	None
	Subgrade for Landfill	-	-	-	-	-	-	-	-	-	-	-	-	2010	-	Not available	Not available	None
	RAB Landfill	134,982	210,179	58,547	169,383	135,853	101,945	86,573	40,827	53,517	42,637	73,487	28,088	2009	-	2,499,000	2,082,500	Soil, HDPE, Geocomposite, HDPE, LCS
Belews Creek	Active Ash Basin	-	-	-	41,216	39,751	37,715	35,847	32,626	32,626	10,605	-	-	1972	-			None
	Structural Fill	-	-	-	-	-	-	-	-	-	-	-	-	2004	-			
	Pine Hall Rd. Landfill	-	-	-	-	-	-	-	-	-	-	-	-	1984	-	3,616,800	3,014,000	None
	Craig Road Landfill	153,418	309,498	156,254	93,893	186,315	126,288	103,104	42,443	94,863	85,171	145,912	69,687	2007	2013	7,586,268	6,321,890	GCL, HDPE, LCS
	Gypsum (FGD) Landfill	113,189	230,078	111,458	87,652	165,591	117,143	3,928	16,703	19,506	30,211	27,316	(5,906)	2008		1,800,000	1,500,000	GCL, HDPE, LCS
Buck	Ash Basin 1 (additional primary pond)	-	-	-	759	-	-	-	-	-	-	-	-	1982	-	Not available	Not available	None
	Ash Basin 2 (Primary Pond)	-	-	-	-	-	-	-	-	-	-	-	-	1957	1977, 1979	Not available	Not available	None
	Ash Basin 3 (Secondary pond	-	-	-	-	-	-	-	-	-	-	-	-	1977	1979	Not available	Not available	None
	Ash fill area	-	-	-	-	-	-	-	-	-	-	-	-	2009	-	235,200	196,000	None
Cliffside	Units 1-4 Inactive Ash Basin	-	-	-	-	-	-	-	-	-	-	-	-	1957	-	Not available	Not available	None
	Unit 5 Inactive Ash Basin	-	-	-	-	-	-	-	-	-	-	-	-	1970	-	Not available	Not available	None
	Active Ash Basin	-	-	-	26,446	44,567	27,357	39,154	-	-	1,212	-	-	1980	-	Not available	Not available	None
	Ash Storage 1 (considered part of active ash basin)	-	-	-	-	-	-	-	-	-	-	-	-		-	204,000	170,000	None
	CCP Landfill	10,153	44,018	47,311	334,524	305,197	275,043	564,240	214,178	407,154	256,873	254,772	142,377	2010	2015	5,204,400	4,337,000	Soil, GCL, HDPE, LCS
Dan River	Primary Ash Basin	-	-	-	-	-	-	-	-	-	-	-	-	1956	1968, 1977	Not available	Not available	None
	Secondary Ash Basin	-	-	-	-	-	-	-	-	-	-	-	-	1977	-	Not available	Not available	None
	Ash Fill 1	-	-	-	-	-	-	-	-	-	-	-	-		-	(954,500)	(795,417)	None
	Ash Fill 2	-	-	-	-	-	-	-	-	-	-	-	-		-	(573,780)	(478,150)	None
	Dan River Landfill	-	-	-	-	-	-	-		440,556	663,964	971,523		2017	-	2,575,327	2,146,106	GCL, HDPE, Geocomposite, HDPE, LCS
Marshall	Active Ash Basin	-	-	-	37,940	43,786	35,065	42,213	39,347	39,347	21,462	-	-	1965	-	Not available	Not available	None
	Structural Fill (solar panels)	-	-	-	-	-	-	-	-	-	-	-	-	2000	-	6,492,000	5,410,000	None
	Subgrade fill (Cells 1&2)	-	-	-	-	-	-	-	-	-	-	-	-	2010	-	Not available	Not available	
	Subgrade fill (Cells 3&4)	-	-	-	-	-	-	-	-	-	-	-	-	2011	-	Not available	Not available	
	Old Ash Fill (part of retired landfill)	-	-	-	-	-	-	-	-	-	-	-	-	1984		626,400	522,000	None
	Retired Landfill (permit 18-04)	-	-	-	-	-	-	-	-	-	-	-	-	1986		4,876,800	4,064,000	None
	Industrial Landfill (Permit 18-12)	-	239,119	62,263	37,296	35,861	74,189	380,169	268,133	371,411	320,079	343,780	172,433	2011	2018	4,594,824	3,829,020	Soil, HDPE, Geocomposite, HDPE, LCS
	FGD Landfill (permit 18-09)	36,349	60,929	24,034	147,986	318,729	334,308	-	-	-	-	-	-	2006		1,068,728	890,607	GCL, HDPE, LCS
Riverbend	Primary Ash Basin	-	-	-	886	-	-	-	-	-	-	-	-	1957	1979	Not available	Not available	
	Secondary Ash Basin	-	-	-	-	-	-	-	-	-	-	-	-	1957	1979	Not available	Not available	
	Ash fill area	-	-	-	-	-	-	-	-	-	-	-	-	1979		Not available	Not available	
	Cinder Pit	-	-	-	-	-	-	-	-	-	-	-	-			Not available	Not available	
WS Lee	Primary Ash Basin	-	-	-	-	-	-	-	-	-	-	38,503	-	1974	1985	Not available	Not available	None
	Secondary Ash Basin	-	-	-	-	-	-	-	-	-	-	-	-	1978	1985	Not available	Not available	None
	Ash Fill Area (Old ash fill area)	-	-	-	-	-	-	-	-	-	-	-	-	1951		Not available	Not available	None
	1951/1959 Inactive Ash Basin	-	-	-	-	-	-	-	-	-	-	-	-	1951		Not available	Not available	None
	Structural Fill	-	-	-	-	-	-	-	-	-	-	-	-	2000		Not available	Not available	None