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MISSOURI PUBLIC SERVICE COMMISSION

CASE NO. ER-2007-0002

DIRECT TESTIMONY

OF

THOMAS S. LaGUARDIA

ON

BEHALF OF

UNION ELECTRIC COMPANY
d/b/a AmerenUE

St. Louis, Missouri
July, 2006

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DIRECT TESTIMONY

OF

THOMAS S. LaGUARDIA

CASE NO. ER-2007-0002

I. QUALIFICATIONS

Q. Please state your name and business address.

A. My name is Thomas S. LaGuardia. My business address is 38 Pell Mell Drive, Bethel, CT 06801.

Q. What is your occupation?

A. I recently became the managing member LaGuardia & Associates, LLC. I was formerly President of TLG Services, Inc. (TLG), a subsidiary of Entergy Nuclear, Inc. (ENI). During my tenure at TLG, the dismantling cost study which is the subject of my direct testimony was conducted and prepared under my direction and supervision.

Q. What were your responsibilities with TLG?

A. As addressed in more detail below, I was responsible for the technical and business management of engineering and field services in the areas of decontamination, decommissioning, waste management and general engineering for nuclear and fossil-fueled electric generating stations.

Q. What are your responsibilities with LaGuardia & Associates, LLC?

A. I continue to engage in work similar to the work I performed while at TLG as a consultant and as the Managing Member of LaGuardia & Associates, LLC.

Q. What is your educational and professional background?

A. I completed my Bachelor of Science in Mechanical Engineering at Polytechnic Institute of Brooklyn in 1962, and my Master of Science in Mechanical Engineering at the University of Connecticut in 1968. I am a registered Professional Engineer in Connecticut (No. 10393), New York (No. 059389), New Jersey (No. 38193), and Virginia (No. 033747). I am a Board Certified Cost Engineer by the Association of the Advancement of Cost Engineering (AACE No. 1679). I founded TLG Engineering in April, 1982 and TLG Services in January 1994. I sold TLG Services to ENI in September 2000 and was retained as President of TLG Services and VP of Decommissioning for ENI.

I was employed by Nuclear Energy Services in Danbury, Connecticut, from 1973 until I founded TLG Engineering. My prior employment was with Gulf Nuclear Fuels Corporation, formerly United Nuclear Corporation (UNC), and Combustion Engineering, Inc.

II. <u>EXPERIENCE</u>

Q. Do you have experience in the design and construction of fossil-fueled generating stations?

A. Yes. During my employment with Combustion Engineering, Inc. from 1962 to 1968, I was a boiler design, performance and construction engineer for 500 megawatt (MW) electric coal-fired power boilers and merchant and Naval oil-fired marine boilers.

Q. What decommissioning experience do you have?

A. My decommissioning experience began as site representative for UNC during the BONUS reactor decommissioning in 1969 and 1970. BONUS was a 17 MW demonstration power reactor located in Puerto Rico that was owned by the U.S. Atomic

Energy Commission (USAEC), now the U.S. Department of Energy (USDOE), and operated by the Puerto Rico Water Resources Authority. It was the largest reactor decommissioned by entombment up to that time. The program involved extensive chemical decontamination of radioactive systems, selective piping and component removal, and entombment of the reactor vessel within a massive concrete barrier. The entombment has a design life of 125 years. My role as site representative was to act as a technical liaison and provide project engineering and schedule management assistance during system decontamination, component removal, vessel entombment and facility close-out.

Following the BONUS program, I was lead engineer for UNC during the Elk River Reactor decommissioning between 1970 and 1973. Elk River was a 20 MW demonstration power reactor located in the State of Minnesota that was owned by the USAEC and operated by United Power Association. Elk River was decommissioned by complete dismantling. The program involved segmentation of the reactor vessel and internal components using remotely-operated cutting torches, as well as the packaging, shipping and controlled burial of the segments. Similarly, radioactive piping and components were removed, packaged, shipped and buried. Radioactive concrete was demolished by controlled blasting, and nonradioactive concrete was demolished by wrecking ball to completely dismantle the facility. Initially, my role for UNC was Consulting Engineer and later Lead Engineer for UNC technical support for on-site activities.

I was Project Engineer, while at Nuclear Energy Services, for the detailed engineering and planning of the Shippingport Station Decommissioning Project from 1979 - 1982. Shippingport was a 72 MW light water breeder reactor located in the state of Pennsylvania, owned by the USDOE and operated by Duquesne Light Company. The facility is now dismantled, and TLG with its joint venture partner, Cleveland Wrecking Company, dismantled all of the clean and contaminated piping and components and removed contaminated concrete. My role for TLG/Cleveland was Project Director, and I selected and managed an on-site project management team to hire and supervise work crews to accomplish the dismantling. All work was completed on schedule and within budget.

I also assisted Atomic Energy of Canada, Ltd. in the detailed engineering and planning for the decommissioning of the 238 MW Gentilly Unit 1 reactor located in Three Rivers, Canada. My role was to provide overall decommissioning consulting services and detailed cost estimation of alternatives.

TLG worked with the Northern States Power Company between 1988 and 1989 in the preparation of the decommissioning plan for the Pathfinder Atomic Power Plant. Pathfinder, located in Sioux Falls, South Dakota, was a 60 MW reactor initially placed in a safe storage condition (SAFSTOR) after an abbreviated operating life. TLG prepared detailed cost and schedule estimates and vessel activation estimates, analyzed the reactor vessel to be used as its own shipping container, and prepared the decommissioning plan in support of plant decommissioning.

TLG has also assisted the Sacramento Municipal Utility District since 1989 with the decommissioning planning for the Rancho Seco Nuclear Generating Station. This work included a detailed reactor vessel activation analysis, preparation of decommissioning alternative cost and schedule estimates, and assistance with the preparation of the decommissioning plan originally using the SAFSTOR method and more recently reflecting the DECON method.

TLG worked with the Long Island Lighting Company in the planning for the decommissioning of the Shoreham Nuclear Power Station. This work included the preparation of a detailed reactor vessel activation analysis, cost estimates, schedules, management organization, waste volume estimates and draft decommissioning plan.

In 1990, TLG was selected by Cintichem, Inc. (a subsidiary of Hoffman-LaRoche) as Decommissioning Co-Manager of a 10 MW thermal research reactor and associated hot cells and facilities. TLG's staff prepared a reactor core activation analysis as well as cost and schedule estimates for the project. TLG assisted in the preparation of the decommissioning plan, which was approved by the Nuclear Regulatory Commission (NRC). TLG's field management staff was on-site co-managing the project with the Cintichem staff and supervising the work crews in decommissioning and dismantling the facility. The program is complete. My role in the project was Senior Decontamination and Decommissioning Expert on the Nuclear Safeguards Committee.

TLG has also been involved in the engineering and planning activities associated with the decommissioning of the Yankee Rowe, Trojan and Big Rock Point, Humboldt Bay 3, Maine Yankee and Oyster Creek nuclear units. This work includes activation analyses, preparation of decommissioning alternative cost and schedule estimates, and assistance with the preparation of the decommissioning plans. In addition, TLG was selected to prepare the steam generators and the pressurizer at Trojan for transport to the burial facility at Richland, Washington. TLG was responsible for certifying package integrity, overseeing the grouting of the components and preparing any supporting transportation analyses. The project was successfully completed in October 1995. TLG supported Portland General Electric in the detailed planning required for completing the decontamination and dismantling of the Trojan nuclear unit, including the intact removal and disposal of the reactor vessel and the highly radioactive internal components.

In addition, TLG prepared the Decommissioning Plan for Dresden Unit 1 and the Environmental Reports for Dresden Unit 1 and Indian Point Unit 1. Under my supervision and direction, TLG has prepared site-specific decommissioning studies for approximately 85% of the nuclear units in the United States and approximately 200 fossil-fueled units.

TLG was responsible for overseeing the dismantling and demolition of a fossil-fueled steam plant for a major Connecticut hospital facility. In connection with this demolition project, I participated in the site inspection and cost estimate development. The work was subcontracted and TLG personnel supervised the contractors.

TLG supervised the dismantling of the Comal fossil-fueled power plant (containing four boilers) in New Braunfels, Texas. The power plant equipment was removed for scrap, and the boiler building restored as a local landmark.

TLG is also participating in dismantling of the Seaholm Power Plant (containing five boilers) in Austin, Texas. The boiler and power plant equipment will be removed, and the building restored as a local landmark.

TLG was recently awarded a contract to demolish the contaminated concrete in the containment building of the Saxton Nuclear Power Plant. Saxton was a 60 MW experimental facility and is located in Saxton, Pennsylvania.

I was a past member of the Executive Committee of the Decommissioning, Decontamination and Reutilization Division of the American Nuclear Society.

Q. Have you prepared or co-authored any studies and reports on decommissioning cost estimating and technology?

A. Yes. While at Nuclear Energy Services, I was Principal Investigator for the Atomic Industrial Forum's National Environmental Studies Project (NESP) decommissioning study entitled "An Engineering Evaluation of Nuclear Power Reactor Decommissioning Alternatives" (AIF/NESP-009). The Atomic Industrial Forum (now Nuclear Energy Institute) is an industry supported advocate and sponsor of research to promote the advancement of nuclear power. This study evaluated the costs, schedules and environmental impacts of decommissioning 1100 MW reactors (Pressurized Water Reactors, Boiling Water Reactors, and High Temperature Gas-Cooled Reactors).

I also co-authored the "Decommissioning Handbook" for the USDOE. The Handbook reported the state-of-the-art in decommissioning technology (as of 1980), including decontamination, piping and component removal, vessel segmentation, concrete demolition, cost estimating and environmental impacts.

At TLG Engineering, in 1986, I co-authored "Guidelines for Producing Commercial Nuclear Power Plant Decommissioning Cost Estimates" (AIF/NESP-036) for the Atomic Industrial Forum's National Environmental Studies Project. These guidelines identify the elements of costs to be included in the estimation of decommissioning activities for each of the principal decommissioning alternatives. Specific guidance in cost estimating methodology and reference cost data is provided in this study. The major objective of this study is to provide a basis for consistent cost estimating methodology.

In 1986, TLG Engineering also prepared a study for the NRC, which I co-authored, entitled, "Identification and Evaluation of Facilitation Techniques for

Decommissioning Light Water Power Reactors" (published as an NRC contractor report - NUREG/CR-3587). The study evaluated the costs and benefits of techniques to reduce occupational exposure and waste volume from decommissioning.

TLG personnel also authored the paper "How to Determine the Cost of Dismantling a Fossil-Fuel Electric Power Plant" (A. Carlstrom, Cost Engineering Magazine, April, 1989).

I am currently an editor and author (with other authors including TLG personnel) of a new USDOE Decontamination and Decommissioning Handbook published by the American Society of Mechanical Engineers (ASME) in 2004.

III. PURPOSE AND SCOPE OF TESTIMONY

Q. What is the purpose of your testimony in this proceeding?

A. I am presenting the results of an updated (from the earlier 2001 study) decommissioning, i.e., dismantling cost study prepared for two distinct dismantling scenarios for each of five different AmerenUE generating stations. The base case is for the complete dismantling of the generating station, including removing the steam turbine-generators, boilers, fuel handling systems, and all plant equipment and above-ground structures, except for the switchyard, and restoration of the site upon cessation of operations. The alternative case assumes limited and partial dismantling of the station, including removal of hazardous waste, and the removal of the non-power block structures, stacks, coal handling facilities, ash ponds, and screen houses. Finally, the power block structures will be secured in a safe condition for an extended duration dormancy. A summary of the costs for the base case and alternative case is shown in Table 1, for the following AmerenUE fossil-fueled power plants:

TABLE 1
SUMMARY OF DISMANTLING COST ESTIMATES

Station	No. of Units	Megawatts (Total)	Base Case: Full Dismantle ($, Thousands)	Alternative Case: Partial Dismantle ($, Thousands)
Labadie	4	2520	131,392	52,478
Rush Island	2	1260	70,230	26,873
Sioux	2	1050	70,399	34,111
Meramec	4	940	74,643	35,446
Venice	6	400	44,970	24,892
Total Cost			391,634	173,800

A summary of my direct testimony is provided as Attachment A.

Q. What is covered by the term "Decommissioning" as used with reference to a fossil-fired generating station?

A. Decommissioning is the planned and orderly retirement of a generating station. Upon retirement, the facility may either be rendered safe indefinitely (through on-going monitoring, maintenance, repair and security measures), or dismantled.

Q. Were the dismantling studies, prepared for the AmerenUE plants, prepared under your direction and supervision?

A. Yes. I developed the basic methodology used to estimate the costs to dismantle fossil-fueled power plants. I trained the TLG engineering and estimating staff in this methodology.

During the preparation of the study, I provided guidance and interpretation to the TLG staff on how to estimate specific elements of cost. I reviewed the results of the estimate to ensure the results were reasonable and representative of the features of the plant. Finally, I supervised the preparation of the report summarizing the results of the estimate, which is attached to this testimony as Schedule TSL-1.

IV. METHODOLOGY

Q. What procedure was used for developing the updated dismantling cost estimates for the AmerenUE power stations?

A. The 2005 estimates were developed using the earlier 2001 site-specific estimates, and adjusting those costs for economic changes und updated inventory and removal costs for major station systems and structure additions. Costs were also included for the removal of asbestos insulation from each station. The individual components of cost were combined to yield the total cost of the dismantling, including contingency. According to the Association for the Advancement of Cost Engineering International (AACE), "contingency" is defined as a "specific provision for unforeseeable elements of cost within the defined project scope; particularly important where previous experience related estimates and actual costs has shown that unforeseeable events which will increase costs are likely to occur."

Accordingly, a 15% contingency was added for work involving non-hazardous materials, and a 25% contingency was added for work involving hazardous materials.

Q. What accuracy do you ascribe to the AmerenUE dismantling estimates as developed by TLG under your direction and supervision?

A. The AACE defines three levels of estimates in its Cost Engineer's Notebook. An "order-of-magnitude" estimate is appropriate for conceptual studies, or where detailed information is not readily available to determine a site-specific estimate. Such estimates are expected to have an accuracy of between -30% and +50%. A "budgetary" estimate is appropriate where detailed information is available to compare the current or proposed design to a similar design, and direct or ratioed comparisons can be made. Budgetary estimates are expected to have an accuracy of between -15% to +30%. A "definitive" estimate is appropriate for detailed studies when all the parameters and/or final designs are completed to determine a site-specific estimate. Definitive estimates are expected to have an accuracy of between -5% to +15%.

The AmerenUE stations estimates would qualify as a "budgetary" estimate with an expected accuracy of -15 to +30%. The "other" estimates relied upon by TLG to develop the 2001 AmerenUE estimates were site-specific estimates, and would therefore be categorized as definitive estimates with an expected accuracy of -5% to +15%.

Q. What type of costs are analyzed in a dismantling study?

A. There are three types of costs included and analyzed in a dismantling study: activity-dependent costs, period-dependent costs and collateral costs. Activity-dependent costs are those associated with the physical work of removing piping, components and structures and transporting and disposing of the same. These costs represent labor, materials and special services (subcontracted) costs associated with the work crew's activities (hence, activity-dependent costs). The summation of the durations to perform these activities when properly sequenced provides the overall schedule for the project.

Period-dependent costs are those associated with the management staff costs which are necessary to provide technical and administrative direction to the project. These management costs must continue for the duration of the project. The project is divided into three periods: 1) Asbestos Abatement and Engineering/Planning; 2) Dismantling Operations; and 3) Site Restoration. The management staff size is adjusted to reflect the crew size and work activities in each period. Accordingly, these staff costs are period-dependent.

Collateral costs are all those costs which are neither activity- nor period-dependent. They include insurance, large equipment rentals and special tools, plant energy, etc.

Q. What methodology was used to prepare other similar fossil power plant site specific cost estimates used as a basis for this updated estimate?

A. The methodology used to develop the other site specific cost estimates followed the basic approach presented in the AIF/NESP-036 study report, "Guidelines for Producing Commercial Nuclear Power Plant Decommissioning Cost Estimates," the USDOE "Decommissioning Handbook", and American Association of Cost Estimators paper "A Methodology for Determining the Cost of Dismantling Fossil-Fueled Electric Power Plants." Obviously, nuclear power plant concerns are not necessary for fossil power plants and, therefore, none were included in the study. However, the basic methodology, which is widely accepted by the electric power industry and regulatory commissions throughout the United States, is applicable for fossil plants as well.

Q. How was this methodology applied to the other similar fossil plant cost estimates?

A. The aforementioned references use a unit cost factor method for estimating decommissioning activity costs to standardize the estimating calculations. Unit cost factors for activities such as concrete removal ($/cu. yd.), steel removal ($/ton), and cutting costs ($/in.) were developed based on the labor cost information provided. Consumable material and equipment rental costs (crane and truck rental, operating costs for heavy equipment, torch cutting gas consumption, etc.) were taken in large part from R.S. Means, "Building Construction Cost Data 2001." The activity-dependent cost for removal, shipping and disposal were estimated using the item quantity (cu. yds., tons, inches, etc.) developed from plant drawings and inventory documents. The activity duration critical path derived from such key activities as boiler removal, turbine removal etc., was used to determine the total dismantling program schedule.

The program schedule is used to determine the period-dependent costs such as program management, administration, field engineering, equipment rental, and security. The salary and hourly rates are typical for personnel associated with period-dependent costs.

In addition, collateral costs were included for heavy equipment rental or purchase, safety equipment and supplies, energy costs, permits, and insurance.

The activity-dependent, period-dependent, and collateral costs were added to develop the total dismantling costs. As discussed later, a contingency percentage was added to allow for the effect of unpredictable program problems on costs. Such a contingency is appropriate for a project of this size and type. The total dismantling costs plus contingency, less scrap credit, provides the total project cost. One of the primary objectives of every dismantling program is to protect public health and safety. The cost estimate for the dismantling activities includes the necessary planning, engineering and implementation to provide this protection to the public.

Q. What methodology did you apply to update the 2001 estimates?

A. As described in detail in Schedule TSL-1, TLG used U.S. Department of Labor, Bureau of Labor Statistics indices to adjust the dismantling costs from 2001 to 2005 dollars.

Based on plant tours taken by me and other TLG representatives in the Fall of 2005, adjustments to the systems and structures inventory for the applicable stations were made. These included:

<u>Labadie:</u> added the fire pump building and diesel pumps;

<u>Rush Island:</u> added the barge loading facility;

<u>Sioux</u>: added the barge loading facility;

<u>Meramec</u>: added the barge loading facility, railcar unloading facility and dry ash facility;

<u>Venice:</u> added five combustion gas turbine-generators.

Q. For purposes of the estimate, when did you assume the units at each site would be dismantled?

A. We assumed dismantling of each unit would occur upon retirement of the last unit at each site. This approach is reasonable because it would be more difficult and costly to protect the operating units from potential damage when demolishing the retired units. Moreover, the dismantling staff and crew would only have to mobilize and demobilize once for the site instead of each time a unit is retired. Using the same staff and crew would take maximum advantage of the lessons learned as the units are dismantled in sequence.

Q. What are the major differences between nuclear and fossil power plants?

A. The major difference is the radioactivity contained in nuclear power plants. Removal of radioactively contaminated piping, components and structures from a nuclear plant is more difficult and costly than the removal of comparable items from a fossil plant. The activities of decontaminating, removing, packaging, shipping and burying radioactive materials from a nuclear plant require strict radiological controls, special containments and packaging, and licenses for the transport for disposal. There are many more opportunities for problems to arise in nuclear plant decommissioning than in fossil plant decommissioning.

Fossil plants have no radioactivity, but they may contain asbestos, polychlorinated byphenals (PCBs), mercury (in switches), lead, and other hazardous materials. These materials require special handling and disposal, but in general, productivity is higher overall when fossil plants are decommissioned than when nuclear plants are decommissioned, and the overall cost is lower.

Q. Does your experience in the decommissioning of nuclear power plants aid in the conduct of a site-specific dismantling study of a fossil-fueled power plant?

A. Yes. The parallelism in approach between nuclear plant decommissioning and fossil plant dismantling enables us to rely on the field experience from nuclear decommissioning to prepare fossil plant studies. In particular, the following major areas of planning and estimating exhibit similar characteristics.

1. Site Characterization

The process and planning for identification of radionuclide contamination composition and extent for nuclear power plants is similar to that required for potentially hazardous materials in fossil-fueled power plants.

2. Removal of Hazardous Material (Asbestos)

Planning and removal of asbestos-containing materials in nuclear and fossil plants is identical.

3. Sequencing of Work Activities

Identification and sequencing of essential (to the decommissioning task) and non-essential systems removal follows the same considerations in both types of plants.

Essential systems include electric power, lighting, and service water systems. For example, power and lighting would be retained as long as possible to assist in the dismantling process.

4. Management Staff

Identification of utility and decommissioning (dismantling) staffing composition and levels follows the same process in both types of units. The specific job functions will differ but the logic is the same. Management staff costs are period-dependent; that is, they are a function of the overall project duration.

5. Removal of Non-Contaminated Equipment/Structures

Removal of non-contaminated piping, components and structures are activity-dependent. The methods for their removal are identical for most of the systems and structures in each type of plant. Piping diameters and lengths are similar (size-for-size plants), and the removal rate will be the same. Clean components, such as feedwater heaters and pumps, condensate pumps, demineralizer systems, etc., in nuclear plants, are the same sizes and types as those found in fossil plants. Steel and concrete structures are removed in the same manner in both types of plants. Removal of equipment unique to fossil plants, such as coal handling and air/flue gas duct systems, relates to the weight of sub-components, and is accomplished by rigging and segmentation.

6. Scheduling

The scheduling of work activities for either type of plant follows the proven planning techniques of activity precedence networks and critical path management. An activity precedence network consists of a series of sequenced activities based upon the priority or "precedence" of completing one or more activities before starting another activity.

The critical path is the longest sequence of work activities in a precedence network from project initiation to completion.

7. Collateral Cost

Collateral costs are neither activity-dependent nor period-dependent costs. These items are identical in both types of plants, although specific cost values will differ.

8. Contingency

Contingency, as described more completely later in this testimony, is a cost allowance for field-related problems that are likely to occur. These problems include tool and equipment breakdown, late deliveries of supplies and equipment, and adverse weather. These field problems occur in both nuclear and fossil plant dismantling, although the specific allowances differ in each case.

9. Field Experience

The field experience in both nuclear and fossil plant dismantling for clean equipment is essentially identical. Heavy lifts of components weighing 50 to 450 tons are common in both plant types, and the planning and implementation activities are virtually identical.

In summary, nuclear plant decommissioning experience is directly applicable to fossil plant dismantling.

Q. How does the dismantling estimating process differ from construction estimating?

A. There is very little difference in the elements of cost between fossil plant dismantling and construction. Both activities must account for labor, materials, equipment, services and collateral costs (as defined earlier). The activities related to construction are similar to those for dismantling. Specifically, construction activities such as rigging components into position and welding connecting piping are comparable to dismantling activities such as cutting connecting piping and rigging components out of the structures. In the case of construction however, the pipe welds must be inspected and re-welded if flaws in the weld are identified. This re-work causes schedule delays and incurs additional expense. In the case of dismantling, the pipe need only be cut once. Problems in dismantling occur when plant drawings and specifications do not properly reflect the plant as constructed. This occurs when changes to the plant are made that have not been recorded on the as-built drawings. This can result in additional dismantling costs. However, in general, dismantling cost estimating is comparable to construction cost estimating.

Q. Please describe the process of dismantling a fossil power plant.

A. Approximately three months prior to final shutdown, engineering and planning would begin the preparation of the Dismantling Engineering Plan (Plan) and Environmental Report (ER). The Plan describes the status of the facility at shutdown, work to be accomplished, safety analyses associated with each of the major activities, general procedures and sequence to be followed, and final site condition upon completion of all work. Similarly, the ER would evaluate environmental effects to workers and the public, and waste generation effects on the site and environment. These documents would be submitted to the Environmental Protection Agency and other applicable regulatory agencies for review and approval, and authorization to proceed.

The sequence of work would be as follows:

Period 1 - Site Preparations - would begin upon shutdown of the facility, and would involve site preparations to initiate dismantling. All usable fuel is assumed to have been burned or removed prior to shutdown. Asbestos abatement work is completed.

Period 2 - Dismantling Operations - would begin upon receipt of approval of all regulatory agencies. This phase of the work involves the removal of all components of the boiler, air quality treatment systems (electrostatic precipitators, etc.), fuel handling systems (coal conveyors, crushers, oil storage tanks, etc.), the turbine-generator, condensate, and feedwater systems. In general, the boiler will be dismantled in a bottoms-up mode, whereby the lower sections of the boilers will be cut at grade level, and remaining upper sections lowered to grade or scaffolding erected to cut the upper sections of the boiler furnace. This method of dismantling is necessary for the top-hung type of boiler that is supported from the steel structure. All of the AmerenUE plants are of the top-hung design except the Venice plant. Those boilers are bottom supported and would be dismantled from the top down.

Care must be taken to ensure boiler sections are removed uniformly from the bottom up to avoid any unbalanced load on the steel structure that may cause it to become unstable.

Steel structures used to support the boiler and turbine-generator components will be dismantled by controlled demolition (by lowering sections to grade by cranes) to prevent injury to workers on lower floors. The steel structures will be dismantled from the top down, essentially reversing the construction sequence.

Concrete structures such as boiler foundations, floors, turbine-generator pedestals and support buildings will be demolished by conventional wrecking methods. These may include the use of wrecking balls, pneumatically-operated rams on a backhoe, or controlled blasting.

Period 3 - Site Restoration - would involve the re-grading of all areas that were disturbed by the dismantling process. All structures will be removed to three feet below grade to permit re-vegetation of the site, or to eliminate at-grade hazards. Clean rubble would be used on site for fill and additional soil would be used to cover each subgrade structure. The site would be graded.

Q. Is it possible that future changes in technology and regulation could affect the dismantling costs?

A. Yes. The TLG cost estimates prepared for these plants are based on state-of-the-art technology. No provision is made to adjust for cost changes associated with future changes in technology and regulations. It is my recommendation that AmerenUE thoroughly review these estimates periodically and revise them, if necessary, to account for cost increases or decreases as influenced by future technology and regulations, Occupational Safety and Health Act (OSHA) requirements, environmental concerns, etc., and general inflation as measured by the Consumer Price Index.

V. CONTINGENCY

Q. What is the purpose of the contingency?

A. The purpose of the contingency is to allow for the costs of high probability program problems, where the occurrence, duration, and severity cannot be accurately predicted and where they have not been included in the basic estimate. The inclusion of contingency in cost estimation for both construction and dismantling is well accepted. The American Association of Cost Engineers (AACE) (in their Cost Engineer's Notebook) defines contingency as follows:

> Contingency - specific provision for unforeseeable elements of cost within the defined project scope; particularly important where previous experience relating estimates and actual costs has shown that unforeseeable events which will increase costs are likely to occur.

Past dismantling and decommissioning experience has shown that these problems are likely to occur and may have a cumulative impact.

Fossil-fueled and nuclear power plants share some of the same potential problems leading to the need for contingency in cost estimates. These problem areas include:

Schedule slippages -	leading to crew overtime payments and/or project extensions
Weather delays -	loss of productivity, overtime, slippages
Labor strikes -	loss of productivity, slippages
Workers injuries -	production interruptions, additional safety training, workers compensation claims, possible increased insurance premiums
Material shipping -	rescheduling of activities, inefficiencies in production
Equipment breakdowns -	rescheduling of activities, out-of-scope backcharges from subcontractors
Regulatory inspections -	insurance inspectors, OSHA inspectors, federal and state EPA inspectors, state building inspectors

Hazardous materials -	special handling requirements beyond planned requirements

A more extensive discussion of nuclear contingency is included in the AIF/NESP-036 Guidelines Study (Chapter 13) referred to earlier. In that study, contingencies for the individual activities ranged from 10% to 75%, depending on the degree of difficulty judged to be appropriate from actual decommissioning experience. The overall contingency, when applied to the appropriate components of nuclear plant decommissioning costs, results in an average contingency of up to 25%.

For fossil plant dismantling, the absence of radioactive materials and their attendant potential problems simplifies the dismantling process. Individual activity contingency estimates for fossil-fueled power plants usually use factors in the range of 15% for work involving non-hazardous materials and 25% for work involving hazardous materials. Independent of our preparation of this estimate for AmerenUE, R.S. Means, "Building Construction Cost Data 2001," suggests that a 15% contingency factor for conventional construction be used.

Q. How do the contingency factors developed for the AmerenUE estimate compare to contingency factors adopted by regulatory agencies for nuclear plant decommissioning?

A. As I discussed earlier, the nuclear contingency is generally in the range of 20-25%. The Federal Energy Regulatory Commission (FERC) adopted a 25% contingency for nuclear power plant decommissioning as reasonable. Numerous state public utility commissions have adopted a 25% contingency for nuclear plant decommissioning, as evidenced by an American Gas Association-Edison Electric Institute Depreciation Committee Survey, which showed that 21 of 32 utility survey respondents had included a

25% contingency in their estimates. The survey also showed that of the 15 utilities that filed rate cases, 11 had approval to use the 25% contingency for their plant decommissioning studies.

Q. Have you compared estimates and actual costs for decommissioning projects that have been undertaken to date?

A. Yes. Based upon information available, TLG's estimates for recent work performed are on average within 10% of the actual costs reported (including contingency).

Q. Is the variation between estimated and actual costs due to contingency costs?

A. No. The differentials were either the result of modifications in the management of the intended program or savings in disposal costs negotiated by the licensee with the burial facility during the project. Since the contingency, as applied in the TLG's estimates, is not pricing or scope related, the correlation of estimated and actual project costs validates the need for contingency in decommissioning planning.

VI. SITE RESTORATION

Q. Are there any regulations or codes applicable to dismantling?

A. Yes. The Uniform Building Code (UBC), widely adopted by most states requires that retired structures may not be left in an unsafe condition, as follows:

> SECTION 102 – UNSAFE BUILDING OR STRUCTURES
>
> All buildings or structures regulated by this code which are structurally unsafe or not provided with adequate egress, or which constitute a fire hazard, or are otherwise dangerous to human life are, for the purpose of this section, unsafe. Any use of buildings or structures constituting a hazard to safety, health or public welfare by reason of inadequate maintenance, dilapidation, obsolescence, fire hazard, disaster, damage or abandonment is, for the purpose of this section, an unsafe use. Parapet walls, cornices, spires, towers, tanks,

> statuary and other appendages or structural members which are supported by, attached to, or a part of a building and which are in deteriorated condition or otherwise unable to sustain the design loads which are specified in this code are hereby designated as unsafe building appendages.
>
> All such unsafe buildings, structures or appendages are hereby declared to be public nuisances and shall be abated by repair, rehabilitation, demolition or removal in accordance with the procedures set forth in the Dangerous Buildings Code or such alternate procedures as may have been or as may be adopted by this jurisdiction. As an alternative, the building official, or other employee or official of this jurisdiction as designated by the governing body, may institute any other appropriate action to prevent, restrain, correct or abate the violation.

A retired power plant fits this definition of an unsafe structure which must be taken down and removed, or made safe and secure.

Q. Why is dismantling after a power plant is taken out of service the appropriate alternative?

A. Securing, maintaining and guarding retired power plants indefinitely is costly, which will require either a full-time guard force, and/or intrusion detection devices and alarms monitored by local law enforcement agencies, as well as general building maintenance to keep the structures in a safe condition. Furthermore, prompt dismantling of retired power plants makes the site available for alternative uses at the earliest possible time.

Q. Is reuse of the site for a power plant a possibility?

A. Yes.

Q. If the site could be reused, why couldn't the power plant components be reused in repowering?

A. The designs of new generation power plants are not likely to use the same size and configuration of components, nor require the same type of building enclosures.

Optimum facility design will be sized to match the megawatt size of a replacement power plant, if any, either larger or smaller. For example, new combustion turbine-generators are modular, self-contained units that don't need a building enclosure. Combined cycle units may require larger turbine buildings to enclose the waste heat steam generators which supply steam to the turbine. The cost to renovate older buildings and bring them to current safety code standards, combined with the less-than-optimum facility design makes reuse of the existing powerhouse buildings an unlikely scenario. Furthermore, the existing components are likely to be of an obsolete design, more costly to operate and maintain, and may not be compatible with new instrumentation and control systems.

Q. Why is it necessary to dismantle a fossil-fired plant?

A. Remediation of fossil-fired facilities is inherently destructive, and may include creation of large access ways, dismantling of peripheral structures, concrete demolition including controlled blasting, removal of roofs and walls, excavation of footings, etc. Precluding reconstruction, a retired fossil-fired facility poses hazards including large interior open areas, pits, shafts and underground tunnels. With many of the plant services removed from service, the structures would be dark, littered with concrete rubble and structural debris obstructing means of egress. Condensation and groundwater intrusion, and bird infiltration would soon create hazardous conditions, promoting unsanitary biological infestations, accelerating corrosion, and general facility deterioration. A dedicated and systematic maintenance program is necessary to maintain the facility in a safe condition. Security measures are necessary to limit the liability inherent in casual or deliberate intrusion by the public. These maintenance and surveillance programs are expensive.

The steel and concrete or brick structures at fossil sites were not designed to prevent deliberate intrusion. Large glass windows, sheet metal siding, loading ramps and multiple ingress points allow easy entry into the station confines. Visitation of older, shutdown units has conclusively demonstrated both the speed and effects of facility deterioration. Such deterioration includes broken windows, leaking roofs, torn or damaged siding, obstructed stairwells with poor egress, and unsanitary conditions caused by the effects of weather, corrosion, ground water intrusion and vermin. Stacks, mine openings, fill ponds and lagoons with steep sloped banks, and river intake structures are high exposure liabilities and inherently dangerous to human life.

The alternative to perpetual caretaking and site surveillance is to dismantle the site as soon as practical. This activity is the most cost-effective when included within the schedule for site remediation, due to resources available on-site and the expected condition of the facilities.

Q. Can you cite some examples where fossil-fueled power plants were dismantled?

A. Yes. As I mentioned in the Experience section of my testimony, the Comal and the Seaholm plants in Texas were dismantled although the buildings were retained as local landmarks. These plants were built in the early 1900s and were no longer economical to operate.

In Missouri, Kansas City Power & Light decommissioned and dismantled the Northeast Station located in Kansas City. This plant was built and placed in service in 1945, and was dismantled in 1985, after about 40 years of operation.

VII. SALVAGE AND SCRAP

Q. How was scrap or salvage credit included in the overall estimate?

A. Credit for carbon steel, stainless steel and copper scrap is included in fossil plant estimates based on published scrap values. No credit was included for salvage of any components because these components will be of an obsolete design by the time these plants are dismantled. Consequently, these materials were considered as scrap.

VIII. DECOMMISSIONING FEASIBILITY

Q. What is the feasibility of the decommissioning premise?

A. There is extensive experience in the United States and in other countries for the complete dismantling of fossil power plants and related industrial facilities. This experience includes the dismantling of chemical refineries, steel mills, and nuclear power plants (with their associated non-nuclear turbine-generator portions). This directly related experience shows that the AmerenUE power plants can be completely dismantled safely.

IX. REGULATORY APPROVAL OF DECOMMISSIONING

Q. Has the Missouri Public Service Commission approved decommissioning estimates?

A. Yes. The Missouri Public Service Commission has accepted TLG's cost estimates for decommissioning the Callaway and Wolf Creek nuclear plants. These estimates include dismantling of the decommissioned structures, following license termination at nuclear power plants, and are an appropriate measure to protect public health and safety. The same safety concerns exist at retired fossil-fired power stations, and for this reason TLG recommends dismantling fossil-fired power plant structures.

Q. Have other regulatory agencies approved fossil-fired power station decommissioning cost estimates for inclusion in rates?

A. Yes. The Florida Public Service Commission in its Order No. 24741 in Docket No. 890186-EI, approved dismantlement studies and associated costs for fossil-fired units as filed by Gulf Power Company, Tampa Electric Company, Florida Power Corporation and Florida Power & Light Company.

Q. How was partial dismantling applied at the stations?

A. Partial dismantling represents an interim step in dismantling the station. The scope of partial dismantling was limited to removal of non-power block structures (structures other than the boiler and turbine buildings) and hazardous materials. The objective of partial dismantling is to minimize potential hazards associated with minimally maintained facilities. As such the principal work activities included the abatement of asbestos (when present), and the removal of structures expected to deteriorate due to environmental exposure (weather).

Q. What is the benefit of partial dismantling?

A. Partial dismantling, while not a substitute for the inevitable necessity to dismantle the facility, is a lower near-term cost option which reduces the number of facilities requiring maintenance. It removes structures exposed to the weather that are expected to deteriorate without maintenance; removes asbestos, eliminating the potential to create an airborne hazard; and removes structures that may be a public nuisance attraction.

Q. How were the partial dismantling costs estimated?

A. Partial dismantling costs were estimated using the same approach used for the complete dismantling cost study.

Q. Does this conclude your prepared direct testimony?

A. Yes, it does.

BEFORE THE PUBLIC SERVICE COMMISSION
OF THE STATE OF MISSOURI

In the Matter of Union Electric Company d/b/a AmerenUE for Authority to File Tariffs Increasing Rates for Electric Service Provided to Customers in the Company's Missouri Service Area.	)))))	Case No. ER-2007- 0002

AFFIDAVIT OF THOMAS S. LAGUARDIA

STATE OF CONNECTICUT)
) ss
COUNTY OF ____________)

Tom LaGuardia, being first duly sworn on his oath, states:

1. My name is Thomas S. LaGuardia. I work in Bethel, CT and I am the Managing Member of LaGuardia & Associates, LLC.

2. Attached hereto and made a part hereof for all purposes is my Direct Testimony on behalf of Union Electric Company d/b/a AmerenUE consisting of 29 pages, Attachment A and Schedule TLG-1, all of which have been prepared in written form for introduction into evidence in the above-referenced docket.

3. I hereby swear and affirm that my answers contained in the attached testimony to the questions therein propounded are true and correct.

Thomas S. LaGuardia
Thomas S. LaGuardia

Subscribed and sworn to before me this 27 day of June, 2006.

Elisabeth Sullivan
Notary Public

My commission expires:

ELISABETH SULLIVAN
Notary Public
My Commission Expires 3/31/2010

EXECUTIVE SUMMARY

Thomas S. LaGuardia

Member, LaGuardia & Associates, LLC

* * * * * * * * * *

I am a member of LaGuardia & Associates, LLC, a consulting engineering company. I was formerly President of TLG Services (TLG), an Entergy Nuclear Company until I retired. In that position I was responsible for the technical and business management of engineering and field services in the areas of decontamination, decommissioning, waste management and general engineering for nuclear and fossil-fueled electric generating stations.

My testimony addresses the results of an updated (from the earlier 2001 TLG study) decommissioning, i.e., dismantling cost study prepared by TLG for two distinct dismantling scenarios for each of AmerenUE's fossil-fueled electric power generating station. The base case is for the complete dismantling of the generating station, including removing the steam turbine-generators, boilers, fuel handling systems, and all plant equipment and above-ground structures, except for the switchyard, and restoration of the site upon cessation of operations. The Alternative case assumes limited and partial dismantling of the station, including removal of hazardous waste, and the removal of the non-power block structures, stacks, coal handling facilities, ash ponds, and screen houses. Finally, the power block structures will be secured in a safe condition for an extended duration dormancy. A summary of the costs for the base case and alternative case is shown for the following Ameren fossil-fueled power plants:

SUMMARY OF DISMANTLING COST ESTIMATES

Station	No. of Units	Megawatts (Total)	Base Case: Full ($, Thousands)	Alternative Case: Partial Dismantle ($, Thousands)
Labadie	4	2520	131,392	52,478
Rush Island	2	1260	70,230	26,873
Sioux	2	1050	70,399	34,111
Meramec	4	940	74,643	35,446
Venice	6	400	44,970	24,892
Total Cost			391,634	173800

Retirement is the planned and orderly removal from service of a generating station. Upon retirement, the facility may either be rendered safe indefinitely (through on-going monitoring, maintenance, repair and security measures), or dismantled. Maintenance and repair indefinitely is a costly process for a facility that has no further use, and accordingly prompt dismantling following retirement of the station is the favored approach.

The TLG cost estimating staff visited each of the five electric power generating stations to become familiar with the equipment and general arrangement. The updated study was developed using the U.S. Department of Labor, Bureau of Labor Statistics indices to adjust the dismantling costs from 2001 to 2005 dollars. Site specific changes (additions) were included in the updated study to reflect actual site equipment.

The results of the cost estimates are consistent with other studies TLG has prepared for over 250 fossil-fueled electric power units. Each plant is unique in terms of the site-specific differences of type of equipment, building construction and site remediation. These factors were incorporated in the estimates prepared for AmerenUE.

Utilities and regulators have begun to recognize the need to dismantle older plants that are no longer economical to operate either through obsolescence, or more restrictive emission requirements. TLG was directly involved with two such dismantling programs at Texas on the Comal and Seaholm power stations, where we provided planning and oversight to contractors dismantling the fossil-fueled power equipment. Kansas City Power & Light dismantled a 100 MW power station in Missouri that was only 40 years old, because the power needs were provided by the Wolf Creek nuclear power station. The Florida Public Service Commission now requires its utilities to account for fossil-fueled power plant dismantling costs in its rate structure to customers so current customers will pay their respective share of the dismantling costs.

TLG recommends that Ameren review these dismantling cost estimates periodically to account for changes in regulations, dismantling techniques, hazardous waste disposal cost increases, and inflation-related expenses.

DISMANTLING COST STUDY

for the

LABADIE, RUSH ISLAND, SIOUX, MERAMEC, AND VENICE POWER STATIONS

prepared for
Ameren Corporation

prepared by
TLG Services, Inc.
Bridgewater, Connecticut

February 2006

APPROVALS

Project Manager	Geoffrey M. Griffiths	22 Feb 06 Date
Technical Manager	Benjamin J. Stochmal	2/22/06 Date
Quality Assurance Manager	for TSL Thomas S. LaGuardia (acting QA Manager)	2/22/06 Date

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0		02/22/2006		Original Issue

EXECUTIVE SUMMARY

This report presents a summary of the estimated costs for the dismantling of the Labadie, Rush Island, Sioux, Meramec, and Venice Steam Electric Stations. These stations, owned and operated by the Ameren Corporation, are located in the vicinity of St. Louis, Missouri.

Dismantling costs were estimated for two distinct dismantling scenarios for each station. The base case consists of the complete dismantling of the generating station upon cessation of operations; it includes the costs for removing the steam turbine generators, boilers, fuel handling systems, and all plant equipment and above ground structures, except for the switchyard. At the conclusion of the dismantling process the entire station area, except for the switchyard, will be available for alternative use. This scenario is identical to the work scope assumed for the 2001 dismantling estimate.

The alternative case assumes limited and partial dismantling of the station. It includes the removal of hazardous waste and the removal of non-power block structures, stacks, coal handling facilities, ash ponds, and screen-houses. Finally, the power block structures will be secured in a safe condition for extended duration dormancy.

The total project costs, expressed in thousands of year 2005 dollars, are estimated as follows:

Station	Base Case: Full Dismantle	Alternative Case: Partial Dismantle
Labadie	$131,392	$52,478
Rush Island	$70,230	$ 26,873
Sioux	$70,399	$ 34,111
Meramec	$74,643	$ 35,446
Venice	$40,501	$ 20,379

Prompt dismantling is the preferred alternative because it relieves the owner of the liabilities associated with leaving behind potentially unsafe structures.

Partial dismantling is not recommended since it tends to make the overall remediation process more costly. Leaving unsafe structures in place would also be a violation of Uniform Building Code, Section 102, as well as state and local building codes. Deferred dismantling (for several years after the cessation of plant operations) can significantly increase total cost since the owner continues to incur the cost of manning and maintaining the site in protective storage. In addition, at the end of the dormancy period, the station must reactivate those systems necessary to support dismantling operations and/or procure replacement services. Refurbishment activities could involve re-qualifying the cranes and other lifting devices, and reactivating electrical, lighting, water, air handling, and other service systems.

A major disadvantage of deferred dismantling is the unavailability of the station operations personnel at the time of final dismantling. The knowledge of the current operating staff is invaluable in the planning for and assisting in plant dismantling activities. Without personnel familiar with station operations, the dismantling program may incur additional costs as it compensates for engineering and planning developed from an incomplete data base. Consequently, although an alternative scenario is provided, dismantling immediately after the permanent cessation of plant operations is the preferred alternative.

1.0 INTRODUCTION

1.1 OBJECTIVE OF STUDY

The objective of the dismantling study prepared by TLG Services, Inc. (TLG) is to develop estimates of the costs to dismantle Labadie, Rush Island, Sioux, Meramec and Venice Stations at the end of their useful generating lives. Two different scenarios were analyzed. The base case assumes the immediate dismantling of the station upon cessation of plant operations. The alternative case assumes only a partial dismantling at that time. This study is not a detailed engineering document, but a cost estimate prepared in advance of the engineering preparations that will be necessary to carry out the dismantling activities. The costs presented in this study should be considered in light of this qualification.

1.2 STATION DESCRIPTIONS

Labadie is a four-unit coal-fired station located in Labadie, MO. Each unit is rated at nominal 630 MW.

Rush Island is a two-unit coal-fired station located in Festus, MO. Each unit is rated at nominal 630 MW.

Sioux is a two-unit coal-fired station located in West Alton, MO. Each unit is rated at nominal 525 MW.

Meramec is a four-unit coal-fired station located in St. Louis, MO. Two units are rated at nominal 140 MW each, one unit is rated at nominal 300 MW, and the fourth unit is rated at nominal 360 MW.

Venice is a six-unit oil/gas-fired station located in Venice, IL. Two units are rated at nominal 40 MW, and four units are rated at nominal 80 MW each.

1.3 GENERAL APPROACH

The cost estimates provided herein are updates to the station estimates which were initially developed in 2001 (Ref 1). The original estimates were prepared on an item-by-item basis using unit cost factors and quantities derived from TLG's database of costs for dismantling power stations of similar size and type. Project schedules were derived from the same database. With the prior study as a basis, the current estimate adjusted these costs for economic changes and updated the inventory and removal costs for major station systems and structures additions. Costs were also included for the removal of asbestos insulation and/or asbestos containing materials from each station.

The estimate includes costs for removal of the turbine generators, boilers, fuel handling, and all other equipment located in power block and miscellaneous site buildings. All structures are removed to an elevation of 3 feet below grade. The assumptions are included in Section 3.3.

Individual components of costs are combined to yield the total cost of the project, including contingency. "Contingency" is defined as "specific provision for unforeseeable elements of cost within the defined project scope; particularly important where previous experience relating estimates and actual costs has shown that unforeseeable events which will increase costs are likely to occur." The cost elements in this estimate are based upon ideal conditions. However, experience has shown that even under the best management, engineering and planning conditions, problems beyond management's control often add to the costs of completing a project. Such problems include: inclement weather, equipment or process breakdown; late shipments from suppliers; equipment/supplies damaged in transit to the site; regulatory changes to the extent of review or revisions needed to approve plans, procedures, or licensing documents. Accordingly, account is taken of the corresponding increased costs by applying a contingency factor of 15% for work involving non-hazardous materials and 25% for work involving hazardous materials.

1.4 REGULATORY GUIDELINES AND CRITERIA

The study assumes that intake, discharge, coal handling, and other shoreline structures must be completely removed and the shoreline returned to its natural state. Shoreline remediation work will be subject to review and approval for compliance with applicable federal and state regulations.

On-site ponds, lagoons, ash disposal sites, etc., must be closed in accordance with a closure plan approved by the appropriate state agencies. After closure, it is assumed that environmental monitoring of the site will continue for 30 years.

During the actual dismantling process, each station must meet all additional federal and state regulations that may exist at that time.

2.0 DISMANTLING OPERATIONS

The estimates (regardless of the scenario) for dismantling Labadie, Rush Island, Sioux, Meramec, and Venice Stations are prepared by organizing the dismantling effort into three phases. The first phase is primarily associated with the planning and organizational phases of the work and performance of asbestos abatement. The second phase includes the physical activities for the removal of hazardous material, and removal of major equipment and components. The final phase includes the final building demolition activities and the reclamation of the site to its designated natural state.

The following sections describe the program necessary for accomplishing the dismantling operations.

2.1 PROJECT ORGANIZATION

For the purposes of this study (regardless of the scenario), the dismantling project is assumed to be managed by an Ameren Company Project Director, who would have the primary authority for dismantling the station. A Dismantling Operations Contractor (DOC), experienced in dismantling similar facilities, would be hired as the prime contractor for the removal of plant components and site facilities. The DOC Project Manager would report to the Project Director. The DOC Project Manager would supervise the day-to-day dismantling activities of the station and be responsible for completing the work in an expeditious and safe manner. DOC personnel would manage and direct the labor force in accordance with approved procedures and under the supervision of the owner's health and safety organization. The owner's staff would maintain and/or provide the engineering resources, environmental expertise, operations and maintenance support, and security services necessary to support dismantling operations. Figure 2.1 gives a simplified typical organizational chart for utility staff and DOC personnel.

2.2 PRELIMINARY PLANNING/PREPARATION

Plant closure planning is initiated once the decision is made to discontinue plant operations. Several activities should be initiated prior to cessation of operations to provide a smooth transition to site dismantling. Since these activities are typically performed during the final year(s) of operations, the associated cost is not specifically reflected within the subsequent dismantling expenditures.

Plant closure support activities include (regardless of selected scenario):

- the removal from the site of non-essential structures and any property owned by others;
- consumption of residual fuel in active or inactive storage areas and tanks;
- installation of supplemental environmental monitoring equipment;
- applications for appropriate permits for off-site disposal of hazardous and toxic materials;
- identification and selection of a qualified DOC;
- removal of acids and caustics, flushing and cleaning of inactive storage tanks;
- cleaning of fly-ash handling equipment, e.g., filters and holding tanks;
- disposition of surplus bulk chemicals and gas storage containers.

2.3 DISMANTLING PROGRAM

A dismantling program is characterized by three distinct periods: Period 1 - Asbestos Abatement and Engineering/Planning; Period 2 - Dismantling Operations; and Period 3 - Site Restoration. This section summarizes the activities performed under each phase of the program.

Although actual sequences of work may differ from those presented herein, these activity descriptions provide a basis for the detailed engineering, planning, and scheduling at the time of dismantling.

2.3.1 Period 1- Asbestos Abatement and Engineering/Planning

Preliminary Planning/Preparation:

During this phase, the owner assembles its dismantling management organization and accomplishes those site preparation activities necessary to provide a smooth transition from plant operations to site dismantling. Costs incurred during this preliminary phase of the program are included in the dismantling costs presented in this study.

Owner prepares the stations for dismantling (base case or alternative case) by performing the following activities:

- Selecting the DOC and an Asbestos Abatement Contractor;

- Obtaining appropriate permits for disposal of hazardous and toxic materials;
- Installing environmental monitoring equipment;
- Initiating and completing all asbestos abatement work. Period 2 dismantling operations cannot begin until asbestos is removed.

Detailed Engineering and Planning:

Detailed engineering and planning activities are initiated once the asbestos abatement contractor and DOC have been selected. The DOC proceeds with dismantling engineering and planning by performing the following activities:

- reviewing plant drawings and specifications;
- establishing the final site configuration and identifying the processes to achieve that configuration;
- identifying the major work sequence;
- categorizing plant systems and component inventory, and their associated disposition;
- preparing dismantling work orders;
- preparing a dismantling plan for utility review and approval;
- preparing permit application(s) for plant demolition;
- mobilizing site staff;
- securing temporary services/facilities to support dismantling operations;
- arranging for heavy lift and dismantling equipment, rigging, and tooling;
- hiring and training the labor force.

2.3.2 Period 2 - Dismantling Operations

The DOC will initiate plant dismantling activities during this period. These activities, which will vary based on the chosen scenario, include:

Base Case - Complete Dismantling

- sealing circulating water lines;

- removing coal yard equipment, including unloading structures, conveyors, transfer towers, and reclaim systems;
- removing systems and/or components that are non-essential to the dismantling effort, including steam piping, generator auxiliary equipment, feedwater and condensate systems, various water systems, etc.;
- removing non-essential equipment that must be removed prior to start of boiler structure removal, including fly-ash handling, coal handling, burner fuel supply, air, and flue gas ducts, etc.;
- removing electrostatic precipitator by cutting collection electrodes, casing, and connecting gas ducts;
- removing the boilers;

  Note: The boiler waterwall is removed from the bottom upward using scaffolding to lower each section to grade. Steel beams are placed across the top of the upper steel structure for rigging and hoist attachment. Platens are rigged from these beams and lowered to grade. Headers are also rigged for removal and lowered to grade.
- removing steam drum and deaerator by severing all connections, segmenting, and lowering to grade;
- disassembling the turbine/generator and condenser;
- removing boiler structural steel from the top, lowering larger pieces to grade for additional processing;
- removing the turbine building superstructure and intermediate floors;
- removing ancillary site structures and facilities;
- blasting/dismantling the monolithic concrete turbine-generator pedestal(s);
- removing concrete stack by blasting/dismantling;
- removing remaining systems such as fire protection, compressed air, water, power, etc.

<u>Alternative Case - Partial Dismantling</u>

- removing coal yard equipment, including unloading structures, conveyors, transfer towers, and reclaim systems;

- removing non-essential equipment that must be removed prior to start of boiler structure removal, including fly-ash handling, coal handling, burner fuel supply, air, and flue gas ducts, etc.;
- removing concrete stack by blasting/dismantling;
- removing screen-house structure;
- removing ancillary non-power block site structures and facilities

2.3.3 Period 3 - Site Restoration

Site restoration activities are initiated following completion of the dismantling operations. The de-watered ash ponds and coal storage areas are to be covered with clay and topsoil. No attempt shall be made to restore the original contour of the land. Landscaping will be limited to grading and seeding necessary for site drainage and erosion control. A final dismantling report is issued upon completion of the program. All personnel and equipment are demobilized from site. The 30-year, post-closure monitoring program is implemented.

2.4 SPECIAL EQUIPMENT

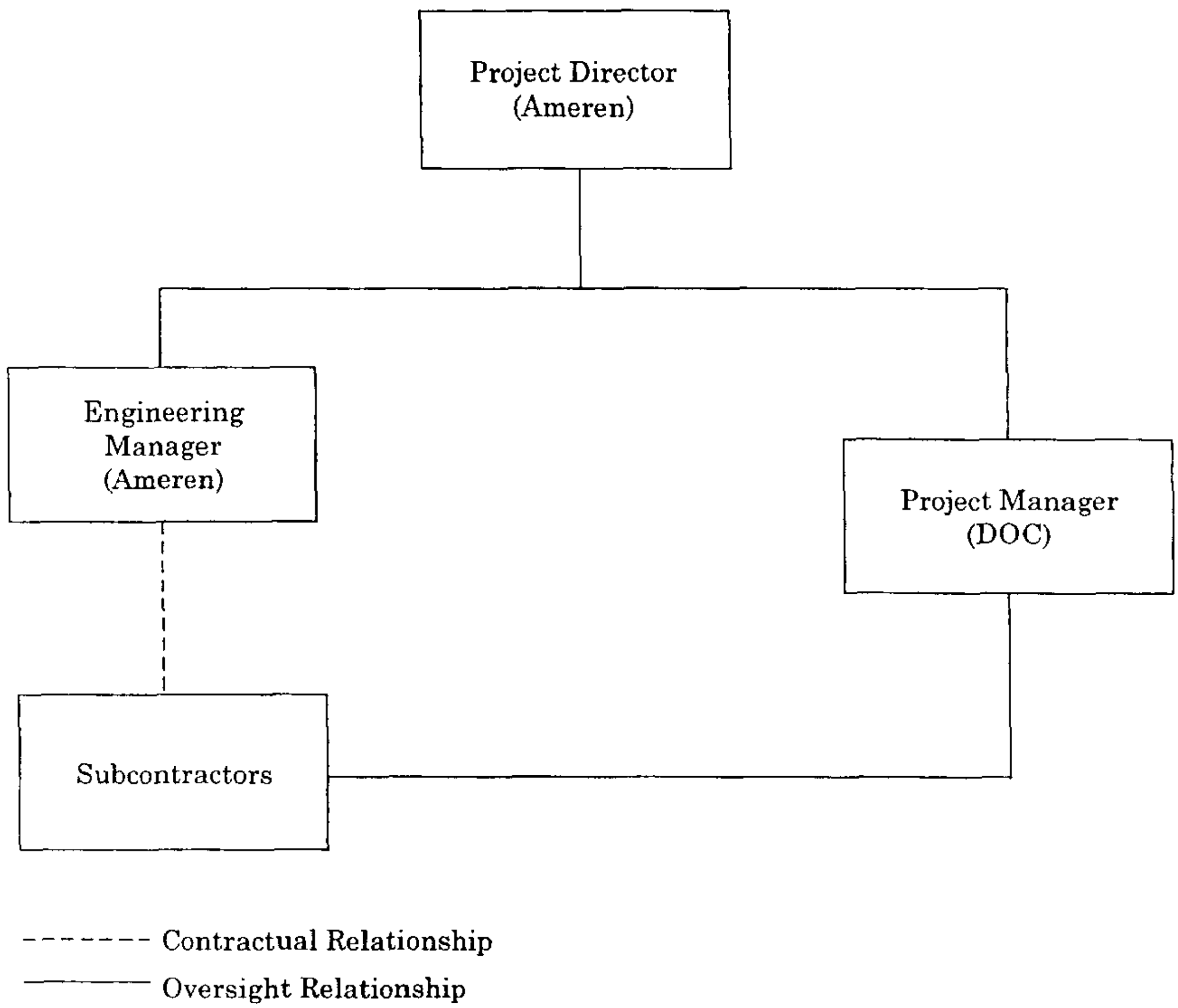
A track-mounted cutting torch is used to segment boiler drums and waterwall headers. The track is magnetically attached to the item to be cut, and the cutting torch is advanced along the track to make the cut. This technique allows greater output than manual cutting, particularly for extremely thick sections.

Hydraulic shears are used for cutting very thick steel plate and structural members. The shears promote productivity by reducing scrap size to manageable levels.

Grapples are used for scrap handling of heavy loads. Grapples include hydraulic, cable and electric styles to handle ferrous, non-ferrous, and solid waste applications. Special combination grapples with magnets are also available.

A front-end loader with a demolition bucket is also used during the dismantling operations. The bucket has two movable jaws that allow it to pick up scrap and place it on a transfer vehicle for removal. Other equipment used in the dismantling process includes forklifts, cutting torches, wheeled backhoes, and mobile cranes, all of which are readily available from rental equipment yards. To the maximum extent possible, existing plant equipment (such as the turbine-hall crane) will be used during the demolition activities.

FIGURE 2.1
PROJECT ORGANIZATION CHART



3.0 COST ESTIMATE

The basis, methodology, and assumptions for the site-specific cost estimates are described in the following sections.

3.1 BASIS OF ESTIMATE

The 2001 estimates were developed using drawings and information provided by Ameren site personnel. Where information was unavailable, TLG used its database for plants of similar size and type.

The 2005 estimate was prepared by adjusting each line item in the prior estimate using economic indices. Changes in indices from 2001 to 2005 were determined and applied against the original costs. The following U.S. Department of Labor, Bureau of Labor Statistics indices were used to adjust the dismantling costs from 2001 to 2005:

Index Series ID and Description	Applicable Cost Elements
Producer Price Index-Commodities, ID WPU112, Construction Machinery and Equipment	Structures demolition[1], Grade & landscape[1], Ash basin remediation[1], Heavy Equipment, Small Tools, Rigging, Pipe cutting equipment.
Producer Price Index-Commodities, ID WPU0543, Industrial Electric Power	Energy.
Consumer Price Index – All Urban Consumers, ID CUUR0000SAS, Services	Security, Insurance.
Employment Cost Index, ID ECU111442i, Administrative support, including Clerical Occupations	Clerical and administrative support.
Employment Cost Index, ID ECU12302i, Construction	Physical craft labor, Plant prep & temporary service.
Employment Cost Index, ID ECU11122i, Professional, Specialty, and Technical Occupations	Site Characterization.

[1] Composite indices were created based upon the percent contribution of labor, equipment, and materials for structures demolition, grading & landscaping, and ash basin remediation activities.

Based upon plant tours performed by TLG Services during the week of September 12, 2005, minor adjustments to the systems and structures inventory for the applicable stations were made. These changes include:

- Barge loading facility, railcar unloading facility, and dry fly ash facility were added to the Maremec Station inventory (base case and alternative case).
- Barge unloading facility was added to the Rush Island Station inventory (base case and alternative case).
- Barge unloading facility was added to the Sioux Station inventory (base case and alternative case).
- Fire pump building and diesel pumps were added to the Labadie Station inventory (base case and alternative case).

The cost estimates are based on averages, such that the total costs shown for the projects are reasonable approximations of what is expected to occur. Individual cost elements are likely to vary from the estimated value. Accordingly, these estimates are not substitutes for the detailed engineering and planning that is performed in preparation for the dismantling of each site.

Listed below are the major factors considered as the basis of the cost estimates:

1. Employee salary and craft labor rates for site administration, construction, and maintenance personnel (derived from TLG's existing database for plants of similar size and type).
2. Engineering services for such items as activity specifications, detailed procedures, structural analysis and modifications, etc. (provided by the DOC).
3. Material and equipment costs for conventional demolition and/or construction activities (taken from R.S. Means Construction Cost Data [Ref. 2]).
4. Costs in this estimate are in year 2005 dollars.

3.2 METHODOLOGY

The methodology used to develop the cost estimate follows the basic approach presented in the AIF/NESP-036 "Guidelines for Producing Commercial Nuclear Power Plant Decommissioning Cost Estimates" (Ref. 3) and the U.S. DOE "Decommissioning Handbook" (Ref. 4). These publications utilize a unit factor method for estimating decommissioning activity costs to simplify the estimating calculations. Unit cost factors for concrete removal ($/cubic yard) steel removal ($/ton) and cutting costs ($/in) are developed from the labor cost information from R. S. Means. With the item quantity (cubic yards, tons, inches, etc.) developed from plant drawings and inventory documents, the activity-dependent costs are estimated.

An activity duration critical path is developed to determine the total dismantling program schedule. This program schedule is then used to determine the period-dependent costs for program management, administration, field engineering, equipment rental, quality assurance, and security. TLG assumed typical salary and hourly rates for personnel associated with period-dependent costs. The costs for conventional demolition of structures, materials, backfill, landscaping, and equipment rental are obtained from R.S. Means. Examples of such unit factor development are presented in AIF/NESP-036.

The unit cost factor method provides a demonstrable basis for establishing reliable cost estimates. The detail of activities for labor costs, equipment, and consumables costs provide assurance that cost elements have not been omitted. Detailed unit cost factors, coupled with the site-specific inventory of piping, components and structures, provide a high degree of confidence in the cost estimates.

The activity-dependent and period-dependent costs are combined with applicable collateral costs to yield the direct decommissioning cost. A contingency is then applied. The cost elements in this estimate are based on ideal conditions; therefore, the contingency factor is applied to allow for non-ideal conditions.

3.3 ASSUMPTIONS

The following assumptions were used in developing the dismantling estimate.

1. Estimated costs are stated in 2005 dollars. Escalation/inflation of the costs over the remaining operating life are not included.
2. The dismantling process will be an engineered process rather than wrecking ball demolition.
3. The demolition will be performed by a DOC who will provide adequate staff and equipment to complete the dismantling.

4. Office trailers will be used to house Owner and DOC personnel.
5. Site security will be provided by the utility.
6. Environmental regulations effective in 2005 are assumed to be in force during the dismantling effort.
7. Structural steel, piping, electrical cable, etc., will be credited for scrap value. Plant equipment is assumed to have no value as salvage.
8. The estimate to dismantle the stations does not address the value of the land.
9. On-site fuel inventories will be used and/or removed prior to start of dismantling.
10. Silos, precipitators, hoppers, tanks, etc., will be emptied prior to the start of dismantling.
11. Acids and caustics will be removed. Ion exchangers and filters will also be emptied in preparation for dismantling.
12. Stores, spare parts, bulk chemical supplies, gas storage containers, laboratory equipment, office furniture, etc., will be removed by the owner in preparation for dismantling.
13. Station transformer oil is assumed to be PCB-free. Lubrication and transformer oils are drained and removed from site by a waste disposal contractor.
14. Essential systems (air, water, electrical, fire water, etc.) required to support dismantling operations will remain in service throughout the project until replaced by temporary services.
15. Turbine building crane, miscellaneous hoists, and trolleys will remain in service to support dismantling until no longer needed.
16. Boiler platens and waterwalls will be cut from their supports, lowered to grade level, and sectioned into 8-foot widths.
17. Conveyors will be rigged, connections severed, and lowered to grade. When on-grade, the conveyors will be torch-cut into 10' long sections.
18. Valves 2" and smaller will be removed intact with the piping. Valves 2-1/2" and larger will be removed from the piping.
19. Structures and foundations will be removed to a depth of three feet below grade, with any resulting voids back-filled to grade level.

20. Turbine pedestals and powerhouse building foundations will be removed by controlled blasting and back-filled to grade.
21. Stand-alone chimney stacks will be blasted to the ground and broken into rubble, the steel liners cut and removed, and the foundations control-blasted to break the concrete in place so that groundwater drainage is provided. The rubble will be used as clean fill.
22. Holes will be drilled in all subsurface, abandoned foundations prior to being back-filled.
23. The dismantling of the electrical equipment terminates at the switch-yard. The switchyard itself is left intact.
24. The site will be graded; however, no effort will be made to restore the original contour of the land. Ground cover will be established for erosion control. Soil required for fill is assumed to be available on site.
25. Solid, non-combustible, non-hazardous, non-toxic rubble generated during dismantling will be used as fill where needed.
26. Ash ponds will be dewatered, backfilled, clay-capped and covered with topsoil and vegetation.
27. Dismantling of any site will not occur until all its units are retired. Costs for security and maintenance on any of the units retired prematurely are not included in the study.
28. Boundary fence shall remain in place after dismantling.
29. Contingency is applied to project costs on a line-item basis.
30. All non-asbestos insulation will be removed for disposal at a local sanitary landfill.
31. Asbestos removal costs included costs for removal of asbestos equipment and piping insulation as well as galbestos siding and asbestos containing floor tiles.
32. Although long term facility dormancy costs (e.g. security, maintenance of structures) are anticipated for the alternative case, no allowance for these costs were included beyond the initial dismantling.

4.0 SCHEDULE ESTIMATES

The following schedule durations were derived from TLG's data base for dismantling power stations of similar size and type. The schedules account for the limitations of personnel workspace and maximum worker safety and protection. Period 2 durations for the Alternative Case were determined by assuming a one week fixed duration for set up and mobilization and adding an additional duration based upon a ratio of the Alternate Case verses Base Case man-hours.

4.1 ASSUMPTIONS

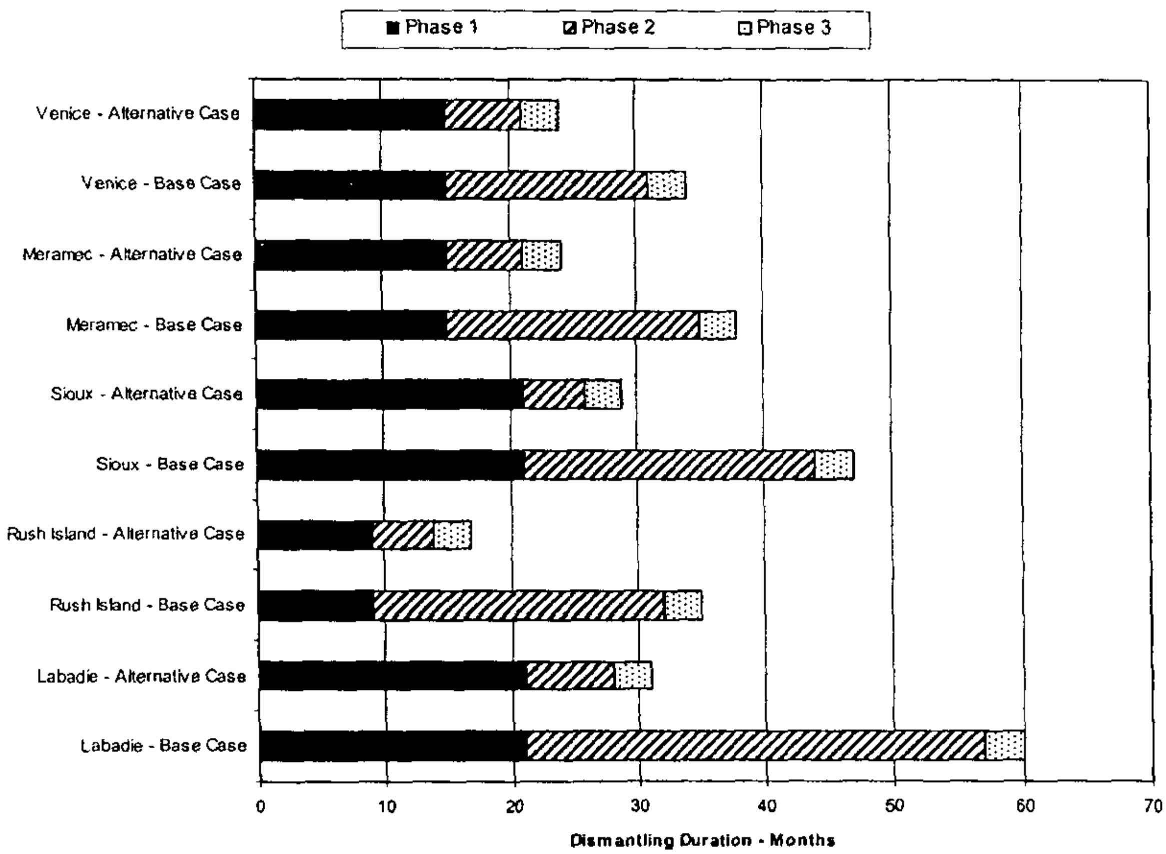
The following limitations and assumptions are reflected in the development of the dismantling schedules.

1. All work is performed during an eight-hour workday, five days per week, with no overtime. There are eleven paid holidays per year.
2. Multiple crews work parallel activities to the maximum extent possible, consistent with optimum efficiency (adequate access for cutting, removal, and laydown space) and with the stringent safety measures necessary during demolition of heavy components and structures.
3. It is assumed that four crews can work safely on boiler waterwall removal at one time. Since the work is in a confined area, additional crews would increase the probability of injury from materials dropping from above.
5. Demolition of concrete stack structures is by controlled blasting. Blast fragments have the potential to cause injury to personnel and ground vibrations could collapse other structures or trailers. In order to limit risk of injury or damage, demolition of the stack is delayed until the number of on-site personnel is reduced.
6. The durations for Period 2 of the Alternate Case were determined by comparing the man-hours of the Alternate Case to the man-hours of the Base Case for that period. The Base Case duration was then multiplied by that percentage and one month was added as allowance for mobilization and de-mobilization of staffing and similar costs.

4.2 PROJECT DURATIONS

Schedule durations corresponding to the dismantling program described in Section 2.3 are given herein.

TABLE 4.1
DISMANTLING PROJECT DURATIONS
(Months)



5.0 WASTE MANAGEMENT

Asbestos-containing insulation and building materials will be removed by qualified contractors and disposed of in a local licensed landfill.

Other types of hazardous materials may be located on-site, including lead, mercury, residual PCBs, oil contaminated soil, etc. If additional hazardous wastes are discovered during dismantling operations, or if environmental regulations change, then appropriate measures will be taken by the Owner and the DOC.

Non-hazardous wastes will be disposed in a safe and reasonable manner. Some non-hazardous wastes may still be subject to state regulations.

6.0 SCRAP VALUE

The dismantling of a typical fossil plant occurs after a 40-60 year plant operating life. Process equipment is assumed to be worn, obsolete, and suitable for scrap only. No equipment is assumed salvageable as used equipment.

The value of scrap was estimated from information on the current market value. In general, scrap materials were assumed to be removed from their installed location and placed on an on-site loading dock or laydown area for a scrap dealer to remove.

The value of the scrap was estimated using scrap metal prices listed Recycler World and transportation and handling costs from Beelman Scrap Dealer of St. Louis (Ref. 5). The estimated scrap amounts and value per ton are summarized herein.

TABLE 6.1a
DISMANTLING SCRAP QUANTITIES
Base Case
Tons @ $/ton

	Carbon Steel	Copper	Stainless Steel
Labadie	137,937 @ $139	3,181 @ $607	402 @ $2,067
Rush island	69,790	1,609	203
Sioux	69,790	1,609	203
Meramec	84,453	3,634	18
Venice	47,769	2,086	10

TABLE 6.1b
DISMANTLING SCRAP QUANTITIES
Alternate case
Tons @ $/ton

	Carbon Steel	Copper	Stainless Steel
Labadie	10,744 @ $139	286 @ $607	0 @ $2,067
Rush island	5,436	145	0
Sioux	5,436	145	0
Meramec	6,107	154	3
Venice	0	0	0

7.0 RESULTS

The techniques, tools, and equipment necessary to remove the large components and remediate the hazardous materials found at fossil-fired power stations are available and have been successfully demonstrated.

Breakdowns of the major cost categories are provided in Tables 7.1a through e. This study provides an estimate for dismantling under current requirements, based on present-day costs and available technology. As additional dismantling experience and technology become available, cost estimates should be modified accordingly.

TABLE 7.1a
DISMANTLING PROJECT COSTS: LABADIE STATION
(Thousands of 2005 Dollars)

Activity	Total Cost	Percent
BASE CASE		
Asbestos Remediation	16,749	10.92
Systems Removal	56,449	36.82
Structures Demolition	41,262	26.91
Landscaping & Reclamation	8,345	5.44
Utility Staffing	7,978	5.20
Dismantling Contractor Staffing	5,468	3.57
Liability & Property Insurance	829	0.54
Plant Energy	829	0.54
Tools & Equipment	15,417	10.06
Total Dismantling Costs	**153,326**	**100.00**
Scrap Credit	**21,934**	
Total Project Cost	**$131,392**	
ALTERNATIVE CASE		
Asbestos Remediation	16,749	30.93
Systems Removal	4,360	8.05
Structures Demolition	14,015	25.88
Landscaping & Reclamation	8,345	15.41
Utility Staffing	4,327	7.99
Dismantling Contractor Staffing	2,242	4.14
Liability & Property Insurance	329	0.61
Plant Energy	224	0.41
Tools & Equipment	3,554	6.56
Total Dismantling Costs	**54,145**	**100.00**
Scrap Credit	**1,667**	
Total Project Cost	**$52,478**	

Note: Columns may not add due to rounding

TABLE 7.1b
DISMANTLING PROJECT COSTS: RUSH ISLAND STATION
(Thousands of 2005 Dollars)

Activity	Total Cost	Percent
BASE CASE		
Asbestos Remediation	2,314	2.84
Systems Removal	28,106	34.56
Structures Demolition	24,615	30.27
Landscaping & Reclamation	6,465	7.95
Utility Staffing	4,789	5.89
Dismantling Contractor Staffing	4,031	4.96
Liability & Property Insurance	606	0.75
Plant Energy	279	0.34
Tools & Equipment	10,123	12.45
Total Dismantling Costs	**81,328**	**100.00**
Scrap Credit	**11,098**	
Total Project Cost	**$70,230**	
ALTERNATIVE CASE		
Asbestos Remediation	2,314	8.35
Systems Removal	1,923	6.94
Structures Demolition	9,479	34.20
Landscaping & Reclamation	6,465	23.32
Utility Staffing	2,483	8.96
Dismantling Contractor Staffing	2,000	7.22
Liability & Property Insurance	292	1.05
Plant Energy	89	0.32
Tools & Equipment	2,671	9.64
Total Dismantling Costs	**27,717**	**100.00**
Scrap Credit	**843**	
Total Project Cost	**$26,873**	

Note: Columns may not add due to rounding

TABLE 7.1c
DISMANTLING PROJECT COSTS: SIOUX STATION
(Thousands of 2005 Dollars)

Activity	Total Cost	Percent
BASE CASE		
Asbestos Remediation	9,608	11.79
Systems Removal	24,455	30.01
Structures Demolition	20,933	25.69
Landscaping & Reclamation	6,277	7.70
Utility Staffing	6,354	7.80
Dismantling Contractor Staffing	4,031	4.95
Liability & Property Insurance	538	0.66
Plant Energy	308	0.38
Tools & Equipment	8,992	11.03
Total Dismantling Costs	**81,496**	**100.00**
Scrap Credit	**11,098**	
Total Project Cost	**$70,399**	
ALTERNATIVE CASE		
Asbestos Remediation	9,608	27.49
Systems Removal	1,709	4.89
Structures Demolition	7,954	22.75
Landscaping & Reclamation	6,277	17.96
Utility Staffing	4,528	12.95
Dismantling Contractor Staffing	2,109	6.03
Liability & Property Insurance	259	0.74
Plant Energy	139	0.40
Tools & Equipment	2,373	6.79
Total Dismantling Costs	**34,955**	**100.00**
Scrap Credit	**843**	
Total Project Cost	**$34,111**	

Note: Columns may not add due to rounding

TABLE 7.1d
DISMANTLING PROJECT COSTS: MERAMEC STATION
(Thousands of 2005 Dollars)

Activity	Total Cost	Percent
BASE CASE		
Asbestos Remediation	10,201	11.51
Systems Removal	31,147	35.14
Structures Demolition	21,673	24.45
Landscaping & Reclamation	5,519	6.23
Utility Staffing	5,238	5.91
Dismantling Contractor Staffing	3,630	4.10
Liability & Property Insurance	602	0.68
Plant Energy	551	0.62
Tools & Equipment	10,063	11.35
Total Dismantling Costs	**88,626**	**100.00**
Scrap Credit	**13,982**	
Total Project Cost	**$74,643**	
ALTERNATIVE CASE		
Asbestos Remediation	10,201	28.03
Systems Removal	2,339	6.43
Structures Demolition	8,617	23.68
Landscaping & Reclamation	5,519	15.17
Utility Staffing	3,487	9.58
Dismantling Contractor Staffing	2,084	5.73
Liability & Property Insurance	319	0.88
Plant Energy	228	0.63
Tools & Equipment	3,600	9.89
Total Dismantling Costs	**36,395**	**100.00**
Scrap Credit	**949**	
Total Project Cost	**$35,446**	

Note: Columns may not add due to rounding

TABLE 7.1e
DISMANTLING PROJECT COSTS: VENICE STATION
(Thousands of 2005 Dollars)

Activity	Total Cost	Percent
BASE CASE		
Asbestos Remediation	8,723	18.01
Systems Removal	13667	28.22
Structures Demolition	8959	18.50
Landscaping & Reclamation	3,358	6.93
Utility Staffing	4,806	9.92
Dismantling Contractor Staffing	3,190	6.59
Liability & Property Insurance	610	1.26
Plant Energy	406	0.84
Tools & Equipment	4,708	9.72
Total Dismantling Costs	**48,428**	**100.00**
Scrap Credit	**7,927**	
Total Project Cost	**$40,501**	
ALTERNATIVE CASE		
Asbestos Remediation	8,723	42.80
Systems Removal	0	0.00
Structures Demolition	0	0.00
Landscaping & Reclamation	3,358	16.48
Utility Staffing	3,502	17.18
Dismantling Contractor Staffing	2,078	10.20
Liability & Property Insurance	406	1.99
Plant Energy	272	1.34
Tools & Equipment	2,039	10.01
Total Dismantling Costs	**20,379**	**100.00**
Scrap Credit	**0**	
Total Project Cost	**$20,379**	

Note: Columns may not add due to rounding

8.0 REFERENCES

1. "Dismantling Cost Study for the Labadie, Rush Island, Sioux, Meramec, and Venice Power Stations," TLG Services, Inc., Document No. A22-1534-002, November 2001.

2. "Building Construction Cost Data, 2001," Robert Snow Means Company, Inc., Kingston, MA.

3. T.S. LaGuardia, et al, "Guidelines for Producing Commercial Nuclear Power Plant Decommissioning Cost Estimates," AIF/NESP-036, May 1986.

4. W.J. Manion and T.S. LaGuardia, "Decommissioning Handbook," U.S. Department of Energy, DOE/EV/10128-1, November 1980.

5. Recycler's World – *www.recycle.net* - Iron and Steel recycling section October 3, 2005.