BEFORE THE NEW MEXICO PUBLIC REGULATION COMMISSION

IN THE MATTER OF SOUTHWESTERN PUBLIC SERVICE COMPANY'S APPLICATION FOR REVISION OF ITS RETAIL RATES UNDER ADVICE NOTICE NO. 255,	)	**CASE NO. 15-00139-UT**
SOUTHWESTERN PUBLIC SERVICE COMPANY,	)	
APPLICANT.	)	

DIRECT TESTIMONY

of

FRANCIS W. SEYMORE

on behalf of

SOUTHWESTERN PUBLIC SERVICE COMPANY

TABLE OF CONTENTS

GLOSSARY OF ACRONYMS AND DEFINED TERMS

Acronym/Defined Term	Meaning
AIF	Atomic Industrial Forum
Commission	New Mexico Public Regulation Commission
DOE	U.S. Department of Energy
ENI	Entergy Nuclear, Inc.
ER	Decommissioning Plan and Environmental Report
Guidelines	Guidelines for Producing Commercial Nuclear Power Plant Decommissioning Cost Estimates
IBC	International Building Code
MW	Megawatt
NESP	National Environmental Studies Project
NRC	U.S. Nuclear Regulatory Commission
NSPM	Northern States Power Minnesota
PSCo	Public Service Company of Colorado
SPS	Southwestern Public Service Company
TLG	TLG Services, Inc.
Xcel Energy	Xcel Energy Inc.

LIST OF ATTACHMENTS

<u>**Attachment**</u>	<u>**Description**</u>
FWS-1	SPS Production Dismantling Cost Study (*Filename:* FWS-1.pdf)
FWS-2	Workpapers (*See Folder:* Testimony/07 - Seymore/FWS-2)

Case No. 15-00139-UT
Direct Testimony
of
Francis W. Seymore

I. WITNESS IDENTIFICATION AND QUALIFICATIONS

Q. Please state your name and business address.

A. My name is Francis W. Seymore. My business address is 148 New Milford Road East, Bridgewater, Connecticut 06752.

Q. On whose behalf are you testifying in this proceeding?

A. I am filing testimony on behalf of Southwestern Public Service Company, a New Mexico corporation ("SPS") and wholly-owned electric utility subsidiary of Xcel Energy Inc. ("Xcel Energy"). Xcel Energy is a registered holding company that owns several electric and natural gas utility operating companies.[1]

Q. By whom are you employed and in what position?

A. I am an Engineering Manager with TLG Services, Inc. ("TLG"). TLG is a wholly owned subsidiary of Entergy Nuclear, Inc. ("ENI").

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[1] Xcel Energy is the parent company of four wholly-owned electric utility operating companies: Northern States Power Company, a Minnesota corporation ("NSPM"); Northern States Power Company, a Wisconsin corporation; Public Service Company of Colorado, a Colorado corporation ("PSCo"); and SPS. Xcel Energy's natural gas pipeline subsidiary is WestGas InterState, Inc. Xcel Energy also has two transmission-only operating companies, Xcel Energy Southwest Transmission Company, LLC and Xcel Energy Transmission Development Company, LLC, both of which are regulated by the Federal Energy Regulatory Commission.

Q. Please briefly outline your responsibilities as Engineering Manager at TLG.

A. I am responsible for the technical engineering consulting services in the areas of decontamination, decommissioning, waste management, and general engineering for fossil- and nuclear-fueled generating stations. I am the chief architect of TLG's decommissioning cost model DECCER, which has been used in preparing over 500 decommissioning cost estimates over the past 32 years for both fossil- and nuclear-fueled generating plans.

Q. Please describe your educational background.

A. I graduated from the Rensselaer Polytechnic Institute with a Bachelor of Science degree in Nuclear Engineering in 1977. I received a Master of Engineering degree in Nuclear Engineering from Rensselaer in 1979.

Q. Please describe your professional experience.

A. I joined TLG Engineering in November 1982 and TLG in January 1994. When TLG was purchased by ENI in September 2000, I was retained as Manager of Design Engineering for ENI. I was employed by Nuclear Energy Services in Danbury, Connecticut, from 1979 until I left to join TLG in 1982.

Q. Do you hold a professional license?

A. Yes. I am a Licensed Professional Engineer in the State of Connecticut (License 12775) and a Registered Professional Engineer in the Commonwealth of Pennsylvania (PE-033109-E).

Q. Have you previously testified before any regulatory commission?

A. Yes. I have filed testimony before the New Mexico Public Regulation Commission ("Commission"), Public Utility Commission of Texas, the Colorado Public Utilities Commission, the Kansas Corporation Commission, and the U.S. Tax Court on the topic of power plant decommissioning and dismantlement. In addition, I have testified before the California Public Utilities Commission, the New York State Public Service Commission, the Alabama Public Service Commission, and the North Carolina Utilities Commission on the same topic.

Q. What experience do you have with the process of dismantling and decommissioning and the estimation of related costs?

A. I have extensive experience in preparing dismantling and decommissioning cost studies for fossil fuel and nuclear plants. I have been involved in preparing over 200 dismantling cost estimates for fossil-fueled units throughout the United

States. I have served as the project manager for several dismantling cost studies for PSCo, NSPM, and Westar Energy, as well as SPS.

Additionally, TLG developed the estimates, contractor bid specifications, contractor selection, and provided on-site oversight of dismantling activities for the coal-fired Comal Power Plant owned by the Lower Colorado River Authority in New Braunfels, Texas.

I have been involved in all of the decommissioning cost estimates performed for the Comanche Peak power plant since 1983, and South Texas Project since 1989.

I was responsible for several aspects of the detailed engineering and planning of the Shippingport Station Decommissioning Project from 1981 to 1982. Shippingport was a 72 megawatt ("MW") light water breeder reactor and the first commercial reactor in the U.S.

I was on site at the Three Mile Island Unit 2 recovery and decommissioning program from 1982 to 1983, where I assisted in the detailed planning for reactor disassembly and removal of the damaged reactor core internals.

TLG assisted Northern States Power Company in 1988-1989 with 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 SAFSTOR, a mothballing option for decommissioning as recognized by the U.S. Nuclear Regulatory Commission ("NRC"). I assisted in preparing schedules, and detailed cost and vessel activation estimates. I analyzed the reactor vessel to be used as its own shipping container, and prepared the decommissioning plan using the NRC's DECON method in support of plant decommissioning. The DECON method is the prompt dismantling option for decommissioning as recognized by the NRC.

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

In 1990, TLG was selected by Cintichem, Inc. (a subsidiary of Hoffman LaRoche) as a Co-Manager of the decommissioning of a 10 MW thermal radio isotope production reactor with associated hot cells and facilities. I prepared a reactor core activation analysis, and assisted in the development of a schedule and cost estimate for the project.

TLG has also been involved in the engineering and planning activities associated with the decommissioning of the Yankee Rowe, Trojan Nuclear Plant, Rancho Seco Nuclear Generating Station, and Big Rock Point nuclear units. I supervised the activation analyses and preparation of decommissioning alternative cost and schedule estimates. TLG also supported Portland General Electric in the detailed planning required for completing the removal and disposal of the reactor vessel and the highly radioactive internal components. More recently, TLG has participated in decommissioning planning for the Crystal River 3, San Onofre Units 2 and 3, and Vermont Yankee.

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

A. Yes. I was a contributor to the U.S. Department of Energy's ("DOE") "Decommissioning Handbook" (DOE reference number DOE/EV/10128-1). The Handbook reported then current 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 was a major contributor to the "Guidelines for Producing Commercial Nuclear Power Plant Decommissioning Cost Estimates" ("Guidelines") (Publication AIF/NESP-036) for the Atomic Industrial Forum ("AIF"), National Environmental Studies Project ("NESP"). The 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.

TLG Engineering also prepared a study in 1986 entitled, "Identification and Evaluation of Facilitation Techniques for Decommissioning Light Water Power Reactors" (Publication No. NUREG/CR-3587) for the NRC. The study evaluated the costs and benefits of techniques to reduce occupational exposure and waste volume from decommissioning. In addition, TLG prepared the Decommissioning Plan and Environmental Report ("ER") for Dresden Unit 1, and the ER for Indian Point Unit 1.

Ultimately, I have been involved in the preparation of site-specific decommissioning studies for approximately 90% of the nuclear units in the United States.

Q. Is your experience preparing decommissioning estimates for nuclear plants applicable to preparing dismantling estimates for fossil-fuel facilities?

A. Yes. There are many similarities to preparing decommissioning estimates for both types of facilities. Additionally, TLG has prepared estimates for both nuclear and fossil-fuel facilities.

Q. Please explain the similarities.

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

1. Site Characterization - The process to identify hazardous and toxic materials is similar for nuclear and fossil-fueled power plants.
2. Removal of Hazardous Material (Asbestos) - The effort required to remove asbestos-containing materials in nuclear and fossil-fueled plants is similar.
3. Removal of Clean Equipment and Structures - The techniques used to remove systems and structures components are expected to be the same.

4. Owner and Contractor Staff - Identification of utility and decommissioning (dismantling) staffing composition and levels follows the same process in both types of units. The specific job functions and number of personnel will differ but the logic is the same.

5. Scheduling - Schedule for both the demolition of the remaining systems and structures in nuclear decommissioning and fossil fuel plant dismantling projects rely on estimating the number of craft workers that can work safely and efficiently.

6. Contingency - Contingency 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-fueled plant dismantling. Work removing radioactive materials incurs a higher contingency.

In summary, the demolition of the remaining systems and structures in nuclear plant decommissioning experience is directly applicable to fossil-fueled plant dismantling. There are, of course, some differences between decommissioning a nuclear plant and dismantling a fossil fuel plant, almost all of which center on the radioactive materials in nuclear plants. However, the needs for planning, cost containment, worker safety, managing field operations, and general management of the projects are similar.

Q. Please explain the major differences between decommissioning a nuclear plant and dismantling fossil-fuel power plants.

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

Fossil plants do not contain radioactive materials, and so dismantling is simplified. The process still requires controls, but limited primarily to worker safety and environmental protection. There are fewer potential hazards for the worker and thus productivity is higher overall than at nuclear plants, and the potential for problems is lower.

II. ASSIGNMENT AND RECOMMENDATIONS

Q. What is your assignment in this proceeding?

A. The purpose of my testimony is to provide an overview of SPS's Production Dismantling Cost Study prepared for this proceeding. The study provides cost estimates for the dismantling of SPS's fossil-fueled electric generating plants, which consist of 27 separate power units on 10 sites in New Mexico and Texas. The study is attached to my testimony as Attachment FWS-1. I also discuss certain components of the estimate, primarily development of the plants' inventory, removal cost development, and scrap metal considerations. Workpapers supporting the study are included in Attachment FWS-2, which is provided in electronic format in Attachment EDE-1(Media) to the Direct Testimony of Evan D. Evans.

Q. Please summarize the conclusions and recommendations in your testimony.

A. The dismantling and demolition of the 27 units in SPS's fossil-fuel fleet is estimated to cost $162 million in 2014 dollars (*i.e.*, escalation and inflation of the costs over the remaining operating life is not reflected), including credit for the scrap generated and sold in the dismantling process. A summary of the cost by unit is presented in the table shown on page viii in the SPS Production Dismantling Cost Study, Attachment FWS-1.

I provided the results of this study to SPS witness Dane A. Watson, who uses the information to support the net salvage values recommended in SPS's depreciation study.

III. METHODOLOGY

Q. Please describe the types of costs 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 crews 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. Characterization, Engineering Planning and Preparations, and Asbestos Abatement;

  2. Systems and Structures Dismantling; 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 that are neither activity nor period dependent. They include insurance, taxes, permits, large equipment rentals, and special tools.

Q. What procedure did you use to develop SPS's Production Dismantling Cost Study?

A. The general approach in assembling the estimate was to develop a site-specific cost for each unit, based on a unit-specific equipment and building materials inventory. The inventory of components designated to be removed as part of the dismantling program was established using site walk-downs (including discussions with SPS Operation & Maintenance staff at each plant), station-provided equipment databases, and plant drawings.

This cost estimate was prepared on an item-by-item basis using the inventory and unit factors developed for each cost item from prior dismantling experience or similar related experience. The costs for project management, equipment and consumables, and similar types of costs were estimated on a period-dependent basis (*i.e.*, the magnitude of the expense depends, in part, on the duration of the project). Contingency was provided within this estimate to account for unpredictable project events. Finally, although equipment salvage was not included, the potential value of scrap from materials generated in dismantling the boilers, plant components, and building structural steel was included as a credit to the dismantling cost.

This estimate includes the costs to remove all structures on the site to a nominal level of three feet below grade. The costs reflect demolition by controlled engineered dismantling. Concerns for worker safety reinforce the need for a controlled approach. Accordingly, all large components are assumed to be lowered to grade for additional disassembly. The steel support structures and other site building structures are dismantled from the top. All plant equipment and their supporting mechanical and electrical systems are removed by disassembly and segmentation where necessary.

Limited site landscaping includes seeding for drainage control. At the end of dismantling activities, the plant site will be in a condition such that the land will be available for alternative use.

Q. What methodology did you use to prepare the detailed cost estimate?

A. The methodology used to develop the detailed cost estimates for the Reference Plants followed the basic approach presented in the AIF/NESP-036 study report, the Guidelines, the DOE "Decommissioning Handbook," and the American Association of Cost Estimators paper "A Methodology for Determining the Cost of Dismantling Fossil-Fueled Electric Power Plants." Obviously, concerns that are unique to a nuclear power plant (*e.g.*, radiation protection) are not necessary for fossil power plants and, therefore, none were included in the study. However, the basic methodology, sometimes called the "bottoms-up" approach, which has been accepted by the electric power industry and regulatory commissions throughout the United States, including the Commission, is applicable for fossil plants as well.

Q. How did you use this methodology to help you develop your cost estimate?

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 ($ per cubic yard), steel removal ($ per ton), and cutting costs ($ per inch cut) 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 gas consumption, etc.) were taken in large part from R.S. Means, "Building Construction Cost Data 2014." The activity-dependent cost for removal, shipping and disposal were estimated using the item quantity (cubic yards, 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. Contingency 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. For the purposes of the estimate, when did you assume the units at each site would be dismantled?

A. TLG did not make any special assumptions regarding the timing of the dismantling program. 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.

Q. What are the major assumptions that you used to develop the dismantling estimate for the SPS stations?

A. The following major assumptions were used in developing the dismantling estimate:

1. Dismantling of the station will not commence until all units are retired (cost estimate is not based on independent dismantling of units while adjacent units are operating).
2. The arrangements of the unit facilities as they existed in 2014 based upon walk-downs conducted by TLG in 2007 and 2008, as well as databases and drawings provided by owner. This information was augmented with conversations with plant personnel in 2012 and 2014.
3. The dismantling process will be an engineered process with substantial consideration for industrial (worker) safety.
4. The demolition will be performed by a Dismantling Contractor who is responsible to provide adequate staff and equipment to complete the dismantling in a safe manner.
5. Site security to restrict access to the demolition project by unauthorized personnel will be provided by the Dismantling Contractor.
6. The estimate is based on industrial safety and environmental regulations effective in 2014.
7. Ponds and basins will be dewatered and residual material removed after shutdown.
8. On-site fuel inventories will be used or removed, as applicable, prior to start of dismantling.

9. Silos, precipitators, hoppers, tanks, etc., will be emptied by operations and maintenance staff after shutdown.

10. Acids, caustics, and similar hazardous materials will be removed by operations and maintenance staff after shutdown.

11. Consumables, such as ion exchange materials and filters, will also be removed by operations and maintenance staff after shutdown.

12. Stores, spare parts, gas storage containers, laboratory equipment, office furniture, etc., will be removed by the owner after shutdown.

13. Oils used in station transformers are PCB-free. Lubricating and transformer oils are drained and removed by operations and maintenance staff after shutdown.

14. Asbestos (if present) will be removed prior to the start of dismantling. Asbestos insulation and PACM (presumed asbestos containing materials) will be disposed of at licensed facilities. Quantities of asbestos are based on owner-provided information and reflect plant status as of mid-2014.

15. Prior to initiating dismantling, essentially all live circuits will have been de-energized (to preclude creating an industrial hazard). If required, temporary services systems (air, water, electrical, fire water, etc.) will be used to support dismantling operations and will remain in service throughout the project until no longer required.

16. Post-shutdown "dormancy" costs (*i.e.,* security and maintenance on any of the units retired prematurely) are not included in the study.

17. Escalation and inflation of the costs over the remaining operating life are not included.

18. A utilities allowance has been included; this provides for electric power for lighting/heating/cooling, telephone and internet access, office equipment and supplies, trash removal, potable water, and sewage.

19. A 12.5% fee is added to the Demolition Contractor's cost to account for its overhead and profit.

20. A 25% contingency is applied to asbestos remediation activities.

21. A 15% contingency is applied to all remaining dismantling-related costs.

22. An allowance has been included for post-dismantling environmental monitoring costs.

23. A credit for scrap metal cost recovery is included in the estimate. Retired plant equipment is assumed to have no value as salvage (sold for re-use).

24. Work is performed during a ten-hour workday, five days per week.

25. Consistent with working on a 10 hour per day, five day per week basis, craft worker billing rates are based upon 40 hours of straight time, and 10 hours of overtime pay. Dismantling contractor staff receives pay for 50 hours straight time. Utility staff does not receive overtime pay.

26. Large equipment and components will be removed prior to structures demolition.

27. An environmental hazards crew will be maintained throughout the demolition period to address such items as lead paint and asbestos that was inaccessible during the asbestos remediation period.

28. Turbine pedestals and powerhouse building foundations will be removed to three feet below grade and back-filled to grade.

29. Structures and foundations will be removed to a depth of three feet below grade, with any resulting voids back-filled to grade level.

30. Chimney stacks will be demolished and broken into rubble, the steel liners cut and removed.

31. Turbine building cranes, miscellaneous hoists, and trolleys will remain in service to support dismantling until no longer needed.

32. The dismantling of the electrical equipment terminates at the switch yard boundary. The switch yard is left intact. Any reconfiguration of control systems for the switchyard to remain in service is not included in this estimate.

33. Concrete rubble generated during dismantling will be used as fill where needed.

34. The site will be graded; however, no effort was included in this estimate to restore the original contour of the land. Ground cover will be established for erosion control.

35. Roads, parking lots, etc., are removed after the facility is dismantled (with the exception of the immediate area around the switchyard).

36. Multiple crews work parallel activities to the maximum extent possible, consistent with efficiency (adequate access for cutting, removal, and laydown space) and with industrial safety appropriate for demolition of heavy components and structures.

37. Scheduling was calculated without constraints on availability of labor, equipment, or materials.

Q. What inputs did you use in the cost estimating model?

A. The Study uses the following input data:

Craft Labor Costs – TLG developed the craft labor rates from the "North Texas Construction Industry Wage Rates," published by TEXO The Construction Association, and escalated to 2014 dollars.

Utility Staff Costs – SPS provided salary information, and overhead and benefit rates, for a variety of current plant positions.

Systems Inventory – TLG personnel performed walk downs at each SPS station, other than Quay County Station, to gather major systems and structural component information. Interviews with plant personnel were also conducted. SPS provided access to the MAXIMO system base data that the Operation & Maintenance personnel use to track plant equipment.

Structural Inventory – In addition to the information TLG personnel gathered during the site walk downs, structural steel assembly drawings were reviewed to obtain column and girder sizes and quantities. Site plot plans were reviewed to obtain acreage and other site restoration quantities.

Other Costs – R.S. Means was the source of information about such items as small tool allowances, permits, fees, insurances, etc.

Q. Were the system and structures inventories estimated for all the SPS units?

A. Yes. Each unit was examined individually and an appropriate system and structure inventory was developed. However, TLG did assume that identical units had identical component inventories, *e.g.*, Harrington Units 1, 2, and 3 are identical except for certain pollution control equipment. Therefore, only one system and structures inventory was developed for a Harrington unit. This inventory was adjusted to reflect the changes in the pollution control equipment. In a similar fashion, there are units on different sites with the same design, and therefore the inventories were also assumed to be the same, *e.g.*, Plant X Unit 1 is the same design as Moore County Unit 3. Any site-specific differences between these units were noted during the site walk downs, and the inventories adjusted as necessary.

Q. What year was used for the cost basis for the estimates?

A. In all cases, the estimate cost basis for the SPS units is 2014.

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

A. Yes. The TLG cost estimate was based on current technology and existing regulations. No provision is made in the cost estimate to adjust for cost changes associated with future changes in dismantling technology and regulations. It is my recommendation that SPS thoroughly review this estimate periodically and revise it as necessary to account for cost changes influenced by future technology and regulations.

IV. CONTINGENCY

Q. What is the purpose of contingency in a dismantlement cost estimate?

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 have not been included as part of the basic estimate. The inclusion of contingency in cost estimation for both construction and dismantling is well accepted. The American Association of Cost Engineers (in its Project and Cost Engineer's Handbook 2nd edition by K. K. Humphreys) 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 problems are likely to occur and may have a cumulative impact. 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, and possible increased insurance premiums;

Equipment breakdowns-	rescheduling of activities, out-of-scope back charges from subcontractors;
Regulatory inspections -	insurance inspectors, Occupational Safety and Health Administration inspectors, federal and state Environmental Protection Agency inspectors, state building inspectors; and
Hazardous materials -	special handling requirements beyond planned requirements.

A more extensive discussion of contingency is included in the AIF/NESP-036 Guidelines (Chapter 13) referred to earlier. In that study, individual contingencies ranged from 10% to 75%, depending on the degree of difficulty judged to be appropriate from actual experience. The Guidelines suggests a 15% contingency for clean system and structure removal activities.

For fossil-fueled 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 are in the range of 15% and greater if there are significant quantities of asbestos on site. Independent of our preparation of this estimate for SPS, R.S. Means, "Building Construction Cost Data 2014," suggests that a 15% contingency factor (for projects that are in the schematic stage) be used.

Q. How did you arrive at the various contingency percentages that you applied?

A. Consistent with the guidance provided by both R.S. Means and the Guidelines, a 15% contingency value was applied to all cost elements, with the exception of asbestos remediation. Since the regulatory requirements imposed on asbestos remediation efforts are similar to those working in a radioactively contaminated environment, and the Guidelines suggest a 25% contingency for the removal of radioactively contaminated systems, a 25% contingency was applied to asbestos removal activities.

V. SITE RESTORATION

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

A. Yes. All of SPS's generating units are located in either New Mexico or Texas. New Mexico has not enacted legislation expressly mandating the demolition of power plants taken out of service, but the Commission has done so implicitly by promulgating regulations requiring that a public utility's "electric plant" comply with the engineering standards of numerous publications, including: (1) the National Electric Safety Code as compiled by the National Bureau of Standards; (2) the National Electrical Code (ANSI Standard C-1); (3) the American standard code for electricity meters (ANSI Standard C-12); (4) American standard requirements for instrument transformers (ANSI Standard C-57.13); (5) preferred voltage ratings for alternating current systems and equipment (ANSI Standard C-84.1); and (6) the New Mexico state electrical code. (N.M. Admin Code tit. 17 § 17.9.560.13(B).) Because a plant that is taken out of service cannot meet these standards, the Commission's regulations effectively require the demolition of such plants.

The International Building Code ("IBC") has been adopted as a statewide minimum standard for all municipalities in Texas. *See* TEX. LOC. GOVT. CODE § 214.216 (West 2008 & Supp. 2014). The IBC applies to all commercial buildings in a municipality for which construction begins on or after January 1, 2006, and to any alteration, remodeling, enlargement, or repair of those commercial buildings. Specifically, the IBC (2012), in Section 116.1 "conditions," states:

> Structures or existing equipment that are or hereafter become unsafe, insanitary or deficient because of inadequate *means of egress* facilities, inadequate light and ventilation or which constitute a fire hazard, or are otherwise dangerous to human life or the public welfare, or that involve illegal or improper occupancy or inadequate maintenance, shall be deemed an unsafe condition. Unsafe structures shall be taken down and removed or made safe, as the *building official* deems necessary and as provided for in this section. A vacant building that is not secured against entry shall be deemed unsafe.

In addition, Texas municipalities may adopt ordinances to require the demolition of a building that is substandard and that poses a hazard to the public health, safety and welfare. TEX. LOC. GOV'T CODE ANN. § 214.001(a) (West 2008 & Supp. 2014). In unincorporated areas of a county, the county may require the demolition of structures that qualify as public nuisances because they are structurally unsafe or because they constitute a hazard to safety, health or public welfare. TEX. HEALTH & SAFETY CODE ANN. §§ 343.011 and 343.021 (West 2010 & Supp. 2014). The foregoing statutes provide authority for removal of all Texas facilities that are structurally unsound or otherwise unsafe.

Q. Why do you recommend that a power plant be dismantled after it is taken out of service?

A. Assuming there are no plans to reconstruct the plant, a retired fossil-fueled 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 unheated, dark, possibly littered with concrete rubble and structural debris obstructing means of egress. Condensation and groundwater intrusion and bird infiltration would soon create hazardous conditions, promoting insanitary biological infestation, 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, concrete, or brick structures at fossil-fuel plant 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 insanitary conditions caused by the effects of weather, corrosion, ground water intrusion and vermin.

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 facilities.

TLG recommends dismantling fossil-fueled power plant structures to assure public health and safety, and we have prepared our estimate for SPS's units on that basis.

VI. SALVAGE AND SCRAP

Q. What is the difference between salvage and scrap?

A. Scrap material consists of quantities of steel, copper, and other metals in various combinations. It only has value as raw material for manufacturing other components. The material is shipped to a metal recycling center to be melted down or otherwise reused. Salvage addresses the re-use of components; *e.g.*, removing an overhead crane and selling it to a third party who presumably will also use it as a crane. Ignoring the risk to SPS of selling used components, the value of salvaged components is determined by the market price that the buyer is willing to pay, the cost of refurbishment of the component, and any recertification of the component for its new application.

Q. What does your cost estimate assume regarding scrap and salvage?

A. No system or structural components will be sold for re-use to a third party. No credit, other than their scrap value, was included for salvage of any components because these components will be of an obsolete design, and near the unit's end of life by the time these plants are dismantled. As such, these materials were considered scrap. All system and structure components will be treated as metallic waste; such waste, including reinforced steel from crushed concrete, will be processed as scrap metal, with the value of the scrap credited to the dismantling program.

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

A. Credit for carbon steel, stainless and high-chrome steel, copper-nickel, and copper scrap is included in the fossil fueled unit estimates based on published scrap values.

Q. Have there been any recent trends in published scrap values?

A. Yes. Compared to the scrap estimate used in SPS's 2012 rate case,[2] scrap values have decreased. The overall reduction in the scrap metal credit, from $103.7 million in the 2012 estimate to $89.8 million in the current estimate, reflects the changes in the published scrap values. This reduction in the scrap metal credit of 13.4% is consistent with the reductions observed at the Recycler's World web site, where the various categories of scrap metal decreased from 10% to 20% between 2012 and 2014.

[2] *In the Matter of Southwestern Public Service Company's Application for Revision of its Retail Electric Rates under Advice Notice No. 245,* Case No. 12-00350-UT, Final Order Partially Adopting Recommended Decision (Mar. 26, 2014).

VII. CONCLUSION

Q. Were Attachments FWS-1 and FWS-2 prepared by you or under your direct supervision and control?

A. Yes.

Q. Does this conclude your pre-filed direct testimony?

A. Yes.

VERIFICATION

STATE OF CONNECTICUT)
) ss. Bridgewater
COUNTY OF LITCHFIELD)

FRANCIS W. SEYMORE, first being sworn on his oath, states:

I am the witness identified in the preceding direct testimony. I have read the testimony and the accompanying attachments and am familiar with their contents. Based upon my personal knowledge, the facts stated in the testimony are true. In addition, in my judgment and based upon my professional experience, the opinions and conclusions stated in the testimony are true, valid, and accurate.

FRANCIS W. SEYMORE

SUBSCRIBED AND SWORN TO before me this 20th day of May, 2015.

Notary Public, State of Connecticut
My Commission Expires: 7/31/2019

CAREN C. VICKERY
NOTARY PUBLIC
MY COMMISSION EXPIRES 7/31/2019

Document X01-1617-009, Rev. 0

Jones

Plant X

PRODUCTION DISMANTLING COST STUDY

for the

Carlsbad Unit 1
Cunningham Units 1, 2, 3 and 4
Harrington Units 1, 2 and 3
Jones Units 1, 2, 3 and 4
Maddox Units 1, 2 and 3
Moore County Units 2 and 3
Nichols Units 1, 2 and 3
Plant X Units 1, 2, 3 and 4
Quay County Unit 1
Tolk Units 1 and 2

Tolk

Cunningham

prepared for

Xcel Energy – Southwestern Public Service Company

Harrington

Nichols

prepared by

TLG Services, Inc.
An Entergy Company
148 New Milford Road East
Bridgewater, CT

November 2014

APPROVALS

Project Engineer	**Benjamin J. Stochmal**	11/14/2014 **Date**
Project Manager	**Francis. W. Seymore**	11/14/2014 **Date**
Technical Manager	**Geoffrey M. Griffiths**	11/14/2014 **Date**

TABLE OF CONTENTS

TABLE OF CONTENTS
(continued)

TABLES

FIGURES

APPENDICES

REVISION LOG

Rev. No.	Date	Item Revised	Reason for Revision
0	11/14/2014		Original Issue

EXECUTIVE SUMMARY

This report, prepared by TLG Services, Inc. (TLG), presents a summary of the estimated costs for the complete dismantling of the following stations, owned and operated by Southwestern Public Service:

In Texas:

- Harrington
- Jones
- Moore County
- Nichols
- Plant X
- Tolk

In New Mexico:

- Carlsbad
- Cunningham
- Maddox
- Quay County

Southwestern Public Service of Texas, a wholly-owned utility subsidiary of Xcel Energy, Inc. (Xcel Energy) owns these stations. All of the stations are located in Texas or New Mexico as indicated.

The dismantling estimate includes the cost of removing the power generating equipment such as boilers, turbine generators, fuel handling systems, and systems and structures for each of the above-referenced units, as well as common shared facilities associated with the sites. The electrical switchyards remain in place and are not included in the estimate.

The scope of the dismantling estimate includes the following significant cost elements:

- Isolation of the units in preparation for safe dismantling (ensuring systems are de-energized to ensure a safe dismantling environment).
- Abatement of asbestos containing materials prior to dismantling (where applicable).
- Labor, equipment, and material costs associated with the removal and disposition of all installed equipment.
- Labor, equipment, and material costs associated with the demolition and disposition of buildings and foundations (to a depth of 3 feet below grade).

- Demolition contractor's on-site management, engineering, safety, and administrative staff.
- Demolition contractor's expenses, including profit, insurance, permits, and fees.
- Owner's on-site management, oversight, and security staff.
- A cost credit associated with the disposition of scrap metals.
- Cost contingency.
- Ongoing environmental monitoring after the completion of the dismantling and demolition.

The general approach in assembling the estimate was to develop a site-specific cost for each unit, based on a unit-specific equipment and building materials inventory. The inventory of components designated to be removed as part of the dismantling program was established using site walk-downs (including discussions with the Operations & Maintenance staff), station-provided equipment databases, and plant drawings.

This cost estimate is prepared on an item-by-item basis using the inventory and unit factors developed for each cost item from prior dismantling experience or similar related experience. The costs for project management, equipment and consumables, and similar types of costs are estimated on a period-dependent basis (i.e., the magnitude of the expense depends, in part, on the duration of the project). Contingency is provided within this estimate to account for unpredictable project events. While equipment salvage is not included, the potential value of scrap from materials generated in dismantling the boilers, plant components, and building structural steel is included as a credit to the project for expected scrap metal cost recovery.

This estimate includes the costs to remove all structures on the site to a nominal level of three feet below grade. The costs reflect demolition by controlled/engineered dismantling. Concerns for worker safety reinforce the need for a controlled approach. Accordingly, all large components are assumed to be lowered to grade for additional disassembly. The steel support structures and other site building structures are dismantled from the top. All plant equipment and their supporting mechanical and electrical systems are removed by disassembly and segmentation where necessary.

Limited site landscaping includes seeding for drainage control. At the end of dismantling activities, the plant site will be in a condition such that the land could be available for alternative use.

The total dismantling costs, expressed in thousands of 2014 dollars, are provided at the end of this section.

SUMMARY OF DISMANTLING COSTS

(All costs are in thousands of 2014 dollars)

Station	Unit	MWe rating	Fuel	In Service	Station Cost*
Carlsbad	1	11	natural gas	1968	495
Cunningham	1	71	natural gas	1957	13,052
	2	196	natural gas	1965	
	3	109	natural gas	1997	
	4	109	natural gas	1997	
Harrington	1	347	coal	1976	29,755
	2	347	coal	1978	
	3	347	coal	1980	
Jones	1	243	natural gas/oil	1971	19,832
	2	243	natural gas/oil	1974	
	3	169	natural gas	2011	
	4	169	natural gas	2013	
Maddox	1	118	natural gas	1967	9,712
	2	60	natural gas	1975	
	3	10	natural gas	1963	
Moore County	2	25	natural gas	n/a	9,129
	3	48	natural gas	1954	
Nichols	1	107	natural gas	1960	22,040
	2	106	natural gas	1962	
	3	244	natural gas	1968	
Plant X	1	48	natural gas/oil	1952	21,299
	2	102	natural gas/oil	1953	
	3	103	natural gas/oil	1955	
	4	189	natural gas/oil	1964	
Quay County	1	23	oil	2013	550
Tolk	1	540	coal	1982	35,776
	2	540	coal	1985	
Fleet Totals		**4624**			**161,641**

* Columns may not total due to rounding

1. INTRODUCTION

1.1 OBJECTIVE OF STUDY

The objective of this dismantling cost study prepared by TLG Services is to present an estimate of the costs to dismantle Southwestern Public Service Company's (SPS) fossil-fuel generating units. This study is not intended to be a dismantling plan for each of the stations, but a cost estimate prepared in advance of those preparations necessary to carry out the dismantling activities, and to support current financial planning for future dismantling.

1.2 STATION DESCRIPTIONS

Carlsbad is a single unit Combustion Gas Turbine (CGT) located in Carlsbad, New Mexico. It has an average (summer / winter) net dependable capacity of 11 MWe. The unit was installed in 1968.

Cunningham is a 4 unit 485 MWe station located west of Hobbs, New Mexico. Units 1 and 2 are gas-fired boilers powering steam turbines with net dependable capacities of 71 MWe and 196 MWe respectively. Units 3 and 4 are CGT's with summer net dependable capacities of 109 MWe each. Unit 1 and Unit 2 were installed in 1957 and 1965, respectively. The CGT's were installed in 1997.

Harrington is a 3 unit 1041 MWe with coal-fired boilers powering steam turbines located northeast of Amarillo, Texas. Units 1, 2 and 3 have a capacity of 347 MWe each. The units were installed in 1976, 1978 and 1980.

Jones is a 4 unit 824 MWe station located southeast of Lubbock, Texas. Units 1 and 2 have gas-fired boilers and steam turbines, with a net dependable capacity of 243 MWe each. Units 3 and 4 are CGTs with a net dependable capacity of 169 MWe each. Unit 1 was installed in 1971, Unit 2 in 1974, Unit 3 in 2011, and Unit 4 in 2013.

Maddox is a 3 unit 193 MWe station located west of Hobbs, New Mexico. Unit 1 is a gas-fired boiler with steam turbine, with a net dependable capacity of 118 MWe. Unit 2 is a CGT with an average net dependable capacity of 60 MWe. Unit 3, originally in service in 1963, is a 10 MWe CGT and was brought out of retirement from Roswell, New Mexico, and moved to Maddox to serve as a standby unit in 1991. Unit 1 was installed in 1967 and Unit 2 in 1975.

Moore County is a 2 unit station with gas-fired boilers and steam turbines located southeast of Sunray, Texas. Unit 2 with a capacity of 25 MW has been retired in place. Unit 3, installed in 1954, with a capacity of 48 MWe was retired in place in 2013.

Nichols is a 3 unit 457 MWe station with gas-fired boilers and steam turbines located northeast of Amarillo, Texas. Units 1 and 2 have a net dependable capacity of 107 MW and 106 MW respectively. Unit 3 has a net dependable capacity of 244 MWe. The units were installed between 1960 and 1968.

Plant X is a 4 unit 442 MWe station with gas-fired boilers and steam turbines located south of Earth, Texas. Unit 1 has a net dependable capacity of 48 MWe. Units 2 and 3 have a net dependable capacity of 102 MWe and 103 MWe respectively. Unit 4 has a net dependable capacity of 189 MWe. The units were installed between 1952 and 1964.

Quay County is a single unit oil-fired CGT with a summer net dependable capacity of 23 MWe. It is located in Tucumcari, New Mexico. The CGT, originally in service in 1973, was removed from the Riverview Station (Electric City, Texas), and installed in Quay County in 2013.

Tolk is a 2 unit 1080 MWe station with coal-fired boilers and steam turbines located southeast of Muleshoe, Texas. Units 1 and 2 have a net dependable capacity of 540 MWe each. The units were installed between 1982 and 1985.

1.3 SCOPE

The scope of the dismantling estimate includes the following significant cost elements:

- Preparation for safe dismantling; including hazardous materials characterization for such items as ACM (asbestos-containing materials), lead, mercury, PCBs, etc. Isolation of the units in preparation for safe dismantling (e.g. ensuring systems are de-energized, fuel and chemical storage tanks are drained and cleaned, etc.).
- Abatement of ACM prior to dismantling (where applicable).
- Labor, equipment, and material costs associated with the removal and disposition of all installed equipment.
- Labor, equipment, and material costs associated with the demolition and disposition of buildings and foundations (to a depth of 3 feet below grade).

- Demolition contractor's on-site management, engineering, safety, and administrative staff.
- Demolition contractor's expenses, including insurance, permits, and fees.
- Owner's on-site management, oversight, and security staff.
- Cost contingency.
- A cost credit associated with the disposition of scrap metals.
- Ongoing environmental monitoring of the facilities after the completion of the dismantling and demolition.

Costs are provided for each station, identified by significant cost element. The cost per station includes the costs for dismantling the generating unit and the common station facilities. Costs are provided in 2014 dollars.

1.4 GENERAL APPROACH

The general approach to developing this estimate was to establish site-specific equipment and building materials inventory for each type of unit. These inventories were established using site walk-downs, station provided equipment databases, and plant drawings.

This cost estimate is prepared on an item-by-item basis using unit factors developed for each cost item from prior dismantling experience or similar related experience. The costs for project management, equipment and consumables, and similar types of costs are estimated on a period-dependent basis (i.e., the magnitude of the expense depends, in part, on the duration of the project). Contingency is provided within this estimate to account for unpredictable project events. While equipment salvage is not included, the potential value of scrap from materials generated in dismantling the boilers, plant components, and building structural steel is included as an offset to the dismantling cost; this results in a credit added to the project for estimated value of scrap metal recovery.

This estimate includes the costs to remove all structures on the site to a nominal level of three feet below grade. The costs reflect demolition by controlled/engineered dismantling. Concerns for worker safety reinforce the need for a controlled approach. Accordingly, all large components are assumed to be lowered to grade for additional disassembly. The steel support structures and other site building structures are dismantled from the top. All plant equipment and their supporting mechanical and electrical systems are removed by disassembly and segmentation where necessary.

Limited site landscaping includes seeding for drainage control. At the end of dismantling activities, the plant site will be in a condition such that the land could be available for alternative use.

Section 2 of this report identifies the activities and their sequence necessary to dismantle a generating station. Section 3 provides the specific bases for the estimate. Section 4 discusses scrap metal and associated credits to the dismantling costs. Section 5 provides the results. Appendices, noted throughout this report, provide additional information important to understanding this estimate.

2. DISMANTLING OPERATIONS

The estimate for dismantling the stations is based on the complete removal of the units and common station facilities (except where noted). The following sections describe the project organization, basic activities, and special equipment necessary for accomplishing the dismantling project.

2.1 PROJECT ORGANIZATION

For the purposes of this study, the dismantling project for each station is assumed to be managed by a Project Director, who would have the primary authority for dismantling the station. A Dismantling Contractor, experienced in dismantling similar facilities, would be hired as the prime contractor for the removal of plant components and site facilities. The Dismantling Contractor's Project Manager would report to the Project Director. The Dismantling Contractor would manage and supervise the dismantling activities of the station and be responsible for completing the work in an expeditious and safe manner. Contractor personnel would manage and direct the labor force in accordance with approved procedures and in accordance with a health and safety program, as well as providing the security services for the site. The owner's staff would maintain and/or provide the engineering, safety, and environmental compliance oversight, necessary to support dismantling operations. Figures 2.1 and 2.2 identify typical organizations for the plant/utility staff and the associated contractor personnel during the dismantling phase of the project.

2.2 POST-SHUTDOWN ACTIVITIES

The estimate is based on each station being shut down and placed into a post-shutdown configuration by the plant staff. The length of time that the facility is in this configuration is indeterminate and is not included within the scope of this dismantling effort. The activities to be completed post-shutdown but prior to dismantling the station include:

- Removal of consumables and supplies not needed in the post-shutdown configuration.
- Removal of residual fuels (including oil/coal).
- Removal of acids and caustics; flushing and cleaning of storage tanks.
- Cleaning of fly-ash handling equipment, e.g., filters and holding tanks.

- Removal of hazardous waste and combustible materials.
- If the unit is to be maintained in a condition where lighting, electricity, heating, water, sanitary, and similar services are to remain active, reconfigure these systems to minimize maintenance requirements.
- Disposition of surplus bulk chemicals and gas storage containers.
- Completion of a hazardous materials survey of the station.
- De-watering and removal of residual material from settling ponds and/or basins.
- Installation of any appropriate physical barriers (sealing circulating water system) and/or security barriers.
- Maintenance of the facility (maintaining roofs and windows, drain systems, and electrical systems to preclude creating hazardous working conditions in the future).

Except for the hazardous materials survey, these activities have not been included in this estimate. The plant operations and maintenance staff would be expected to perform these activities in the interval of time between final plant shutdown, and the onset of the dismantling program.

2.3 DISMANTLING PROGRAM

The actual dismantling program begins once the station owner has decided to dismantle the site, either immediately following final shutdown, or after a period of storage following final shutdown. A dismantling program can be characterized by three distinct periods: Period 1 - Engineering/Planning and Asbestos and Other Hazardous Material Abatement (if necessary); Period 2 - Dismantling Operations; and Period 3 - Site Restoration. This section summarizes the activities performed under each phase of the program.

For the purposes of this estimate it is assumed that once the decision to dismantle has been made and a project start date established, the work in each of the these periods will be completed successively (no delay between periods). This report does not attempt to describe all of the activities necessary to successfully dismantle a station, but identifies the types of activities appropriate to this type of project.

2.3.1 Period 1- Engineering/Planning and Asbestos Abatement

Engineering/Planning:

A preliminary planning phase of the program begins once it is has been determined that a station will be dismantled and the project has been authorized to proceed. During this phase, the owner assembles its dismantling management organization, makes appropriate decisions regarding the extent of dismantling and the approach to managing the activities, and accomplishes those site preparation activities necessary to transition from a plant shutdown configuration to site dismantling. For purposes of this estimate it is assumed that the intent is to dismantle the entire station as a single project. Costs incurred during this preliminary phase of the program are included in the dismantling costs presented in this study.

The owner prepares the stations for dismantling by performing the following activities:

- Prepare specifications that identify and describe the objectives and major work activities to be accomplished (establishing the final site configuration).
- Assemble plant documentation that may be relevant to dismantling (drawings, hazardous material reports, environmental studies, etc.).
- Select an asbestos abatement contractor (if required) and Dismantling Contractor.
- Assemble and mobilize the management and oversight team responsible for the project.

Asbestos Abatement (if necessary)

The asbestos abatement contractor prepares for this work by thoroughly understanding the scope of the asbestos remediation work and obtaining the permits necessary to initiate the work. Abatement of asbestos is considered an important prerequisite to dismantling the station's systems and structures. The method by which asbestos is abated is strictly controlled by federal and/or state regulations and includes the following requirements:

- Work will be done inside enclosures designed to capture any asbestos-containing particles. With the exception of removal of small quantities of asbestos in local areas, it would be expected that most work will be done in large enclosures (containment tents). The enclosures will have a filtered exhaust and be maintained under negative air pressure (air will leak into the enclosure rather than leak out).

- The air outside of the enclosures will be monitored to ensure barriers are effective.
- Workers, while working inside enclosures, will wear respiratory protective equipment as well as protective clothing.
- All materials removed from the enclosure will be packaged in accordance with regulations (minimum double-bag), and will be removed via a materials handling access area.
- Workers will enter and exit the enclosures through a personnel decontamination chamber in a controlled manner (ensuring asbestos contamination does not spread beyond the containment).
- After the asbestos abatement is complete, the effectiveness of the process will be established via regulatory-specified processes (generally verifying that there is no asbestos containing material capable of becoming airborne).
- Asbestos containing materials will be disposed of at a properly licensed disposal facility.
- After ensuring that all asbestos has been removed, the enclosures will be taken down in accordance with regulatory requirements and disposed of at a licensed facility.

Dismantling Preparations

The dismantling contractor prepares the station for dismantling by performing the following activities:

- Installing environmental barriers and monitoring equipment.
- Reviewing plant drawings and specifications that may be useful for the dismantling project.
- Identifying the processes to achieve the final desired station configuration.
- Identifying the major work sequence.
- Preparing dismantling activity specifications and work orders/forms.
- Preparing detailed dismantling procedures.

- Preparing a dismantling plan.
- Preparing permit application(s) for plant demolition.
- Mobilizing site staff.
- Configuring 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 Dismantling Contractor will initiate dismantling after completing the engineering and planning process and all asbestos abatement activities are completed. The sequence of activities will be determined at the time of dismantling, but typically a sequence would include a sequence similar to the following listing. Not all activities will be required for each unit, particularly for CGTs:

- Remove above-ground storage tanks.
- Remove large equipment from rooftops or at higher elevations.
- Remove all fly-ash handling piping and equipment, coal preparation equipment (pulverizers and feeders), burner corner fuel supply piping, scrubbers and /or precipitators, air and flue gas ducts, coal silos etc. prior to start of boiler structure removal.
- Remove air heaters by cutting away the casings and pulling out the air heater baskets to expose the rotor and basket frames. A heavy lift crane will be used to remove the rotor.
- Remove electrostatic precipitator and bag houses by cutting casings and connecting gas ducts.
- Remove the top of the boiler enclosure to allow access to the platens.
- Remove the boiler waterwall from the bottom upward, using scaffolding to lower sections to grade. The boiler support structure will be used for rigging and hoist attachment. Platens will be rigged from the structure and lowered to grade. Headers will also be rigged for removal and lowered to grade.
- Remove steam drum and deaerator by severing all connections and lowering to grade.

- Remove boiler structural steel from the top, placing small pieces in transfer containers; larger pieces are lowered to grade for additional processing.
- Main Transformers will have all wiring, bushings, cooling fans and electrical control cabinets removed. The cooling oil will be drained and the main and auxiliary transformers will be jacked up from the mounting pad and loaded onto a suitable transport vehicle or railroad car.
- Cable trays and electrical conduits will have the cabling cut at intervals and the electrical cables recovered for copper scrap. The cable tray and conduit will be cut down and recovered for steel scrap.
- Piping will be cut into nominal ten foot sections and removed for scrap.
- Feed water heaters will have all piping disconnected as well as all level controls removed. Each unit will be rigged out as a complete unit and transported by truck or rail to the scrap or recycle facility.
- The turbine/generator will be disassembled. After all upper steam piping has been removed, the upper turbine shells will be unbolted and the internal components (diaphragms and rotors) removed. The lower shells will be removed after the extraction steam piping has been cut away. This work will be performed using the turbine room overhead crane or other suitable heavy lift crane.
- The Main Steam and Reheat Steam Valves will be removed by torch cutting the connecting steam lines. The valves will then be lifted out using the turbine room overhead crane or other suitable heavy lift crane.
- The Condenser Water boxes will be removed to expose the tube sheets. The individual tubes will be extracted, and the tube sheets removed.
- Remove all other equipment and components required prior to structures demolition.
- Remove the turbine building superstructure and interior floors.
- Remove the concrete turbine-generator pedestal(s).
- Remove siding from buildings.
- Dismantle steel framing.
- Demolish structural concrete.

- Removing the stack(s).
- Remove cooling tower(s).
- Remove all other site structures within the scope of the dismantling program.
- Sort and organize materials for pickup by the scrap dealer(s).
- Size reduce concrete rubble to enhance its suitability for backfill.
- Remove any temporary services used to support the dismantling effort (lighting / ventilation / electrical / groundwater management).

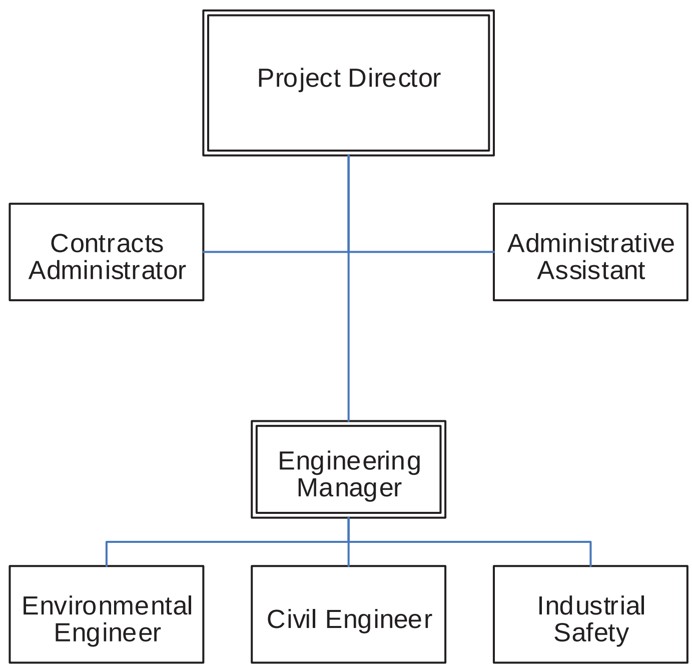
2.3.3 Period 3 - Site Restoration

Site restoration activities are initiated following completion of the dismantling operations. The objective of site restoration in this estimate is to restore the station grounds to a configuration that does not pose a safety hazard; and plant vegetation for erosion control. As such, landscaping will be limited to grading, placement of top soil, and seeding. Site restoration as used in this estimate is not intended to re-configure the station for redevelopment, e.g. use as a recreational or industrial facility.

A typical site restoration sequence would be:

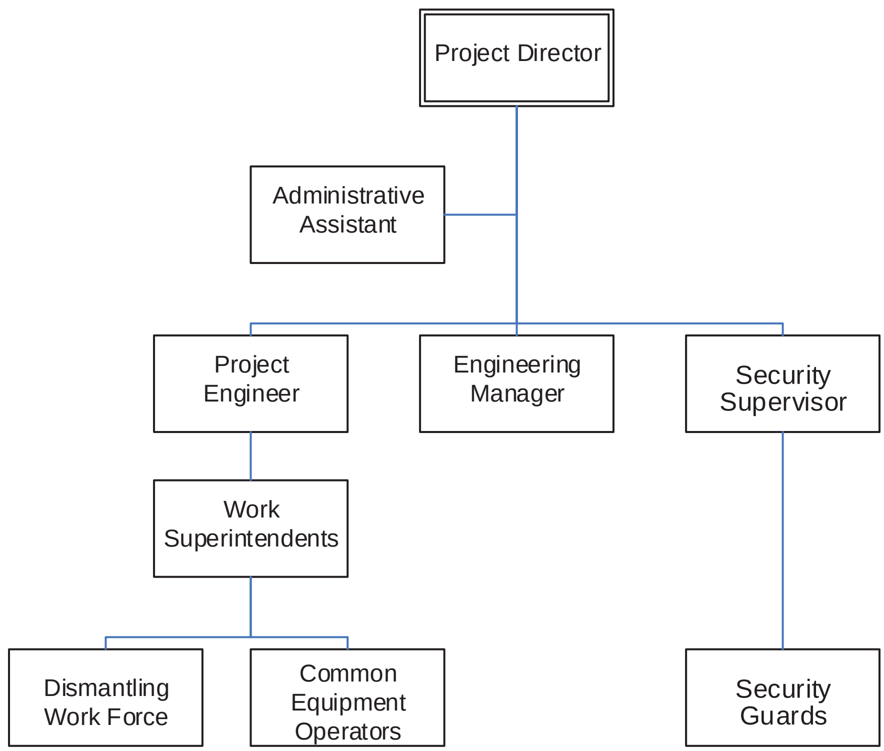
- Backfill below grade voids with recycled concrete rubble (reinforcing steel removed from concrete) or with additional fill, if necessary,
- General grading of the station,
- Placement of top soil or other suitable surface material necessary to support the growth of native vegetation and maintain erosion control,
- Landscaping to the extent necessary to re-vegetate the station (grass or similar plant materials), and
- Demobilizing personnel and equipment.

FIGURE 2.1
DISMANTLING PROJECT ORGANIZATION
UTILITY STAFF



Note: The number of persons assigned to the staff is dependent upon the level of effort of the dismantling program

FIGURE 2.2
DISMANTLING PROJECT ORGANIZATION
DISMANTLING CONTRACTOR STAFF



Note: The number of persons assigned to the staff is dependent upon the level of effort of the dismantling program

3. COST ESTIMATE

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

3.1 BASIS OF ESTIMATE

Inventory of Materials to be Removed

Site-specific inventories of materials were developed using information obtained during physical walk-downs of each type of unit (including discussions with the Operations & Maintenance staff), station-specific maintenance databases (lists of equipment), and station-specific drawings and photos. This information was used to determine the general arrangement of each unit and to develop estimates of building concrete volumes, steel quantities, and component inventories of each unit. The inventory developed for each station is provided in Appendix A.

Economic Cost Drivers

In developing an estimate, the cost of labor, equipment and material, credit for scrap, and similar costs will influence the results of the estimate. The basis for the significant cost drivers are:

1. Craft labor rates are based on information extracted from the North Texas Construction Industry Wage Rates. [1]*
2. Utility labor rates are based on current labor costs for positions likely to be employed during the dismantling project. These rates were provided by Xcel Energy.[2] Overhead and benefit rates for utility personnel were provided by Xcel Energy.[3]
3. Material and equipment costs for conventional demolition and/or construction activities, Contractors Insurance, Small Tools Allowance, Permit / Fees, and Contractor's Fee are based on R.S. Means Construction Cost Data.[4]
4. Scrap metal prices are based on published indices.[5]
5. Contingency, contractor fee, contractor insurance, environmental sampling, and permits & fees are based upon R.S. Means Construction Cost Data.
6. Costs in this estimate are in 2014 dollars.

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* References provided in Section 6 of the document

7. Property taxes (or payments in lieu of taxes) are not included within the estimate.
8. The estimate to dismantle the stations does not include any cost for environmental remediation of the soil, nor does it include any credit associated with the residual value of the land.

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" [6] and the US DOE "Decommissioning Handbook."[7] 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. The activity-dependent costs are estimated using item quantities (cubic yards, tons, inches, etc.) developed from plant drawings and inventory documents. The unit factors used in this study reflect the latest available information on worker productivity in plant dismantling. A sample unit cost factor is provided in Appendix B. A list of unit cost factors is provided in Appendix C.

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 estimated 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 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. "Contingencies" are defined in the "Project and Cost Engineers' Handbook"[8] 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 on ideal conditions; therefore, a contingency factor has been applied.

Examples of items that could occur but have not otherwise been accounted for in this estimate include: labor work stoppages, bad weather delays, equipment/tool breakage, changes in the anticipated plant shutdown conditions, etc. These types of unforeseeable events are discussed in the AIF/NESP-036 study. Guidelines are also provided for applying contingency.

3.3 ASSUMPTIONS

The following assumptions were used in developing the dismantling estimate.

Pre-requisite Activities

1. Dismantling of the station will not commence until all units are retired (cost estimate is not based on independent dismantling of units while adjacent units are operating).
2. The arrangements of the unit facilities as they existed in 2014 based upon walk-downs conducted by TLG in 2007 and 2008, as well as databases and drawings provided by owner. This information was augmented with conversations with plant personnel in 2012 and 2014.
3. The dismantling process will be an engineered process with substantial consideration for industrial (worker) safety.
4. The demolition will be performed by a Dismantling Contractor who is responsible to provide adequate staff and equipment to complete the dismantling in a safe manner.
5. Site security to restrict access to the demolition project by unauthorized personnel will be provided by the dismantling contractor.
6. The estimate is based on industrial safety and environmental regulations effective in 2014.
7. Ponds and basins will be dewatered and residual material removed after shutdown.
8. On-site fuel inventories will be used and/or removed prior to start of dismantling.

9. Silos, precipitators, hoppers, tanks, etc., will be emptied by operations and maintenance staff after shutdown.
10. Acids, caustics, and similar hazardous materials will be removed by operations and maintenance staff after shutdown.
11. Consumables, such as ion exchange materials and filters, will also be removed by operations and maintenance staff after shutdown.
12. Stores, spare parts, gas storage containers, laboratory equipment, office furniture, etc., will be removed by the owner after shutdown.
13. Oils used in station transformers are PCB-free. Lubricating and transformer oils are drained and removed by operations and maintenance staff after shutdown.
14. Asbestos (if present) will be removed prior to the start of dismantling. Asbestos insulation and PACM (presumed asbestos containing materials) will be disposed of at licensed facilities. Quantities of asbestos are based on owner-provided information and reflect plant status as of mid-2014.
15. Prior to initiating dismantling, essentially all live circuits will have been de-energized (to preclude creating an industrial hazard). If required, temporary services systems (air, water, electrical, fire water, etc.) will be used to support dismantling operations and will remain in service throughout the project until no longer required.

<u>Economic Assumptions</u>

16. Post-shutdown "dormancy" costs (i.e., security and maintenance on any of the units retired prematurely) are not included in the study.
17. Escalation/inflation of the costs over the remaining operating life is not included.
18. A utilities allowance has been included; this provides for electric power for lighting/heating/cooling, telephone and internet access, office equipment and supplies, trash removal, potable water and sewage.
19. A 12.5% fee is added to the Demolition Contractor's cost to account for its overhead and profit.
20. A 25% contingency is applied to asbestos remediation activities.
21. A 15% contingency is applied to all remaining dismantling-related costs.
22. An allowance has been included for post-dismantling environmental monitoring costs.

23. A credit for scrap metal cost recovery is included in the estimate. Retired plant equipment is assumed to have no value as salvage (sold for re-use).
24. Consistent with working on a 10 hour per day, five day per week basis, craft worker billing rates are based upon 40 hours of straight time, and 10 hours of overtime pay. Dismantling contractor staff receives pay for 50 hours straight time. Utility staff does not receive overtime pay.

<u>Physical Work Assumptions</u>

25. Large equipment and components will be removed prior to structures demolition.
26. An environmental hazards crew will be maintained throughout the demolition period to address such items as lead paint and asbestos that was inaccessible during the asbestos remediation period.
27. Turbine pedestals and powerhouse building foundations will be removed to three feet below grade and back-filled to grade.
28. Structures and foundations will be removed to a depth of three feet below grade, with any resulting voids back-filled to grade level.
29. Chimney stacks will be demolished and broken into rubble, the steel liners cut and removed.
30. Turbine building cranes, miscellaneous hoists, and trolleys will remain in service to support dismantling until no longer needed.
31. The dismantling of the electrical equipment terminates at the switch yard boundary. The switch yard is left intact. Any reconfiguration of control systems for the switchyard to remain in service is not included in this estimate.
32. Concrete rubble generated during dismantling will be used as fill where needed.
33. The site will be graded; however, no effort was included in this estimate to restore the original contour of the land. Ground cover will be established for erosion control.
34. Roads, parking lots, etc., are removed after the facility is dismantled (with the exception of the immediate area around the switchyard).

<u>Scheduling Assumptions</u>

35. Work is performed during a ten-hour workday, five days per week.
36. Multiple crews work parallel activities to the maximum extent possible, consistent with efficiency (adequate access for cutting, removal, and

laydown space) and with industrial safety appropriate for demolition of heavy components and structures.

37. Scheduling was calculated without constraints on availability of labor, equipment, or materials.

3.4 STATION-SPECIFIC NOTES

3.4.1 Carlsbad

- Reduced decommissioning management and contractor staff due to small size of facility.

3.4.2 Cunningham

- Cunningham Unit 2 is similar to Plant X Unit 4. Plant X Unit 4 was used as the systems and structures inventory basis for Cunningham Unit 2. Differences between the units were accounted for during the site walk-down. This estimate reflects the expected quantity of ACM as of mid-2014.

3.4.3 Harrington

- Coal handling equipment owned by others and not included in estimate.
- SPS believes that asbestos insulation remains at Harrington, and provided TLG with an allowance value for removal of the remainder of asbestos insulation on site; there is also an additional allowance for some ACM in building material.
- Fly ash collection system: Unit 1 has an electrostatic precipitator; Units 2 and 3 have a bag-house.

3.4.4 Jones

- Jones Units 1 or 2 are essentially identical to Nichols Unit 3. Nichols Unit 3 was used as the systems and structures inventory basis for Jones Units 1 and 2, with the structures inventory being adjusted for larger building dimensions at the Jones station. Jones Units 3 and 4 systems and structures inventories are based on a site specific walk-down. This estimate reflects the expected quantity of ACM as of mid-2014 at Units 1 and 2.

3.4.5 Maddox

- Maddox Unit 1 is similar to Nichols Unit 1. Nichols Unit 1 was used as the systems and structures inventory basis for Maddox Unit 1. Differences between the units were accounted for during the site walk-down. This estimate reflects the expected quantity of ACM as of mid-2014.

3.4.6 Moore County

- Estimate performed as described in Section 3. This estimate reflects the expected quantity of ACM as of mid-2014.

3.4.7 Nichols

- Estimate performed as described in Section 3. This estimate reflects the expected quantity of ACM as of mid-2014.

3.4.8 Plant X

- Plant X Unit 1 is similar to Moore County Unit 3. Moore County Unit 3 was used as the systems and structures inventory basis for Plant X Unit 1. Differences between the units were accounted for during the site walk-down.
- Plant X Units 2&3 are similar to Nichols Unit 1. Nichols Unit 1 was used as the systems and structures inventory basis for Plant X Units 2&3. Differences between the units were accounted for during the site walk-down.
- This estimate reflects the expected quantity of ACM as of mid-2014.

3.4.9 Quay County

- The Quay County CGT is a unit recovered from the Riverview Station.
- Carlsbad station was used as the systems and structures basis for Quay County. The inventory was adjusted based on generation capacity and input from Xcel Energy.

3.4.10 Tolk

- Coal handling equipment owned by others and not included in estimate.

- SPS believes that asbestos insulation remains at Tolk, and provided TLG with an allowance value for removal of the remainder of asbestos insulation on site; there is also an additional allowance for some ACM in building material.

4. SCRAP METAL CREDITS

The dismantling of a typical fossil plant occurs after a lengthy plant operating life. The existing plant equipment is likely considered obsolete and suitable only for scrap as deadweight quantities. Xcel Energy will make economically reasonable efforts to salvage equipment following final plant shutdown. However, dismantling techniques assumed by TLG for equipment in this analysis are not consistent with removal techniques required for salvage (resale) of equipment. Experience has indicated that buyers prefer equipment stripped down to very specific requirements before they would consider purchase. This can require expensive work to remove the equipment from its installed location, which is inconsistent with the rapid dismantling approach assumed in this estimate. Since placing a salvage value on this machinery and equipment would be speculative, and the value would be small in comparison to the overall cost of dismantling, this analysis does not attempt to quantify the value that an owner may realize based upon those efforts.

Furniture, tools, mobile equipment such as forklifts, trucks, bulldozers, and other property are removed at no cost or credit to the dismantling effort. Disposition may include relocation to other facilities. Spare parts are made available for alternative use.

The materials used in the equipment and buildings are suitable for recycle as scrap metals. As such, an estimated value of the scrap metal credit has been developed and applied to each station's cost estimate. The value of scrap was estimated using average 2014 market values extracted from published sources and applying this value to the estimated quantities of materials generated from the dismantling project. There were three basic types of metals used in the scrap estimates; carbon steel (the most common material used at the station), copper, and stainless steel (high alloy steel). The scrap credit, in addition to considering the quantity and types of materials, also considered the cost of handling and transporting these materials to a major scrap processing location in the Houston area where scrap is used or sold. The value of the scrap is reduced by the transportation costs.

The basis for scrap metal value is summarized in Table 4.1. A summary of the basis for the scrap credit is provided in Tables 4.2 which details the scrap quantities by material type from each unit, and Table 4.3 lists the dollar value of these quantities.

TABLE 4.1
BASIS FOR SCRAP METAL VALUE
(2014 dollars)

Type of Material	Scrap Category [1]	Market Value [2]	Units	Transport Cost [3]	Scrap Metal Credit [4] (per ton)
Carbon Steel	Cast Iron	272.98	Per Ton	99.06	173.92
	No. 1	341.23	Per Ton	99.06	242.17
	Mixed Scrap	272.98	Per Ton	99.06	173.92
	Galvanized	75.07	Per Ton	99.06	0.00
Stainless Steel	SS-1	0.88	Per Pound	0.05	1,663.79
Copper	Insulated Cable	1.59	Per Pound	0.05	3,079.24
	No. 2 Copper	2.54	Per Pound	0.05	4,988.83
	Copper-Nickel	4.14	Per Pound	0.05	8,182.97
	Large Motor	0.38	Per Pound	0.05	664.18

Note 1: Scrap categories are consistent with information provided in Recycler's World.

Note 2: The market value for scrap metal used in this estimate is based on Recycler's World U.S. Scrap Metal Index Spot Market Prices. Values shown represent the average over the 12 month period of 2014 from July 1, 2013 to June 30, 2014.

Note 3: The estimated cost for handling and transporting the materials to a major scrap processing center in the Houston, TX area is $ 99.06 / ton or $0.05 / pound.

Note 4: The scrap metal credit reflects the market value of scrap adjusted for handling and transport cost to a scrap metal recycler.

TABLE 4.2
QUANTITY OF SCRAP METALS BY STATION
(pounds)

	Carbon Steel			Stainless Steel	Galvanized	Copper			Copper	
Station Name	**Cast Iron**	**No. 1**	**Mixed Scrap**	**SS-1**	**Steel**	**Insul Cbl**	**No. 2 Cu**	**Large Mtr**	**Nickel**	**Total**
Carlsbad	84,096	189,277	285,533	3,035	36,819	3,980	3,481	7,599	-	613,820
Cunningham	1,550,173	15,293,072	28,822,014	681,931	581,047	175,763	630,838	1,984,099	118,642	49,837,579
Harrington	3,872,737	64,731,464	100,694,047	1,759,259	1,576,125	505,096	1,344,790	4,163,866	-	178,647,385
Jones	1,812,708	20,841,288	37,734,998	973,122	716,819	241,661	778,208	1,735,515	-	64,834,318
Maddox	622,569	8,030,733	14,308,970	485,317	337,566	62,849	228,077	607,705	-	24,683,786
Moore County	527,372	6,148,104	7,817,265	252,176	294,677	87,376	112,719	629,378	-	15,869,067
Nichols	2,060,468	24,314,341	37,109,391	1,148,732	761,350	233,947	293,703	2,170,249	-	68,092,180
Plant X	2,549,317	25,713,030	42,148,429	1,029,447	1,046,171	277,799	565,113	2,380,605	130,179	75,840,091
Quay County	118,499	485,708	411,563	4,182	49,447	5,767	4,970	11,011	-	1,091,148
Tolk	2,722,351	71,945,195	91,991,643	1,292,192	2,472,712	558,562	897,395	3,056,096	-	174,936,146
Total	**15,920,291**	**237,692,212**	**361,323,852**	**7,629,392**	**7,872,733**	**2,152,802**	**4,859,293**	**16,746,122**	**248,821**	**654,445,519**

TABLE 4.3
SCRAP METAL CREDITS BY STATION
(thousands of 2014 dollars)

	Carbon Steel			Stainless Steel	Galvanized	Copper			Copper	
Station Name	**Cast Iron**	**No. 1**	**Mixed Scrap**	**SS-1**	**Steel**	**Insul Cbl**	**No. 2 Cu**	**Large Mtr**	**Nickel**	**Total**
Carlsbad	$ 7	$ 23	$ 25	$ 3	$ 0	$ 6	$ 9	$ 3	$ -	$ 75
Cunningham	$ 135	$ 1,852	$ 2,506	$ 567	$ 0	$ 271	$ 1,574	$ 659	$ 485	$ 8,049
Harrington	$ 337	$ 7,838	$ 8,756	$ 1,464	$ 0	$ 778	$ 3,354	$ 1,383	$ -	$ 23,910
Jones	$ 158	$ 2,524	$ 3,281	$ 810	$ 0	$ 372	$ 1,941	$ 576	$ -	$ 9,662
Maddox	$ 54	$ 972	$ 1,244	$ 404	$ 0	$ 97	$ 569	$ 202	$ -	$ 3,542
Moore County	$ 46	$ 744	$ 680	$ 210	$ 0	$ 135	$ 281	$ 209	$ -	$ 2,305
Nichols	$ 179	$ 2,944	$ 3,227	$ 956	$ 0	$ 360	$ 733	$ 721	$ -	$ 9,119
Plant X	$ 222	$ 3,113	$ 3,665	$ 856	$ 0	$ 428	$ 1,410	$ 791	$ 533	$ 11,017
Quay County	$ 10	$ 59	$ 36	$ 3	$ 0	$ 9	$ 12	$ 4	$ -	$ 133
Tolk	$ 237	$ 8,711	$ 8,000	$ 1,075	$ 0	$ 860	$ 2,238	$ 1,015	$ -	$ 22,136
Total	**$ 1,384**	**$ 28,781**	**$ 31,421**	**$ 6,347**	**$ 0**	**$ 3,314**	**$ 12,121**	**$ 5,561**	**$ 1,018**	**$ 89,948**

5. RESULTS

An estimate for dismantling each of the SPS fossil stations was developed by applying the system and structures inventories against the associated unit cost factors and accounting for program support costs. A summary of each station's major cost categories is presented in Table 5.1. Breakdowns of the major cost categories by unit and common facilities are provided in Tables 5.2, a through l. Note that columns may not total due to rounding.

The following is an explanation of the contents of each line item in these tables:

Station Unit Rating (MWe) – This is the nominal electrical rating of each unit at the station. In Table 5.1 this represents the sum of all units on site.

Demolition Preparations / Temporary Services – The cost associated with ensuring that all energized systems have been isolated from the buildings scheduled for dismantling and the cost for installing temporary services to support the dismantling.

Scaffolding / Worker Access – The cost associated with providing safe access to areas of the station being dismantled.

Asbestos Remediation – The cost associated with remediating asbestos from the station prior to initiating dismantling activities. It should be noted that dismantling can proceed much more efficiently if asbestos containing materials have been removed.

Equipment Removal – The cost associated with removing all station equipment (piping, valves, heat exchangers, tanks, electrical equipment, etc.).

Boiler(s) – The cost associated with removing the boiler.

Structures Demolition – The cost associated with demolishing the buildings and concrete foundations (to three feet below grade).

Backfill / Grade / Landscaping – The cost associated with backfilling below grade voids, and grading and landscaping the grounds to preclude erosion of soils.

Pond Removal – The cost associated with removal and disposal of pond liners, removal of the berm, and backfilling the void.

Ongoing Environmental Monitoring (quarterly for 5 years) – The cost associated with monitoring the environment around the station after the completion of dismantling activities.

Utility Management / Oversight – The staff directly assigned to manage the dismantling project, including planning, execution, oversight, and restoration.

Demolition Contractor Staff – The contractor's staff assigned to manage, engineer, and supervise the dismantling project.

Security – Personnel assigned to control access to the dismantling site.

Property Taxes – Not included in this estimate.

Shared Heavy Equipment / Operating Engineers – The cost for renting / operating equipment in general use throughout the dismantling project (cranes, trucks, forklifts, front-end loaders, etc.).

Small Tool Allowance – The cost for procuring small tools; this is consistent with R.S. Means 2014 Item 01 54 39.70.

Utilities Allowance (Office Equip & supplies / Telephone, Electric etc.) – The cost for procuring utility services and office supplies in support of the field office for the utility management and demolition contractor staffs.

Permits – The cost of obtaining permits; this is consistent with R.S. Means 2014 Item 01 41 26.50.

Demolition Contractors Insurance – The cost of the demolition contractors insurance; the value is consistent with the R.S. Means 2014 Item 01 31 13.30, lines 0020, 0200, and 0600.

Demolition Contractors Fee – A fee applied to contractor activities; this represents the Contractors overhead and profit payment for the project and is consistent with R.S. Means 2014 Item 01 31 13.80 lines 0350, 0400 and 0450.

Contingency – The cost to cover expenses for unforeseen events that are likely to occur. The estimate assumes 25% [consistent with TLG's experience for similarly highly regulated activities in the nuclear industry) for the asbestos remediation work, and 15% for all other project activities, consistent with the R.S. Means 2014 Item 01 21 16.50 lines 0050 and 0100.

Scrap Credit – A credit to the project for the recovery of scrap metals. This corresponds to value shown in Table 4.3.

Unit (Table 5.2) – Costs directly attributed to the physical work associated with dismantling a generating unit.

Common (Table 5.2) – Costs directly attributed to the physical work associated with dismantling facilities shared by more than one unit.

Station (Table 5.2) – Costs associated with supporting the physical dismantling work for a station.

This study provides an estimate for dismantling under current requirements, based on present-day costs and available technology. As inputs to the cost model change over time, such as labor rates, equipment costs, scrap metal value, etc., this cost estimate should be reviewed and updated to reflect these changes.

TABLE 5.1
SUMMARY OF ACTIVITY COSTS
(2014 Dollars)

Activities (Costs)	*Carlsbad*	*Cunningham*	*Harrington*	*Jones*	*Maddox*	*Moore County*	*Nichols*	*Plant X*	*Quay County*	*Tolk*	*Fleet Totals*
Station Rating (MWe)	11	485	1041	824	188	73	457	442	23	1080	4624
Characterization / Temporary Services	29,000	884,444	719,583	738,583	641,583	420,722	670,583	876,444	32,000	503,722	5,516,666
Scaffolding / Worker Access	-	627,941	637,235	284,026	92,611	118,894	324,453	364,195	-	607,689	3,057,043
Asbestos Remediation	-	2,201,678	2,609,531	2,551,461	1,334,295	2,288,378	4,921,558	5,234,277	-	2,109,531	23,250,710
Equipment Removal	71,566	2,367,733	6,715,991	2,658,285	1,247,253	835,186	3,043,492	3,291,313	118,696	6,312,619	26,662,135
Boiler(s)	-	1,344,934	3,457,783	1,564,327	591,972	332,190	1,884,667	2,213,241	-	3,059,991	14,449,104
Structures Demolition	53,670	1,985,936	9,875,927	3,344,088	1,173,557	892,837	3,033,017	2,988,303	83,121	12,311,593	35,742,048
Backfill / Grade / Landscaping	21,228	495,930	2,988,098	1,819,151	211,180	402,976	1,053,252	791,342	28,302	3,646,719	11,458,178
Pond Removal	-	-	899,196	-	-	-	-	-	-	1,798,803	2,697,999
Ongoing environ. monitoring (quarterly for 5 years)	-	283,000	794,000	301,000	213,000	224,000	307,000	348,000	-	1,065,000	3,535,000
Utility Management / Oversight	51,008	1,162,544	2,005,539	1,665,717	996,240	536,924	1,674,079	1,667,817	50,471	2,099,464	11,909,803
Demolition Contractor Mgmt / Super. / Safety Staff	61,852	1,983,556	4,038,441	3,168,046	1,592,072	947,367	2,811,242	2,796,852	60,612	4,254,288	21,714,328
Security	20,665	235,892	668,317	350,914	197,876	190,078	537,752	535,539	20,665	701,511	3,459,209
Property Taxes	0	0	0	0	0	0	0	0	0	0	0
Project Expenses											
Shared Heavy Equipment / Operating Engineers	121,616	2,167,155	4,717,266	3,634,797	1,682,087	1,227,019	2,840,804	2,823,700	119,456	4,973,818	24,307,718
Small Tool Allowance	2,193	115,014	342,160	155,367	59,523	61,718	180,005	188,146	3,276	374,962	1,482,365
Utilities Allowance	4,115	46,972	58,618	69,876	39,402	37,850	47,166	46,972	4,115	61,530	416,616
Permits	4,824	184,252	481,527	257,999	113,455	99,740	270,687	281,229	5,878	522,272	2,221,864
Demolition Contractors Insurance	11,351	433,555	1,133,057	607,085	266,966	234,694	636,941	661,746	13,831	1,228,933	5,228,157
Demolition Contractors Fee	42,529	1,636,430	4,413,036	2,254,495	956,470	892,785	2,430,547	2,537,056	53,667	4,776,712	19,993,727
Sub-Total	495,617	18,156,967	46,555,305	25,425,215	11,409,544	9,743,358	26,667,246	27,646,174	594,090	50,409,156	217,102,670
Contingency	74,343	2,943,713	7,109,370	4,068,928	1,844,861	1,690,341	4,492,243	4,670,354	89,113	7,502,506	34,485,772
Project Total (before scrap credit)	569,960	21,100,679	53,664,675	29,494,143	13,254,405	11,433,699	31,159,489	32,316,527	683,203	57,911,662	251,588,442
Scrap Credit	(74,921)	(8,048,723)	(23,909,555)	(9,661,757)	(3,542,077)	(2,304,582)	(9,119,461)	(11,017,304)	(133,318)	(22,136,129)	(89,947,827)
Project Total	495,039	13,051,957	29,755,120	19,832,386	9,712,328	9,129,118	22,040,027	21,299,223	549,885	35,775,533	161,640,615

TABLE 5.2a
CARLSBAD STATION
SUMMARY OF ACTIVITY COSTS
(2014 Dollars)

Activities	*Unit 1*	*Station*	*Station Total*
Carlsbad Unit Rating (MWe)	11		
Characterization / Temporary Services	29,000	0	29,000
Worker Access	-		0
Asbestos Remediation	-		0
Equipment Removal	71,566		71,566
Boiler(s)	-		0
Structures Demolition	53,670		53,670
Backfill / Grade / Landscaping	21,228	-	21,228
Ongoing environmental monitoring (quarterly for 5 years)		0	0
Utility Management / Oversight		51,008	51,008
Demolition Contractor Management / Supervisory / Safety Staff		61,852	61,852
Security		20,665	20,665
Property Taxes	-	-	0
Project Expenses			
Shared Heavy Equipment / Operating Engineers		121,616	121,616
Small Tool Allowance	2,193	n/a	2,193
Utilities Allowance (Office Equip & supplies / Telephone, Electric etc.)		4,115	4,115
Permits		4,824	4,824
Demolition Contractors Insurance		11,351	11,351
Demolition Contractors Fee		42,529	42,529
Sub-Total			495,617
Contingency (excluding activities currently under contract)			74,343
Project Total (before scrap credit)			569,960
Scrap Credit	(74,921)	-	(74,921)
Project Total			495,039

TABLE 5.2b
CUNNINGHAM STATION
SUMMARY OF ACTIVITY COSTS
(2014 Dollars)

Activities	*Unit 1*	*Unit 2*	*Unit 3*	*Unit 4*	*Common*	*Station*	*Station Total*
Cunningham Unit Rating (MWe)	71	196	109	109	485		
Characterization / Temporary Services	39,000	52,000	43,000	43,000	-	707,444	884,444
Worker Access	77,915	115,551	217,238	217,238	-		627,941
Asbestos Remediation	1,274,349	815,589	-	-	111,740		2,201,678
Equipment Removal	712,866	888,814	257,703	257,703	250,648		2,367,733
Boiler(s)	491,505	853,429	-	-	-		1,344,934
Structures Demolition	560,678	729,233	111,374	111,374	473,278		1,985,936
Backfill / Grade / Landscaping	101,735	102,366	14,011	14,011	263,807	-	495,930
Ongoing environmental monitoring (quarterly for 5 years)						283,000	283,000
Utility Management / Oversight						1,162,544	1,162,544
Demolition Contractor Management / Supervisory / Safety Staff						1,983,556	1,983,556
Security						235,892	235,892
Property Taxes	-	-	-	-	-	-	0
Project Expenses							
Shared Heavy Equipment / Operating Engineers						2,167,155	2,167,155
Small Tool Allowance	40,726	44,462	8,042	8,042	13,743	n/a	115,014
Utilities Allowance (Office Equip & supplies / Telephone, Electric etc.)						46,972	46,972
Permits						184,252	184,252
Demolition Contractors Insurance						433,555	433,555
Demolition Contractors Fee						1,636,430	1,636,430
Sub-Total							18,156,967
Contingency (excluding activities currently under contract)							2,943,713
Project Total (before scrap credit)							21,100,679
Scrap Credit	(2,135,005)	(3,719,064)	(960,170)	(960,170)	(274,314)	-	(8,048,723)
Project Total							13,051,957

TABLE 5.2c
HARRINGTON STATION
SUMMARY OF ACTIVITY COSTS
(2014 Dollars)

Activities	Unit 1	Unit 2	Unit 3	Common	Station	Station Total
Harrington Unit Rating (MWe)	347	347	347	1,041		
Characterization / Temporary Services	63,000	63,000	63,000	-	530,583	719,583
Worker Access	212,412	212,412	212,412	-		637,235
Asbestos Remediation	800,000	800,000	800,000	209,531		2,609,531
Equipment Removal	2,127,134	2,149,745	2,146,255	292,858		6,715,991
Boiler(s)	1,152,594	1,152,594	1,152,594	-		3,457,783
Structures Demolition	2,525,983	2,774,955	2,774,955	1,800,033		9,875,927
Backfill / Grade / Landscaping	338,205	359,667	359,667	1,930,560	-	2,988,098
Pond Removal				899,196	0	899,196
Ongoing environmental monitoring (quarterly for 5 years)					794,000	794,000
Utility Management / Oversight					2,005,539	2,005,539
Demolition Contractor Management / Supervisory / Safety Staff					4,038,441	4,038,441
Security					668,317	668,317
Property Taxes	-	-	-	-	-	0
Project Expenses						
Shared Heavy Equipment / Operating Engineers					4,717,266	4,717,266
Small Tool Allowance	90,242	93,905	93,861	64,152	n/a	342,160
Utilities Allowance (Office Equip & supplies / Telephone, Electric etc.)					58,618	58,618
Permits					481,527	481,527
Demolition Contractors Insurance					1,133,057	1,133,057
Demolition Contractors Fee					4,413,036	4,413,036
Sub-Total						46,555,305
Contingency (excluding activities currently under contract)						7,109,370
Project Total (before scrap credit)						53,664,675
Scrap Credit	(7,437,627)	(7,510,991)	(7,474,294)	(1,486,643)	-	(23,909,555)
Project Total						29,755,120

TABLE 5.2d
JONES STATION
SUMMARY OF ACTIVITY COSTS
(2014 Dollars)

Activities	*Unit 1*	*Unit 2*	*Unit 3*	*Unit 4*	*Common*	*Station*	*Station Total*
Jones Unit Rating (MWe)	243	243	169	169	824		
Characterization / Temporary Services	55,000	55,000	49,000	49,000	-	530,583	738,583
Worker Access	142,013	142,013	-	-	-		284,026
Asbestos Remediation	1,452,768	989,162	-	-	109,531		2,551,461
Equipment Removal	924,404	924,404	257,184	257,184	295,108		2,658,285
Boiler(s)	782,163	782,163	-	-	-		1,564,327
Structures Demolition	802,591	802,591	209,356	209,356	1,320,196		3,344,088
Backfill / Grade / Landscaping	251,301	251,301	60,910	60,910	1,194,730	-	1,819,151
Ongoing environmental monitoring (quarterly for 5 years)						301,000	301,000
Utility Management / Oversight						1,665,717	1,665,717
Demolition Contractor Management / Supervisory / Safety Staff						3,168,046	3,168,046
Security						350,914	350,914
Property Taxes	-	-	-	-	-	-	0
Project Expenses							
Shared Heavy Equipment / Operating Engineers						3,634,797	3,634,797
Small Tool Allowance	55,128	49,333	7,206	7,206	36,495	n/a	155,367
Utilities Allowance (Office Equip & supplies / Telephone, Electric etc.)						69,876	69,876
Permits						257,999	257,999
Demolition Contractors Insurance						607,085	607,085
Demolition Contractors Fee						2,254,495	2,254,495
Sub-Total							25,425,215
Contingency (excluding activities currently under contract)							4,068,928
Project Total (before scrap credit)							29,494,143
Scrap Credit	(3,434,159)	(3,434,159)	(658,536)	(658,536)	(1,476,369)	-	(9,661,757)
Project Total							19,832,386

TABLE 5.2e
MADDOX STATION
SUMMARY OF ACTIVITY COSTS
(2014 Dollars)

Activities	*Unit 1*	*Unit 2*	*Unit 3*	*Common*	*Station*	*Station Total*
Maddox Unit Rating (MWe)	118	60	10	188		
Characterization / Temporary Services	44,000	38,000	29,000	-	530,583	641,583
Worker Access	92,611	-	-	-		92,611
Asbestos Remediation	1,222,525	-	-	111,770		1,334,295
Equipment Removal	806,594	281,794	43,233	115,631		1,247,253
Boiler(s)	591,972	-	-	-		591,972
Structures Demolition	790,365	117,682	60,442	205,069		1,173,557
Backfill / Grade / Landscaping	78,882	25,791	5,903	100,604	-	211,180
Ongoing environmental monitoring (quarterly for 5 years)					213,000	213,000
Utility Management / Oversight					996,240	996,240
Demolition Contractor Management / Supervisory / Safety Staff					1,592,072	1,592,072
Security					197,876	197,876
Property Taxes	-	-	-	-	-	0
Project Expenses						
Shared Heavy Equipment / Operating Engineers					1,682,087	1,682,087
Small Tool Allowance	45,337	5,791	1,732	6,663	n/a	59,523
Utilities Allowance (Office Equip & supplies / Telephone, Electric etc.)					39,402	39,402
Permits					113,455	113,455
Demolition Contractors Insurance					266,966	266,966
Demolition Contractors Fee					956,470	956,470
Sub-Total						11,409,544
Contingency (excluding activities currently under contract)						1,844,861
Project Total (before scrap credit)						13,254,405
Scrap Credit	(2,487,822)	(736,804)	(114,312)	(203,139)	-	(3,542,077)
Project Total						9,712,328

TABLE 5.2f
MOORE COUNTY STATION
SUMMARY OF ACTIVITY COSTS
(2014 Dollars)

Activities	Unit 2	Unit 3	Common	Station	Station Total
Moore County Unit Rating (MWe)	25	48	73		
Characterization / Temporary Services	32,000	35,000	-	353,722	420,722
Worker Access	50,955	67,939	-		118,894
Asbestos Remediation	792,592	1,161,524	334,262		2,288,378
Equipment Removal	199,035	416,332	219,819		835,186
Boiler(s)	128,003	204,187	-		332,190
Structures Demolition	315,024	331,113	246,700		892,837
Backfill / Grade / Landscaping	153,741	130,963	118,272	-	402,976
Ongoing environmental monitoring (quarterly for 5 years)				224,000	224,000
Utility Management / Oversight				536,924	536,924
Demolition Contractor Management / Supervisory / Safety Staff				947,367	947,367
Security				190,078	190,078
Property Taxes	-	-	-	-	0
Project Expenses					
Shared Heavy Equipment / Operating Engineers				1,227,019	1,227,019
Small Tool Allowance	20,892	29,338	11,488	n/a	61,718
Utilities Allowance (Office Equip & supplies / Telephone, Electric etc.)				37,850	37,850
Permits				99,740	99,740
Demolition Contractors Insurance				234,694	234,694
Demolition Contractors Fee				892,785	892,785
Sub-Total					9,743,358
Contingency (excluding activities currently under contract)					1,690,341
Project Total (before scrap credit)					11,433,699
Scrap Credit	(773,510)	(1,207,529)	(323,543)	-	(2,304,582)
Project Total					9,129,118

TABLE 5.2g
NICHOLS STATION
SUMMARY OF ACTIVITY COSTS
(2014 Dollars)

Activities	*Unit 1*	*Unit 2*	*Unit 3*	*Common*	*Station*	*Station Total*
Nichols Unit Rating (MWe)	107	106	244	457		
Characterization / Temporary Services	43,000	42,000	55,000	-	530,583	670,583
Worker Access	91,220	91,220	142,013	-		324,453
Asbestos Remediation	1,569,893	1,487,204	1,612,353	252,107		4,921,558
Equipment Removal	734,688	760,560	963,544	584,701		3,043,492
Boiler(s)	583,812	557,509	743,346	-		1,884,667
Structures Demolition	592,296	592,296	787,520	1,060,906		3,033,017
Backfill / Grade / Landscaping	111,667	111,667	253,563	576,355	-	1,053,252
Ongoing environmental monitoring (quarterly for 5 years)					307,000	307,000
Utility Management / Oversight					1,674,079	1,674,079
Demolition Contractor Management / Supervisory / Safety Staff					2,811,242	2,811,242
Security					537,752	537,752
Property Taxes	-	-	-	-	-	0
Project Expenses						
Shared Heavy Equipment / Operating Engineers					2,840,804	2,840,804
Small Tool Allowance	46,582	45,531	56,967	30,926	n/a	180,005
Utilities Allowance (Office Equip & supplies / Telephone, Electric etc.)					47,166	47,166
Permits					270,687	270,687
Demolition Contractors Insurance					636,941	636,941
Demolition Contractors Fee					2,430,547	2,430,547
Sub-Total						26,667,246
Contingency (excluding activities currently under contract)						4,492,243
Project Total (before scrap credit)						31,159,489
Scrap Credit	(2,378,404)	(2,404,219)	(3,429,018)	(907,821)	-	(9,119,461)
Project Total						22,040,027

TABLE 5.2h
PLANT X STATION
SUMMARY OF ACTIVITY COSTS
(2014 Dollars)

Activities	*Unit 1*	*Unit 2*	*Unit 3*	*Unit 4*	*Common*	*Station*	*Station Total*
Plant X Unit Rating (MWe)	48	102	103	189	442		
Characterization / Temporary Services	35,000	42,000	42,000	50,000	-	707,444	876,444
Worker Access	67,939	91,220	91,220	113,816	-		364,195
Asbestos Remediation	911,532	1,807,282	1,775,437	449,355	290,671		5,234,277
Equipment Removal	416,332	732,553	732,983	857,248	552,197		3,291,313
Boiler(s)	204,187	584,937	584,951	839,167	-		2,213,241
Structures Demolition	331,113	582,277	589,914	720,972	764,027		2,988,303
Backfill / Grade / Landscaping	128,843	110,662	110,662	100,986	340,190	-	791,342
Ongoing environmental monitoring (quarterly for 5 years)						348,000	348,000
Utility Management / Oversight						1,667,817	1,667,817
Demolition Contractor Management / Supervisory / Safety Staff						2,796,852	2,796,852
Security						535,539	535,539
Property Taxes	-	-	-	-	-	-	0
Project Expenses							
Shared Heavy Equipment / Operating Engineers						2,823,700	2,823,700
Small Tool Allowance	26,187	49,387	49,090	39,144	24,339	n/a	188,146
Utilities Allowance (Office Equip & supplies / Telephone, Electric etc.)						46,972	46,972
Permits						281,229	281,229
Demolition Contractors Insurance						661,746	661,746
Demolition Contractors Fee						2,537,056	2,537,056
Sub-Total							27,646,174
Contingency (excluding activities currently under contract)							4,670,354
Project Total (before scrap credit)							32,316,527
Scrap Credit	(1,209,536)	(2,354,504)	(2,364,532)	(3,661,766)	(1,426,967)	-	(11,017,304)
Project Total							21,299,223

TABLE 5.2i
QUAY COUNTY STATION
SUMMARY OF ACTIVITY COSTS
(2014 Dollars)

Activities	*Unit 1*	*Station*	*Station Total*
Quay County Unit Rating (MWe)	23		
Characterization / Temporary Services	32,000	0	32,000
Worker Access	-		0
Asbestos Remediation	-		0
Equipment Removal	118,696		118,696
Boiler(s)	-		0
Structures Demolition	83,121		83,121
Backfill / Grade / Landscaping	28,302	-	28,302
Ongoing environmental monitoring (quarterly for 5 years)		0	0
Utility Management / Oversight		50,471	50,471
Demolition Contractor Management / Supervisory / Safety Staff		60,612	60,612
Security		20,665	20,665
Property Taxes	-	-	0
Project Expenses			
Shared Heavy Equipment / Operating Engineers		119,456	119,456
Small Tool Allowance	3,276	n/a	3,276
Utilities Allowance (Office Equip & supplies / Telephone, Electric etc.)		4,115	4,115
Permits		5,878	5,878
Demolition Contractors Insurance		13,831	13,831
Demolition Contractors Fee		53,667	53,667
Sub-Total			594,090
Contingency (excluding activities currently under contract)			89,113
Project Total (before scrap credit)			683,203
Scrap Credit	(133,318)	-	(133,318)
Project Total			549,885

TABLE 5.2j
TOLK STATION
SUMMARY OF ACTIVITY COSTS
(2014 Dollars)

Activities	*Unit 1*	*Unit 2*	*Common*	*Station*	*Station Total*
Tolk Unit Rating (MWe)	540	540	1,080		
Characterization / Temporary Services	75,000	75,000	-	353,722	503,722
Worker Access	303,845	303,845	-		607,689
Asbestos Remediation	900,000	900,000	309,531		2,109,531
Equipment Removal	2,861,601	2,861,601	589,418		6,312,619
Boiler(s)	1,529,995	1,529,995	-		3,059,991
Structures Demolition	4,788,588	4,774,930	2,748,074		12,311,593
Backfill / Grade / Landscaping	319,306	319,306	3,008,107	-	3,646,719
Pond Removal			1,798,803	0	1,798,803
Ongoing environmental monitoring (quarterly for 5 years)				1,065,000	1,065,000
Utility Management / Oversight				2,099,464	2,099,464
Demolition Contractor Management / Supervisory / Safety Staff				4,254,288	4,254,288
Security				701,511	701,511
Property Taxes	-	-	-	-	0
Project Expenses					
Shared Heavy Equipment / Operating Engineers				4,973,818	4,973,818
Small Tool Allowance	134,729	134,558	105,674	n/a	374,962
Utilities Allowance (Office Equip & supplies / Telephone, Electric etc.)				61,530	61,530
Permits				522,272	522,272
Demolition Contractors Insurance				1,228,933	1,228,933
Demolition Contractors Fee				4,776,712	4,776,712
Sub-Total					50,409,156
Contingency (excluding activities currently under contract)					7,502,506
Project Total (before scrap credit)					57,911,662
Scrap Credit	(10,022,408)	(9,749,193)	(2,364,527)	-	(22,136,129)
Project Total					35,775,533

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APPENDIX A
SUMMARY OF STATION SYSTEMS AND STRUCTURES INVENTORIES

TABLE A
SUMMARY OF STATION SYSTEMS AND STRUCTURES INVENTORIES

Index	System/Structure Inventory Data Point	Carlsbad	Cunningham	Harrington	Jones	Maddox	Moore County	Nichols	Plant X	Quay County	Tolk
Station Rating (Mwe)		11	485	1041	824	188	73	457	442	23	1080
2	Piping 0.25 to 2 inches diameter, linear foot	304	34,442	179,280	49,984	18,866	11,239	63,406	60,396	304	152,051
3	Piping >2 to 4 inches diameter, linear foot	203	22,961	119,520	34,623	12,578	7,493	42,271	40,264	203	101,367
4	Piping >4 to 8 inches diameter, linear foot	635	16,108	79,680	25,635	8,838	5,895	28,181	26,863	859	67,578
5	Piping >8 to 14 inches diameter, linear foot	90	10,205	53,120	15,170	5,590	3,330	18,787	17,895	130	45,052
6	Piping >14 to 20 inches diameter, linear foot	30	6,750	35,595	4,880	2,060	1,900	8,720	8,900	43	18,440
7	Piping >20 to 36 inches diameter, linear foot	-	3,140	12,900	4,020	1,320	1,120	4,110	8,710	-	20,820
8	Piping >36 inches diameter, linear foot	-	470	7,880	2,390	1,120	480	2,710	1,020	-	11,600
9	Valves <2 inches	27	1,706	3,636	1,881	693	432	2,093	2,592	27	2,862
10	Valves >2 to 4 inches	18	1,137	2,424	1,350	462	288	1,395	1,728	18	1,908
11	Valves >4 to 8 inches	20	812	1,616	894	336	222	930	1,152	20	1,272
12	Valves >8 to 14 inches	6	379	808	452	154	96	465	576	6	636
13	Valves >14 to 20 inches	-	143	411	50	18	65	116	110	-	329
14	Valves >20 to 36 inches	-	36	381	32	7	8	28	58	-	268
15	Valves >36 inches	-	17	72	16	8	11	24	32	-	62
24	Pipe hangers for small bore piping, each	20	2,296	11,952	3,384	1,258	749	4,227	4,026	20	10,137
25	Pipe hangers for large bore piping, each	30	1,467	7,567	2,084	757	509	2,500	2,536	30	6,540
26	Pump and motor set < 300 pounds	4	90	280	110	68	37	117	135	4	268
27	Pumps, 300-1000 pound pump	-	10	61	37	8	9	27	26	-	49
28	Pumps, >1000-10,000 pound pump	-	10	40	12	4	19	20	19	-	24
29	Pumps, >10,000 pound pump	-	11	30	12	4	4	16	21	-	18
32	Pump motors, 300-1000 pound pump	-	28	75	39	8	5	34	32	-	48
33	Pump motors, >1000-10,000 pound pump	-	8	60	8	5	19	29	23	-	21
34	Pump motors, >10,000 pound pump	-	11	35	12	5	5	18	21	-	18
37	Turbine-driven pumps > 10,000 pounds	-	-	6	-	-	-	-	-	-	2
38	Main turbine-generator (pounds per MW(e) input)	-	4	3	2	1	2	3	4	-	2
39	Heat exchanger <3000 pound	-	23	39	24	43	7	26	46	-	33
40	Heat exchanger >3000 pound	-	26	15	18	28	7	33	31	-	-
41	Feedwater heater/deaerator	-	17	24	20	5	8	20	24	-	18
49	Main condenser (pounds per MW(e) input)	-	2	3	2	1	2	3	4	-	2
51	Tanks, <300 gallons, filters, and ion exchangers	4	66	73	27	30	14	17	38	4	90
52	Tanks, 300-3000 gallons	3	38	67	56	26	11	53	30	3	52
53	Tanks, >3000 gallons, square foot surface	576	43,144	15,687	19,698	19,665	20,822	84,793	88,460	10,280	48,473
54	Electrical equipment, <300 pound	105	1,060	1,951	1,197	474	253	826	945	105	1,677
55	Electrical equipment, 300-1000 pound	10	177	352	291	70	124	144	165	10	294
56	Electrical equipment, 1000-10,000 pound	14	92	145	173	65	92	94	104	14	244
57	Electrical equipment, >10,000 pound	1	76	58	44	41	8	22	19	1	38
59	Electrical transformers < 30 tons	-	5	9	6	5	5	7	9	-	10
60	Electrical transformers > 30 tons	-	10	10	6	4	2	3	6	-	4
62	Standby diesel-generator, 100 kW to 1 MW	2	-	1	-	-	-	-	-	2	-
63	Standby diesel-generator, >1 MW	1	-	1	-	-	-	-	-	1	-
64	Fluorescent light fixture	20	68	159	222	61	49	183	141	20	-
65	Incandescent light fixture	30	596	1,730	824	273	226	908	1,023	30	2,238
66	Electrical cable tray, linear foot	350	10,660	30,900	15,120	1,910	3,090	10,080	11,650	507	49,200
67	Electrical conduit, linear foot	500	31,500	90,000	42,400	15,000	20,000	50,000	60,000	724	70,000
69	Mechanical equipment, <300 pound	11	679	1,925	617	197	227	584	799	11	1,947
70	Mechanical equipment, 300-1000 pound	16	300	325	295	64	58	169	245	16	305
71	Mechanical equipment, 1000-10,000 pound	-	48	335	116	198	30	49	82	-	389
72	Mechanical equipment, >10,000 pound	15	97	30	59	41	6	5	21	15	149

TABLE A
SUMMARY OF STATION SYSTEMS AND STRUCTURES INVENTORIES
(Continued)

Index	System/Structure Inventory Data Point	Carlsbad	Cunningham	Harrington	Jones	Maddox	Moore County	Nichols	Plant X	Quay County	Tolk
Station Rating (Mwe)		11	485	1041	824	188	73	457	442	23	1080
76	HVAC equipment, <300 pound	-	29	217	23	35	10	19	55	-	248
77	HVAC equipment, 300-1000 pound	-	23	33	19	-	-	3	6	-	14
78	HVAC equipment, 1000-10,000 pound	-	1	21	-	-	2	-	2	-	-
79	HVAC equipment, >10,000 pound	-	3	-	-	-	-	-	3	-	-
82	HVAC ductwork, pound	-	14,700	122,500	-	-	25,358	-	40,058	-	227,033
201	Standard reinforced concrete, cubic yard	295	3,722	27,107	12,144	3,102	1,538	10,330	5,161	602	22,284
202	Grade slab concrete, cubic yard	193	6,028	34,992	11,266	3,702	1,480	6,174	8,962	256	34,222
206	Heavily rein concrete w/#9 rebar, cubic yard	-	1,361	3,150	2,037	1,159	1,087	2,722	3,027	-	7,415
221	Mechanical draft cooling tower, cubic yard	-	69,537	55,556	69,583	21,667	32,000	88,833	51,556	-	250,000
222	Hollow masonry block wall, cubic yard	-	104	762	107	204	-	107	53	-	-
224	Solid masonry block wall, cubic yard	-	-	2,242	148	-	-	-	-	-	2,345
229	Backfill of below grade voids, cubic yard	0	11,954	109,639	69,858	0	11,778	45,868	31,217	0	147,967
235	Building by volume, cubic foot	36,450	453,375	1,961,300	496,720	143,900	235,000	689,100	449,065	48,483	4,552,000
236	Building metal siding, square foot	7,920	137,405	219,600	121,348	84,369	35,600	155,547	218,902	10,535	512,250
242	Standard asphalt roofing, square foot	-	52,500	122,604	48,916	28,336	10,000	47,544	61,136	-	137,425
244	Transite panels, square foot	-	-	-	-	-	26,950	-	-	-	-
253	Overhead cranes/monorails < 10 ton capacity, each	-	1	10	1	1	1	2	3	-	29
255	Overhead cranes/monorails >10 - 50 ton capacity, e	-	1	17	3	-	3	3	3	-	18
258	Gantry cranes > 50 ton capacity, each	-	-	1	1	2	1	1	1	-	1
260	Structural steel, pounds	66,000	10,337,906	42,402,917	12,711,444	4,817,122	3,937,994	15,225,538	16,797,856	87,788	47,092,695
262	Steel floor grating, square foot	-	43,875	118,391	77,000	32,100	14,300	102,700	106,475	-	286,004
268	Placement of scaffolding in clean areas, square foot	-	130,076	134,014	59,732	19,184	25,004	68,234	76,592	-	127,800
270	Landscaping with topsoil, acre	0	2	3	1	0.6	1	2	1.7	0.1	3
271	Landscaping w/o topsoil, acre	-	18	95	21	12	13	21	26	-	151
272	Chain link fencing, linear foot	1,350	900	28,800	9,800	3,500	8,000	3,975	8,200	1,796	13,600
273	Railroad track, linear foot	-	-	17,000	-	-	-	-	800	-	25,000
274	Asphalt pavement, square foot	-	220,400	609,000	413,000	74,400	65,500	292,500	114,600	-	852,500
291	Carbon steel plate 1/4 inch thick, square foot	-	-	-	5,027	-	9,870	-	-	-	-
294	Carbon steel plate 1/2 inch thick, square foot	-	10,073	128,823	102,463	4,712	-	15,692	15,080	-	127,706
359	Steam drum removal (fossil)	-	2	3	2	1	2	3	4	-	2
360	Water drum removal (fossil)	-	-	-	-	-	3	-	2	-	-
361	Upper/lower waterwall headers (fossil)	-	24	90	28	12	5	38	41	-	52
362	Top sup boiler waterwall (8'x8' section), inches cut	-	123,488	343,716	147,263	56,306	27,844	186,244	206,663	-	262,845
369	Boiler convective superheaater platens	-	345	813	354	132	87	441	551	-	614
371	Boiler reheat platens	-	119	378	280	72	-	284	263	-	280
372	Boiler economizer platens	-	202	864	188	70	-	234	272	-	840
374	Stationary soot blowers	-	-	144	-	-	-	-	-	-	196
375	Retractable soot blowers	-	-	204	-	-	-	-	-	-	140
376	Process ductwork (8'x8' section), inches cut	3,876	399,816	1,232,418	630,584	224,366	127,823	537,735	561,521	5,616	1,438,580
378	Non-asbestos insulated regenerative air preheaters	-	3	6	2	1	1	3	4	-	4
382	Induced, forced, primary draft fans	-	4	24	4	2	3	6	8	-	10
384	Conveyors	-	-	1,000	-	-	-	-	-	-	1,000
389	Ball mills	-	-	15	-	-	-	-	-	-	24
390	Coal feeders	-	-	300	-	-	-	-	-	-	240

APPENDIX B

UNIT COST FACTOR DEVELOPMENT

APPENDIX B

UNIT COST FACTOR DEVELOPMENT
(Using Texas-based labor rates)

Example: Unit Factor for Removal of Heat Exchanger < 3,000 pounds

1. SCOPE

Heat exchangers weighing < 3,000 lb. will be removed in one piece using a crane or small hoist. They will be disconnected from the inlet and outlet piping. The heat exchanger will be sent to the laydown area.

2. CALCULATIONS

Act ID	Activity Description	Activity Duration	Critical Duration
a	Remove insulation	20	(b)
b	Mount pipe cutters	60	60
c	Disconnect inlet and outlet lines	60	60
d	Rig for removal	30	30
e	Unbolt from mounts	30	30
f	Remove, send to packing area	60	60
	Totals (Activity/Critical)	260	240

Duration adjustment(s):	
+ Work break adjustment (6.67 % of productive duration)	16
Total work duration (minutes)	256

***** Total duration = 4.267 hr *****

3. LABOR REQUIRED

Crew	Number	Duration (hr)	Rate ($/hr)	Cost
Laborers	3.0	4.267	$20.81	$266.39
Craftsmen	2.0	4.267	$30.37	$259.18
Foreman	1.0	4.267	$31.67	$135.14
General Foreman	0.25	4.267	$32.98	$ 35.18
Fire Watch	0.05	4.267	$20.81	$ 4.44
Total labor cost				$700.33

4. EQUIPMENT & CONSUMABLES COSTS

Equipment Costs	none
Consumables/Materials Costs	
Gas torch consumables 1 @ $17.61/hr x 1 hr {1}	17.61
Subtotal cost of equipment and materials	17.61
Overhead & profit on equipment and materials @ 16.25%	2.86
Total costs, equipment & material	$20.47
TOTAL COST Removal of heat exchanger <3000 pound:	**$720.80**
Total labor cost:	$700.33
Total equipment/material costs:	$20.47
Total craft labor man-hours required per unit:	26.882

5. NOTES AND REFERENCES

- Durations are shown in minutes. The integrated duration accounts for those activities that can be performed in conjunction with other activities, indicated by the alpha designator of the concurrent activity. This results in an overall decrease in the sequenced duration.

- Work difficulty factors were developed in conjunction with the AIF program to standardize decommissioning cost studies and are delineated in the "Guidelines" study (Reference 6, Vol. 1, Chapter 5).

- References for equipment and consumables costs:

  1. R.S. Means (2014) Line Number 01 5433 40-6360

- Material and consumables costs were adjusted using the regional indices for Amarillo, TX (for Texas units) and Roswell, NM (for New Mexico units).

APPENDIX C

REPRESENTATIVE UNIT COST FACTOR LISTING

TABLE C-1

UNIT COST FACTOR LISTING
Texas Stations
(Costs are in 2014 dollars/Scrap Weights in pounds)

	Unit Cost Factors				Scrap Weight							
UCF #	Description	Total Cost	Labor Cost	Labor Hours	Cast Iron	Carbon Steel No. 1	Mixed Scrap	SS-1	Galv. Steel.	Insul Cable	No. 2 Copper	Large Motor
2	Piping 0.25 to 2 inches diameter, linear foot	2.53	2.46	0.1	-	4	-	0.5	-	-	-	-
3	Piping >2 to 4 inches diameter, linear foot	3.55	3.44	0.2	-	7	-	0.9	-	-	0.4	-
4	Piping >4 to 8 inches diameter, linear foot	7.11	6.97	0.3	-	22	-	-	-	-	-	-
5	Piping >8 to 14 inches diameter, linear foot	13.45	13.28	0.6	-	57	-	-	-	-	-	-
6	Piping >14 to 20 inches diameter, linear foot	17.96	17.45	0.7	-	-	120	-	-	-	-	-
7	Piping >20 to 36 inches diameter, linear foot	26.09	25.41	1.0	-	-	221	-	-	-	-	-
8	Piping >36 inches diameter, linear foot	31.03	30.35	1.3	-	-	417	-	-	-	-	-
9	Valves <2 inches	50.23	49.56	2.0	-	-	-	-	-	-	-	-
10	Valves >2 to 4 inches	46.43	45.41	1.8	75	-	-	8.8	-	-	4.4	-
11	Valves >4 to 8 inches	71.11	69.74	2.8	510	-	-	-	-	-	-	-
12	Valves >8 to 14 inches	134.50	132.80	5.5	1,066	-	-	-	-	-	-	-
13	Valves >14 to 20 inches	179.58	174.47	7.2	-	-	2,040	-	-	-	-	-
14	Valves >20 to 36 inches	260.93	254.12	10.4	-	-	3,334	-	-	-	-	-
15	Valves >36 inches	310.31	303.50	12.5	-	-	11,535	-	-	-	-	-
24	Pipe hangers for small bore piping, each	18.89	13.78	0.6	-	10	-	-	-	-	-	-
25	Pipe hangers for large bore piping, each	61.15	50.91	2.3	-	50	-	-	-	-	-	-
26	Pump and motor set < 300 pounds	124.75	116.22	4.6	-	-	50	12.5	-	-	-	62.3
27	Pumps, 300-1000 pound pump	342.65	328.99	12.5	293	-	49	48.9	-	-	-	-
28	Pumps, >1000-10,000 pound pump	1,330.17	1,309.70	50.5	2,834	-	472	472.3	-	-	-	-
29	Pumps, >10,000 pound pump	2,587.58	2,526.17	97.4	43,693	-	7,282	7,282.1	-	-	-	-
32	Pump motors, 300-1000 pound pump	140.66	140.66	5.3	-	-	-	-	-	-	-	307.8
33	Pump motors, >1000-10,000 pound pump	550.02	550.02	21.2	-	-	-	-	-	-	-	3,531.6
34	Pump motors, >10,000 pound pump	1,235.67	1,235.67	47.6	-	-	-	-	-	-	-	42,324.5
37	Turbine-driven pumps > 10,000 pounds	3,455.62	3,387.39	130.6	20,000	-	20,000	-	-	-	-	-
38	Main turbine-generator (pounds per MW(e) input)	83,070.00	81,759.82	2,995.2	-	-	851,500	-	-	-	-	851,500.0
39	Heat exchanger <3000 pound	720.80	700.33	26.9	-	-	416	623.4	-	-	-	-
40	Heat exchanger >3000 pound	1,832.61	1,750.72	67.2	-	-	5,599	8,397.9	-	-	-	-
41	Feedwater heater/deaerator	5,122.92	4,959.15	191.2	-	-	12,000	18,000.0	-	-	-	-
49	Main condenser (pounds per MW(e) input)	233,827.36	215,173.52	8,116.8	149,400	-	149,400	199,200.0	-	-	-	-
51	Tanks, <300 gallons, filters, and ion exchangers	159.02	148.78	5.9	-	-	401	401.2	-	-	-	-
52	Tanks, 300-3000 gallons	496.28	475.81	18.8	-	-	2,700	300.0	-	-	-	-
53	Tanks, >3000 gallons, square foot surface	4.25	3.99	0.2	-	21	-	-	-	-	-	-

TABLE C-1 (continued)

UNIT COST FACTOR LISTING
Texas Stations
(Costs are in 2014 dollars/Scrap Weights in pounds)

Unit Cost Factors					Scrap Weight							
UCF #	Description	Total Cost	Labor Cost	Labor Hours	Cast Iron	Carbon Steel No. 1	Mixed Scrap	SS-1	Galv. Steel.	Insul Cable	No. 2 Copper	Large Motor
54	Electrical equipment, <300 pound	65.93	65.93	2.6	-	-	56	-	-	-	2.9	-
55	Electrical equipment, 300-1000 pound	228.36	228.36	8.6	-	-	624	-	-	-	32.8	-
56	Electrical equipment, 1000-10,000 pound	456.61	456.61	17.3	-	-	2,212	-	-	-	116.4	-
57	Electrical equipment, >10,000 pound	1,093.11	1,093.11	40.3	-	-	19,950	-	-	-	1,050.0	-
59	Electrical transformers < 30 tons	758.76	758.76	28.0	-	-	11,250	-	-	-	3,750.0	-
60	Electrical transformers > 30 tons	2,186.33	2,186.33	80.7	-	-	375,000	-	-	-	125,000.0	-
62	Standby diesel-generator, 100 kW to 1 MW	1,731.06	1,731.06	63.9	9,450	-	-	-	-	-	-	1,050.0
63	Standby diesel-generator, >1 MW	3,580.63	3,580.63	132.1	47,250	-	-	-	-	-	-	5,250.0
64	Fluorescent light fixture	25.98	25.98	1.1	-	-	-	-	-	-	-	-
65	Incandescent light fixture	13.35	13.35	0.6	-	-	-	-	-	-	-	-
66	Electrical cable tray, linear foot	6.29	5.95	0.2	-	-	-	-	6.6	6.6	-	-
67	Electrical conduit, linear foot	2.80	2.63	0.1	-	-	-	-	3.4	3.4	-	-
69	Mechanical equipment, <300 pound	65.93	65.93	2.6	-	-	127	-	-	-	-	-
70	Mechanical equipment, 300-1000 pound	228.36	228.36	8.6	-	-	641	-	-	-	-	-
71	Mechanical equipment, 1000-10,000 pound	456.61	456.61	17.3	-	-	4,184	-	-	-	-	-
72	Mechanical equipment, >10,000 pound	1,093.11	1,093.11	40.3	-	-	11,938	-	-	-	-	-
76	HVAC equipment, <300 pound	78.15	78.15	3.1	-	-	184	-	-	-	-	-
77	HVAC equipment, 300-1000 pound	273.14	273.14	10.3	-	-	643	-	-	-	-	-
78	HVAC equipment, 1000-10,000 pound	548.35	548.35	20.7	-	-	3,813	-	-	-	-	-
79	HVAC equipment, >10,000 pound	1,093.11	1,093.11	40.3	-	-	19,391	-	-	-	-	-
82	HVAC ductwork, pound	0.25	0.25	0.0	-	-	-	-	1.0	-	-	-
201	Standard reinforced concrete, cubic yard	55.23	16.52	0.6	-	183	-	-	-	-	-	-
202	Grade slab concrete, cubic yard	68.16	24.78	1.0	-	183	-	-	-	-	-	-
206	Heavily rein concrete w/#9 rebar, cubic yard	94.27	21.34	0.8	-	730	-	-	-	-	-	-
221	Mechanical draft cooling tower, cubic yard	2.26	1.20	0.0	-	-	-	-	-	-	-	-
222	Hollow masonry block wall, cubic yard	67.59	29.94	1.4	-	66	-	-	-	-	-	-
224	Solid masonry block wall, cubic yard	67.59	29.94	1.4	-	66	-	-	-	-	-	-
229	Backfill of below grade voids, cubic yard	29.80	1.76	0.1	-	-	-	-	-	-	-	-
235	Building by volume, cubic foot	0.23	0.09	-	-	-	1	-	-	-	-	-
236	Building metal siding, square foot	0.85	0.44	0.0	-	-	-	-	2.4	-	-	-
242	Standard asphalt roofing, square foot	1.11	1.11	0.1	-	-	-	-	-	-	-	-

TABLE C-1 (continued)

UNIT COST FACTOR LISTING
Texas Stations
(Costs are in 2014 dollars/Scrap Weights in pounds)

		Unit Cost Factors			Scrap Weight							
UCF #	Description	Total Cost	Labor Cost	Labor Hours	Cast Iron	Carbon Steel No. 1	Mixed Scrap	SS-1	Galv. Steel.	Insul Cable	No. 2 Copper	Large Motor
244	Transite panels, square foot	1.35	0.79	0.0	-	-	-	-	-	-	-	-
253	Overhead cranes/monorails < 10 ton capacity, each	324.82	324.82	11.6	-	3,700	-	-	-	-	-	-
255	Overhead cranes/monorails >10 - 50 ton capacity, each	779.88	779.88	27.9	-	-	298,832	-	-	-	3,018.5	-
258	Gantry cranes > 50 ton capacity, each	13,658.40	13,658.40	504.0	-	-	712,800	-	-	-	7,200.0	-
260	Structural steel, pounds	0.13	0.08	-	-	1	-	-	-	-	-	-
262	Steel floor grating, square foot	2.63	2.28	0.1	-	-	6	-	1.1	-	-	-
268	Placement of scaffolding in clean areas, square foot	12.18	2.28	0.1	-	-	-	-	-	-	-	-
270	Landscaping with topsoil, acre	21,783.43	1,429.85	52.6	-	-	-	-	-	-	-	-
271	Landscaping w/o topsoil, acre	1,018.04	161.96	5.3	-	-	-	-	-	-	-	-
272	Chain link fencing, linear foot	2.05	1.29	0.1	-	-	-	-	10.0	-	-	-
273	Railroad track, linear foot	19.01	5.55	0.2	-	91	-	-	-	-	-	-
274	Asphalt pavement, square foot	0.61	0.30	0.0	-	-	-	-	-	-	-	-
291	Carbon steel plate 1/4 inch thick, square foot	2.11	1.42	0.1	-	-	10	-	-	-	-	-
294	Carbon steel plate 1/2 inch thick, square foot	2.24	1.50	0.1	-	-	20	-	-	-	-	-
359	Steam drum removal (fossil)	9,347.41	9,210.92	405.3	-	-	480,000	-	-	-	-	-
360	Water drum removal (fossil)	3,452.92	3,427.33	150.8	-	-	320,000	-	-	-	-	-
361	Upper/lower waterwall headers (fossil)	2,609.76	2,584.17	113.7	-	-	120,000	-	-	-	-	-
362	Top sup boiler waterwall (8'x8' section), inches cut	0.34	0.30	0.0	-	-	11	-	-	-	-	-
369	Boiler convective superheaater platens	860.92	683.51	29.1	-	-	19,501	-	-	-	-	-
371	Boiler reheat platens	364.46	289.41	12.3	-	-	19,501	-	-	-	-	-
372	Boiler economizer platens	462.88	367.36	15.7	-	-	11,703	-	-	-	-	-
374	Stationary soot blowers	16.41	16.41	0.7	-	-	500	-	-	-	-	50.0
375	Retractable soot blowers	158.07	158.07	6.7	-	-	11,150	-	-	-	-	100.0
376	Process ductwork (8'x8' section), inches cut	0.17	0.14	0.0	-	-	0	-	-	-	-	-
378	Non-asbestos insulated regenerative air preheaters	5,790.46	4,218.24	185.6	-	-	1,376,000	-	-	-	-	-
382	Induced, forced, primary draft fans	775.80	734.86	31.3	-	-	30,000	-	-	-	-	3,531.6
384	Conveyors	6.98	5.95	0.3	-	-	820	-	-	-	-	-
389	Ball mills	665.24	665.24	27.6	-	-	360,000	-	-	-	-	7,063.1
390	Coal feeders	168.18	157.94	7.0	-	-	1,194	-	-	-	-	-

TABLE C-2

UNIT COST FACTOR LISTING
New Mexico Stations
(Costs are in 2014 dollars/Scrap Weights in pounds)

	Unit Cost Factors				Scrap Weight								
UCF #	Description	Total Cost	Labor Cost	Labor Hours	Cast Iron	Carbon Steel No. 1	Mixed Scrap	SS-1	SS-2	Galv. Steel.	Insul Cable	No. 2 Copper	Large Motor
2	Piping 0.25 to 2 inches diameter, linear foot	2.61	2.55	0.1	-	4	-	0.5	-	-	-	-	-
3	Piping >2 to 4 inches diameter, linear foot	3.67	3.57	0.2	-	7	-	0.9	-	-	-	0.4	-
4	Piping >4 to 8 inches diameter, linear foot	7.36	7.22	0.3	-	22	-	-	-	-	-	-	-
5	Piping >8 to 14 inches diameter, linear foot	13.92	13.75	0.6	-	57	-	-	-	-	-	-	-
6	Piping >14 to 20 inches diameter, linear foot	18.58	18.06	0.7	-	-	120	-	-	-	-	-	-
7	Piping >20 to 36 inches diameter, linear foot	26.99	26.31	1.0	-	-	221	-	-	-	-	-	-
8	Piping >36 inches diameter, linear foot	32.11	31.43	1.3	-	-	417	-	-	-	-	-	-
9	Valves <2 inches	52.01	51.33	2.0	-	-	-	-	-	-	-	-	-
10	Valves >2 to 4 inches	48.05	47.03	1.8	75	-	-	8.8	-	-	-	4.4	-
11	Valves >4 to 8 inches	73.59	72.22	2.8	510	-	-	-	-	-	-	-	-
12	Valves >8 to 14 inches	139.20	137.51	5.5	1,066	-	-	-	-	-	-	-	-
13	Valves >14 to 20 inches	185.75	180.65	7.2	-	-	2,040	-	-	-	-	-	-
14	Valves >20 to 36 inches	269.92	263.13	10.4	-	-	3,334	-	-	-	-	-	-
15	Valves >36 inches	321.06	314.27	12.5	-	-	11,535	-	-	-	-	-	-
24	Pipe hangers for small bore piping, each	19.37	14.27	0.6	-	10	-	-	-	-	-	-	-
25	Pipe hangers for large bore piping, each	62.90	52.70	2.3	-	50	-	-	-	-	-	-	-
26	Pump and motor set < 300 pounds	128.88	120.37	4.6	-	-	50	12.5	-	-	-	-	62.3
27	Pumps, 300-1000 pound pump	354.35	340.73	12.5	293	-	49	48.9	-	-	-	-	-
28	Pumps, >1000-10,000 pound pump	1,376.78	1,356.37	50.5	2,834	-	472	472.3	-	-	-	-	-
29	Pumps, >10,000 pound pump	2,677.47	2,616.23	97.4	43,693	-	7,282	7,282.1	-	-	-	-	-
32	Pump motors, 300-1000 pound pump	145.68	145.68	5.3	-	-	-	-	-	-	-	-	307.8
33	Pump motors, >1000-10,000 pound pump	569.62	569.62	21.2	-	-	-	-	-	-	-	-	3,531.6
34	Pump motors, >10,000 pound pump	1,279.70	1,279.70	47.6	-	-	-	-	-	-	-	-	42,324.5
38	Main turbine-generator (pounds per MW(e) input)	85,988.30	84,681.90	2,995.2	-	-	851,500	-	-	-	-	-	851,500.0
39	Heat exchanger <3000 pound	745.71	725.30	26.9	-	-	416	623.4	-	-	-	-	-
40	Heat exchanger >3000 pound	1,894.82	1,813.17	67.2	-	-	5,599	8,397.9	-	-	-	-	-
41	Feedwater heater/deaerator	5,299.18	5,135.88	191.2	-	-	12,000	18,000.0	-	-	-	-	-
49	Main condenser (pounds per MW(e) input)	241,433.19	222,849.95	8,116.8	149,400	-	149,400	199,200.0	-	-	-	-	-
51	Tanks, <300 gallons, filters, and ion exchangers	164.28	154.08	5.9	-	-	401	401.2	-	-	-	-	-
52	Tanks, 300-3000 gallons	513.17	492.76	18.8	-	-	2,700	300.0	-	-	-	-	-
53	Tanks, >3000 gallons, square foot surface	4.40	4.14	0.2	-	21	-	-	-	-	-	-	-
54	Electrical equipment, <300 pound	68.28	68.28	2.6	-	-	56	-	-	-	-	2.9	-
55	Electrical equipment, 300-1000 pound	236.51	236.51	8.6	-	-	624	-	-	-	-	32.8	-
56	Electrical equipment, 1000-10,000 pound	472.90	472.90	17.3	-	-	2,212	-	-	-	-	116.4	-
57	Electrical equipment, >10,000 pound	1,132.18	1,132.18	40.3	-	-	19,950	-	-	-	-	1,050.0	-
59	Electrical transformers < 30 tons	785.89	785.89	28.0	-	-	11,250	-	-	-	-	3,750.0	-
60	Electrical transformers > 30 tons	2,264.51	2,264.51	80.7	-	-	375,000	-	-	-	-	125,000.0	-
62	Standby diesel-generator, 100 kW to 1 MW	1,792.96	1,792.96	63.9	9,450	-	-	-	-	-	-	-	1,050.0
63	Standby diesel-generator, >1 MW	3,708.67	3,708.67	132.1	47,250	-	-	-	-	-	-	-	5,250.0
64	Fluorescent light fixture	26.91	26.91	1.1	-	-	-	-	-	-	-	-	-
65	Incandescent light fixture	13.84	13.84	0.6	-	-	-	-	-	-	-	-	-

TABLE C-2 (continued)

UNIT COST FACTOR LISTING
New Mexico Stations
(Costs are in 2014 dollars/Scrap Weights in pounds)

UCF #	Description	Total Cost	Labor Cost	Labor Hours	Cast Iron	Carbon Steel No. 1	Mixed Scrap	SS-1	SS-2	Galv. Steel.	Insul Cable	No. 2 Copper	Large Motor
66	Electrical cable tray, linear foot	6.50	6.16	0.2	-	-	-	-	-	6.6	6.6	-	-
67	Electrical conduit, linear foot	2.89	2.72	0.1	-	-	-	-	-	3.4	3.4	-	-
69	Mechanical equipment, <300 pound	68.28	68.28	2.6	-	-	127	-	-	-	-	-	-
70	Mechanical equipment, 300-1000 pound	236.51	236.51	8.6	-	-	641	-	-	-	-	-	-
71	Mechanical equipment, 1000-10,000 pound	472.90	472.90	17.3	-	-	4,184	-	-	-	-	-	-
72	Mechanical equipment, >10,000 pound	1,132.18	1,132.18	40.3	-	-	11,938	-	-	-	-	-	-
76	HVAC equipment, <300 pound	80.94	80.94	3.1	-	-	184	-	-	-	-	-	-
77	HVAC equipment, 300-1000 pound	282.88	282.88	10.3	-	-	643	-	-	-	-	-	-
78	HVAC equipment, 1000-10,000 pound	567.92	567.92	20.7	-	-	3,813	-	-	-	-	-	-
79	HVAC equipment, >10,000 pound	1,132.18	1,132.18	40.3	-	-	19,391	-	-	-	-	-	-
82	HVAC ductwork, pound	0.26	0.26	0.0	-	-	-	-	-	1.0	-	-	-
201	Standard reinforced concrete, cubic yard	56.07	17.11	0.6	-	183	-	-	-	-	-	-	-
202	Grade slab concrete, cubic yard	69.32	25.66	1.0	-	183	-	-	-	-	-	-	-
206	Heavily rein concrete w/#9 rebar, cubic yard	95.51	22.10	0.8	-	730	-	-	-	-	-	-	-
221	Mechanical draft cooling tower, cubic yard	2.30	1.24	0.0	-	-	-	-	-	-	-	-	-
222	Hollow masonry block wall, cubic yard	68.55	30.99	1.4	-	66	-	-	-	-	-	-	-
224	Solid masonry block wall, cubic yard	68.55	30.99	1.4	-	66	-	-	-	-	-	-	-
229	Backfill of below grade voids, cubic yard	29.77	1.82	0.1	-	-	-	-	-	-	-	-	-
235	Building by volume, cubic foot	0.23	0.09	-	-	-	1	-	-	-	-	-	-
236	Building metal siding, square foot	0.86	0.45	0.0	-	-	-	-	-	2.4	-	-	-
242	Standard asphalt roofing, square foot	1.15	1.15	0.1	-	-	-	-	-	-	-	-	-
253	Overhead cranes/monorails < 10 ton capacity, each	336.45	336.45	11.6	-	3,700	-	-	-	-	-	-	-
255	Overhead cranes/monorails >10 - 50 ton capacity, each	807.80	807.80	27.9	-	-	298,832	-	-	-	-	3,018.5	-
258	Gantry cranes > 50 ton capacity, each	14,146.80	14,146.80	504.0	-	-	712,800	-	-	-	-	7,200.0	-
260	Structural steel, pounds	0.13	0.08	-	-	1	-	-	-	-	-	-	-
262	Steel floor grating, square foot	2.72	2.36	0.1	-	-	6	-	-	1.1	-	-	-
268	Placement of scaffolding in clean areas, square foot	12.23	2.36	0.1	-	-	-	-	-	-	-	-	-
270	Landscaping with topsoil, acre	21,768.41	1,480.88	52.6	-	-	-	-	-	-	-	-	-
271	Landscaping w/o topsoil, acre	1,021.09	167.78	5.3	-	-	-	-	-	-	-	-	-
272	Chain link fencing, linear foot	2.09	1.34	0.1	-	-	-	-	-	10.0	-	-	-
274	Asphalt pavement, square foot	0.62	0.31	0.0	-	-	-	-	-	-	-	-	-
291	Carbon steel plate 1/4 inch thick, square foot	2.16	1.47	0.1	-	-	10	-	-	-	-	-	-
294	Carbon steel plate 1/2 inch thick, square foot	2.29	1.55	0.1	-	-	20	-	-	-	-	-	-
359	Steam drum removal (fossil)	9,672.79	9,536.69	405.3	-	-	480,000	-	-	-	-	-	-
361	Upper/lower waterwall headers (fossil)	2,701.07	2,675.56	113.7	-	-	120,000	-	-	-	-	-	-
362	Top sup boiler waterwall (8'x8' section), inches cut	0.35	0.31	0.0	-	-	11	-	-	-	-	-	-
369	Boiler convective superheaater platens	884.65	707.75	29.1	-	-	19,501	-	-	-	-	-	-
371	Boiler reheat platens	374.51	299.68	12.3	-	-	19,501	-	-	-	-	-	-
372	Boiler economizer platens	475.65	380.40	15.7	-	-	11,703	-	-	-	-	-	-
376	Process ductwork (8'x8' section), inches cut	0.17	0.15	0.0	-	-	0	-	-	-	-	-	-
378	Non-asbestos insulated regenerative air preheaters	5,935.10	4,367.42	185.6	-	-	1,376,000	-	-	-	-	-	-
382	Induced, forced, primary draft fans	801.76	760.93	31.3	-	-	30,000	-	-	-	-	-	3,531.6

Attachment FWS-2

is provided in

electronic format in

Attachment EDE-1(Media) to the Direct Testimony of Evan D. Evans