DOE/MC/27205--5068
UC-104

DOE/MC27205-1

RECEIVED

JAN 09 1996

OSTI

**AFBC CO-FIRING OF COAL
AND HOSPITAL WASTE**

Quarterly Progress Report

COOPERATIVE AGREEMENT: DE-FG21-91MC27205

May 1, 1995 to July 31, 1995

Prepared by

James M. Stuart

DONLEE TECHNOLOGIES INC.

693 North Hills Road

York, PA 17402

Prepared for the

U.S. DEPARTMENT OF ENERGY

MASTER
DISTRIBUTION OF THIS DOCUMENT IS UNLIMITED *DLC*

DISCLAIMER

This report was prepared as an account of work sponsored by an agency of the United States Government. Neither the United States Government nor any agency thereof, nor any of their employees, makes any warranty, express or implied, or assumes any legal liability or responsibility for the accuracy, completeness, or usefulness of any information, apparatus, product, or process disclosed, or represents that its use would not infringe privately owned rights. Reference herein to any specific commercial product, process, or service by trade name, trademark, manufacturer, or otherwise does not necessarily constitute or imply its endorsement, recommendation, or favoring by the United States Government or any agency thereof. The views and opinions of authors expressed herein do not necessarily state or reflect those of the United States Government or any agency thereof.

This report has been reproduced directly from the best available copy.

Available to DOE and DOE contractors from the Office of Scientific and Technical Information, 175 Oak Ridge Turnpike, Oak Ridge, TN 37831; prices available at (615) 576-8401.

Available to the public from the National Technical Information Service, U.S. Department of Commerce, 5285 Port Royal Road, Springfield, VA 22161; phone orders accepted at (703) 487-4650.

TABLE OF CONTENTS

	<u>Page</u>
I. INTRODUCTION	1
A. Project Objective.....	1
B. Reporting Period.....	2
C. Report Layout.....	2
II. TASK ONE - Design, Specify, Procure, Install and Start-Up Facility	2
A. Subtask 1-A Design.....	2
B. Subtask 1-B Equipment Purchase and Fabrication.....	3
C. Subtask 1-C Installation	3
D. Subtask 1-D Shredder System Verification.....	5
E. Subtask 1E Start-Up.....	5
III. TASK TWO - Obtain Permits	6
IV. TASK THREE - Procure Coal, Limestone and Ash Disposal Contracts	6
V. TASK FOUR - Conduct One Year Test Program	7
VI. TASK FIVE - Prepare Final Report.....	7
VII. PROJECT COSTS.....	7
VIII. SUMMARY	11

LIST OF TABLES

	<u>Page</u>
Table 1. Lebanon VA Project Equipment Status Report.....	12
Table 2. Lebanon VA Project Cost-to-Date Summary	16
Table 3. Lebanon VA Project Equipment Costs	17
Table 4. Lebanon VA Project Schedule	25

I. INTRODUCTION

A. PROJECT OBJECTIVE

The project objective is to design, construct, install, provide operator training and start-up a circulating fluidized bed combustion system at the Lebanon Pennsylvania Veteran's Affairs Medical Center. This unit will co-fire coal and hospital waste providing lower cost steam for heating and possibly cooling (absorption chiller) and operation of a steam turbine-generator for limited power generation. This would permit full capacity operation of the FBC year round in spite of the VA laundry that was shut down as well as efficient destruction of both general and infectious hospital waste and steam generation. The steam generated is as follows:

- Steam = 20,000 lb/hr
- Temperature = 353 F (saturated)
- Pressure = 125 psig
- Steam quality = ~98.5%

On February 3, 1995 DONLEE notified Lebanon VA and DOE-METC that additional funding would be required to complete the project. This funding, in the amount of \$1,140,127, is needed to complete the facility, start-up and shakedown the facility, perform the test program and write the final report. After review DOE-METC approved funding in the amount of \$1,246,019 to be available August 1, 1995.

On March 7, 1995 the vendors were notified that the Lebanon VA Steam Plant Project was shut down and that all work outside DONLEE was stopped pending obtaining additional funding.

During the period in which the work at the LVA site was stopped, DONLEE, DOE-METC and Lebanon VA Medical Center personnel worked to obtain additional funding for the project.

Date	Task Description
6/1/95	The Estimate of Costs to Complete LVAMC Project was submitted by DONLEE to DOE-METC.
7/3/95	Formal Application for Funding was made by DONLEE to DOE-METC.
7/13/95	The LVAMC Project Review Meeting was held at Lebanon VA Medical Center.
7/21/95	Non-Essential LVA Items list was sent to DOE-METC from DONLEE.
7/24/95 - 7/27/95	A LVAMC Project Construction Status Review was performed by Gilbert/Commonwealth.
7/31/95	The first weekly LVAMC Project Meeting was held via a three-way telephone conference call among DOE-METC, LVAMC and DONLEE personnel.

Funding is expected to be approved by August 1, 1995.

B. REPORTING PERIOD

The reporting period is from May 1, 1995 to July 31, 1995.

C. REPORT LAYOUT

The Progress Reports will show progress and direction for each task and subtask. The Final Technical Report will also provide a coherent chronology of tasks and subtasks throughout the project.

II. TASK ONE - Design, Specify, Procure, Install and Start-Up Facility

A. SUBTASK 1-A - DESIGN

Progress:

The process of filling out fact sheets for each piece of equipment for the operation and maintenance manual continues, and about 80% of the fact sheets have been completed.

The status of the fact sheets is as follows:

- 56 fact sheets have been written.
- 54 fact sheets have been typed and completed.
- 2 fact sheets have been typed and proofed.
- 10 fact sheets remain to be written.

Currently, the coal bins and structure have been fabricated and installed along with the combustor, boiler and economizer. X-bracing will be added to give added strength to the supports of the combustor, boiler and other structures.

Work on the training manual continues. The vendor manuals will be incorporated as appendices of this manual. Shakedown, start-up and operation will begin after completion of the equipment and instrumentation installation. A computerized preventative maintenance program will be developed throughout shakedown, start-up and the one-year test period.

The feedwater and chemical treatment system was redesigned for the new system and will be identical to the system utilized on the existing VA boilers.

The stack has been redesigned because analysis showed the base did not meet acceptable standards and there was too great of a deflection over the length of the stack. This new design was reviewed by the building/foundation engineer. The stack anchoring design has not yet been completed and will be investigated further. Platforms and ladders have been redesigned for field installation. The installation will begin later this summer after the funding is approved.

The design of the Varco Pruden building has been completed and the structural steel has been placed. The roof and walls have been installed. Only the interior liner and the area above the control room need to be fully completed for the building walls and structure to be completed.

Problems: None

Plans:

Continue filling out fact sheets for the equipment. Continue design and drafting work. The orifices and venturis have been designed and procured. Several orifices and venturis have already been installed.

B. SUBTASK 1-B - EQUIPMENT PURCHASE AND FABRICATION

Progress:

The status of the major pieces of equipment in the procurement process is shown on Table 1. The fabrication procedure developed for the combustor, boiler, economizer and bins allowed these items to be fabricated by DONLEE.

The coal bins, limestone silo and the limestone bins have been installed at site along with the structures. The ash silos and structure are almost completely installed.

Problems:

None

Plans:

Continue with authorized expenditures after funding is approved. Proceed with the building and equipment installation after the work restarts.

C. SUBTASK 1-C - INSTALLATION

Progress:

The construction work has been broken into smaller contracts. This allows us to take advantage of smaller constructors who specialize in specific portions of the construction package.

Problems:

None.

Plans:

The installation contractor began Phase 1 of the equipment installation (those items that would be placed inside the building) on August 15, 1994. A second vendor has been chosen for the piping and their work is about 75% complete.

INSTALLED EQUIPMENT AND PIPING:

- Circulating fluidized bed combustor with supports (additional supports are being added)
- Refractory duct work
- Boiler
- Economizer
- Coal silos and supporting structures
- Grizzly and hopper
- Coal conveying screen
- Bucket elevator
- Draining "Live Bottom" screws
- Coal weigh belts and structure
- Limestone feed system: 2-ton limestone bin and structure and 30-ton limestone silo and structure
- Bed cleaning system including the vibrating screen and crusher
- Valves and drains for the various beds on the combustor
- Shredder system and the skip hoist
- Air Lines
- Downcomers and risers between the boiler and cooling bed coils
- Ash pneumatic piping systems have been installed at the baghouse and the bed cleaning system
- Lime injection system was installed upstream of the baghouse
- Venturis and bags for the process baghouse
- Cooling bed and lift channel blowers
- Primary and ID fans
- Shredder blower
- Roots Blowers (3)
- Baghouse (in-place, repair to support structure that was damaged in shipping is required)
- Shredder hydraulic unit
- Air compressor
- Additional platforms, ladders and supporting columns
- Ash structures, platforms and the two silos
- Orifices/venturis and the associated piping
- Limestone silo and structure
- The motor control center (MCC) room
- Conduit and electrical panels were placed near the equipment and in the control room
- Thermocouple placement was begun
- The sand funnel and the supporting stand were designed and installed

**ADDITIONAL EQUIPMENT STORED ON-SITE
UNTIL NEEDED IN THE INSTALLATION:**

- Instruments: thermocouples, sensors, probes
- Electrical panels to various equipment
- Ash conditioner and ash rotary
- Various valves and slidegates
- Heatless air dryer

COMPLETED CONSTRUCTION DURING THE PREVIOUS REPORT PERIOD:

- Cement block work for control room;
- Building structural beams;
- Roof and the four walls of main building; and
- ID fan room.

**D. SUBTASK 1-D - SHREDDER SYSTEM VERIFICATION
AND TESTING**

Part of Phase I Contract testing to be done at DONLEE Pilot facility.

Progress:

Task completed in June 1992.

Problems:

None.

Plans:

Task completed in June 1992. Sterilization testing will be completed prior to completion of the installation.

E. SUBTASK 1-E - START-UP

Progress:

None. This subtask is due only after the installation of the facility is completed.

Problems:

None. This subtask has not been started at this time.

Plans:

The facility is anticipated to be completed during the winter of 1995. Work has begun on the Training Program and the Operation and Maintenance Manual.

III. TASK TWO - Obtain Permits

Progress:

Application for the extension of the Plan Approval to December 27, 1994 for the Lebanon VA facility was sent to the PA DER on January 31, 1994. DONLEE has received the Plan Approval and the 180 day extension. The Plan Approval was extended again to allow for the completion of installation and for start-up.

Problems:

None. Preparation for the PA DER site review after construction will commence when the installation of the equipment starts.

Plans:

No action with PA DER is required until site review following construction. The Plan Approval was extended a second time to November 30, 1995 to cover the time of installation and the start-up period.

IV. TASK THREE - Procure Coal, Limestone and Ash Disposal Contracts

Progress:

Early in the project the coal, limestone and ash disposal contracts could not be finalized because the initial supply date was in question due to NEPA approval related delays. Lebanon VA had received a supply proposal from Naughton Energy for coal, limestone and for ash disposal. During May 1994 the Lebanon VA set up a contract for procuring coal and limestone and for disposing of the generated ash when the facility is operational.

Problems:

Naughton has a three-year contract (through September 1997) to supply the coal and limestone, and to dispose of the ash generated. The contract started in October 1994. From then until the time that the facility is operational, the right to purchase the coal and limestone and dispose of ash is lost.

Plans:

None.

V. TASK FOUR - Conduct One Year Test Program

Progress:

None. This task is due after the installation, and start-up/shakedown is completed.

Problems:

None.

Plans:

A preliminary request for proposal for performing stack sampling tests has been written and is to be sent to three (3) vendors for competitive bids.

VI. TASK FIVE - Prepare Final Report

Progress:

None. The report is due 3 months after the test program is completed.

Problems:

None. The task is to be completed after the test program is finished.

Plans:

Currently information has been gathered concerning the equipment and facility. Preparation is being made to perform a matrix of tests that will demonstrate the performance and operation limits of the CFB system, quantify emission levels, identify problem areas and aid in performing scale-up analyses for future commercial designs.

VII. PROJECT COSTS

Changes to the contract

The following items have undergone price increases during this project. (The numbers in parentheses refer to Table 3 item numbers.)

- The boiler required \$8,111.00 of additions to meet the VA specifications. This number will be revised pending final boiler design. (8)
- The coal feeders were originally proposed to be screws. The VA has requested weighing capability. Weigh belt feeders were selected in place of screw feeders. The cost was \$45,690.00. (15)
- The annunciator panel requested by the VA will be approximately \$8160.00. (17)

Changes to the contract (Continued)

- The emissions monitoring system required \$56,500 above the proposal for the HCl monitoring system and heated sample lines. (22)
- An ash conditioner needed to be added to the contract. The Solid Waste Division of Pennsylvania's Department of Environmental Resources requires that the ash be conditioned with water before transport. The ash conditioner was supplied at a cost of \$59,804 (revised), including ducts and screw conveyors. (2, 3, 4)
- A refrigerated room is required for the storage of medical waste in the event that the unit is not operating. The cost of the refrigerated room was \$14,877. (48)
- The scope of the sand silo design has been reduced to a sand "funnel," resulting in a cost reduction of \$5,000 to \$10,000. The cost of the sand funnel was \$2925. (6)
- The Solid Waste Division of Pennsylvania's Department of Environmental Resources requires that the medical waste be weighed before disposal. The cost of a scale to be mounted in the loading dock was \$4382. (49)
- An air compressor will need to be purchased for the new facility. It was originally believed that the present system would be able to provide sufficient air quantities but the new facilities requirements are larger than originally anticipated. The cost of a 300 cfm air compressor rated at 110 psi was \$20,880. The air is supplied for the pneumatic transport of limestone and ash, pneumatic slidegates and instrumentation. (1)
- A heatless air dryer was purchased to provide air dried to -40 F dewpoint, at a cost of \$7,028 (revised). (74)
- Soil borings were required to determine soil bearing capacity before the foundation design could be started. It was originally believed that the VA had this information. The cost of the soil borings was \$5850. (54)
- Slidegates were needed for the coal, limestone and ash handling systems at a cost of \$52,665. (53)
- An oxygen analyzer to be used to measure oxygen at the boiler entrance and to be used to help control oxygen levels in the system was needed at a cost of \$6429. (23)
- Expansion joints were needed to allow for thermal growth throughout the system at a cost of \$25,862. (24)
- The electrical contractor cost for the facility installation is currently \$305,348 with change order additions. (21)
- The refractory engineering, materials and installation vendor's cost was \$88,007. (47)

Changes to the contract (Continued)

- The start-up burner system, including its panel and motors, for the circulating fluidized bed cost is \$10,792. (55, 56, 57)
- The general valves for the circulating fluidized bed system currently cost \$26,065. (63)
- Geotechnical Engineering Services for the building and foundation have been added to ensure that the facility is constructed properly and safely. The cost is partly offset by the October 1993 budget cost of the building and foundation. The cost of the services was \$9,512. (39)
- Design Engineering Services have been added to provide independent supervision for the construction. The cost of these services is included in the October 1993 budget cost of the building and foundation. The cost has since been reduced to \$10,911 from \$17,000. (43)
- The bed cleaning system which processes the ash generated from the combustion of the coal, limestone and medical waste currently costs \$26,114. The vendor agreed to upgrade the equipment being supplied to meet the equipment specifications. (5)
- The cost to move the gas lines at the facility was originally \$5,500. This cost was deleted by the gas company, UGI, in early February. (29)
- The cost of the economizer sootblower was \$8,784. (12)
- The baghouse and sorbent injection system currently cost \$138,444 (revised). (19)
- The cost of the vendor doing the ducting and piping has increased to \$170,716. (20)
- The cooling bed and lift channel blowers cost \$13,060. (25)
- The hospital waste handling and subsystems (or skip hoist) currently cost \$36,815. (30)
- The cost of the added transmitters for pressure and flow indication added to the specification, was \$4,097. This cost increase is due to the number of transmitters that have been added. (33)
- The price of the shredder blower has increased due to a freight charge. The final price was \$3,140. (51)
- The cost of the controls computer package has increased from \$83,442 to \$97,001. This cost increase is due to a required increase in the I/O capacity of the control system and for two computer courses. (17)
- The total cost of the bins: ash, limestone (2) and coal has increased from \$43,065 to an estimated \$123,663. (7a thru 7d).

Changes to the contract (Continued)

- The cost of the steelwork or equipment support (structure) has increased from \$72,290 to \$143,639 (estimated). (59)
- The cost of the design and manufacture of the platforms, supports and ladders was \$27,000. (45)
- The cost of the vendor equipment installation, including the platform installation and extras, is now \$447,575. (64)
- The cost of additional payment/performance bonds has been maintained in the individual contracts (vendor equipment installation and ducting and piping). This item as a result is \$0. (66)
- The air cannons were purchased for the coal silos at a cost of \$5,527. (72)
- The redesign of the stack is complete. The final total cost of the stack is now \$44,428. (13)
- The noise control pads and bases for the blowers, fans, compressor and shredder hydraulic unit have been purchased and installed at a cost of \$4,288. (73)
- The additional feedwater and steam valves will be ordered at a cost of \$3,875. (70)
- Spare shredder hydraulic filters were purchased for \$421. (71)
- The orifices and venturis for flow measurement have been designed and cost \$12,932. (75)
- A cart for medical waste handling was purchased to check out the skip hoist and shredder equipment. The cart cost was \$682. However, this cart was returned when it was discovered that the cart design had changed, and the cart dimensions were too large to be used. Another cart design was chosen by DONLEE and LVA and will be purchased and used after funding is approved. (76)
- The site trailer for an office and storage space was rented for a minimum of 4 months at a cost of \$2,237 for an expected 11 months. (77)

Contract Costs-to-Date:

The Lebanon VA Project Costs-to-Date are shown on Table 2.

Equipment Costs

The equipment costs are shown on Table 3 Lebanon VA Project Equipment Cost Summary. Several of these costs are preliminary and purchase orders have not been released yet.

VIII. SUMMARY

The State permitting process required for construction is completed. Operating permits will be obtained after construction has been completed.

The installation of the equipment at site started August 15, 1994. Construction and equipment fabrication, the purchase of equipment from vendors and the piping which began during October 1994, will all continue after additional funding has been obtained.

The vendors were notified on March 7, 1995 that the Lebanon VA Steam Plant project was shut down, and all work outside DONLEE was stopped pending additional funding.

Funding is expected to be approved by August 1, 1995.

A current schedule for the project is included with this report.

AFBC Co-Firing of Coal and Hospital Waste
 CONTRACT DE-FC21-91MC27205
 Quarterly Progress Report
 (May1, 1995 - July 31, 1995)
 Page 12

Table 1. Lebanon VA Project Equipment Status

ITEM NUMBER	EQUIPMENT	VENDOR	PURCHASE ORDER NO.	RELEASE FOR FABRICATION	TARGET DELIVERY DATE
1	Air Compressor	C.H. REED	70054	5/31/94	7/12/94
2	Ash Conditioner	DETROIT STOKER	70009	7/27/93	12/31/93
3	Ash Conditioner; Chutes	DETROIT STOKER	70062	6/6/94	11/4/94
4	Ash Handling; Storage and Screw	MACAWBER SYSTEMS	134568/70048	7/27/93	3/14/94
5	Bed Material Cooling/Cleaning System	CSI SYSTEMS INC.	70041/70042	5/25/94	8/3/94
6	Bin, Sand (Sand funnel)-Replaces bed mat'l bin estimated @ \$10,000	DONLEE	WO	5/1/94	7/1/94
7	Bins: Ash, Limestone & Coal				
7a	Coal Bins	DONLEE	WO	5/1/94	7/20/94
7b	Limestone Bin - 30 Ton	DONLEE	WO	5/1/94	11/1/94
7c	Limestone Bin - 2 Ton	DONLEE	WO	5/1/94	8/19/94
7d	Ash Bins (2)	DONLEE	WO	5/1/94	11/18/94
8	Boiler & Economizer: Boiler	DONLEE	WO	10/1/93	4/29/94
9	Boiler & Economizer: Boiler Sootblower	FUEL EFFICIENCY	70001	6/28/93	8/2/93
10	Boiler & Economizer: Boiler Sootblower-Engr Only	FUEL EFFICIENCY	41916		8/2/93
11	Boiler & Economizer: Economizer Casing	DONLEE	WO	6/1/94	7/6/94
12	Boiler & Economizer: Economizer Sootblower	COPES-VULCAN	41917B	3/4/94	6/16/94
13a	Stack (Chimney)	TRI FAB INC	41819	2/28/94	10/31/94
13b	Stack (Chimney) - 2nd Design	DONLEE	WO	2/10/95	10/15/95
14	Circulating Pumps, Feedwater	CHESTER PUMP		6/1/94	7/15/94
15	Coal Storage, Handling & Feeding	BEAUMONT BIRCH	13455B	7/27/93	12/15/93
16	Compuator/Cyclone/Cooling Bed Unit -No Tubes	DONLEE	WO	6/10/93	11/1/93
17	Controls Computer Package	HONEYWELL	42190B	8/16/93	9/1/95

AFBC Co-Firing of Coal and Hospital Waste
 CONTRACT DE-FC21-91MC27205
 Quarterly Progress Report
 (May1, 1995 - July 31, 1995)
 Page 13

Table 1. Lebanon VA Project Equipment Status

ITEM NUMBER	EQUIPMENT	VENDOR	PURCHASE ORDER NO.	RELEASE FOR FABRICATION	TARGET DELIVERY DATE
18	Cooling Bed & Economizer Tubes*	ALLEGHENY BOILER TUBE	70000	6/15/93	9/15/93
19	Dry Injection Fabric Filter: Baghouse	AEROPULSE INC	42019B	6/3/94	9/19/94
20	Ducting & Piping	McClure	70085	9/28/94	12/21/94
21	Electrical Equipment & Installation	DBG/Carpenter Engr	70024	2/3/94	2/28/95
22	Emissions Monitoring Equipment	ENERTEC	14172B	8/2/93	12/20/94
23	Emissions Monitoring Equipment: Oxygen	W.A.GREGORY & CO	70040	6/3/94	7/20/94
24	Expansion Joints	SENIOR FLEXONICS	70011	8/8/93	10/28/93
25	Fans & Blowers: ACB & LCB**	SPENCER TURBINE	41809	3/15/94	6/30/94
26	Fans & Blowers: Primary & ID	ROBINSON	41811	6/28/93	12/31/93
27	Flyash ReInjection System	DONLEE/FOX VALVE	70034	6/6/94	7/15/94
28	Flyash ReInjection System: Bed Mat'l Blowers	R.M. ASSC	41810	5/25/94	7/20/94
29	Natural Gas line moved	UGI	70028	3/1/94	3/15/94
30	Hospital Waste, Handling & Sub-Systems	ESSEX CONVEYOR	41820	3/1/94	9/23/94
31	Instruments: Pressure Indicators/Transmitters	DWYER/HONEYWELL	70055	6/15/94	7/15/94
32	Instruments: Pressure Transmitters	HONEYWELL	70010	7/27/93	8/25/93
33	Instruments: Pressure Transmitters (Additional)***	HONEYWELL	70045	6/15/94	7/15/94
34	Instruments: Thermocouples	CGS	70052	6/7/94	7/19/94
35	Insulation Materials & Installation	DONLEE	W/O	7/1/94	9/18/94
36	Limestone Storage, Handling & Feeding	MACAWBER SYSTEMS	41684B	7/27/93	12/15/93
37	Outside Review of Bldg-Preliminary/Final	ENTECH		6/24/93	7/1/93
38	Painting	DONLEE		7/15/94	2/28/96
39	Plant Encl/Site Prep/Foundation: Geotechnical Engr.	SCHNABEL	70027	2/16/94	7/1/94
40	Plant Encl/Site Prep/Foundation: Bldg & Foundation****	ARTHUR FUNK	70023	1/24/94	9/30/94

AFBC Co-Firing of Coal and Hospital Waste
 CONTRACT DE-FC21-91MC27205
 Quarterly Progress Report
 (May1, 1995 - July 31, 1995)
 Page 14

Table 1. Lebanon VA Project Equipment Status

ITEM NUMBER	EQUIPMENT	VENDOR	PURCHASE ORDER NO.	RELEASE FOR FABRICATION	TARGET DELIVERY DATE
41	Plant Enc/Site Prep/Foundation: Building			9/30/93	4/29/94
42	Plant Enc/Site Prep/Foundation: Design	DBG/Steckbeck		6/10/93	2/15/94
43	Plant Enc/Site Prep/Foundation: Engineer	DBG/Steckbeck	70026	2/16/94	9/30/94
44	Plant Enc/Site Prep/Foundation: Foundation			9/30/93	4/29/94
45	Platforms, Supports and Stairs and Design	BSM, Inc.	70084	9/27/94	12/5/94
46	Refractory Materials & Installation: Installation	DONLEE	WO	11/1/93	5/31/94
47	Refractory Materials & Installation: Materials	J.T.THORPE	70002	6/28/93	8/30/94
48	Refrigerated Room	PERLEY-HALLADAY	70012	7/28/93	8/30/94
49	Scale	B&M SCALE	70048	6/8/94	8/30/94
50	Shredder	SSI SHREDDING SYSTEMS			
51	Shredder Blower	ROBINSON	387648	8/20/93	12/31/93
52	Shredder: Move from York to Site	DONLEE	70035	11/19/93	7/15/94
53	Slide Gates	ROVALVE/TECHNAFLOW	70007	7/28/93	2/28/94
54	Soil Borings	Schnabel			
55	Start-up Burner	ECLIPSE/YORKAIRE	70013	9/1/93	1/3/94
56	Start-up Burner (Mod. Motor)	HONEYWELL	70014	8/20/93	9/30/93
57	Startup Burner Panel	DONLEE	W.O.	12/7/93	6/30/94
58	Steam Silencer	VIBRATION & NOISE ENGR	70070	6/7/94	8/15/94
59	Steelwork or Equipment Support	DONLEE	W/O	11/15/93	5/30/94
60	Sterilization System	DONLEE	70067	6/8/94	8/15/94
61	Sterilization Testing	DONLEE	70049	8/30/94	9/30/94
62	Transformer for Leb VA Equipment	Blatt & Myers	70085	7/31/94	12/1/94
63	Valves & Dampers	IPS	70044	5/31/94	7/28/94

Table 1. Lebanon VA Project Equipment Status

ITEM NUMBER	EQUIPMENT	VENDOR	PURCHASE ORDER NO.	RELEASE FOR FABRICATION	TARGET DELIVERY DATE
64	Vendor Equipment Installation	AYCOCK	70059		12/15/94
65	Computerized Portable Analyzers	ECOM America	70030	3/11/94	3/25/94
66	Additional payment/performance bonds	TBD			
67	Onsite refractory cure	Hotworks	70081	10/7/94	1/15/96
68	Bonding and Grounding	TBD			
69	Sump pumps and controls	Raeden			
70	Steam/Feedwater Valves	IPS	70092		
71	Shredder Hydraulic Filter	SSI	70094	1/24/95	2/15/95
72	Air Cannons	Airmatics	70099	1/6/95	1/20/95
73	Noise Suppression: Motor/Blowers	BRD Noise/Vibration	70096	11/29/94	12/20/94
74	Heatless Air Dryer	Air Flow Co., Inc.	70191	1/25/95	3/10/95
75	Orifices and venturis	C/B/ NES	70093	1/4/95	2/15/95
76	Cart for medical waste	CONSOLIDATED PLASTIC CO	70102	1/25/95	2/1/95
77	Site trailer rental - 11 months	GE CAPITAL MODULAR SPACE	70098	12/20/94	1/23/95
78	Heat Tracing	DONLEE		9/1/95	10/15/95
79	Added Lighting	DONLEE		9/1/95	10/1/95
80	Sump Pump/Controls	RAEDEN		9/1/95	10/15/95
81	Cal Gases and Regulators	SCOTT SPECIALTY		9/1/95	12/1/95
82	Sink/Shower Decontamination Stations	LAB SAFETY		9/1/95	11/1/95
83	Sand for Beds	U.S.SILICA SAND	70080	9/15/95	12/1/95
84	Coal Pit Cover	DONLEE		9/15/95	11/15/95
85	Grizzly Cover	DONLEE		9/15/95	11/15/95

Table 2. Lebanon VA Project Costs-to-Date Reported by Task

TASK	ACTUAL			Feb-95 Apr-95	ACTUAL			May-95 Jul-95	TO-DATE CONTRACT COSTS
	45 Feb-95	46 Mar-95	47 Apr-95	QRTLY TOTAL	48 May-95	49 Jun-95	50 Jul-95	QRTLY TOTAL	
TASK I: DESIGN/BUILD/INSTALL	175,407.15	65,739.91	23,205.57	264,352.63	18,814.75	33,652.01	262,124.61	314,591.37	\$5,212,086.08
TASK II: PERMITTING									\$38,030.59
TASK III: OBTAIN COAL, LIMESTONE & ASH CONTRACTS									\$44,098.29
TASK IV: TESTING									
TASK V: FINAL REPORT									\$0.00
PROJECT TOTAL	175,945.71	68,591.31	23,257.05	267,794.07	18,874.15	33,691.61	262,124.61	314,690.37	\$5,610,170.69
COST SHARE	13,037.62	2,938.28	(304.77)	15,671.13	(68.37)	64.29	21,757.74	21,753.66	\$394,735.61
DOE BILLING	162,908.09	65,653.03	23,561.82	252,122.94	18,942.52	33,627.32	240,366.87	292,936.71	\$5,215,435.08

Table 3. Lebanon VA Project Equipment Costs

ITEM NUMBER	EQUIPMENT	VENDOR	QUOTE/ESTIMATE DATE	OCTOBER 1993 BUDGET	CURRENT COST (Quote/Est.)	ORIGINAL COST (3/25/91)	VARIANCE-Current vs. 10/93 costs	PAID TO-DATE	BALANCE
1	Air Compressor	C.H. REED	6/1/93	\$21,801	\$20,880		(\$921)	\$20,880	\$0
2	Ash Conductor	DETROIT STOKER	7/22/93	\$34,815	\$34,815		\$0	\$34,815	\$0
3	Ash Conductor; Chutes	DETROIT STOKER	5/28/93	\$4,000	\$2,979	\$0	(\$1,021)	\$2,979	\$0
4	Ash Handling: Storage and Screw	MACAWBER SYSTEMS	8/10/93	\$123,985	\$145,995	\$83,200	\$22,010	\$145,995	\$0
5	Bed Material Cooling/Cleaning System	CSI SYSTEMS INC.	9/2/93	\$21,113	\$28,114	\$31,200	\$5,001	\$28,114	\$0
6	Bin, Sand (Sand Inert) Replaces bed multi bin estimated @ \$10,000	DONLEE		\$0	\$2,925	\$0	\$2,925	\$2,925	\$0
7	Bins Ash, Limestone & Coal			\$0				\$0	
7a	Coal Bins	DONLEE		\$18,948	\$55,805		\$38,857	\$55,805	\$0
7b	Limestone Bin - 30 Ton	DONLEE		\$8,460	\$14,408		\$7,948	\$14,408	\$0
7c	Limestone Bin - 2 Ton	DONLEE		\$2,594	\$4,200		\$1,616	\$4,200	\$0
7d	Ash Bins (2)	DONLEE		\$15,073	\$34,250		\$19,177	\$34,250	\$0
8	Boiler & Economizer; Boiler	DONLEE	6/15/93	\$41,478	\$41,478	\$58,050	\$0	\$41,478	\$0
9	Boiler & Economizer; Boiler Sootblower	FUEL EFFICIENCY	6/18/93	\$5,102	\$5,113	\$0	\$11	\$5,113	\$0
10	Boiler & Economizer; Boiler Sootblower; Engr Only	FUEL EFFICIENCY	6/18/93	\$1,300	\$1,300		\$0	\$1,300	\$0

— DONLEE ENERGY SYSTEMS —

Table 3. Lebanon VA Project Equipment Costs

ITEM NUMBER	EQUIPMENT	VENDOR	QUOTE/ESTIMATE DATE	OCTOBER 1993 BUDGET	CURRENT COST (Quote/Est.)	ORIGINAL COST (325/91)	VARIANCE-Current vs. 10/93 costs	PAID TO-DATE	BALANCE
11	Boiler & Economizer: Economizer Casing	DONLEE	5/15/93	\$8,352	\$8,205		\$1,853	\$8,205	\$0
12	Boiler & Economizer: Economizer Sootblower	COPEES-VULCAN	6/9/93	\$7,923	\$8,784		\$861	\$8,784	\$0
13a	Stack (Chimney)	TRI FAB INC	8/3/93	\$21,921	\$19,428	\$9,390	(\$2,493)	\$19,428	\$0
13b	Stack (Chimney) : 2nd Design	DONLEE	2/7/95	\$0	\$25,000	\$0	\$25,000	\$0	\$25,000
14	Circulating Pumps, Feedwater	CHESTER PUMP	7/15/93	\$7,000	\$7,163	\$9,640	\$163	\$0	\$0
15	Coal Storage, Handling & Feeding	BEAUMONT BIRCH	7/21/93	\$291,162	\$297,203	\$265,200	\$6,051	\$297,203	\$0
16	Combustor/Cyclone/Cooling Bed Unit -No Tubes	DONLEE	5/15/93	\$123,355	\$123,355	\$150,230	\$0	\$123,355	\$0
17	Controls Computer Package	HONEYWELL	4/30/93	\$83,442	\$97,001	\$80,500	\$13,559	\$97,001	\$0
18	Cooling Bed & Economizer Tubes*	ALLEGHENY BOILER TUBE	6/9/93	\$29,000	\$29,000	*	\$0	\$29,000	\$0
19	Dry Injection Fabric Filter; Baghouse	AEROPULSE INC	5/20/92	\$130,378	\$138,444	\$161,250	\$8,068	\$138,432	\$2,012
20	Ducting & Piping	McClure		\$65,292	\$170,716	\$26,570	\$105,424	\$109,131	\$61,585
21	Electrical Equipment & Installation	DBG/Carpenter Engr	2/3/94	\$245,000	\$305,348	\$135,200	\$60,348	\$187,950	\$117,398
22	Emissions Monitoring Equipment	ENERTEC	8/11/93	\$135,300	\$135,300	\$87,050	\$0	\$113,098	\$22,202
23	Emissions Monitoring Equipment: Oxygen	W.A.GREGORY & CO	9/3/93	\$8,119	\$8,548		\$429	\$8,548	\$0

— DONLEE ENERGY SYSTEMS —

21

Table 3. Lebanon VA Project Equipment Costs

ITEM NUMBER	EQUIPMENT	VENDOR	QUOTE/ESTIMATE DATE	OCTOBER 1993 BUDGET	CURRENT COST (Quote/Est.)	ORIGINAL COST (3/25/91)	VARIANCE-Current vs. 10/93 costs	PAID TO-DATE	BALANCE
24	Expansion Joints	SENIOR FLEXONICS	7/13/93	\$26,099	\$25,862		(\$237)	\$25,862	\$0
25	Fans & Blowers: ACB & LCB**	SPENCER TURBINE	11/13/91	\$12,709	\$13,060	**	\$351	\$13,060	\$0
26	Fans & Blowers: Primary & ID	ROBINSON	7/13/93	\$54,608	\$54,608	\$28,900	\$0	\$54,608	\$0
27	Flyash ReInjection System	DONLEE/FOX VALVE	12/5/91	\$14,290	\$14,290	\$41,600	\$0	\$9,031	\$5,259
28	Flyash ReInjection System: Bed Mat'l Blowers	R.M. ASSC	7/27/93	\$10,075	\$10,025		(\$50)	\$10,025	\$0
29	Natural Gas line moved	UGI		\$0	\$0	\$0	\$0	\$0	\$0
30	Hospital Waste, Handling & Sub Systems	ESSEX CONVEYOR	7/15/93	\$31,010	\$38,815	\$72,800	\$5,805	\$38,815	\$0
31	Instruments: Pressure Indicators/Transmitters	DWYER/HONEYWELL	9/10/93	\$2,500	\$1,090		(\$1,410)	\$1,090	\$0
32	Instruments: Pressure Transmitters	HONEYWELL	5/24/93	\$12,569	\$12,569	\$16,490	\$0	\$12,569	\$0
33	Instruments: Pressure Transmitters (Additional)***	HONEYWELL		\$0	\$4,097	***	\$4,097	\$4,097	\$0
34	Instruments: Thermocouples	CGS	5/28/93	\$4,347	\$5,428		\$1,081	\$5,428	\$0
35	Insulation Materials & Installation	DONLEE	5/26/93	\$17,220	\$17,220	\$17,220	\$0	\$0	\$17,220
36	Limestone Storage, Handling & Feeding	MACAWBER SYSTEMS	5/23/93	\$60,881	\$60,881	\$72,800	\$0	\$60,881	\$0
37	Outside Review of BMG Preliminary/Final	ENTECH		\$5,000	\$928	\$0	(\$4,074)	\$928	\$0

Table 3. Lebanon VA Project Equipment Costs

ITEM NUMBER	EQUIPMENT	VENDOR	QUOTE/ESTIMATE DATE	OCTOBER 1993 BUDGET	CURRENT COST (Quote/Est.)	ORIGINAL COST (3/25/91)	VARIANCE-Current vs. 10/93 costs	PAID TO-DATE	BALANCE
38	Painting	DONLEE		\$15,000	\$24,240	\$31,200	\$9,240	\$0	\$24,240
39	Plant Encl./Site Prep/Foundation: Geotechnical Engr.	SCHNABEL		\$0	\$9,512	\$0	\$9,512	\$9,512	\$0
40	Plant Encl./Site Prep/Foundation: Bldg & Foundation****	ARTHUR FUNK	9/8/93	\$545,700	\$629,578	****	\$83,878	\$547,145	\$82,433
41	Plant Encl./Site Prep/Foundation: Building					\$87,680	\$0	\$0	\$0
42	Plant Encl./Site Prep/Foundation: Design	DBG/Stockbeck	9/1/93	\$25,725	\$29,128	\$0	\$3,403	\$29,128	\$0
43	Plant Encl./Site Prep/Foundation: Engineer	DBG/Stockbeck		\$0	\$10,911		\$10,911	\$8,911	\$2,000
44	Plant Encl./Site Prep/Foundation: Foundation					\$209,560	\$0	\$0	\$0
45	Platforms, Supports and Stairs and Design	BSM, Inc.		\$4,400	\$27,000		\$22,600	\$27,000	\$0
46	Refractory Materials & Installation: Installation	DONLEE	6/24/93	\$52,915	\$88,789	\$52,915	\$35,884	\$88,799	\$0
47	Refractory Materials & Installation: Materials	J.T. THORPE	6/24/93	\$78,975	\$88,007	\$77,515	\$11,032	\$88,007	\$0
48	Refrigerated Room	PERLEY-HALLADAY	7/19/93	\$14,877	\$14,877		\$0	\$7,439	\$7,438
49	Scale	B&M SCALE	6/7/93	\$4,597	\$4,382		(\$215)	\$4,382	\$0
50	Shredder	SSI SHREDDING SYSTEMS		\$0	\$0	\$0	\$0	\$0	\$0
51	Shredder Blower	ROBINSON	4/28/93	\$3,019	\$3,140		\$121	\$3,140	\$0

— DONLEE ENERGY SYSTEMS —

Table 3. Lebanon VA Project Equipment Costs

ITEM NUMBER	EQUIPMENT	VENDOR	QUOTE/ESTIMATE DATE	OCTOBER 1993 BUDGET	CURRENT COST (Quote/Est.)	ORIGINAL COST (3/25/91)	VARIANCE-Current vs. 10/93 costs	PAID TO-DATE	BALANCE
52	Site/Jar. Move from York to Site	DONLEE		\$5,200	\$5,200	\$5,200	\$0	\$5,200	\$0
53	Slide Gates	ROVALVE/TECHINAFLOW	7/28/93	\$52,461	\$52,664		\$203	\$52,665	\$0
54	Soil Borings	Schnabel		\$5,850	\$5,850		\$0	\$5,850	\$0
55	Start up Burner	ECLIPSE/YORKAIRE	8/8/93	\$9,242	\$9,242	\$6,230	\$0	\$9,242	\$0
56	Start up Burner (Mod Motor)	HONEYWELL	8/20/93	\$268	\$268		\$0	\$268	\$0
57	Startup Burner Panel	DONLEE		\$0	\$1,284	\$0	\$1,284	\$0	\$1,284
58	Steam Silencer	VIBRATION & NOISE ENGR	7/12/93	\$3,415	\$3,065		(\$350)	\$3,065	\$0
59	Steelwork for Equipment Support	DONLEE		\$72,290	\$143,639	\$45,430	\$71,349	\$143,639	\$0
60	Sterilization System	DONLEE	12/10/91	\$6,187	\$6,187		\$0	\$1,650	\$4,537
61	Sterilization Testing	DONLEE		\$7,000	\$888		(\$6,112)	\$888	\$0
62	Transformer for Lab VA Equipment	Blatt & Myers		\$8,000	\$49,400		\$41,400	\$49,400	\$0
63	Valves & Dampers	IPS		\$14,384	\$28,065	\$26,020	\$11,701	\$28,065	\$0
64	Vendor Equipment Installation	AYCOCK		\$194,930	\$447,575		\$252,645	\$253,263	\$194,312
65	Computerized Portable Analyzers	ECOM America		\$0	\$4,638		\$4,638	\$4,638	\$0

Table 3. Lebanon VA Project Equipment Costs

ITEM NUMBER	EQUIPMENT	VENDOR	QUOTE/ESTIMATE DATE	OCTOBER 1993 BUDGET	CURRENT COST (Quote/Est.)	ORIGINAL COST (9/25/91)	VARIANCE-Current vs. 10/93 costs	PAID TO-DATE	BALANCE
66	Additional payment/performance bonds	TBD		\$0	\$0		\$0	\$0	\$0
67	Onsite refractory cure	Hotworks	Jul-95	\$0	\$8,950		\$8,950	\$0	\$8,950
68	Bonding and Grounding	TBD		\$0	\$8,000		\$8,000	\$0	\$8,000
69	Sump pumps and controls	Raeden		\$0	\$2,500		\$2,500	\$0	\$2,500
70	Steam/Feedwater Valves	IPS	11/4/94	\$0	\$3,875		\$3,875	\$0	\$3,875
71	Shredder Hydraulic Filter	SSI	11/3/94	\$0	\$421		\$421	\$0	\$421
72	Air Cannons	Airmatics	11/16/94	\$0	\$5,527		\$5,527	\$5,527	\$0
73	Noise Suppression; Motor/Blowers	BRD Noise/Vibration	10/28/94	\$0	\$4,288		\$4,288	\$4,288	\$0
74	Heatless Air Dryer	Air Flow Co., Inc.	12/8/94	\$0	\$7,028		\$7,028	\$0	\$7,028
75	Orifices and venturis	C/B IVES	10/20/94	\$0	\$12,932	\$0	\$12,932	\$12,932	\$0
76	Cart for medical waste	CONSOLIDATED PLASTIC CO	12/15/94	\$0	\$0		\$0	\$0	\$0
77	Site trailer rental - 11 months	GE CAPITAL MODULAR SPACE	12/15/94	\$0	\$2,237		\$2,237	\$1,308	\$929
78	Heat Tracing	DONLEE	7/31/95	\$0	\$5,200	\$0	\$5,200	\$0	\$5,200
79	Added Lighting	DONLEE	7/31/95	\$0	\$14,500	\$0	\$14,500	\$0	\$14,500

— DONLEE ENERGY SYSTEMS —

Table 3. Lebanon VA Project Equipment Costs

ITEM NUMBER	EQUIPMENT	VENDOR	QUOTE/ESTIMATE DATE	OCTOBER 1993 BUDGET	CURRENT COST (Quote/Est.)	ORIGINAL COST (325/91)	VARIANCE-Current vs. 10/93 costs	PAID TO-DATE	BALANCE
80	Sump Pump/Controls	RAEDEN	11/18/94	\$0	\$2,500	\$0	\$2,500	\$0	\$2,500
81	Cal Gases and Regulators	SCOTT SPECIALTY	12/15/94	\$0	\$4,530	\$0	\$4,530	\$0	\$4,530
82	Sink/Shower Decontamination Stations	LAB SAFETY	7/3/95	\$0	\$1,750	\$0	\$1,750	\$0	\$1,750
83	Sand for Beds	U.S.SILICA SAND	8/23/94	\$0	\$2,387	\$0	\$2,387	\$0	\$2,387
84	Coal Pit Cover	DONLEE	7/3/95	\$0	\$3,200	\$0	\$3,200	\$0	\$3,200
85	Grizzly Cover	DONLEE	7/3/95	\$0	\$4,800	\$0	\$4,800	\$0	\$4,800
PROJECT EQUIPMENT TOTALS				\$2,822,612	\$3,794,770	\$1,889,040	\$972,158	\$3,088,909	\$633,470

NOTES.

* The cost of the cooling bed tubes was originally included in the combustor/cyclone/cooling bed cost of \$150,230 (Item 16). The economizer tube cost was originally included in the boiler cost of \$58,050 (Item 8).

** The cost of these blowers was originally included in the fans and blowers cost of \$28,900 (Item 26).

*** The cost of the additional pressure transmitters is included in Item 32.

**** The cost of the building and foundation originally included Items 41 and 44 at a cost of \$297,240.

Table 3. Lebanon VA Project Equipment Costs

NOTES:

1. Items 1-28 and 30-64 were all part of the original October 1993 Budget.
2. Item 29 was added in March of 1994 prior to the start of the foundation.
3. Items 20, 45 and 62 have been modified and approved after the equipment installation started.
4. Item 64 was formed from two previous items: "Vendor Equipment Installation" and "Vendor Equipment Installation: Rentals, etc."

Lebanon VA Project Schedule