Contract No. DE-FC22-90PC90548

LIFAC Sorbent Injection Desulfurization Demonstration Project

Presented By

LIFAC NORTH AMERICA, INC.

A Joint Venture Between

ICF KAISER ENGINEERS

Four Gateway Center
Pittsburgh, Pennsylvania 15222

Tampella power

P.O. Box 626
SF-33101
Tampere, Finland

Presented To

U.S. Department of Energy

Pittsburgh Energy Technology Center
Pittsburgh, Pennsylvania 15236

DOE/PC/90548--T4

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Quarterly Report

No. 4

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July-September 1991

LIFAC SORBENT INJECTION
DESULFURIZATION DEMONSTRATION PROJECT

QUARTERLY REPORT NO. 4
JULY - SEPTEMBER 1991

Submitted to

U. S. DEPARTMENT OF ENERGY

by

LIFAC NORTH AMERICA

LIFAC Sorbent Injection Desulfurization Demonstration Project

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INTRODUCTION

In December 1990, the U.S. Department of Energy selected 13 projects for funding under the Federal Clean Coal Technology Program (Round III). One of the projects selected was the project sponsored by LIFAC North America, (LIFAC NA), titled "LIFAC Sorbent Injection Desulfurization Demonstration Project." The host site for this $17 million, three-phase project is Richmond Power and Light's Whitewater Valley Unit No. 2 in Richmond, Indiana. The LIFAC technology uses upper-furnace limestone injection with patented humidification of the flue gas to remove 75-85% of the sulfur dioxide (SO_2) in the flue gas.

In November 1990, after a ten (10) month negotiation period, LIFAC NA and the U.S. DOE entered into a Cooperative Agreement for the design, construction, and demonstration of the LIFAC system. This report is the fourth Technical Progress Report covering the period July 1, 1991 through the end of September 1991. Due to the power plant's planned outage schedule, and the time needed for engineering, design and procurement of critical equipment, DOE and LIFAC NA agreed to execute the Design Phase of the project in August 1990, with DOE funding contingent upon final signing of the Cooperative Agreement.

BACKGROUND

Project Team

The LIFAC demonstration at Whitewater Valley Unit No. 2 is being conducted by LIFAC North America, a joint venture partnership between:

- ICF Kaiser Engineers - A U.S. company based in Oakland, California, and a subsidiary of ICF International (ICF) based in Fairfax, Virginia.

- Tampella Power Corp. - A U.S. subsidiary of a large diversified international company, Tampella Corp., based in Tampere, Finland and the original developer of the LIFAC technology.

LIFAC NA is responsible for the overall administration of the project and for providing the 50 percent matching funds. Except for project administration, however, most of the actual work is being performed by the

two parent firms under service agreements with LIFAC NA. Both parent firms work closely with Richmond Power and Light and the other project team members, including ICF Resources, the Electric Power Research Institute (EPRI), Indiana Corporation for Science and Technology (ICS&T), and Black Beauty Coal Company. LIFAC NA is having ICF Kaiser Engineers manage the demonstration project out of its Pittsburgh office, which provides excellent access to the DOE representatives of the Pittsburgh Energy Technology Center. Figure 1 shows the management structure being used throughout the three phases of the project.

LIFAC NA administers the project through a Management Committee that decides the overall policies, budgets, and schedules. All funding sources, invoicing, and information flows to LIFAC NA where the managing partners ensure that the project, funding and expenditures are consistent and in-line with the established policies, budgets, schedules and procedures.

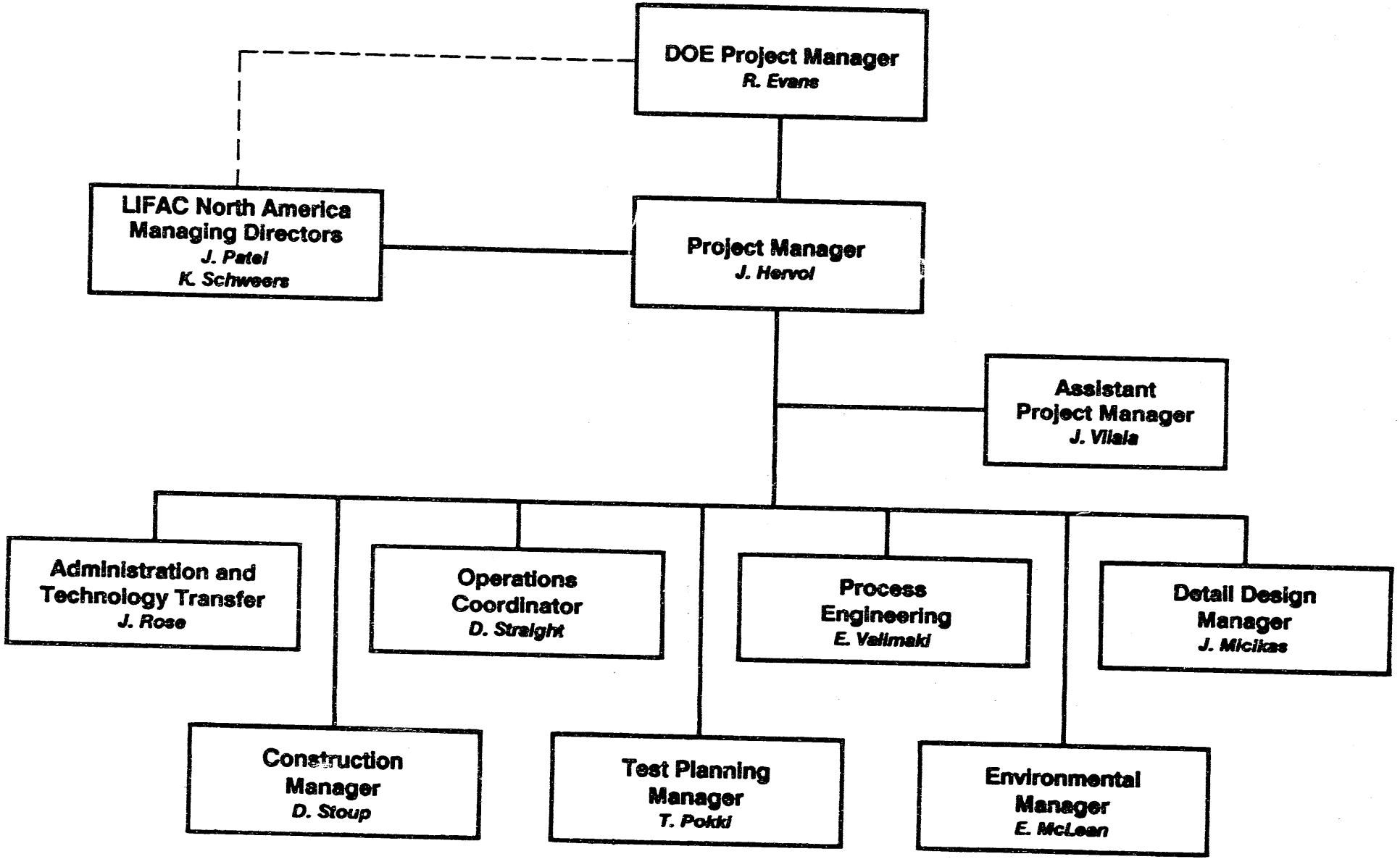
Process Development

In 1983, Finland enacted acid rain legislation which applied limits on SO_2 emissions sufficient to require that flue gas desulfurization systems have the capability to remove about eighty percent (80%) of the sulfur dioxide in the flue gas. This level could be met by conventional scrubbers, but could not be met by then available sorbent injection technology. Therefore, Tampella began developing an alternative system which resulted in the LIFAC process.

Initially, development included laboratory-scale and pilot-plant tests. Full-scale limestone injection tests were conducted at Tampella's Inkeroinen facility, a 160 Mwe coal-fired boiler using high-ash, low-sulfur Polish coal. At Ca:S ratios of 3:1, sulfur removal was less than 50%. Better results could have been attained using lime, but was rejected because the cost of lime is much higher than that of limestone.

In-house investigations by Tampella led to an alternative approach involving humidification in a separate vertical chamber which became known as the LIFAC Process. In cooperation with Pohjolan Voima Oy, a Finnish utility, Tampella installed a full-scale limestone injection facility on

Project Organization



a 220 Mwe coal-fired boiler located at Kristiinankaupunki. At this facility, a slipstream (5000 SCFM) containing the calcined limestone was used to test a small-scale activation reactor (2.5 MW) in which the gas was humidified. Reactor residence times of 3 to 12 seconds resulted in SO_2 removal rates up to 84%. Additional LIFAC pilot-scale tests were conducted at the 8 Mwe (thermal) level at the Neste Kulloo combustion laboratory to develop the relationships between the important operating and design parameters. Polish low-sulfur coal was burned to achieve 84% SO_2 removal.

In 1986, full-scale testing of LIFAC was conducted at Imatran Voima's Inkoo power plant on a 250 Mwe utility boiler. An activation chamber was built to treat a flue gas stream representing about 70 Mwe. Even though the boiler was 250 Mwe, the 70 Mwe stream represented about one-half of the flue gas feeding one of the plant's two EPS's (i.e., each ESP receives a 125 Mwe gas stream). This boiler used a 1.5% sulfur coal and sulfur removal was initially 61%. By late 1987, SO_2 removal rates had improved to 76%. In 1988, a LIFAC activation reactor was added to treat an additional 125 Mwe -- i.e., an entire flue gas/ESP stream-worth of flue gas from this same boiler. This newer activation reactor is achieving 75-80% SO_2 removal with Ca:S ratios between 2:1 and 2.5:1. In 1988, the first tests using high-sulfur U.S. coals were run at the pilot scale at the Neste Kulloo Research Center, using a Pittsburgh No. 8 coal containing 3% sulfur. SO_2 removal rates of 77% were achieved at a Ca:S ratio of 2:1.

This LIFAC demonstration project will be conducted on a 60 Mwe boiler burning high-sulfur U.S. coals to demonstrate the commercial application of the LIFAC process to U.S. utilities.

Process Description

LIFAC combines upper-furnace limestone injection followed by post-furnace humidification in an activation reactor located between the air preheater and the ESP. The process produces a dry and stable waste product that is partially removed from the bottom of the activation reactor and partially removed at the ESP.

Finely pulverized limestone is pneumatically conveyed and injected into the upper part of the boiler. Since the temperatures at the point of injection are in the range of 1800-2000° F, the limestone ($CaCO_3$) decomposes to form lime (CaO). As the lime passes through the furnace, initial desulfurization reactions take place. A portion of the SO_2 reacts with the CaO to form calcium sulfite ($CaSO_3$), part of which then oxidizes to form calcium sulfate ($CaSO_4$). Essentially all of the sulfur trioxide (SO_3) reacts with the CaO to form $CaSO_4$.

The flue gas and unreacted lime exit the boiler and pass through the air preheater. On leaving the air preheater, the gas/lime mixture is directed to the patented LIFAC activation reactor. In the reactor, additional sulfur dioxide capture occurs after the flue gas is humidified with a water spray. Humidification converts lime (CaO) to hydrated lime, $Ca(OH)_2$, which enhances further SO_2 removal. The activation reactor is designed to allow time for effective humidification of the flue gas, activation of the lime, and reaction of the SO_2 with the sorbent. All the water droplets evaporate before the flue gas leaves the activation reactor. The activation reactor is also designed specifically to minimize the potential for solids build-up on the walls of the chamber. The net effect is that at a Ca:S ratio in the range of 2:1 to 2.5:1, 70-80% of the SO_2 is removed from the flue gas.

The flue gas leaving the activation reactor then enters the existing ESP where the spent sorbent and fly ash are removed from the flue gas and sent to the disposal facilities. ESP effectiveness is also enhanced by the humidification of the flue gas. The solids collected by the ESP consist of fly ash, $CaCO_3$, $Ca(OH)_2$, CaO, $CaSO_4$, and $CaSO_3$. To improve utilization of the calcium, and increase SO_2 reduction to between 75 and 85%, a portion of the spent sorbent collected in the bottom of the activation reactor and/or in the ESP hoppers is recycled back into the ductwork just ahead of the activation reactor.

Process Advantages

The LIFAC technology has similarities to other sorbent injection technologies using humidification, but employs a unique patented vertical reaction chamber located down-stream of the boiler to facilitate and

control the sulfur capture and other chemical reactions. This chamber improves the overall reaction efficiency enough to allow the use of pulverized limestone rather than more expensive reagents such as lime which are often used to increase the efficiency of other sorbent injection processes.

Sorbent injection is a potentially important alternative to conventional wet lime and limestone scrubbing, and this project is another effort to test alternative sorbent injection approaches. In comparison to wet systems, LIFAC, with recirculation of the sorbent, removes less sulfur dioxide - 75-85% relative to 90% or greater for conventional scrubbers - and requires more reagent material. However, if the demonstration is successful, LIFAC will offer these important advantages over wet scrubbing systems:

- LIFAC is relatively easy to retrofit to an existing boiler and requires less area than conventional wet FGD systems.
- LIFAC is less expensive to install than conventional wet FGD processes.
- LIFAC's overall costs measured on a dollar-per-ton SO_2 removed basis are less, an important advantage in a regulatory regime with trading of emission allocations.
- LIFAC produces a dry, readily disposable waste by-product versus a wet product.
- LIFAC is relatively simple to operate.

HOST SITE DESCRIPTION

The site for the LIFAC demonstration is Richmond Power and Light's Whitewater Valley 2 pulverized coal-fired power station (60 Mwe), located in Richmond, Indiana. Whitewater Valley 2, which began service in 1971, is a Combustion Engineering tangentially-fired boiler which uses high-sulfur bituminous coal from Western Indiana. Actual power generation produced by the unit approaches 65 megawatts. As such, it is one of the

smallest existing, tangentially-fired units in the United States. The furnace is 26-feet, 11-inches deep and 24-feet, 8-inches wide. It has a primary and secondary superheater. Tube sizes and spacings are designed to achieve the highest possible heat-transfer rates with the least potential for gas-side fouling. The unit also has an inherent low draft-loss characteristic because of the lack of gas turns. At full load 540,000 lbs/hr. of steam are generated. The heat input at rated capacity is 651 x 10^6 Btu per hour. The design superheater outlet pressure and temperature are 1320 psi at 955°F. The unit has a horizontal shaft basket-type air preheater. The temperature leaving the economizer is about 645°F, while the stack gas temperature is about 316°F. The balanced-draft unit has 12 burners.

In 1980 the unit was fitted and fully optimized with a state-of-the-art Low-NO_x Concentric Firing System (LNCFS). The LNCFS represents a very cost effective means of reducing NO_x emissions in comparison with other retrofit possibilities. The system works on the principal of directing secondary air along the sides of the furnace and creating a fuel rich zone in the center of the furnace. With the LNCFS, the excess air can be maintained below 20 percent. Additionally, the installation reduces ash accumulation on the furnace walls increasing heat absorption and reducing attemperation requirements. With the LNCFS, each corner of the furnace has a tangential windbox consisting of three coal compartments and four auxiliary air compartments. At full load with all three 593 RB pulverizers operating, primary transport air from the pulverizers amounts to 23 percent of the total combustion air. Pulverizer capacity is 26,400 lbs/hr. with 52 grind coal and 70 percent minus 200 mesh.

Whitewater Valley 2 has a Lodge Cottrell cold side precipitator which was erected with the boiler. The precipitator treats 227,000 actual cubic feet per minute of 316°F flue gas with 45,000 square feet of collection area. The unit has two mechanical fields and four electrical fields and achieves 99 percent removal efficiency (from 3.9 gr/ft^3 to 0.04 gr/ft^3). The ESP performance was optimized by Lodge Cottrell when Richmond Power and Light purchased new controllers in 1985.

Whitewater Valley Unit 2's overall efficiency of 87.47 percent at full load has shown little variation over the years. The unit's average heat rate is 10,280 Btu/Kwh. At 60 percent of full load, the unit's efficiency increases to 88.17 percent. The unit uses approximately 0.935 pounds of coal per Kwh and generates 8.51 pounds of steam per Kwh.

The primary emissions monitored at the station are SO_2 and opacity. SO_2 emissions are calculated based on the coal analysis and are limited to 6 lbs/MBtu. Opacity is monitored using an in-situ meter at the ESP outlet and is currently limited to 40 percent. Current SO_2 emissions for the unit are approximately 4 lbs/MBtu, while opacity at full load ranges from 15 to 20 percent. Opacity at low load (40MW) ranges from 3 to 5 percent. Limited testing was conducted in November of 1986 for NO_x emissions. Results from the test work indicated that NO_x emissions averaged 0.65 lbs/MBtu.

Whitewater Valley 2 has several important qualities as a LIFAC demonstration site. One of these is that Whitewater Valley 2 was the site of a prior joint EPA/EPRI demonstration of LIMB sorbent injection technology. Much of the sorbent injection equipment remains on site and will be used in the LIFAC demonstration, if possible. Another advantage of the site is that Whitewater Valley 2 is a challenging candidate for a retrofit due to the cramped conditions at the site. The plant is thus typical of many U.S. power plants which are potential sites for application of LIFAC. In addition, the Whitewater Valley 2 boiler is small relative to its capacity; hence, it has high-temperature profiles relative to other boilers. This situation will require sorbent injection at higher points in the furnace in order to prevent deadburning of the reagent and may decrease residence times needed for sulfur removal. Whitewater Valley 2 will show LIFAC's performance under operational conditions most typical of U.S. power plants. The project will demonstrate LIFAC on high-sulfur U.S. coals and is a logical extension of the Finnish demonstration work and important for LIFAC's commercial success in the U.S.

PROJECT SCHEDULE

To demonstrate the technical viability of the LIFAC process to economically reduce sulfur emissions from the Whitewater Valley Unit No. 2, LIFAC NA is conducting a three-phase project.

Phase I: **Design**
Phase IIA: **Long Lead Procurement**
Phase IIB: **Construction**
Phase III: **Operations**

Except Phase IIA, each phase is comprised of three (3) tasks, a management and administration task, a technical task and an environmental task. The design phase began on August 8, 1990 and was scheduled to last six (6) months. Phase IIA, long lead procurement, overlaps the design phase and was expected to require about four (4) months to complete. The construction phase was then to continue for another seven (7) months, while the operations phase was scheduled to last about twenty-six (26) months. Figure 2 shows the original estimated project schedule which is based on a August 8, 1990 start date and a planned outage of Whitewater Valley 2 during March 1991.

It is during this outage that all the tie-ins and modifications to existing Unit No. 2 equipment were made. This required that the construction phase begin in early February, 1991 -- construction and start-up were to be completed by the end of August 1991. Operations and testing were to begin in September 1991 and continue for 26 months. However, during the last two reporting periods, the project encountered delays in receiving its construction permit. These delays, along with some design changes, required that the Design Phase be extended by about seven months. Therefore, construction and start-up will not be completed until the end of January 1992. This represents a five-month slip in the overall schedule. Figure 3 shows the revised project schedule. Total project duration will now be 44 months.

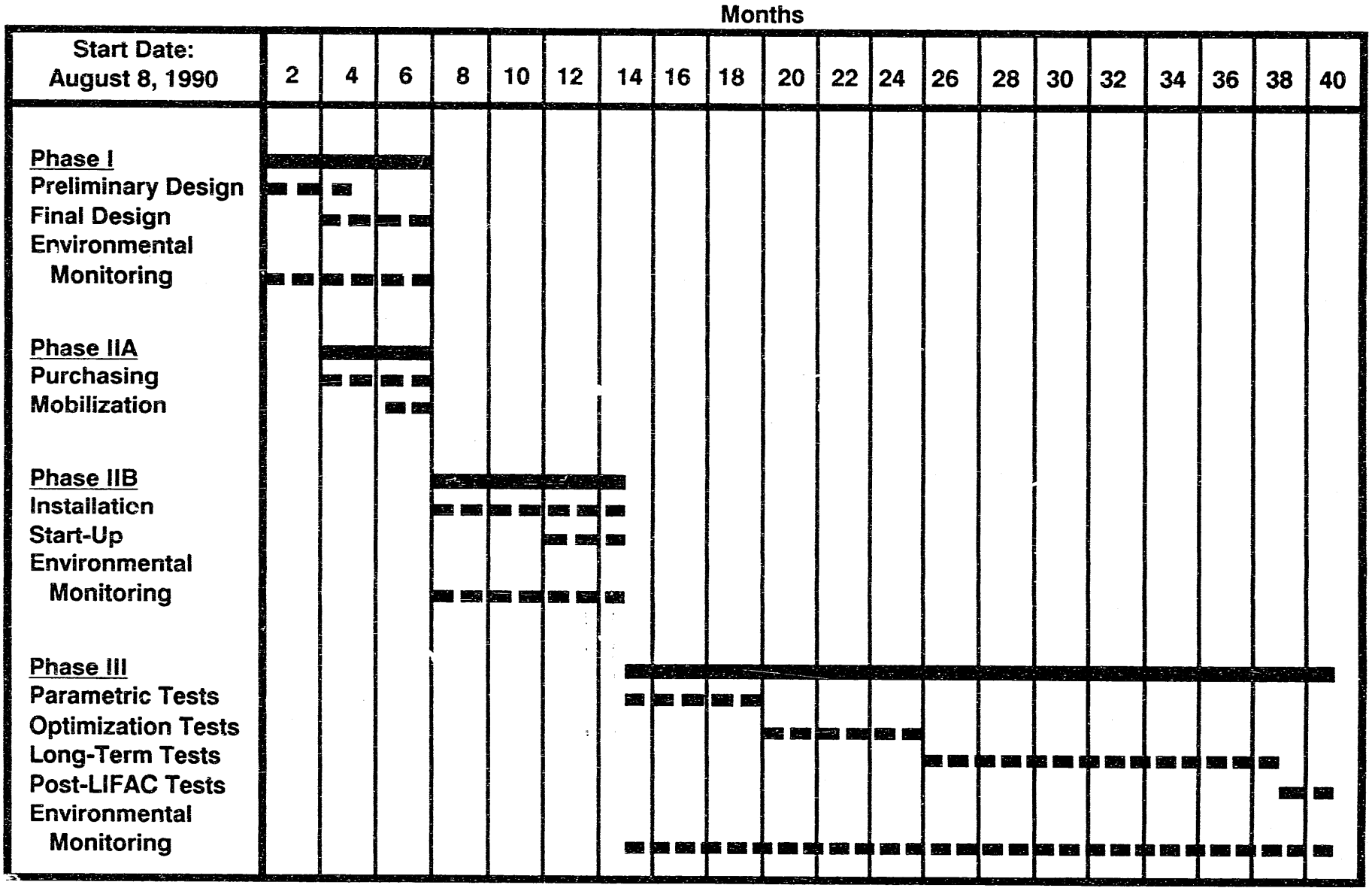
TECHNICAL PROGRESS

The work performed during this period (July - September 1991) was consistent with the Statement of Work and the approved schedule change

LIFAC

LIFAC Demonstration

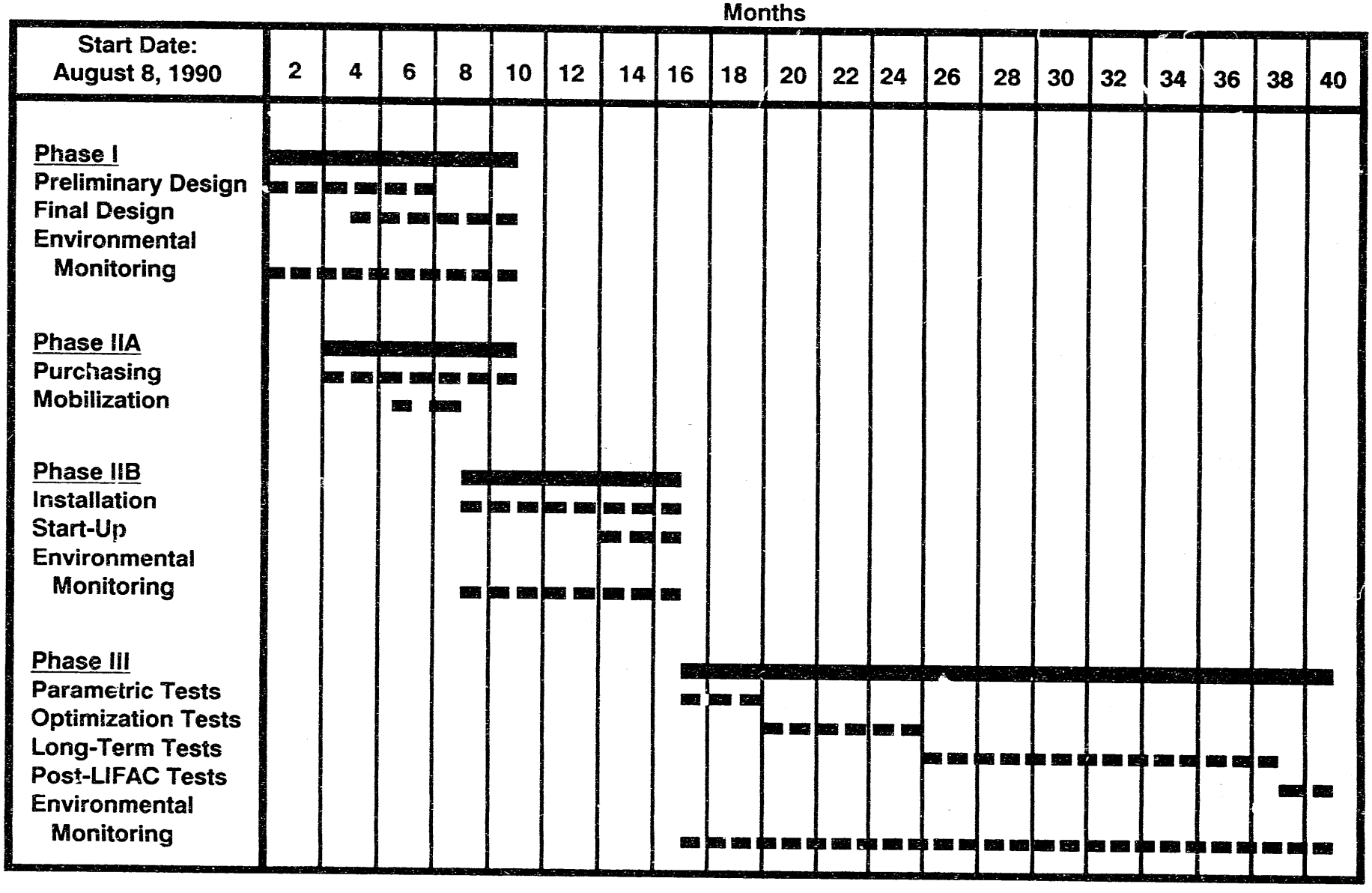
Original Project Schedule



LIFAC

LIFAC Demonstration

Revised Project Schedule



contained in the Cooperative Agreement. During this period, emphasis was placed on five separate tasks. In the Design Phase, work continued on the Engineering and Design task. In the Construction Phase, work continued on all four tasks including Project Management, Long Lead Procurement, Installation and Start-up, and Environmental Monitoring. Following is a summary of the work performed under these tasks.

Project Management (WBS 1.2.1B)

During the July through September period, management efforts and achievements included:

- **LIFAC Management Committee Meetings** - In the previous period, a formal management process was established involving regular management committee review meetings to supplement frequent phone meetings and conversations between key managers. During this period this process continued. Two formal LIFAC management committee meetings were held: (1) July 12, 1991 in the Fairfax, Virginia offices of ICF Kaiser Engineers, and (2) August 28, 1991 also in Fairfax. The agenda of these meetings was structured around reports from the project managers of ICF Kaiser Engineers and Tampella Power on the progress of the project. During the meetings, the management committee authorized financial commitments, and developed and approved project policy. Some of the topics covered during the meetings included:

  - Change in Scope related to the recycling of wastes, ESP upgrade, materials of construction, etc.

  - Regulatory and permitting developments

  - Schedule and budget

  - Relations with host site utility

  - Management fulfillment of the DOE Cooperative Agreement and interfaces with co-funders.

- **Joint LIFAC NA/DOE Cooperation** - In the previous period, several steps were undertaken to improve coordination with DOE, and to implement DOE reporting and administrative requirements. During this period, LIFAC NA undertook the remaining management steps necessary to ensure full implementation of the Cooperative Agreement's management, administrative and technical provisions including:

  - Delivered a new management plan to DOE under which the ICF Resources subcontract was discontinued as of September 1991, and those responsibilities were assumed by ICF Kaiser Engineers.

  - Identified new Key Personnel: Jim Hervol as Project Manager, and LIFAC Management Committee members, Ken Schweers and Jim Patel.

  - Provided to DOE on an on-time basis all required financial, project and cost reports including: (1) monthly technical progress, (2) cost management, and (3) federal assistance management summary reports. These reports met all DOE specifications related to committed costs.

  - Sent all LIFAC NA invoices to DOE during the period consistent with DOE requirements that invoiced costs be presented on a phase-by-phase basis.

- **Regulatory** - Continued to manage/oversee the permitting process, and in some cases directly participated in permitting and approvals process (e.g. meeting with lawyers). Overall, significant progress was made in resolving permitting issues, allowing management attention to shift to other issues.

  - At the beginning of the period, the construction permit was delayed due to complications related to the unresolved state of RP&L's particulate emissions. By the end of September, Indiana's Department of Environmental Management (IDEM) had

not yet approved the permit. Formal approval is expected early in the next reporting period.

- The project was subject to a determination of whether a Prevention of Significant Deterioration (PSD) regulatory review was required. This review/determination was required before the construction permit could be issued. The result of the review was that PSD regulations were not triggered.

- RP&L submitted a variance request as the first part of resolving RP&L's particulate emission limit situation. This variance was in process independent of the LIFAC project, but a clause specifically addressing the LIFAC demonstration was added.

- The Indiana Department of Environmental Management officials will review our request for solid waste disposal permit/approval. Material was prepared on the characteristics of the waste and was presented to IDEM for review.

- **Funding Agreements** - Continued efforts to negotiate and finalize arrangements for participation/funding of other project participants:

  - Electric Power Research Institute - LIFAC project managers conferred with representatives of EPRI to discuss EPRI funding. EPRI formally requested from its board $250,000 for the project, with money to be earmarked to ESP tests. More information on funding and technical assistance is expected in the next reporting period.

  - Indiana Corporation for Science and Technology (ICS&T) - A contract was signed with ICS&T which provides $0.8 million to LIFAC NA. Received $0.1 million during the period and additional funding is expected during the next period.

- Peabody Coal Company - Decided that the terms for Peabody's participation were not consistent with the needs of the host site, and have ended negotiations with Peabody.

- Black Beauty Coal Company - LIFAC NA is optimistic that contract negotiations will be successful, and that Black Beauty can perform most if not all the functions to have been performed by Peabody. Additional progress is expected in the next reporting period.

- Southdown/Kosmos Cement Company - In the previous period, Kosmos had preliminarily indicated an interest in participating and is investigating the possibility of supplying pulverized limestone from their Dayton, Ohio cement works. During the reporting period, Southdown indicated that it was not willing to donate the limestone and pay for transportation costs, but would be willing to discuss supply and some contribution to the project. We are continuing to work with Southdown to negotiate limestone supply from Southdown. If these negotiations are not successful, limestone will be purchased based on competitive solicitation.

- **Technology Transfer Activities** - Increased management attention is focusing on the need to transfer to the utility community the results and findings of the demonstration. Undertook technology transfer activities including planning for the 1991 SO_2 Control Symposium. Activities planned include new posters highlighting the demonstration project, exhibition booth, and new marketing materials which describe the demonstration as on-going.

- **Schedule Change** - During August, a five-month, no-cost time extension was submitted to DOE for approval. This extension was needed as a result of delays in completing design activities and delays in receiving a formal construction permit from Indiana Department of Environmental Management. The time extension was approved.

- **Scope Increase** - A draft of a formal request to increase the project scope was submitted to DOE for preliminary review and comment. The scope increase is to add sorbent recycle and other process improvements to the LIFAC system to improve SO_2 capture another 5 to 10 percentage points. A formal request will be submitted during next reporting period after preliminary design and cost estimating is completed.

Engineering and Design (WBS 1.1.2)

During the last reporting period, all original design activities were completed with the exception of detail changes required as a result of vendor drawing reviews. During this reporting period, engineering activities were concentrated in three specific areas:

- **Vendor Drawing Reviews/Approvals** - Engineers continued to review mechanical and structural detail drawings including:

  - Limestone storage and transport equipment
  - Reactor slag crushing and transfer conveyors
  - Humidification nozzle assemblies
  - Limestone storage bin
  - Activation reactor
  - Limestone storage building structural details
  - Ductwork details
  - Reheat system

Based on these reviews, the engineering drawings were updated and/or corrected so that the most up-to-date information could be provided to the construction contractors for installation.

- **Redesign of Reactor Humidification Section** - During this period, most engineering activities centered around redesign of the reactor top section and its impact on all engineering disciplines including:

  - Redesign of the reactor vessel top to improve air flow and humidification

- Redesign of the water and air piping systems and nozzle headers for proper humidification
- Redesign of the inlet duct section to match the new reactor top
- Redesign and procurement of the expansion joint between the reactor and the ductwork
- Revisions to the electrical and instrumentation systems associated with the new reactor top
- Review and modification of the HVAC requirements
- Updating and correcting construction specifications

As the redesign efforts progressed, the engineering drawings were updated to incorporate the revised design. By the end of the reporting period, about 75 percent of the redesign work had been completed.

- **Preliminary Engineering of Scope Increase** - Engineers and estimators began to assemble layout drawings and construction estimates for process enhancements that include:

  - Addition of a secondary air system to improve limestone injection/dispersion in the boiler
  - Construction of the activation reactor and conveyors using stainless steel
  - Recycle of the spent sorbent from the ESP hoppers and reactor bottom to improve sorbent utilization and increase SO_2 capture
  - Improvements to the ESP to handle additional solids loading due to recycle of spent sorbent

These activities will be completed in the next reporting period so that a formal scope increase can be submitted to DOE for review and approval.

Long Lead Procurement (WBS 1.2.1A)

All long lead procurement activities were completed last reporting period. If a scope increase is approved, then additional long lead items will have to be procured, including the sorbent recycle equipment and possible ESP upgrade items.

Installation and Startup (WBS 1.2.2B)

No field construction activities occurred during this reporting period pending approval of the Construction Permit by Indiana Department of Environmental Management. Meetings were held with IDEM during the period to review the LIFAC process and discuss construction activities. Formal approval of the permit is expected next reporting period.

Although no field construction occurred this period, all remaining construction bid specifications were issued and contractors selected for field activities including:

- Insulation and cladding
- Structural steel erection
- Pile driving and foundations
- Electrical installation
- Piping and mechanical equipment installation
- Siding and roofing
- Instrumentation

Subcontracts will be issued during the next reporting period for all the above activities.

RP&L completed the arrangements to install the new equipment and controls for the new dry ash handling system. The complete system will be installed next reporting period.

Environmental Monitoring (WBS 1.2.3B)

Preliminary comments were received from DOE on the second draft of the EMP. Work on the EMP was placed on hold due to the project delays in schedule and the possible scope increase. The EMP activities will be reactivated during the first quarter of 1992 after the final draft of the Test Plan is completed.

Two other environmental activities continued during this period:

- A formal letter was prepared and submitted to IDEM describing the exothermic properties of LIFAC ash. Due to the better properties of

LIFAC ash compared to other SO_2 control systems, permission to dispose of LIFAC ash in any approved sanitary landfill was requested from IDEM. Also, budgetary estimates were developed by RP&L to compare alternative waste disposal sites.

- Numerous meetings and discussions were held with IDEM personnel to expedite the processing of a variance request submitted to allow RP&L to operate at current particulate emissions levels and to allow the operations of LIFAC with a sorbent recycle system if the scope increase is approved by DOE. Plans were being developed to have meteorological evaluations (dispersion modeling) conducted to demonstrate that RP&L's current particulate emission levels do not impact ambient air quality standards and that the 2800 hours of LIFAC operation over a 26-month period will also not contribute to impacting ambient air quality standards.

Progress on these two items will be monitored closely during the next reporting period to insure the startup of LIFAC on schedule.

FUTURE PLANS

During the next reporting period, emphasis will concentrate on the following activities:

- Complete redesign of the reactor humidification section
- Place all remaining subcontracts for field construction
- Receive the construction permit and expedite field activities
- Submit a formal request for a Scope Increase
- Procure all remaining equipment and instrumentation
- Receive a waste disposal permit for LIFAC ash and continue expediting the variance request
- Expedite detailed design and procurement of the sorbent recycle system if the Scope Increase is approved
- Finalize co-funding agreements with limestone supplier and coal supplier.

Also, during the next period continue the normal monthly reporting requirements of the Cooperative Agreement.

END

DATE
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6/12/92