CDOE21601N
Issue A

Low NOx/SOx Burner Retrofit for Utility Cyclone Boilers

Topical Report
Termination of LNSB Cyclone Retrofit Project

Reference Cooperative Agreement
DE-FC22-90PC89661

Patents Cleared by Chicago
on October 9, 1991

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CONTENTS

1.0 INTRODUCTION

On September 10, 1991, TransAlta Technologies, Inc. (TTI) gave formal notice to the Department of Energy (DOE) that the Low NOx/SOx Burner (LNSB) Cyclone Boiler Retrofit Project at Marion, Illinois would be terminated at the end of Budget Period I on September 30, 1991.

This report summarizes the reasons for this decision and presents the relevant documentation.

2.0 TERMINATION OF PROJECT

2.1 Additional Funding Required for Budget Period I

Notification of an additional funding requirement of $2,100,219 to complete Budget Period I was submitted to DOE by TransAlta on July 22, 1991. DOE agreement to provide $931,867 of this additional funding was sought. A copy of the notification of additional funding, request for cost-sharing and supporting documentation is attached as Appendix A.

2.2 Continuation Application

A Continuation Application for authorization to proceed with Budget Period II was submitted to DOE on July 24, 1991, together with a revised Project EAC of $26.2 million to take account of the extension of Budget Period I to September 30, 1991, Budget Period I cost overruns and the revised estimated costs for Budget Period II. A copy of the Continuation Application documents is attached as Appendix B. The Continuation Application was subject to the following conditions:

1. TransAlta having the unilateral right to stop demonstration testing when project costs reached $24.2 million and then begin restoration at an estimated total cost of $2.0 million, including all management and reporting activities.

2. Prior agreement with SIPC on the detailed scope of restoration work and a maximum total cost for all restoration work and associated activities which would not exceed the estimate of $2.0 million.

3. Receipt of results from the LNS Burner Heavy Oil Recovery Demonstration Project at Cold Lake in Alberta, Canada which support the basic theory of the LNS Burner.

4. Provision by DOE of additional funding for Budget Period I as requested in TransAlta's letter dated July 22, and 50% of the costs of Budget Period II.

5. The availability of additional funding of $3.0 million from other Participants.

6. Commencement of Budget Period II on October 1, 1991 to avoid additional increases in project costs which would result from further schedule delay.

7. Preliminary approval of the Continuation Application on the above conditions by August 31, 1991 with final approval by September 31, 1991.

TransAlta also handed to DOE a supplementary letter dated July 24, 1991, which discussed some of the factors involved in their assessment of the prudency of continuing the project. A copy of this letter is attached as Appendix C.

2.3 DOE Response to Continuation Application

By its letter dated August 20, 1991, DOE formally advised TransAlta that approval of the Continuation Application would be contingent upon:

1. A commitment by TransAlta to complete the project.

2. Limitation of DOE funding to 125% of its original share.

3. The arrangement by TransAlta of all additional funding required to complete the project.

4. The submission to DOE of successful results from the Cold Lake LNS-CAP Project.

A copy of this letter is attached as Appendix D.

2.4 Notice of Termination of Project

On September 10, 1991, TransAlta informed DOE that it was unable to obtain the additional funding required to complete Budget Period II and that the Cold Lake LNS-CAP Project was close to termination without confirmation of the technology. TransAlta's letter to DOE dated September 10, 1991, gave formal notice of termination of the Cyclone Boiler Retrofit Project, such termination to be effective at the end of Budget Period I on September 30, 1991. A copy of this letter is attached as Appendix E.

2.5 Announcement of Termination of Project

On September 17, 1991, DOE issued a press release announcing the termination of the LNSB Cyclone Retrofit Project. A copy of this document is attached as Appendix F.

Appendix A

TransAlta Technologies, Inc.

110 - 12th Avenue S.W., Box 1900, Calgary, Alberta, Canada T2P 2M1 Telephone: (403) 267-7692 Fax:(403) 267-3630

July 22, 1991

Dr. Gerard Elia
PETC Technical Project Manager
U.S. Department of Energy
Mail Stop 920-L
Building 120, Cochran Mill Road
Bruceton, PA
15236 USA

Dear Dr. Elia:

Reference: DOE Cooperative Agreement DE-FC22-90PC89661

Subject: Additional Funding Required for Budget Period I
Request for Cost Sharing by DOE

In accordance with Article IV(E) of the Cooperative Agreement and further to our letters dated March 26 and 28, 1991, we hereby give notice that additional funding is required to cover the cost of work in Budget Period I (BP I). We request formal agreement that DOE will share these additional costs.

The additional funds required to complete Budget Period I and the amount of cost-sharing requested from DOE are as follows:

Current (July 1991) EAC for Budget Period I	$11,100,219
Cooperative Agreement Budget Period I Limit	$9,000,000
Additional funds required to complete Budget Period I	$2,100,219
Additional DOE Share requested for Budget Period I (2,100,219 x 44.37%)	$931,867

The following exhibits are attached in support of this application:

- Exhibit #1: Additional funds required to complete Budget Period I.
  - Fig. 1 Project EAC for BP I - July 1991
  - Fig. 2 Project EAC for BP I - June 1990
  - Fig. 3 Variation in EAC for BP I between June 1990 and July 1991
  - Fig. 4 Additional Funding Requirements for BP I
- Exhibit #2: Explanation of requirement for additional funds.

On March 26, 1991 we gave notice of the additional funds which were then required to complete Budget Period I in accordance with the March 1991 EAC. Our letter dated March 28, 1991 gave a detailed explanation of these additional funding requirements and requested a positive indication that the DOE would cost-share. By letter dated April 18, 1991, Mr. R.D. Rogus authorized us to incur the additional costs at our own risk and advised that these costs could not be invoiced until after negotiation, finalization and execution of an amendment to the Cooperative Agreement. This has not yet occurred.

The requirement for additional funds presented in this application is based on completion of Budget Period I on September 30, 1991. Further delay beyond that date will again increase the requirement for additional funding. We require your confirmation that the DOE will share in the additional funds required to complete Budget Period I before we are prepared to proceed to Budget Period II and therefore request your timely approval of this cost sharing.

Overall project costs have increased. An explanation of the Budget Period II cost increases will be provided in the Continuation Application which is currently being prepared.

Yours very truly,

A.C. Moon
Program Director

Attachments

c.c.: Mr. W.R. Mundorf, DOE

TransAlta Technologies, Inc.
Low NOx/SOx Burner Retrofit for Utility Cyclone Boilers
Project EAC For Budget Period I - July 1991

WBS	WBS Element	BP I					
		Bechtel	Riley	SIPC	TTI	Others	Total
Preaward							
010	Management	37,763	0	13,707	653,021	0	704,491
020	Engineering	278,997	52,894	28,828	133,159	2528	496,406
040	Reporting	204,860	0	0	83	0	204,943
	Total	***521,620***	***52,894***	***42,535***	***786,263***	***2,528***	***1,405,840***
Phase 1							
110	Management	188,357	1,380	10,960	417,501	0	618,198
120	Engineering	997,814	675,054	30,646	327,460	23,860	2,054,834
130	Permitting	12,248	0	0	2,905	0	15,153
140	Reporting	62,420	0	0	213,077	0	275,497
	Total	***1,260,839***	***676,434***	***41,606***	***960,944***	***23,860***	***2,963,683***
Phase 2							
210	Management	77,143	4,555	5,506	183,827	0	271,031
220	Proc/Fab	989,629	2,312,052	388	0	0	3,302,069
230	Construction	1,722,602	20,048	538,114	0	0	2,280,764
240	Reporting	10,318	0	0	67,840	0	78,158
250	Startup	0	64,754	7,500	0	0	72,254
260	Engg. Support	0	0	0	0	0	0
	Total	***2,799,692***	***2,401,409***	***551,508***	***251,668***	***0***	***6,004,277***
Phase 3							
310	Management	38,526	0	0	2,071	0	40,597
320	Demo. Prog.	68,965	131,777	0	0	0	200,742
330	Restore	0	0	0	0	0	0
340	Reporting	7,215	0	0	0	0	7,215
350	Baseline Test	463,203	0	10,759	0	0	473,962
360	Maintenance	3,904	0	0	0	0	3,904
	Total	***581,813***	***131,777***	***10,759***	***2,071***	***0***	***726,420***
Project Totals		***5,163,964***	***3,262,514***	***646,408***	***2,000,945***	***26,388***	***11,100,219***

Exhibit 1
Figure 1

TransAlta Tec[illegible]logies, Inc.
Low NOx/SOx Burner Retrofit for Utility Cyclone Boilers
Project EAC For Budget Period I - June 1990

WBS	WBS Element	BP I Bechtel	Riley	SIPC	TTI	Others	Total
Preaward							
010	Management	32,269	0	11,056	548,636	0	591,961
020	Engineering	456,443	41,863	20,221	117,453	2,528	638,508
040	Reporting	0	0	0	0	0	0
	Total	***488,712***	***41,863***	***31,277***	***666,089***	***2,528***	***1,230,469***
Phase 1							
110	Management	54,000	0	0	356,908	0	410,908
120	Engineering	674,217	361,314	68,900	142,605	23,860	1,270,896
130	Permitting	6,720	0	2,000	0	0	8,720
140	Reporting	48,000	13,683	0	12,480	0	74,163
	Total	***782,937***	***374,997***	***70,900***	***511,993***	***23,860***	***1,764,687***
Phase 2							
210	Management	32,000	0	0	285,224	8,659	325,883
220	Proc/Fab	798,000	2,116,657	0	0	0	2,914,657
230	Construction	1,118,110	233,209	96,000	0	0	1,447,319
240	Reporting	33,000	13,683	0	5,760	0	52,443
250	Startup	0	0	0	0	0	0
260	Engg. Supp	0	0	0	0	0	0
	Total	***1,981,110***	***2,363,549***	***96,000***	***290,984***	***8,659***	***4,740,302***
Phase 3							
310	Management	71,120	0	0	0	0	71,120
320	Demo. Prog.	104,909	0	129,400	0	0	234,309
330	Restore	0	0	0	0	0	0
340	Reporting	20,000	0	0	0	0	20,000
350	Baseline Test	615,192	21,891	196,000	0	0	833,083
360	Maintenance	0	0	0	0	0	0
	Total	***811,221***	***21,891***	***325,400***	***0***	***0***	***1,158,512***
Project Totals		***4,063,980***	***2,802,300***	***523,577***	***1,469,066***	***35,047***	***8,893,970***

Exhibit 1
Figure 2

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TransAlta Technologies, Inc.
Low NOx/SOx Burner Retrofit for Utility Cyclone Boilers
Variations Between July 1991 and June 1990
Budget Period I Project EAC

Exhibit 1
Figure 3

WBS	WBS Element	BP I Bechtel	Riley	SIPC	TTI	Others	Total
Preaward							
010	Management	5,494	0	2,651	104,385	0	112,530
020	Engineering	-177,446	11,031	8,607	15,706	0	-142,102
040	Reporting	204,860	0	0	83	0	204,943
	Total	***32,908***	***11,031***	***11,258***	***120,174***	***0***	***175,371***
Phase 1							
110	Management	134,357	1,380	10,960	60,593	0	207,290
120	Engineering	323,597	313,740	-38,254	184,855	0	783,938
130	Permitting	5,528	0	-2,000	2,905	0	6,433
140	Reporting	14,420	-13,683	0	200,597	0	201,334
	Total	***477,902***	***301,437***	***-29,294***	***448,951***	***0***	***1,198,996***
Phase 2							
210	Management	45,143	4,555	5,506	-101,397	-8,659	-54,852
220	Proc/Fab	191,629	195,395	388	0	0	387,412
230	Construction	604,492	-213,161	442,114	0	0	833,445
240	Reporting	-22,682	-13,683	0	62,080	0	25,715
250	Startup	0	64,754	7,500	0	0	72,254
260	Engg. Support	0	0	0	0	0	0
	Total	***818,582***	***37,860***	***455,508***	***-39,316***	***-8,659***	***1,263,975***
Phase 3							
310	Management	-32,594	0	0	2,071	0	-30,523
320	Demo. Prog.	-35,944	131,777	-129,400	0	0	-33,567
330	Restore	0	0	0	0	0	0
340	Reporting	-12,785	0	0	0	0	-12,785
350	Baseline Test	-151,989	-21,891	-185,241	0	0	-359,121
360	Maintenance	3,904	0	0	0	0	3,904
	Total	***-229,408***	***109,886***	***-314,641***	***2,071***	***0***	***-432,092***
Project Totals		***1,099,984***	***460,214***	***122,831***	***531,879***	***-8,659***	***2,206,249***

Note: (+) numbers indicate increase in cost, while (-) numbers indicate decrease in costs.

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REVISED VAR BY BP-WBS

TransAlta Technologies, Inc.
Low NOx/SOx Burner Retrofit for Utility Cyclone Boilers
Additional Funding Requirements for Budget Period I

Project Phase	Invoiced Costs: DOE Invoices	Invoiced Costs: TransAlta Share	Invoiced Costs: Project Costs Invoiced	Project Costs Not Invoiced	Project Costs: Jul-91 EAC	Project Costs: Jun-90 EAC	Approved Budget	Additional Funds Required
Preaward	532,392	667,608	1,200,000	205,840	1,405,840	1,230,500	1,200,000	205,840
Phase 1	887,400	1,112,600	2,000,000	963,683	2,963,683	1,765,000	2,000,000	963,683
Phase 2	2,348,754	2,944,810	5,293,564	710,713	6,004,277	4,740,000	4,876,000	1,128,277
Phase 3	224,347	281,280	505,627	220,793	726,420	1,159,000	924,000	-197,580
Total	3,992,893	5,006,298	8,999,191	2,101,029	11,100,220	8,894,500	9,000,000	2,100,220

Note: **EAC = Estimate At Completion**

EXHIBIT 1
FIGURE 4

EXHIBIT 2

Explanation of Requirement for Additional Funds for Budget Period I

Introduction:

Completion of Budget Period I(BP I) was delayed from January 1991 to September 1991 through three extensions. The first extension delayed Budget Period I completion to the end of March 1991, the second extension to the end of June 1991, and the third extension to the end of September 1991. A comparison of the baseline schedule and the revised schedule for BP I is shown in the attached Project Schedule. The delays in completing BP I were due to:

1) A longer than anticipated Preaward Phase.

2) Better understanding of project requirements. Changes in project scope and design were needed as the preliminary concepts were translated into detailed engineering.

3) Delays in NEPA approval, which necessitated a slow down in project expenditure and progress to contain TransAlta's(TTI) financial risk. NEPA approval is a prerequisite for DOE sharing any project costs for detailed engineering and construction. NEPA approval was granted at the end of March 1991.

   TransAlta performed some work without NEPA approval and therefore at its own risk and this work prevented delays that would have been even longer.

4) Delays by TTI in completion of DOE reporting requirements. The man-hours needed to meet the level of reporting requirements by DOE was much greater than originally planned.

5) Unscheduled inspection and repairs to the boiler.

6) A slow down in engineering and construction to take full advantage of all relevant design and operating information from TTI's Heavy Oil Recovery (HOR) LNS Burner Demonstration at Cold Lake, Alberta. Areas such as the fuel injection and air port design, and selection of refractory will benefit from additional experience and testing planned for July and August 1991.

7) Continuing work to refine the design of the slag screen and its operating envelope and doing further tests of the coal splitter design for Cyclone retrofit.

8) The process of acquiring a boiler modelling program and a fluid dynamics program incorporating LNS Burner criteria which were not available from conventional boiler manufacturers. These models will be used to run final design checks of the Burner/boiler integration, boiler performance with the LNS Burner, Burner fuel, and air injection and mixing.

Cost Comparisons:

The revised Estimate at Completion (EAC) for BP I as of July, 1991 is shown in Exhibit 1, Figure 1. The initial EAC for BP I as presented in the first Management Report (June 1990) to the DOE is shown in Exhibit 1, Figure 2. The comparison between the July, 1991 EAC and June, 1990 EAC is presented in Exhibit 1, Figure 3.

The revised EAC of $11,100,219 is an increase of $2,206,249 over the budget of $8,893,970 reported in the June, 1990 DOE Budget Information Form included with the Management Reports, and an invoice of $2,100,219 over the BP I Limit of $9,000,000 in the Cooperative Agreement.

Presented in the following sections are summaries of the cost changes for each Phase by Level 2 Work Breakdown Structure (WBS). The changes are further broken out by participating organizations where appropriate.

Preaward

Preaward costs increased by $175.4K as a result of a longer than anticipated Preaward Phase.

Bechtel costs increased by $32.9K due to tasks associated with delays in completing the Cooperative Agreement. Conceptual and other technical support for completion of Demonstration Program Plan, coordination of the Program with the Environmental Monitoring Plan and EPRI requirements were transfered to WBS 040 (Reporting). The reporting costs increased to resolve issues relating to the Environmental Information Volume and Environmental Monitoring Plan.

Riley costs increased by $11K due to extended conceptual design and other technical support.

SIPC costs increased by $11.2K due to higher management costs to complete the Cooperative Agreement and associated business and management issues.

TTI costs increased by $120.2K due to higher legal and management costs to complete the Cooperative Agreement and to resolve business, management, funding and project administration issues.

Phase I - Design and Permitting

WBS 110, Management -

Costs have increased by $207.3K. This reflects an extension of eight months to Phase I management activities. Additional manhours were assigned for project administration to meet the extended project schedule.

The TTI estimates decreased initially by $14.7K primarily due to transfer of the accounting and reporting functions to WBS 140, however, this was offset by an increase of $60.6K due to the extended schedule.

WBS 120, Engineering -

Costs have increased by $783.9K.

Bechtel costs have increased by $323.6K due to delays in project schedule, SIPC initiated changes, and the resulting additional scope of work. This resulted in unbudgeted design changes such as Seismic 3 steelwork design imposed by the Uniform Building Code, relocation of bucket elevator, addition of air blast cannons, oxygen analyzers, acoustic pyrometry, painting, electrical equipment and instrumentation changes.

Riley costs have increased by $313.7K which reflect delays in project schedule, SIPC initiated changes and the associated increase in engineering. These include additions to the DCS control system, revised burner design, boiler modelling, increase in instrumentation such as thermocouples and flow elements, additional dampers and ductwork, increased boiler ports and access doors, and development of the slag screen.

SIPC costs decreased by $38.2K as a result of an underrun in their estimated costs to date.

TTI costs increased by $184.9K due to the extensions and changes in the project schedule and costs related to the changes in scope of work. These changes include burner and slag screen development, boiler modelling, acoustic pyrometry, and additional input for the DCS control system.

WBS 130, Permitting -

Costs increased by $6.4K which primarily reflects increased work for additional responses and supply of technical information to government agencies, in support of the permitting process.

WBS 140, Reporting -

Costs increased by $201.3K.

Bechtel costs increased by $14.4K, to support reporting originally budgeted for Riley.

TTI costs have increased by $200.6K, due to the extended Phase I; unbudgeted increase in resources to meet the level of reporting required by the DOE; a better understanding of the work involved in meeting the reporting requirements. The budget for the accounting function was also transfered from WBS 110, Management to WBS 140, Reporting.

Phase II - Construction and Startup

WBS 210, Management -

Overall costs decreased by $54.8K.

Bechtel costs increased by $45.1K due to changes in the scope of work and delays in the project schedule.

TTI costs decreased by $101.4K because the bulk of project support in Phase I was defered until BP II and the accounting function was transfered to WBS 240 (Reporting).

Costs for Others (Dykema Engineering and Griffin Inc.) decreased by $8.6K as their costs were transfered to BP II, WBS 260 (Engineering Support).

WBS 220, Procurement and Fabrication -

Costs for this task have increased by $387.4K.

Bechtel costs increased by $191.6K for the purchase of additional steelwork to meet the Seismic 3 building design code and relocation of the bucket elevator and the coal feeders; changes to the electrical equipment, the bunker, the silo, the fuel piping, and the instrumentation; increased cabling, raceways, and pipe supports; additional painting, and addition of air flow meter mounting and acoustic pyrometry to the scope of work.

Riley costs increased by $195.4K to cover design changes to the burner and fuel preparation systems; change in the burner materials from Corten to stainless steel; addition of the DCS control system, furnace ports and access doors; changes to the coal dust collectors, and instrumentation.

WBS 230, Construction -

Construction costs increased by $833.4K.

Bechtel costs increased by $604.5K to cover additional manhours for delays in the project schedule, and to account for the increased scope of work resulting from revisions in WBS 120 (Engineering) and WBS 220 (Procurement and Fabrication).

Riley costs decreased by $213.1K because the bulk of Burner construction and completion was defered until BP II.

SIPC costs have increased by $442.1K to reflect increases in the purchased power and opportunity costs incurred resulting from the actual and anticipated outages of Unit #4 at Marion and the delays in completing BP I.

WBS 240, Reporting -

Overall costs have increased by $25.7K.

Bechtel and Riley costs have decreased by $22.7K and $13.7K respectively, which reflects the slow down and delay in construction activities. The bulk of the Phase II reporting was defered until BP II.

TTI costs have increased by $62K because the level of effort required to meet the DOE reporting requirements was higher than budgeted and the accounting function was transfered from WBS 210 (Management).

WBS 250, Start up -

Costs have increased by $72.2K.

Riley costs have increased by $64.7K to account for start up activities of the Baseline Testing (WBS 350). These costs were incorrectly coded and will be transfered to WBS 350 in the subsequent months.

SIPC costs increased by $7.5K to bring forward the hiring of additional operators in preparation for start up of the project.

WBS 260, Engineering Support -

This is an additional WBS item set up for Bechtel, Dykema Engineering and Griffin Inc. for their engineering field support during construction in BP II.

Phase III - Operation and Disposition

WBS 310, Management -

Overall costs have decreased by $30.5K.

Bechtel costs have decreased by $32.5K to account for slow down and delays in the approved project activities.

WBS 320, Demonstration Program -

Costs have decreased by $33.5K,

Bechtel costs have decreased by $35.9K as activities were defered until BP II.

Riley costs have increased by $131.8K to account for the additional Baseline Testing (WBS 350). These costs were incorrectly coded and will be transfered to WBS 350 in the subsequent months.

SIPC costs decreased by $129.4K as operator training was defered until BP II.

WBS 340, Reporting -

Costs have decreased by $12.7K. This is an underrun in Bechtel costs in completing the data analysis required for the Baseline Test Report.

WBS 350, Baseline Test -

Costs have decreased by $359.1K for this testing. This will be offset in the subsequent months by $196.5K of Riley costs incorrectly coded to other WBS codes. The overall decrease will therefore be adjusted to $162.6K.

Bechtel and SIPC costs have decreased by $151.9K and $185.2K respectively due to underruns in the completed testing phase.

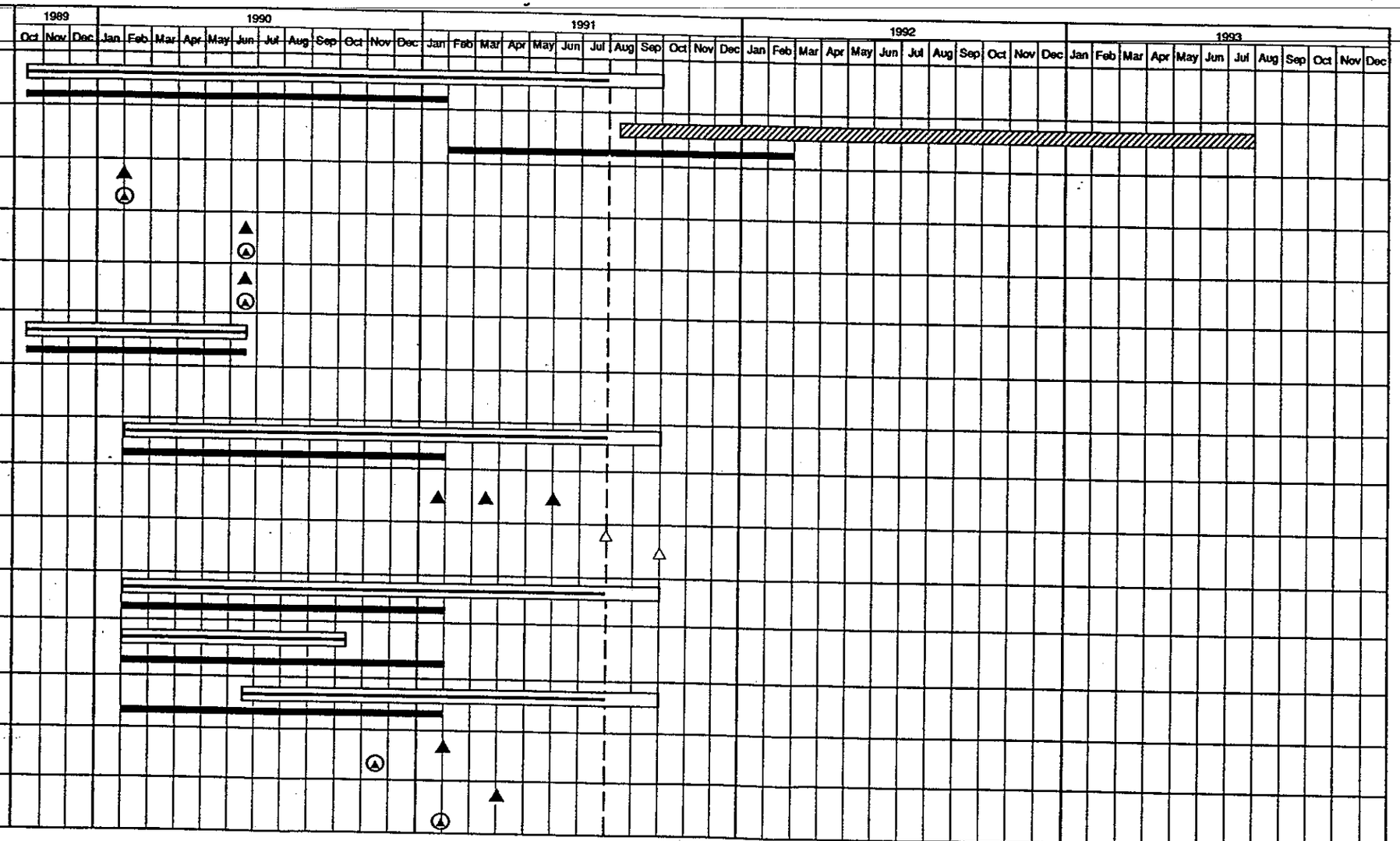
WBS 360, Maintenance -

These costs have increased by $3.9K to account for an increase in plant maintenance prior to the Baseline testing.

Exhibit 2
Project Schedule

TransAlta Technologies, Inc.
Low NOx/SOx Burner Retrofit for Utility Cyclone Boilers
Project Schedule

ID	WBS	Name
1	0.1	Budget Period #1
2	0.2	Budget Period #2
3	0.3.1	Project Engineering Start
4	0.3.2	Project Kickoff Meeting
5	0.3.3	Cooperative Agreement
6	0.4	Phase 0 - Preaward
7	1.0	Phase 1 - Design & Permitting
8	1.1	Management
9	1.1.1	No Cost Extension
10	1.1.2	Continuation Application - Approval -
11	1.2	Engineering
12	1.3	Permitting
13	1.4	Reporting
14	1.4.1	Project Review #1
15	1.4.2	Project Review #2

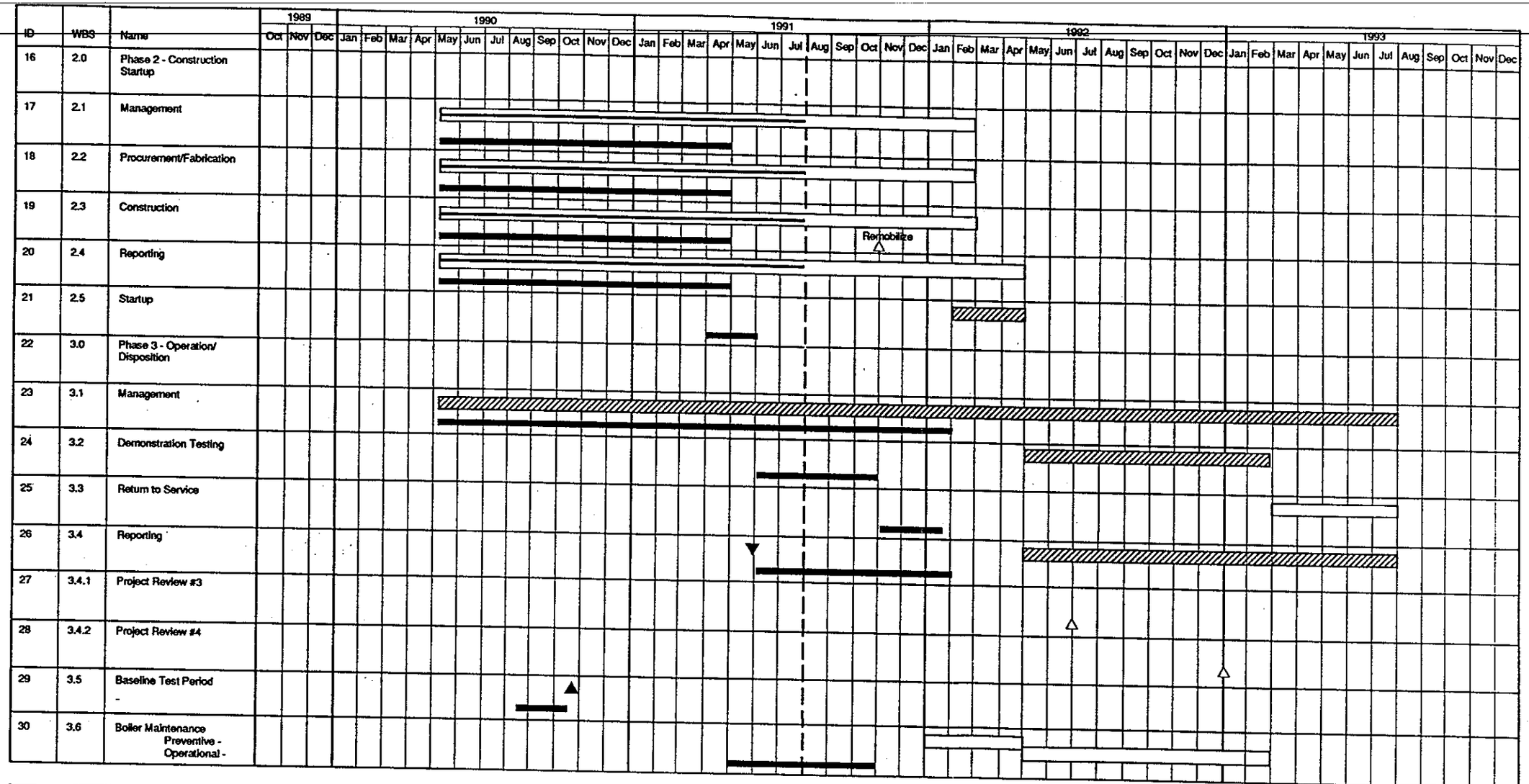


Project DOE Cyclone Retrofit
Date: July 22, 1991
Approved: _____

Scheduled - Critical
Scheduled - Noncritical
Scheduled - Milestone
Completed Milestone
Progress
Baseline
Planned Milestone

Exhibit 2
Project Schedule

TransAlta Technologies, Inc.
ow NOx/SOx Burner Retrofit for Utility Cyclone Boilers
Project Schedule



Appendix B

TransAlta Technologies, Inc.

110 - 12th Avenue S.W., Box 1900, Calgary, Alberta, Canada T2P 2M1 Telephone: (403) 267-7692 Fax:(403) 267-3630

July 24, 1991

Dr. Gerard Elia
PETC Technical Project Manager
U.S. Department of Energy
Mail Stop 920-L
Building 120, Cochran Mill Road
Bruceton, PA
15236 USA

Dear Dr. Elia:

Reference: DOE Cooperative Agreement DE-FC22-90PC89661

Subject: Continuation Application and Additional Funding Requirement for Budget Period II

In accordance with Article III (C) (2) of the Cooperative Agreement, we hereby apply for DOE authorization to proceed to Budget Period II (BP II).

As required by Attachment C.7 of the Cooperative Agreement, we present the following exhibits in support of this application:

- Exhibit 1: Project schedule and Activities Planned for Budget Period II.
- Exhibit 2: Budget for Budget Period II.
- Exhibit 3: Project Evaluation Report, Issue B (to be submitted by August 7, 1991).

Exhibit 1 presents the revised project schedule for Budget Period II in comparison with the baseline schedule. The startup period has been increased from two to three months and the demonstration test period from six to ten months. These increases in the startup and demonstration schedules reflect changes in the scope of work, a better understanding of project requirements, and experience gained from the LNS Burner Heavy Oil Recovery Demonstration Project at Cold Lake,

Alberta, Canada. The project activities planned for Budget Period II are described under the level two task headings of the Work Breakdown Structure (WBS) which forms part of the Cooperative Agreement.

Exhibit 2 presents tables showing:

- The July 1991 Estimate at Completion (EAC) for BP II by WBS and supplier.
- The original (June 1990) EAC for BP II by WBS and supplier.
- A comparison between the July 1991 and June 1990 EAC by WBS and supplier.
- A summary of additional funds required to complete BP II. This summary is in accordance with the five categories identified by the Department of Energy at the meeting with TransAlta on February 14, 1991.

Exhibit 2 is also supported by a description of changes, by WBS task level and supplier, between the July 1991 and June 1990 cost estimates.

Exhibit 3, the Project Evaluation Report Issue B, reviews the work accomplished in Budget Period I and evaluates progress in relation to the criteria which were established for that purpose in the Project Evaluation Plan.

You will note from Exhibit 2 that our current Project EAC cost is $26.2 million, comprising $11.1 million to complete Budget Period I (described in TTI letter of July 22, 1991 requesting additional funding for BP I) and $15.1 million to complete Budget Period II. This EAC is based on completing the test program as described in the Statement of Work of the Cooperative Agreement. Please note all Exhibits are based on this current Project EAC cost of $26.2 million.

We are also prepared to complete the project within an alternative $24 million EAC cost which supports a reduced test program. In this case, we would be prepared to increase the project funding to extend the reduced program by an amount equal to the revenues obtained from the generation of power during the demonstration, net of TTI purchased power and opportunity costs.

We are therefore prepared to proceed to Budget Period II with the following conditions:

1. TransAlta has the unilateral ability to stop demonstration testing when the project costs reach $24.2 million and then begin restoration and associated management and reporting work which is estimated to be $2.0 million. This is required to ensure that TTI can control their total expenditures. The Project would therefore be limited to a total cost of $26.2 million. (In the case of the alternative EAC of $24 million, the demonstration would stop when costs reach $22.0 million).

2. TTI obtain a prior SIPC agreement on a detailed scope of work and a not to exceed a price limit for all restoration scenarios. This is required to ensure the restoration costs are covered within the $2 million assigned for restoration and associated management and reporting work referred to above.

3. The results from the LNS Burner Heavy Oil Recovery Demonstration Project in Cold Lake, Alberta, Canada support the basic theory of the LNS Burner.

4. The DOE provide additional funding in the amount of:
   a) $978,912 for Budget Period I as requested in TransAlta's letter dated July 22, 1991.
   b) 50% of Budget Period II costs to a maximum funding of $7.55 million in the case of the Project EAC of $26.2 million ($6.55 million for the alternative EAC of $24 million).

5. $3 million of additional funding is obtained from other Participants ($2 million becomes available from other Participants in the alternative EAC case of $24 million). We are currently attempting to obtain these additional funds.

The original Project had an estimate of $13.6 million for which the DOE was to contribute $6.8 million (50%) and TransAlta's net share was $1.7 million (13%). The current EAC of $26.2 million includes a maximum DOE share of $12.5 million (48%) and TransAlta share of $5.6 million (21%). These figures demonstrate that TransAlta is accepting more than its proportional share of the cost increases.

This application and associated Project EAC is based on starting Budget Period II on October 1, 1991 and any delay would increase Project costs. Therefore, in order to proceed with the Project, we would require a preliminary indication of approval of this Continuation Application by August 31, 1991, with a final approval by September 30, 1991.

Please contact Bryan Simonson or me if you have questions or require clarification on any of the items in this letter. I look forward to discussing this matter when we meet on Thursday, July 25, 1991.

Yours very truly,

A.C. Moon
Program Director

c.c.: Mr. W.R. Mundorf, DOE

Exhibit 1

Project Schedule and Activities Planned for Budget Period II

Project Schedule:

Revised plan for the various activities are shown in the attached Project Schedule.

Start of Budget Period II(BP II) was delayed from February 1991 to October 1991 through three extensions. The first extension delayed the start to February 1, 1991, the second extension to July 1, 1991, and the third extension to October 1, 1991. A comparison of the baseline schedule and the revised schedule for BP II is shown in the attached Project Schedule. BP II was revised to increase the startup period to three months and demonstration to ten months.

The revisions in completing BP II are due to:

1) Better understanding of project requirements.

2) Changes in scope and design.

3) Revised construction schedule.

4) Longer startup and demonstration schedule.

Planned Project Activities

Planned project activities for Budget Period II for each Phase II and Phase III Work Breakdown Structure (WBS) component are as follows:

Phase II - Construction and Startup

WBS 210 - Management

This activity will continue from Budget Period I, and includes monitoring and control of project costs and schedule, update of project and Phases II and III plans, and holding technical and progress reviews as required. This activity will be completed by February 29, 1992.

WBS 220 - Procurement and Fabrication

A majority of the procurement and fabrication was completed in Budget Period I. However, certain key components such as the LNS Burner fabrication and selection and procurement of the burner refractory will

be carried out in the first 2 months of Budget Period II. Other procurement will be completed in support of the construction schedule and field installation in WBS 230.

WBS 230 - Construction

Site construction will recommence with full mobilization of Bechtel and Riley Stoker field forces on November 1, 1991. A one month delay is anticipated in the release of final LNS Burner fabrication drawings and delivery of the LNS Burners to site, which will extend the retrofit construction into February 1992. The major areas of the plant retrofit installation to be completed include the LNS Burner, boiler pressure part modifications, boiler repairs and maintenance, final ductwork, electrical equipment and wiring, DCS control system and wiring, and local instrumentation. Construction will be completed by February 29, 1992.

WBS 240 - Reporting

Phase II reporting will continue into Budget Period II until the completion of Startup on April 30, 1992. All DOE reports will be issued as required by the Cooperative Agreement.

WBS 250 - Startup

Startup will commence February 1, 1992 and be completed by April 30, 1992. This activity includes checkout of the retrofitted Host Unit, preparation of O&M manuals, cold system tests, training of plant personnel, and preparation and testing of all systems prior to demonstration testing (WBS 320). The schedule has been extended by one month based on a better understanding of startup and shakedown requirements gained at the LNS Burner Heavy Oil Recovery Demonstration Project at Cold Lake, Alberta, Canada.

WBS 260 - Engineering Supports

This is an additional activity for Bechtel, Dykema Engineering and Griffin Inc. to account for engineering support of the field during transfer from construction into startup and during the startup.

Phase III - Operation and Disposition

WBS 310 - Management

This activity will continue throughout Budget Period II until completion of the project on July 31, 1993. Ongoing work will be monitored against the revised project budget and schedule. Two Progress Review meetings will be held in June 1992 and December 1992 respectively.

WBS 320 - Demonstration Testing

Demonstration testing will commence on May 1, 1992 and continue for ten months until February 28, 1993. The schedule has been extended to 10 months based on experience gained at the LNS Burner Heavy Oil Recovery Demonstration Project at Cold Lake, Alberta. Activities to support the Demonstration will include:

- Instrument and control modification and review.
- Process development and revisions to demonstrate the Burner.
- DCS program changes and trouble shooting.
- Process refinement, testing and any resulting engineering modifications.
- Procurement, fabrication and installation services to modify equipment to better fit demonstration requirements.
- Repair of failure of balance of plant equipment in the plant envelope under project control and responsibility.
- Twenty-four hour retrofit operation.

- Consultant support of engineering, testing and refinement of process.

WBS 330 - Return to Service

The identification and implementation of a plan to return the Host Unit to service, based on a prior SIPC agreement on scope of work and a not to exceed price will be carried out after completion of demonstration testing, through the March 1 to July 1, 1993 time period.

WBS 340 - Reporting

The reporting for Phase III will commence May 1, 1992 and be completed by July 31, 1993. In addition to DOE reporting requirements, the activity includes issue of the Final Project deliverables.

WBS 350 - Baseline Testing

This activity was essentially completed during BP I, however some additional testing work will be undertaken to test the impact of the Burner on the existing boiler.

WBS 360 - Boiler Maintenance

This WBS activity has been added to capture the ongoing plant maintenance required during demonstration testing (previously included under WBS 320), plus identify the plant preventative maintenance carried out in support of reasonable baseload availability for the Host unit. Preventative maintenance will be carried out in parallel with boiler retrofit modifications in WBS 230 in the January to April 1992 time frame. Operational maintenance will be performed during the demonstration test period, May 1992 to February 1993.

Low NOx/SOx Burner Retrofit for Utility Cy[illegible]ne Boilers
Project Schedule

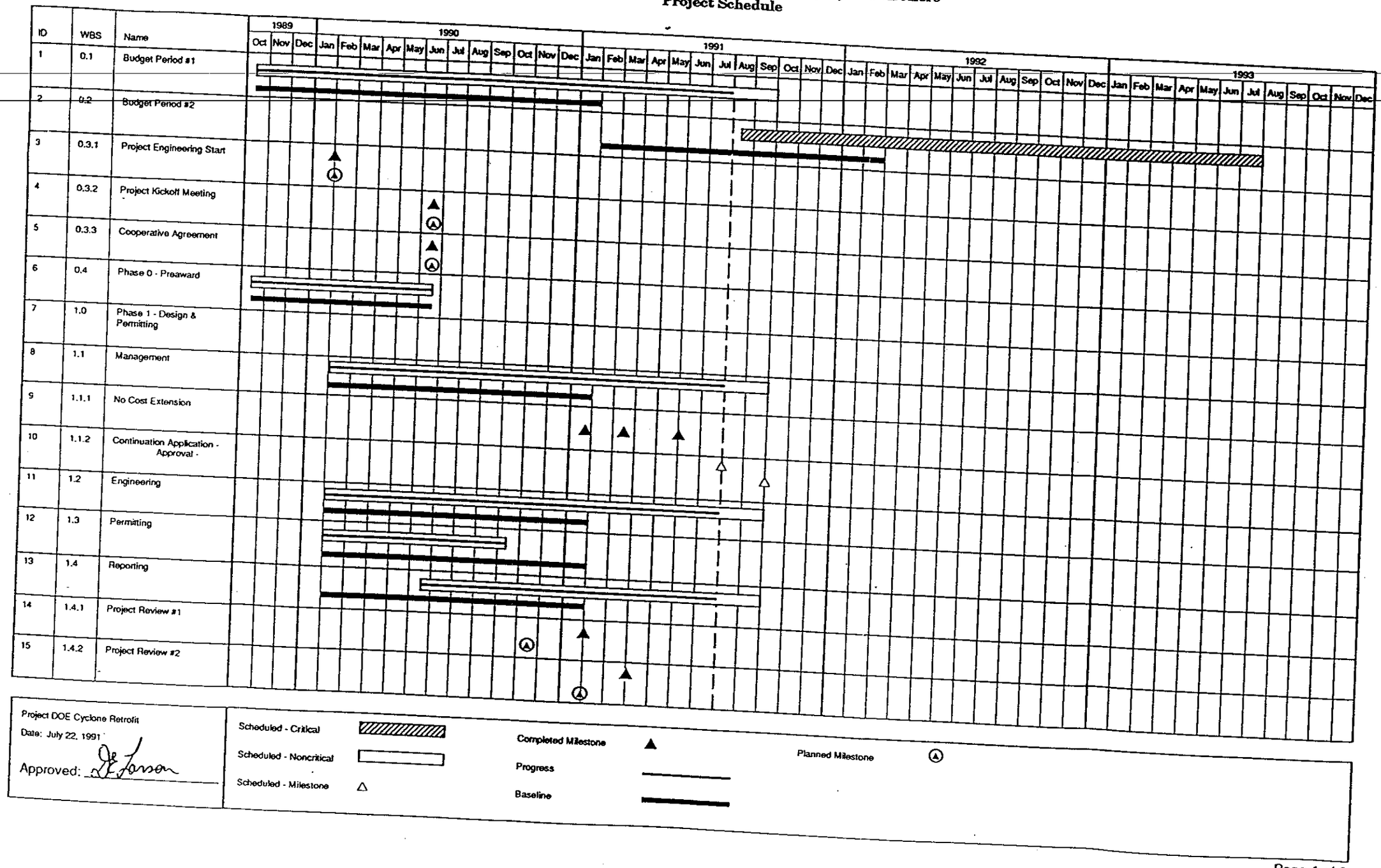


Exhibit 1
Project Schedule

...w Technologies, Inc.
...ow NOx/SOx Burner Retrofit for Utility Cyclone Boilers
Project Schedule

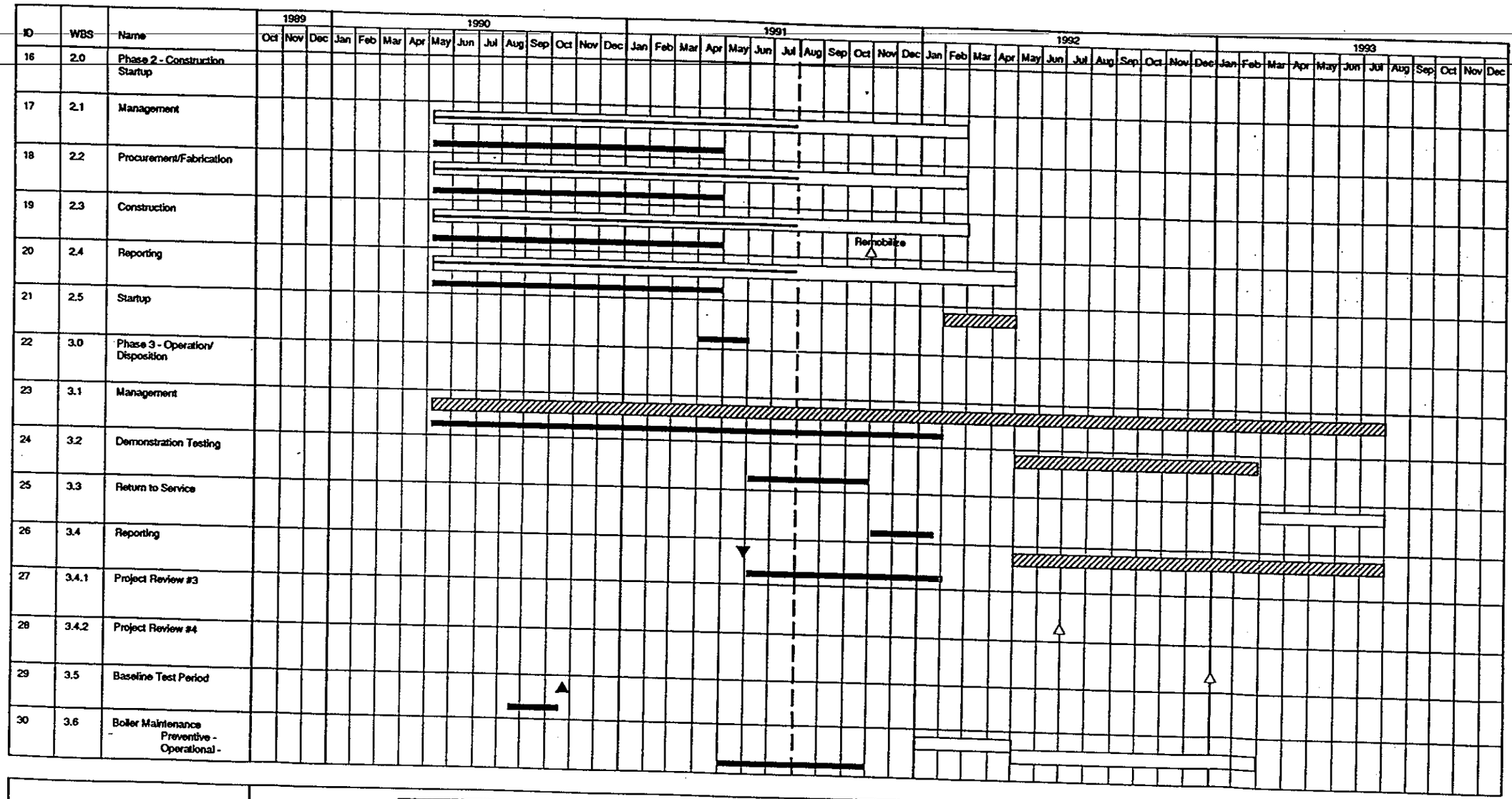


Exhibit 2

Budget for Budget Period II

The Estimate at Completion (EAC) for Budget Period II, as of July, 1991, is shown in Figure 1.

The initial EAC for BP II as presented in the first Management Report (June 1990) to the DOE is shown in Figure 2.

The comparison between the June, 1990 BP II EAC and July, 1991 BP II EAC is presented in Figure 3 as a variation report.

The additional funding requirements for Budget Period II are shown in Figure 4 using the five-category breakdown of costs which was requested by the DOE at a meeting with TTI on February 14, 1991.

The revised EAC of $15,060,507 is an increase of $8,546,809 over the original budget of $6,513,698 presented in the June, 1990 Budget Information Form included in Management Reports.

Summary of Cost Changes

Presented in the following sections are summaries of the cost changes for each Phase by Level 2 Work Breakdown Structure (WBS). The changes are further broken out by participating organizations where appropriate. The changes in cost estimates are also shown in Figure 3.

Phase I - Design and Permitting

WBS 110, Management -

Costs have decreased by $2K. This is a decrease in Bechtel costs, primarily due to transfer of costs from BP II to BP I to account for delays in the project schedule.

WBS 120, Engineering -

Costs have decreased by $45.8K.

Bechtel costs have decreased by $53.7K due to changes in the project schedule and transfer of costs to WBS 260 (Engineering Support).

Riley costs have increased by $14.9K to reflect delays in the project schedule and the increased engineering support required to accommodate changes in the scope of work.

SIPC costs decreased by $7K; this reflects an underrun in their estimated costs to date.

WBS 140, Reporting -

Costs decreased by $7.6K. Bechtel and Riley decreased by $3K and $4.5K respectively due to changes in the project schedule and transfer of costs to BP I.

Phase II - Construction and Startup

WBS 210, Management -

Overall costs decreased by $23.1K.

Bechtel costs increased by $57.7K due to delays in the project schedule and changes in the scope of work.

TTI costs decreased by $21.7K because some of the project support in Phase I was deferred until BP II and the accounting function was transfered to WBS 240 (Reporting).

Costs for Others (Dykema Engineering and Griffin Inc.) decreased by $12.7K as the costs were reassigned to WBS 260 (Engineering Support) to reflect their role during construction startup.

WBS 220, Procurement and Fabrication -

Costs for this task have increased by $589.1K.

Bechtel costs increased by $131.2K for the additions of air flow meter mounting and acoustic pyrometry to the scope of work and the delays in project schedule .

Riley's costs increased by $457.9K. This accounts for delays in release of Burner fabrication, changes in design and scope of work, cost overruns and additional costs anticipated for the refractory.

WBS 230, Construction -

Costs increased by $2,449.3K.

Bechtel costs have increased by $1,301.6 because of delays in the project schedule, and the increased scope of work detailed in WBS 120 (Engineering) and (Procurement and Fabrication).

~~Riley costs have increased by $828.6K due to the deferral of Burner~~ construction until BP II, the increased scope of work associated with changes in WBS 120 (Engineering) and 220 (Procurement and Fabrication) and additional boiler maintenance requirements.

SIPC costs have increased by $319K to reflect higher purchased power and opportunity costs resulting from anticipated outages of Unit #4 at Marion, a longer BP II with subsequent additional opportunity and purchased power costs, and labour costs to install the refractory selected for the lower furnace walls.

WBS 240, Reporting -

Overall costs have increased by $157.6K.

Bechtel costs have increased by $43.1K for additional manhours needed to support the longer schedule and the higher level of reporting required by the DOE.

Riley costs have decreased by $4K to reflect a reduction in Riley support of the DOE reporting.

TTI costs have increased by $119.1K to reflect the longer schedule, the increased man-hours required to meet the DOE reporting requirements and the transfer of accounting function from WBS 210 (Management).

WBS 250, Startup -

Costs have increased by $462.4K to reflect the one month extension in the startup schedule. Bechtel costs increased by $83.9K to account for the longer schedule and the higher level of technical support required for the startup and shakedown process.

SIPC costs have increased by $138.5K to account for the longer schedule, the increased number of operators required to startup and shakedown the plant, and their associated training time.

TTI costs have increased by $239.7K which reflects the longer schedule, an increased level of technical support for the startup process and the higher level of operations and DCS support required during startup of the retrofit.

WBS 260, Engineering Support -

This is an additional WBS item set up for engineering support of the field during construction. $191.3K has been assigned to this WBS, of which $141.3K was formerly included in Bechtel's WBS 120 (Engineering).

Others (Dykema and Griffin Inc.) support was increased by $21.4K, part of which was reassigned from WBS 210 (Management) to more accurately define their role.

Phase III - Operation and Disposition

WBS 310, Management -

Overall costs have increased by $520.3K.

Bechtel costs have increased by $304.8K to account for delays in the project schedule, extensions in the Demonstration tasks, increased supervision of the ongoing preventative maintenance, and changes in the air quality and sulphur balance instrumentation.

TTI costs have increased by $140.9K because of delays in the project schedule, a four month extension of demonstration schedule, and the resulting increase in manhours to support the Phase III work.

Others (Dykema and Griffin Inc.) costs have increased by $74.6K to reflect a better understanding of consultant support required in managing Phase III work.

WBS 320, Demonstration Program -

Costs have increased by $2,548.8K. This reflects a 10 month schedule to complete the originally proposed six month demonstration. The revised schedule is based on a more realistic assessment of the problems that will be encountered and resulting delays to resolve them.

Bechtel costs increased by $1,319.1K to reflect increased support levels required; procurement, fabrication and installation services to modify equipment to better fit demonstration requirements; and repair of major breakdowns in balance of plant equipment in the plant envelope under project control.

Riley costs increased by $31.1K to reflect increased testing requirements, increased site support over the revised schedule, and procurement, fabrication and installation services needed to modify the Burner systems to better fit demonstration requirements.

SIPC costs increased by $174.4K to account for increased numbers of operators required for around-the-clock operation now planned; and purchased power and opportunity costs anticipated during periods of process development, unit maintenance and repair or modification of project equipment.

TTI costs increased by $824.2K to reflect a better understanding of the process development required to demonstrate the Burner. The costs include extended DCS programming changes and trouble shooting, refinement of process, testing and any resulting engineering modifications. The increases also reflect the level of TTI operations and technical support required during the extended demonstration schedule and round the clock operation.

Others (Dykema Engineering and Griffin Inc.) costs increased by $200K to reflect the level of consulting support required in engineering, testing, and refining the LNS Burner process during the demonstration.

WBS 330, Restoration -

Costs have increased by $540.7K . The estimate assumes that the technology will be removed upon completion of the demonstration and the subsequent restoration will not include a full reconfiguration of the retrofit DCS to cyclone operation.

Riley costs increased by $320K to reflect technical support required in removal of the Burner and restoration of the Cyclone.

SIPC costs increased by $220.2K to account for additional purchased power and opportunity costs anticipated during the extended restoration schedule.

WBS 340, Reporting -

Costs have increased by $410.3K.

Bechtel costs have increased by $78.1K to reflect increased reporting support required over the extended schedule.

Riley costs have decreased by $36.5K due to revised scope of work.

TTI costs have increased by $368.6K to more fully reflect the increased amount of reporting and the scope of work in completing the data analysis and compilation of interim and the final reports to complete the project.

WBS 350, Baseline Test -

Costs have increased by $24K for additional testing to assess the effect of LNS Burner on the existing boiler.

WBS 360, Maintenance -

These costs have increased by $663.9K to account for maintenance during the four additional months of the Demonstration program, an increase in planned plant maintenance prior to demonstration, and to include a provision for the anticipated major repairs of equipment breakdown in the plant envelope under the project responsibility .

TransAlta Technologies Inc.
Low Nox/Sox Burner Retrofit for Utility Cyclone Boilers
Project EAC For Budget Period II - July 1991

WBS	WBS Element	BP II Bechtel	Riley	SIPC	TTI	Others	Total
Preaward							
010	Management	0	0	0	0	0	0
020	Engineering	0	0	0	0	0	0
040	Reporting	0	0	0	0	0	0
	Total	***0***	***0***	***0***	***0***	***0***	***0***
Phase 1							
110	Management	0	0	0	0	0	0
120	Engineering	0	14,946	0	0	0	14,946
130	Permitting	0	0	0	0	0	0
140	Reporting	0	0	0	0	0	0
	Total	***0***	***14,946***	***0***	***0***	***0***	***14,946***
Phase 2							
210	Management	66,000	0	0	172,198	0	238,198
220	Proc/Fab	214,033	722,053	0	0	0	936,086
230	Construction	1,608,598	1,072,457	464,000	0	0	3,145,055
240	Reporting	61,240	0	0	124,055	0	185,295
250	Startup	252,598	36,704	154,500	252,538		696,340
260	Engg. Support	191,280	0	0	0	21,440	212,720
	Total	***2,393,749***	***1,831,214***	***618,500***	***548,791***	***21,440***	***5,413,694***
Phase 3							
310	Management	314,304	0	0	611,013	100,000	1,025,317
320	Demo. Prog.	1,688,173	118,610	1,754,400	832,225	200,000	4,593,408
330	Restore	1,064,962	742,811	401,700	0		2,209,473
340	Reporting	186,784	0	0	454,349	0	641,133
350	Baseline Test	24,000	0	0	0	0	24,000
360	Maintenance	1,138,536	0	0	0	0	1,138,536
	Total	***4,416,759***	***861,421***	***2,156,100***	***1,897,587***	***300,000***	***9,631,867***
Project Totals		***6,810,508***	***2,707,581***	***2,774,600***	***2,446,378***	***321,440***	***15,060,507***

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REVISED EAC(Jn91)-WBS

Exhibit 2
Figure 1

TransAlta Technologies, Inc.
Low NOx/SOx Burner Retrofit for Utility Cyclone Boilers
Project EAC For Budget Period II - June 1990

WBS	WBS Element	BP II Bechtel	Riley	SIPC	TTI	Others	Total
Preaward							
010	Management	0	0	0	0	0	0
020	Engineering	0	0	0	0	0	0
040	Reporting	0	0	0	0	0	0
	Total	***0***	***0***	***0***	***0***	***0***	***0***
Phase 1							
110	Management	2,000	0	0	0	0	2,000
120	Engineering	53,781	0	7,000	0	0	60,781
130	Permitting	0	0	0	0	0	0
140	Reporting	3,128	4,561	0	0	0	7,689
	Total	***58,909***	***4,561***	***7,000***	***0***	***0***	***70,470***
Phase 2							
210	Management	8,320	0	0	193,936	12,781	215,037
220	Proc/Fab	82,811	264,172	0	0	0	346,983
230	Construction	306,921	243,842	145,000	0	0	695,763
240	Reporting	18,128	4,561	0	4,960	0	27,649
250	Startup	168,650	36,488	16,000	12,800	0	233,938
260	Engg. Supp	0	0	0	0	0	0
	Total	***584,830***	***549,063***	***161,000***	***211,696***	***12,781***	***1,519,370***
Phase 3							
310	Management	9,520	0	0	470,120	25,410	505,050
320	Demo. Prog.	369,074	87,543	1,580,000	8,000	0	2,044,617
330	Restore	1,064,960	422,318	181,500	0	0	1,668,778
340	Reporting	108,632	36,488	0	85,693	0	230,813
350	Baseline Test	0	0	0	0	0	0
360	Maintenance	474,600	0	0	0	0	474,600
	Total	***2,026,786***	***546,349***	***1,761,500***	***563,813***	***25,410***	***4,923,858***
Project Totals		***2,670,525***	***1,099,973***	***1,929,500***	***775,509***	***38,191***	***6,513,698***

Exhibit 2
Figure 2

TransAlta Technologies Inc.
Low Nox/Sox Burner Retrofit for Utility Cyclone Boilers
Variations between July 1991 & June 1990 Budget Period II Project EAC

WBS	WBS Element	BP II Bechtel	Riley	SIPC	TTI	Others	Total
Preaward							
010	Management	0	0	0	0	0	0
020	Engineering	0	0	0	0	0	0
040	Reporting	0	0	0	0	0	0
	Total	***0***	***0***	***0***	***0***	***0***	***0***
Phase 1							
110	Management	-2,000	0	0	0	0	-2,000
120	Engineering	-53,781	14,946	-7,000	0	0	-45,835
130	Permitting	0	0	0	0	0	0
140	Reporting	-3,128	-4,561	0	0	0	-7,689
	Total	***-58,909***	***10,385***	***-7,000***	***0***	***0***	***-55,524***
Phase 2							
210	Management	57,680	0	0	-21,738	-12,781	23,161
220	Proc/Fab	131,222	457,881	0	0	0	589,103
230	Construction	1,301,677	828,615	319,000	0	0	2,449,292
240	Reporting	43,112	-4,561	0	119,095	0	157,646
250	Startup	83,948	216	138,500	239,738	0	462,402
260	Engg. Support	191,280	0	0	0	21,440	212,720
	Total	***1,808,919***	***1,282,151***	***457,500***	***337,095***	***8,659***	***3,894,324***
Phase 3							
310	Management	304,784	0	0	140,893	74,590	520,267
320	Demo. Prog.	1,319,099	31,067	174,400	824,225	200,000	2,548,791
330	Restore	2	320,493	220,200	0	0	540,695
340	Reporting	78,152	-36,488	0	368,656	0	410,320
350	Baseline Test	24,000	0	0	0	0	24,000
360	Maintenance	663,936	0	0	0	0	663,936
	Total	***2,389,973***	***315,072***	***394,600***	***1,333,774***	***274,590***	***4,708,009***
Project Totals		***4,139,983***	***1,607,608***	***845,100***	***1,670,869***	***283,249***	***8,546,809***

Note: (+) numbers indicate increase in cost, while (-) numbers indicate decrease in costs.

Exhibit 2
Figure 3

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REVISED VAR BY BP-WBS

TransAlta Technologies Inc.
Low Nox/Sox Burner Retrofit for Utility Cyclone Boilers
Additional Funding Requirements For Budget Period II

Project Phase	Invoiced Costs: DOE Invoices	Invoiced Costs: TransAlta Share	Invoiced Costs: Project Costs Invoiced	Project Costs Not Invoiced	Project Costs: Jul-91 EAC	Project Costs: Jun-90 EAC	Approved Budget	Additional Funds Required
Preaward	0	0	0	0	0	0	0	0
Phase 1	0	0	0	14,946	14,946	70,470	0	14,946
Phase 2	0	0	0	5,413,694	5,413,694	1,519,370	1,324,000	4,089,694
Phase 3	0	0	0	9,631,867	9,631,867	4,923,858	4,976,000	4,655,867
Total	0	0	0	15,060,507	15,060,507	6,513,698	6,300,000	8,760,507

Note: **EAC = Estimate At Completion**

Exhibit 2
Figure 4

Low NOx/SOx Burner Retrofit for Utility Cyclone Boilers

Project Evaluation Report

July 23, 1991

Reference Cooperative Agreement
DE-FC22-90PC89661

TransAlta Technologies, Inc

Table of Contents

List of Figures

1.0 Introduction

TransAlta Resources Investment Corporation, Calgary, Alberta, Canada, is the holder of world-wide rights of certain advanced combustion Technology. TransAlta Resources Investment Corporation (TransAlta) was selected for a Clean Coal Technology II contract with the U. S. Department of Energy (DOE) for a retrofit demonstration of the Low NO_x/SO_x (LNS) Burner on a 33 MW cyclone boiler. Two LNS Burners, sized at 200 MBtu/h, burning a high sulfur (nominal 3.2%) bituminous coal, will be retrofitted to Unit 1 boiler at the Marion Station of Southern Illinois Power Cooperative, (SIPC) near Marion, Illinois.

The Cooperative Agreement was signed by the DOE with TransAlta on June 14, 1990. Preliminary engineering started in early 1990. The Project is expected to be completed by August 1992. The work is being conducted in accordance with the Statement of Work (SOW), CDOE10101N, Issue G.

The Project is divided into two budget periods covering three phases of work. The first budget period (BP #1) includes Phase 1, Design and Permitting, and most of Phase 2, Construction. The second budget period (BP #2) includes the remainder of Phase 2 and the demonstration testing activities in Phase 3, Operation and Disposition. Baseline Testing (a Phase 3 task) is included in BP #1.

BP #1 was started with the initial announcement of the selection of TransAlta during CCT II in October 1988, in the Cooperative Agreement BP #1 was designated as starting on October 14, 1989. This period includes Preaward activity and extends through the end of Phase 1 which was originally scheduled to be completed on January 31, 1991. Project delays have pushed back the end of BP #1 to September 30, 1991. Phase 1 design and engineering was started in early 1990 prior to receipt of the Cooperative Agreement. DOE's signature to the Cooperative Agreement on June 14, 1990 established Project baseline activity and schedule.

1.1 Purpose of Project Evaluation Report

This Project Evaluation Report will review the progress of work identified in the Project Evaluation Plan (CDOE10103N Issue B) against the actual accomplishment of this work during BP #1. Presented in the Project Evaluation Plan were objective criteria which covered key Project elements in the areas of design, construction, economics, cost, schedule, resource, commercialization and project reporting. This report will review each BP #1 criterion which was identified and evaluate the success in achieving the stated criteria.

This Project Evaluation Report for BP #1 has been prepared using the format presented in the Project Evaluation Plan.

1.2 Project Objectives

The primary technical objectives of the Project are to demonstrate the LNS Burner as retrofitted to the Host Unit for effective, low-cost control of NO_x and SO_2 emissions while firing a bituminous coal.

- Construct a full-scale retrofit of a utility cyclone boiler using the Technology.
- Evaluate the long-term durability, operability and reliability of the LNS Burner in an utility environment.
- Demonstrate the LNS Burner's control of SO_2 emissions against a criteria of 70 percent or greater SO_2 reduction when burning high-sulfur midwestern bituminous coals, with a Project goal of meeting the New Source Performance Standards (NSPS) of 90 percent SO_2 reduction.
- Demonstrate the LNS Burner's control of NO_x emissions with a Project goal of NO_x emissions less than 0.2 lb/MBtu (or 150 ppm) when burning high-sulfur midwestern bituminous coals.
- Demonstrate the LNS Burner's effect on cyclone boiler full-load heat rate.

1.3 Phase Objectives

The Project consists of the required planning, design, permitting, equipment retrofit, demonstration of the Technology and subsequent return to service at the SIPC's 33 MW, Unit 1 cyclone boiler (Host Unit). The Project activity consists of three phases, each with the following objectives:

- Phase 1: Establish detailed plans and organizational structure for the Project; develop design and performance specifications for the retrofit of the Host Unit; and secure any licenses or permits required for construction and operation of the Host Unit.
- Phase 2: Select suppliers and contractors for the construction activities; construct and startup the Host Unit retrofitted with the LNS Burner; and prepare operating and maintenance manuals.

- Phase 3: Operate the Host Unit; obtain baseline and retrofit performance data; determine the Technology's ability to limit NO_x and SO_2 emissions; document the results of the demonstration phase of the Project; and return the Host Unit to service.

2.0 Project Description

2.1 Technology

The Technology employs a simple innovative combustion process burning pulverized coal to provide substantial sulfur dioxide and nitrous oxides control. This Technology is incorporated in a device called the LNS Burner. The LNS Burner operates at high temperatures which results in a major fraction of the sulfur laden coal ash being removed as molten slag.

The Project has started to retrofit an existing cyclone boiler with the LNS Burner Technology. As most of the infrastructure is presently in place and operational, the primary Project tasks involve modifying the cyclone furnace with the LNS Burner and adding a fuel preparation and pulverizing system. Figure 1 shows a process flow diagram describing the retrofit of the Technology.

2.2 Management Structure and Responsibilities

TransAlta Resources Investment Corporation, located in Calgary, Alberta, Canada, is a non-regulated, wholly owned subsidiary of TransAlta Utilities Corporation. This subsidiary has formed a U.S. based company called TransAlta Technologies, Inc. (TTI) with offices in Los Angeles and Calgary, Alberta. TTI is responsible for overall program management. During BP #1, all Project Management activities were consolidated in the Calgary office. Engineering and Technology Management activities remain in the Los Angeles office.

The Project organization is divided into two functioning teams: A Technology Management Team which provides for integrated LNS Burner design; and a Contract Support Team which provides the necessary contract support, site coordination and construction. Figure 2 shows the structure of overall organization and key relationships.

The Technology Management Team has been assembled with specialists in each field: TTI provides system integration and LNS Burner design; Owen Dykema, technology support; Riley Stoker, LNS Burner design support and fabrication; E. M. Griffin, Inc., cyclone boiler consultants.

The Contract Support Team comprises Bechtel Power Corporation for balance of plant and Riley Stoker for boiler modifications. Bechtel provides the Contract Support Team management to complete the balance of plant work and conduct the testing program. Reporting directly to the Project Manager, Mr. Joe Smith, the Contract Support Manager, is responsible for all assigned tasks needed to complete the Project.

The Contract Support Manager plans, organizes, staffs, and directs the team to work as an integral unit.

Bechtel integrates and maintains all intermediate and detailed schedules for the project by all team members. Individual team members maintain their project costs and submit detailed invoices to TransAlta for consolidation and submittal of project costs to the Funding Parties.

The Bechtel construction organization is headed by a Construction Manager, who is responsible for all construction activity using direct hire personnel, contract personnel, or a combination of both. The Construction Manager and has key individuals reporting to him in the following typical areas: craft supervision, field engineering, cost and scheduling, field procurement and contracts administration. Modifications to the cyclone boiler and installation of the LNS Burner are under the supervision of the Riley Stoker site manager reporting to the Bechtel construction manager.

A Demonstration Manager is responsible for managing and conducting the demonstration phase of the Project in accordance with the Demonstration Plan. This includes equipment baseline inspections, operational readiness plans and inspections, pre-modification performance and air quality testing, and the post-modification demonstration tests.

Riley Stoker Corporation reports to both the Technology Management Team and the Contract Support Team with specific roles in each area. Mr. Dave Lavoie is the Project Manager for Riley Stoker . As a member of the Technology Management Team, Riley Stoker provides the following: Process flow, logic and control system design, LNS Burner detail engineering and fabrication.

As a member of the Contract Support Team reporting to Bechtel, Riley Stoker will install the LNS Burner and make the boiler modifications to complete the retrofit. In this role, Riley Stoker will provide detailed engineering for the boiler modifications ,install the LNS Burner, provide support to Bechtel engineering, provide support to Bechtel construction, provide support to Bechtel start-up and test group, provide pulverizer and fuel feed equipment, provide boiler modifications, components, and analyze boiler performance data.

All team members support the development of operation and maintenance manuals for the retrofit. The Demonstration Test Manager will be responsible to organize and conduct with the support of the team members all necessary training.

2.3 Host Site

Southern Illinois Power Co-operative (SIPC) is providing the Host Unit for the Project. In this major role, SIPC performs the following: Operates the Host Unit as directed by the Demonstration Test Manager, participates in all Project review and planning meetings, and provides services necessary for supply of fuel, disposal of ash and slag, and the generation of power in the operation of the Host Unit.

The 33 MW Unit 1 cyclone boiler went into service in the early 1960's. Its current condition and other necessary improvements to assure reliability have dictated that some refurbishment is required. Based on the results of the Baseline Test and upgrades planned by SIPC for the betterment of all of the 33-MW units, additional work was undertaken. SIPC has accomplished significant work in key areas to increase reliability with respect in its designated role of a peaking unit. TTI is further upgrading the reliability of the unit to that expected for a base-loaded unit in order to support the six month demonstration test.

2.4 Funding Parties

The Project is cost-shared by TransAlta and the DOE together with other Funding Parties. The other Funding Parties are: Illinois Department of Energy and Natural Resources (IDENR), the Electric Power Research Institute (EPRI), the National Rural Electric Cooperative Association (NRECA) represented by Associated Electric Cooperative, Baltimore Gas & Electric, and Central Illinois Public Service Company. The roles played by each Funding Party are:

- DOE monitors all aspects of the Project and grant or deny approvals as required by the Cooperative Agreement.
- IDENR provides a representative to monitor the Project and report to the State of Illinois and potential cyclone users the results of the Project.
- EPRI provides support and technical advice on the emissions and performance monitoring of the Project, based on their experience with several fossil energy system demonstrations.
- NRECA through a designated member utility, Associated Electric Power Cooperative, provides the Project information from their experience as a cyclone boiler operator.
- Baltimore Gas & Electric provides the Project information from their experience as a cyclone boiler operator.

- Central Illinois Public Service provides the Project information from their experience as a cyclone boiler operator.

2.5 Industrial Panel and Review

All Funding Parties have received technical briefing on the LNS Burner theory and operation. Each Funding Party has designated a technical representative to attend progress reviews. These representatives also will constitute an industry panel of cyclone users and operators to assist with guidance on the conduct of the Project and test program.

2.6 Accomplishments in Budget Period #1

To achieve the Project objectives as defined in the Statement of Work (CDOE10101N Issue G), the project was structured and planned to identify the sequence of events that must occur to accomplish the Project. The Project logic was initially planned to recognize constraints represented by the availability of and the minimizing of the downtime of the Host Unit. Initially, the plan incorporated the impact of loss of potential power production, cost sharing constraints, performance of a pre-modification boiler test and the interdependence of selected events.

Subsequent funding constraints have altered the initial plan. The initial Project planning did not recognize the difficulty that DOE would encounter in satisfying the National Environmental Policy Act (NEPA) requirements. Several Project reschedules were required because NEPA was not approved as timely as expected. By DOE contract, until NEPA was approved, DOE could not cost share activities other than preliminary design. In an attempt to minimize financial exposure, while waiting for NEPA approval, TransAlta imposed three schedule delays. However, the Project had to continue in order to meet basic objectives at the risk of TransAlta. BP #1 has now been extended to September 30, 1991, even though funding limits had been reached, in order for TransAlta to complete all of the necessary reporting and to prepare the Continuation Application as required in the Cooperative Agreement.

Because of BP #1 funding cap, TransAlta has decided to reschedule the work load until the Continuation Application is granted. Please see Section 5.0 for plans for BP #2 activities.

In the following discussion of the work plan, work which has been accomplished has been identified and other tasks which are either in work or have been delayed are discussed. A more detailed discussion of the work accomplished in BP #1 can be found in the Quarterly Technical Progress Reports for June-September 1990, October-December 1990, January-March 1991, and April-June 1991.

2.6.1 Phase 1 - Design and Permitting

A logical sequence of steps was planned to develop the retrofit design requirements. The design and permitting tasks have been accomplished as originally planned. The items reviewed below represent the key preliminary and definitive design activities accomplished during BP #1.

The physical and process interfaces of the Host Unit were defined and the retrofit detailed interfaces identified. The Project coal and limestone characteristics were documented. The modifications to the boiler were designed and analyzed. The requirements for combustion air supply pressure, temperature, and flow rates and for the coal/limestone feed. Cooling requirements for the LNS Burner were established and materials of construction selected. Piping and Instrumentation (P & I) diagrams for the combustor system, along with dimensioned layout and arrangement drawings, have been prepared. Interfaces with the existing boiler and balance of plant (BOP) have been designed. The support structure for the LNS Burner has been specified. Water circulation, flue gas temperature distribution, and overall boiler performance have been analyzed. Design descriptions, specifications and drawings have been compiled into design packages. The detailed design of the LNS Burner has been completed, and technical specifications for procurement and construction packages have been issued. Amendments and addenda to existing O & M manuals have been started and will be issued before startup.

Detailed design has been completed for the limestone and additive receiving, storage, and preparation system and the slag transport and discharge system. Modifications to the combustion air system and ducting, as well as to the coal handling and preparation system, have been engineered and specified. Relocation requirements for existing plant equipment and piping have been identified. Modifications of the plant control system and auxiliary power supply system have been designed. Foundations and structural supports for new and modified equipment and revised plant and equipment/piping arrangement drawings have been prepared. Procurement and construction technical documents have been issued.

Requirements for licenses and permits have been met. A construction and operating permit has been received from the State of Illinois.

2.6.2 Phase 2 - Construction and Startup

Major items of supply, such as the LNS Burner and coal pulverizer are supplied by Riley Stoker. Riley Stoker will also perform the necessary modifications to the Host Unit boiler. Bechtel supplies the balance of plant engineering and construction work.

Fabrication services and retrofit equipment procurement and construction packages have been prepared. Technical and construction specifications, terms and conditions, and instructions to bidders were assembled into bid solicitation packages. Bids received on each solicitation were evaluated for conformance with the specifications, ranked according to relative cost, and the bid most advantageous for the Project was selected. Services or products resulting from the contract were accepted upon verification of compliance with specifications.

The Host Unit was shut down and secured. A field engineering office was established and staffed and temporary construction facilities provided. Equipment and piping that are to be replaced as part of the retrofit or that are obstructing construction work have been removed and stored. Foundations and footings were prepared for new/relocated equipment. Materials and equipment purchased for the retrofit are being received, inspected, and placed in temporary storage. The Host Unit retrofit equipment interconnecting piping and ductwork is being installed. Relocated plant equipment and piping is being installed, along with wiring connections for power, instrumentation and control. Field engineering and inspection services are ongoing as required. Until BP #2 is started, the site is currently demobilized and a caretaker has been assigned to the site. The site will be remobilized and construction activities will be completed after BP #2 approval.

More inspections have been done than originally planned to assess the condition of the unit. Non-destructive examination of the boiler tubes have indicated a thinning of the outer surfaces caused by rust and corrosion. SIPC has replaced the floor tubes and sections of the wall corner tubes. TransAlta is also replacing other tubes as necessary to improve reliability to near that expected for a base-loaded unit. SIPC and TransAlta are continuing to assess the condition of the unit and will make repairs as necessary.

The retrofitted Host Unit will be checked out and all required testing will be conducted. Plans will be drawn up for plant startup and for the conduct of the demonstration operations.

Plant operating personnel designated to run the Host Unit during demonstration operation will be trained. Sensors and instrumentation will be calibrated. Lube oil and hydraulic oil reservoirs will be flushed and refilled. Cold flow tests and cold system tests will be conducted. Plant start-up sequence will be tested and verified. Operation will be tested and set points established. Any equipment malfunctions will be corrected. Once all systems show satisfactory operation, the Host Unit will be declared ready for demonstration operation with the Project coal.

2.6.3 Phase 3 - Operation and Disposition

The Host Unit was operated in October 1990 to obtain baseline data and engineering data required to establish operating characteristics of the Host Unit. The Host unit was instrumented to provide stack emissions and boiler performance data. An independent emissions test contractor, Clean Air Engineering, was hired. The Demonstration Test Plan was prepared and issued for the Baseline Test. The Host Unit was operated by SIPC as directed by TransAlta through the Bechtel Demonstration Test Manager. Specific testing by the independent test contractor was accomplished in accordance with the Demonstration Test Plan. The Baseline test phase used the Host Site coal. Routine inspections and maintenance activities were performed. An operating log was maintained and plant performance, as indicated by the routine instrumentation, was monitored. Routine sampling and analyses were performed.

Readings from sensors installed specifically for monitoring demonstration operation were taken. The data has been reduced and analyzed. A Baseline Test report summarizing the results has been issued

The Demonstration Test Plan will be updated and reissued for demonstration testing. Lessons learned from the Baseline Test will be incorporated. The Demonstration Test Manager will direct SIPC to run the unit as a base-loaded unit during the test periods. The results of the Demonstration Test will be issued in a final report.

At the completion of demonstration testing the available alternatives for returning the Host Unit to normal operating status within the SIPC system will be identified. The required plant modification, with each of these alternatives will be specified, and the cost of the modifications will be estimated. The technical and economic merits of these alternative options will be compared and evaluated. Recommendations for the preferred option will be prepared. With SIPC's concurrence, the Host Unit will be returned to service.

2.7 Project Schedule

The project milestone schedule, shown in Figure 3, compares work planned (baselined as of June 14, 1990) to the actual work accomplished during BP #1. The schedule is summarized at Level 3 of the work breakdown structure (WBS) in accordance with the requirements of the Cooperative Agreement.

A key schedule issue has been the National Environmental Policy Act (NEPA) review process, which limited DOE's ability to cost share the project costs until approval is granted. TransAlta decided early in the Project to begin only those key, critical path project activities that fit within the limits of available funding without sacrificing the

necessary critical objectives. Some activities which were not critical path items were delayed by lack of NEPA approval.

Phase 1 activities started in January 1990 and are expected to be complete by the end of September 1991. The original plan had these activities completed by February 1990. Delays were encountered in meeting all of the DOE reporting requirements. These reporting requirements have now been brought up to date. The planned technical design and engineering activities (WBS 1.2) were completed in accordance with the baseline plan. These Level 3 tasks remain open and will be closed out once all of the technical reporting requirements are completed. The permitting task (WBS 1.3) was completed earlier than planned when the State of Illinois issued a construction and operating permit for the Project in October 1990.

Phase 2 tasks started as planned in early May 1990 with the onsite mobilization of the site construction office. Equipment and Materials (WBS 2.2) were ordered as planned and construction activities (WBS 2.3) were started. The completion of procurement and construction activities have been delayed. Continuing delays in achieving NEPA have limited DOE funding for these areas. TransAlta continued the Project with internal funds and funds from other Funding Parties until the BP #1 funding cap of $9,000,000 was reached. In March 1991, TransAlta advised DOE of insufficient BP #1 funding. On April 18, 1991, DOE authorized TransAlta to incur additional costs at its own risk. TransAlta has elected to delay the completion of procurement and construction until BP #2 has started. Site demobilization was done and a caretaker has been assigned to maintain the site until such time BP #2 approval is received from DOE.

Phase 3 activities will be delayed until procurement and construction activities have been completed. The Management task (WBS 3.1) was started in May 1990 to support the work required to prepare for the Baseline Test (WBS 3.5) The Baseline Test was delayed as long as possible as a result of the lack of DOE funding caused by NEPA. The test which was not critical to the completion of any other work was delayed until October, 1990. The test was performed just prior to the removal of Unit 1 from service for modifications.

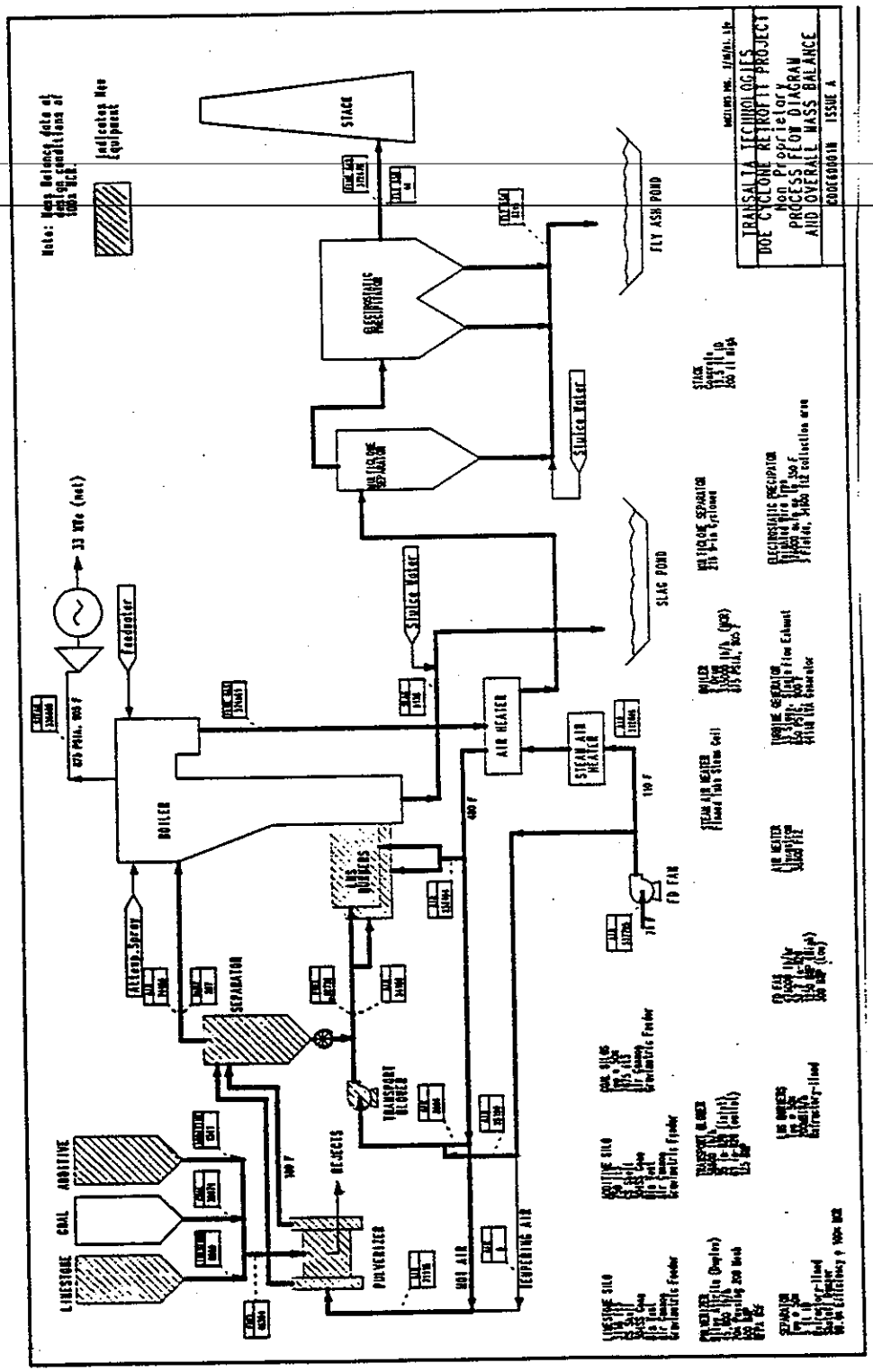

Figure 1 Process Flow Diagram

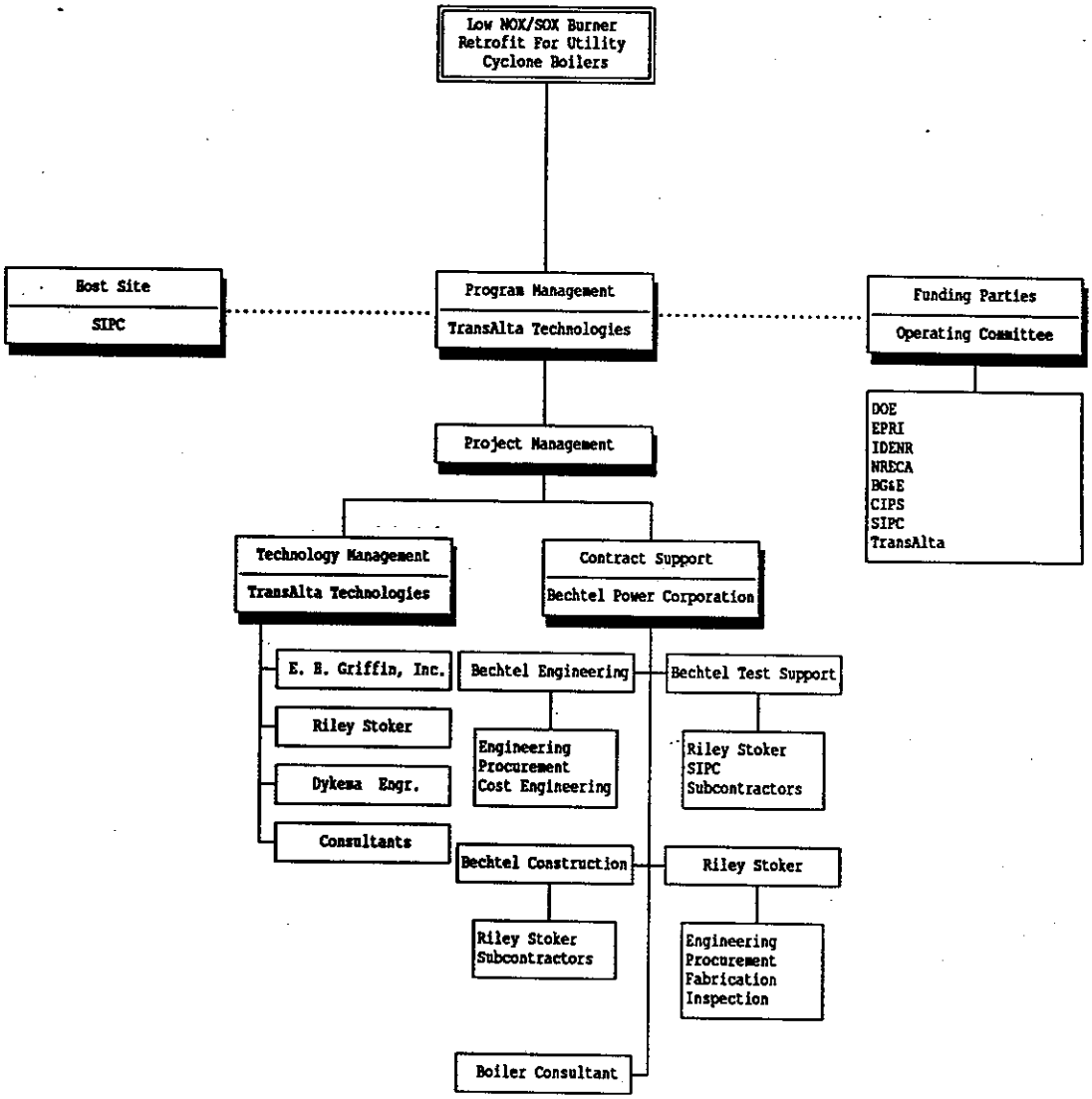

Figure 2 Project Organization

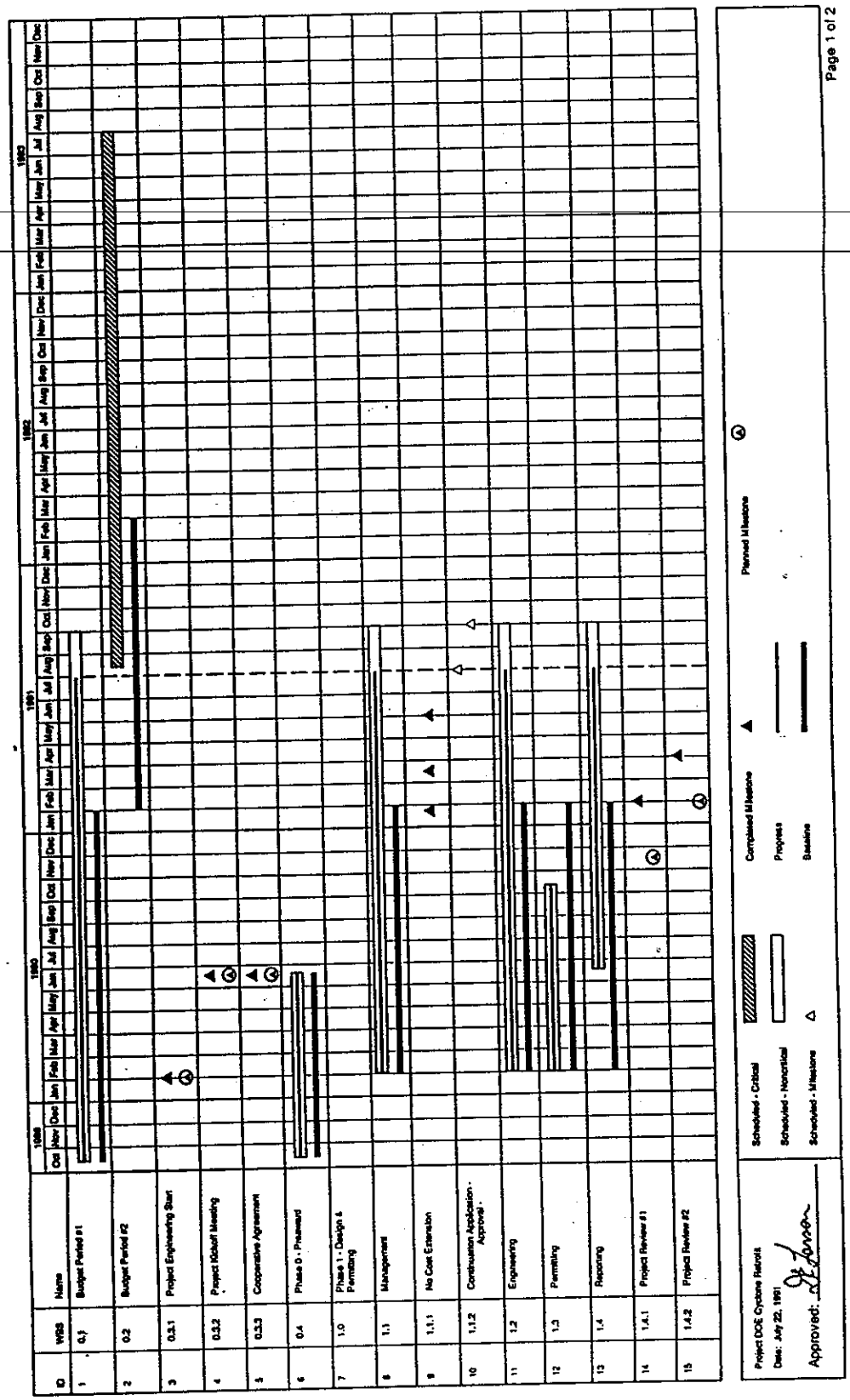

Figure 3 Project Milestone Schedule (Page 1 of 2)

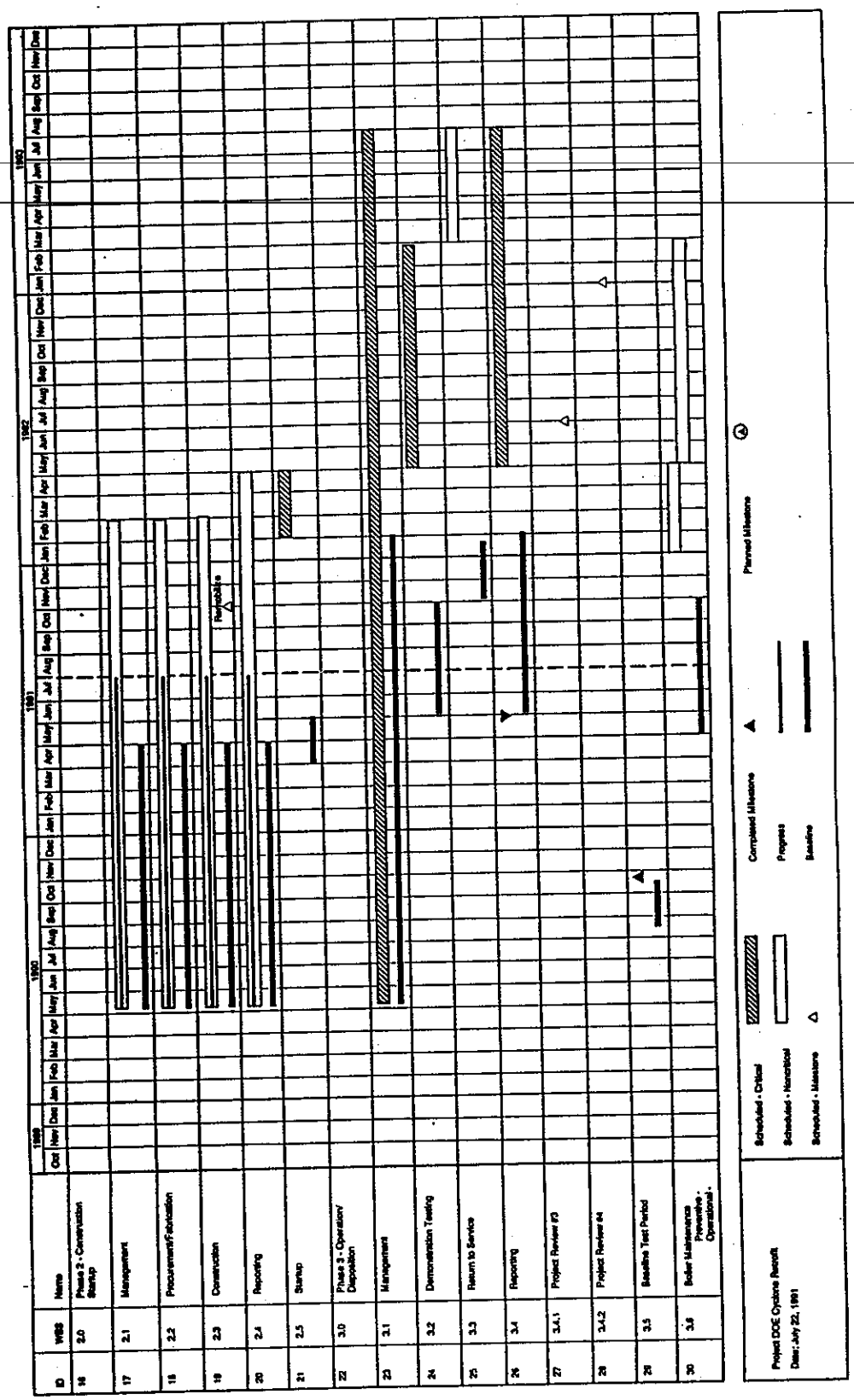

Figure 3 Project Milestone Schedule (Page 2 of 2)

3.0 Criteria

Each of the project criteria identified in the Project Evaluation Plan have been evaluated against a measure that was available to assess the achievement of these criteria. These criteria are aligned with respect to Project phases and subdivided into technical and management areas.

3.1 Technical Criteria

The technical criteria defined in the Project Evaluation Plan have been evaluated in terms of achieving the stated goal. Presented below are descriptions of these technical criteria and the action that satisfies the criteria.

3.1.1 Phase 1, Engineering and Permitting

Design Criteria

Criteria	Description	Achievement
1-D1	Assure that the Project is feasible with respect to meeting performance, cost and schedule requirements.	A public non-proprietary preliminary design report has been prepared and issued as CDOE10105N Issue A to the Funding Parties.
1-D2	Assure that the Project identifies all Project applicable requirements and shows that the design meets all mandatory standards (NFPA, UBC, etc.) Document design.	A public non-proprietary detailed design report is in work and will be issued as CDOE10105N Issue A to the Funding Parties as required 30 days after the end of Phase 1.
1-D3	Assure that equipment meets all design standards and requirements.	Equipment and material specifications have been developed. See Appendix for list of specifications .
1-D4	Assure all necessary equipment and materials are identified and procured in accordance with Project design requirements and applicable company and governmental requirements, e.g. Bechtel internal standards, Riley standards, applicable national codes such as ASME, ANSI, NFPA, etc.	Procurement packages have been developed. See Appendix for a list of specifications.

1-D5	Assure that installation requirements for equipment and materials are identified.	Construction packages have been developed for outside contractors. See Appendix for a list of construction packages. Bechtel and Riley Construction use technical specifications and drawings for ongoing work.
1-D6	Establish design basis information required to fabricate the LNS Burner. Ensure applicable results from ongoing work are incorporated.	Proprietary drawings and analyses have been developed for the LNS Burner design. See Appendix for a list of drawings and analyses. This information is available for inspection in the TTI's California offices to authorized representatives of Funding Parties.
1-D7	Ensure applicable safety criteria have been incorporated into Project requirements.	See 1-D2.

Permitting Criteria

Criteria	Description	Achievement
1-P1	Assure that plant construction and operation will meet all applicable federal, state and local regulations.	The required construction and operating permit (ID 199856AAC, 10/90) has been received from Illinois and it allows for constructing and operating the Host Unit with the LNS Burner.
1-P2	Assure no potential environmental consequences exist for operating the Host Site with the LNS Burners	Issued as final to DOE the Environmental Monitoring Plan Outline (6/89), Environmental Monitoring Plan (11/89) and Environmental Information Volume (11/89).
1-P3	Assure Host Site that USEPA will not apply NSPS or PSD criteria to the site after the completion of the Project	Received from USEPA a "No Action" assurance letter on 1/19/89.

3.1.2 Phase 2, Construction and Startup

Procurement and Fabrication Criteria

Criteria	Description	Achievement
2-PF1	Procure all necessary equipment.	Issued technical specifications and drawings. See list in Appendix.
2-PF2	Procure all necessary materials.	Issued technical specifications and drawings. See list in Appendix.
2-PF3	Implement design basis information required for the LNS Burner.	Fabricate the LNS Burner in accordance with requirements. See list of LNS Burner drawings in Appendix.

Construction Criteria

Criteria	Description	Achievement
2-C1	Adapt the LNS Burner Technology to the Host Site.	Issued technical specifications and drawings to make the necessary modifications. See Appendix for listing.
2-C2	Provide for new material handling systems as required by the LNS Burner retrofit.	Constructed new fuel preparation building and installed all materials and equipment.
2-C3	Ensure that all on-site construction work meet applicable standards and insure that all construction labor activities are implementing Project requirements.	Mobilized Bechtel (5/90) and Riley field construction offices and staffed offices.

3.1.3 Phase 3, Operation and Disposition

Testing Criteria

Criteria	Description	Achievement
3-DT1	Evaluate information needed to establish operating characteristics of the Host Unit.	Issued Demonstration Test Plan for Baseline Test as CDOE30101N, Issue A
3-DT2	Establish operating characteristics of Host Site before LNS Burners are installed.	Issued Baseline Test Report to Funding Parties as CDOE30301N, Issue A.
3-DT3	Ensure condition of boiler and related systems will permit a successful test program to be conducted.	Perform careful examination of boiler, turbine, auxiliary equipment, precipitator and other systems. Perform non-destructive exam of key boiler areas as required.

3.2 Economic, Management, Cost and Schedule Feasibility

Presented below are economic and management criteria that were used to evaluate the progress of the Project.

3.2.1 Phase 1 and 2

Project Management Criteria

Criteria	Description	Achievement
1-PM1	Ensure adequate funding to achieve planned Project work	Developed Project budget and issued Budget Information Form.
1-PM2	Assure Funding Parties that planned Project work can be accomplished within Project time constraints.	Documented Project schedule and issued Milestone Plan.
1-PM3	Ensure completion of planned tasks on schedule and within budget.	Issued Project Status Reports: June 1990 - December 1990, and January 1991 - July 1991
1-PM4	Monitor engineering and construction progress and performance.	Issued Technical Progress Quarterly reports for June-September 1990, October-December 1990, January-March 1991 and March-June 1991

1-PM5	Monitor and report costs and deviations from the Project scope.	Issued management summary reports: June 1990 - December 1990, and January 1991 - May 1991.
1-PM6	Ensure that any proposed changes to budget can be accomplished within funding limits .	See 1-PM1,1-PM2 and 1-RP7.
1-PM7	Complete contract negotiations with all Funding Parties.	Executed contracts: DOE(6/90), IDENR(3/90), EPRI(12/90), NRECA(12/89), BG&E(1/90), CIPS(4/90).
1-PM8	Document Project progress at approximately 40% of the budget period.	Held first Project Progress Review on 1/30/91. Issued minutes as CDOE17001N Issue A.
1-PM9	Document Project progress at approximately 90% of the budget period.	Held second Project Progress Review on 4/3/91. Issued minutes as CDOE17002N Issue A.

Commercialization Criteria

1-B1	Assure that any new patentable ideas are tracked.	Issued Intellectual Property Procedure as CDOE10208N, Issue Draft, 1/10/91.
1-B2	Disclose any new patentable ideas.	None to disclose at this time. Will issue patent disclosure as required.

Resource Criteria

1-R1	Identify resource requirements, Project structure and organization.	Updated Project Management Plan and issued as CDOE10102N, Issue E.
1-R2	Assure availability of Host Site.	Completed Host Site Agreement. Approved by REA 5/11/90.

Project Reporting Criteria

Criteria	Description	Achievement
1-RP1	Describe Project activity reflecting major milestones and projected cost data.	Issued management summary reports for June 1990 - December 1990 and January 1991 - May 1991.
1-RP2	Track Baseline Project schedule with major milestones.	Issued Milestone Plan, including milestone log identifying planned and completion dates for each item.
1-RP3	Provide a concise monthly narrative assessment of the status of the Project.	Issued Project Status Reports: June 1990 - December 1990 and January 1991 - July 1991.
1-RP4	Provide the status of funds expended and committed.	Issued Financial Status Reports: June 1990 - December 1990 and January 1991 - May 1991.
1-RP5	Provide summary level data on the total Project budget.	Issued Budget Information Form.
1-RP6	Provide actual labor cost expended for the reporting period and estimates of labor cost for project reporting periods.	Issued Labor Management June 1990 - December 1990 and January 1991 - May 1991.
1-RP7	Provide actual cost status of material and equipment committed and estimates of the costs for the balance of the Project.	Issued Cost Management Reports: June 1990 - December 1990, and January 1991 - May 1991.
1-RP8	Document the technical status of the Project in monthly reports.	Issued monthly executive summary: June 1990 - December 1990 and January 1991 - July 1991.
1-RP9	Summarize progress of work performed during the reporting period.	Issued for June-September 1990, October-December 1990, January-March 1991, April - June 1991.
1-RP10	Document any special Project situations.	Issue as required exception reports which include telephone conference records, hot line reports, public information reports, and conference and journal articles.

4.0 Budget Period #1 Cost Assessment

An assessment of changes which occurred during Budget Period 1 has been made to compare the Projected costs from the estimate at completion (EAC) made in June 1990 to the revised EAC developed in July 1991. These estimated total Project costs are presented in Table 1 at the third level of the work breakdown structure. These costs are expressed in thousands of dollars.

Please note that the total contract value shown in the June 1990 Management Reports is $107.7K higher than the $15,300K presented in the Cooperative Agreement. The Cooperative Agreement costs were originally submitted as estimates with the understanding that the costs could change as they were finalized. The costs presented in the June 1990 Management Reports were used to establish Project baseline EAC.

The Project EAC has increased from $15,407.7K (June 1990) to $26,160.7K (July 1991.) The causes of this net increase of $10,753K are discussed below.

4.1 Preaward

Preaward costs increased by $175.4K as a result of tasks associated with delays in completing the Cooperative Agreement., coordination of the Program with the Environmental Monitoring Plan and EPRI requirements, additional legal and management costs required to complete the Cooperative Agreement and to resolve business, management, funding and project administration issues.

4.2 Phase 1 - Engineering and Permitting

WBS 1.1, Management - Costs have increased by $207.3K. This reflects an extension of eight months to Phase 1 management activities. Additional manhours were assigned for project administration to meet the extended project schedule.

WBS 1.2, Engineering - Costs have increased by $783.9K due to delays in project schedule, SIPC initiated changes, and the resulting additional scope of work. This resulted in unbudgeted design changes such as Seismic 3 steelwork design imposed by the Uniform Building Code, relocation of bucket elevator, addition of air blast cannons, oxygen analyzers, acoustic pyrometry, painting, electrical equipment and instrumentation changes. Other changes include additions to the DCS control system, revised burner design, boiler modelling, increase in instrumentation such as thermocouples and flow elements, additional dampers and ductwork, increased boiler ports and access doors and development of the slag screen.

WBS 1.3, Permitting - Costs increased by $6.5K which primarily reflects increased work for additional responses and supply of technical information to government agencies, in support of the permitting process.

WBS 1.4, Reporting - Costs increased by $201.3K due to the extended Phase 1; unbudgeted increase in resources to meet the level of reporting required by the DOE; a better understanding of the work involved in meeting the reporting requirements.

4.3 Phase 2 - Construction and Startup

WBS 2.1, Management - Overall costs decreased by $54.9K due to changes in the scope of work and delays in the project schedule and because the bulk of project support in Phase I was deferred until BP #2.

WBS 2.2, Procurement and Fabrication - Costs for this task have increased by $387.4K due to the purchase of additional steelwork to meet the Seismic 3 building design code and relocation of the bucket elevator and the coal feeders; changes to the electrical equipment, the bunker, the silo, the fuel piping, and the instrumentation; increased cabling, raceways, and pipe supports; additional painting, and addition of air flow meter mounting and acoustic pyrometry to the scope of work. Other increases were due to design changes to the burner and fuel preparation systems; addition of the DCS control system, furnace ports and access doors; changes to the coal dust collectors; and instrumentation.

WBS 2.3, Construction - Construction costs increased by $833.5K due to additional manhours required for delays in the project schedule, and to account for the increased scope of work resulting from revisions in WBS 120 (Engineering) and WBS 2.2 (Procurement and Fabrication). Costs decreases for LNS Burner construction occurred as completion was deferred until BP #2. Purchased power and opportunity costs increased resulting from the actual and anticipated outages of Unit #4 at Marion and the delays in completing BP #1.

WBS 2.4, Reporting - Overall costs have increased by $25.8K because the level of effort required to meet the DOE reporting requirements was higher than originally budgeted. Some partially offsetting cost reductions were made due to the Project slow down and the subsequent delay in construction activities. The bulk of the Phase 2 reporting was deferred until BP #2.

WBS 2.5, Startup - Costs have increased by $72.3K to account for start up activities of the Baseline Testing (WBS 3.5).

WBS 2.6, Engineering Support - This is an additional WBS item set up for engineering field support during construction in BP #2.

4.4 Phase 3 - Operation and Disposition

WBS 3.1, Management - Overall costs have decreased by $30.5K to account for slow down and delays in the approved project activities.

WBS 3.2, Demonstration Test - Costs have decreased by $33.6K as activities were deferred until BP #2.

WBS 3.3, Return to Service - There were no planned costs in BP #1.

WBS 3.4, Reporting - Costs have decreased by $12.8K due to an underrun in completing the Baseline Test Report.

WBS 3.5, Baseline Test - Costs have decreased by $359.2K for this testing. This will be offset in the subsequent months by $196.5K for costs incorrectly coded to other WBS codes. The overall decrease will therefore be adjusted to $162.6K.

WBS 3.6, Boiler Maintenance - These costs have increased by $3.9K to account for an increase in plant maintenance prior to the Baseline testing.

WBS	Description	June 1990 Estimate BP 1	BP 2	EAC	July 1991 Estimate BP 1	BP 2	EAC	EAC Change 6-90 to 7-91
0.1	Management	592.0	0.0	592.0	704.5	0.0	704.5	112.5
0.2	Engineering	638.5	0.0	638.5	496.4	0.0	496.4	-142.1
0.3	Reporting	0.0	0.0	0.0	204.9	0.0	204.9	204.9
	Preaward Total	1,230.5	0.0	1,230.5	1,405.8	0.0	1,405.8	175.3
1.1	Management	410.9	2.0	412.9	618.2	0.0	618.2	205.3
1.2	Engineering	1,270.9	60.8	1,331.7	2,054.8	14.9	2,069.7	738.0
1.3	Permitting	8.7	0.0	8.7	15.2	0.0	15.2	6.5
1.4	Reporting	74.2	7.7	81.9	275.5	0.0	275.5	193.6
	Phase 1 Total	1,764.7	70.5	1,835.2	2,963.7	14.9	2,978.6	1,143.4
2.1	Management	325.9	215.0	540.9	271.0	238.2	509.2	-31.7
2.2	Procurement/fabrication	2,914.7	346.9	3,261.6	3,302.1	936.1	4,238.2	976.6
2.3	Construction	1,447.3	695.9	2,143.2	2,280.8	3,145.1	5,425.9	3,282.7
2.4	Reporting	52.4	27.6	80.0	78.2	185.3	263.5	183.5
2.5	Startup	0.0	233.9	233.9	72.3	696.3	768.6	534.7
2.6	Engineering Support	0.0	0.0	0.0	0.0	212.7	212.7	212.7
	Phase 2 Total	4,740.3	1,519.3	6,259.6	6,004.4	5,413.7	11,418.1	5,158.5
3.1	Management	71.1	505.1	576.2	40.6	1,025.3	1,065.9	489.7
3.2	Demonstration Test	234.3	2,044.6	2,278.9	200.7	4,593.5	4,794.2	2,515.3
3.3	Restoration	0.0	1,668.8	1,668.8	0.0	2,209.5	2,209.5	540.7
3.4	Reporting	20.0	230.8	250.8	7.2	641.1	648.3	397.5
3.5	Baseline Test	833.1	0.0	833.1	473.9	24.0	497.9	-335.2
3.6	Boiler Maintenance	0.0	474.6	474.6	3.9	1,138.5	1,142.4	667.8
	Phase 3 Total	1,158.5	4,923.9	6,082.4	726.3	9,631.9	10,358.2	4,275.8
	Total Project	8,894.0	6,513.7	15,407.7	11,100.2	15,060.5	26,160.7	10,753.0

Estimates Expressed in Thousands of Dollars

Table 1 Project Estimate at Completion

5.0 Plans for Budget Period #2

Start of BP #2 was delayed from February 1991 to October 1991 through three extensions. The first extension delayed the start to February 1, 1991, the second extension to July 1, 1991, and the third extension to October 1, 1991. A comparison of the baseline schedule and the revised schedule for BP #2 is shown in the attached Project Schedule. BP #2 was revised to increase the startup period to three months and demonstration to ten months.

Presented below are the planned activities for each Phase 2 and 3 task identified for BP #2.

5.1 Phase 2 - Construction and Startup

WBS 2.1, Management - This activity will continue from BP #1, and includes monitoring and control of project costs and schedule, update of project plans for Phases 2 and 3, and holding technical and progress reviews as required. This activity will be completed by February 29, 1992.

WBS 2.2, Procurement and Fabrication - A majority of the procurement and fabrication was completed in BP #1. However, certain key components such as the LNS Burner fabrication and selection and procurement of the burner refractory will be carried out in the first 2 months of BP #2. Other procurement will be completed in support of the construction schedule and field installation.

WBS 2.3, Construction - Site construction will recommence with full mobilization of Bechtel and Riley Stoker field forces on November 1, 1991. A one month delay is anticipated in the release of final LNS Burner fabrication drawings and delivery of the LNS Burners to site, which will extend the retrofit construction into February 1992. The major areas of the plant retrofit installation to be completed include the LNS Burner, boiler pressure part modifications, boiler repairs and maintenance, final ductwork, electrical equipment and wiring, DCS control system and wiling, and local instrumentation. Construction will be completed by February 29, 1992.

WBS 2.4, Reporting - Phase 2 reporting will continue into BP #2 until the completion of Startup on April 30, 1992. All DOE reports will be issued as required by the Cooperative Agreement.

WBS 2.5, Startup - Startup will commence February 1, 1992 and be completed by April 30, 1992. This activity includes checkout of the retrofitted Host Unit, preparation of O&M manuals, cold system tests, training of plant personnel, and preparation and

testing of all systems prior to demonstration testing (WBS 3.2). The schedule has been extended by one month based on a better understanding of startup and shakedown requirements.

WBS 2.6, Engineering Support - This is an additional activity to account for engineering support of the field during transfer from construction into startup and during the startup.

5.2 Phase 3 - Operation and Disposition

WBS 3.1, Management - This activity will continue throughout BP #2 until completion of the project on July 31, 1993. Ongoing work will be monitored against the revised project budget and schedule. Two Progress Review meetings will be held in June 1992 and December 1992, respectively.

WBS 3.2, Demonstration Testing - Demonstration testing will commence on May 1, 1992 and continue for ten months until February 28, 1993. The schedule has been extended to 10 months based on experience gained at the LNS Burner Heavy Oil Recovery Demonstration Project at Cold Lake, Alberta.

WBS 3.3, Return to Service - The identification and implementation of a plan to return the Host Unit to service, based on a prior SIPC agreement on scope of work and a not to exceed price will be carried out after completion of demonstration testing, through the March 1 to July 1, 1993 time period.

WBS 3.4, Reporting - The reporting for Phase 3 will commence May 1, 1992 and be completed by July 31, 1993. In addition to DOE reporting requirements, the activity includes issue of the Final Project deliverables.

WBS 3.5, Baseline Test - This task was completed October, 1990 during BP #1.

WBS 3.6, Boiler Maintenance - This WBS activity has been added to capture the ongoing plant maintenance required during demonstration testing plus identify the plant preventative maintenance carried out in support of reasonable baseload availability for the Host unit. Preventative maintenance will be carried out in parallel with boiler retrofit modifications in the January to April 1992 time frame. Operational maintenance will be performed during the demonstration test period, May 1992 to February 1993.

Appendix

Technical Criteria - List of Supporting Documents

List of Equipment and Material Specification

19630-A-003	Fuel Preparation Building Doors
19630-A-003A	Fuel preparation Building Doors
19630-A-151	Roof Personnel Hatch
19630-A-154	Aluminum Louvers
19630-E-003	Dry Type Distribution Power Center
19630-E-004	480 Volt Load Center Breaker
19630-E-005	480 Volt Bus Duct
19630-E-006	Electrical Bulk Commodities
19630-E-007	480 V MCC Bus Tie Breaker
19630-E-008	Electrical Grounding Materials
19630-E-009	Stack Platform Lighting Material
19630-J-003	Stack Monitoring Platform
19630-J-004	Silo Level Indicators and Switches
19630-J-005	Weld Pad Thermocouples
19630-J-007	Tanks for Instrument Calibration
19630-J-009	Instruments
19630-M-002	Bucket Elevator, Loading Hopper, Screw Conveyor
19630-M-004	Silo Dust Collector
19630-M-005	Martin Rig Blaster Air Cannon System
19630-M-010	Roof Ventilator Fans
19630-M-012	Elevator Hopper Winch

List of Technical Specifications

19630-A-042	#Preformed Metal Siding
19630-A-051	#Single Ply Roofing
19630-C-010	#Reinforced Concrete Work
19630-C-011	Structural and Misc. Steel
19630-C-012	Limestone and Fuel Additive Silos
19630-C-1000	#Subsurface Investigation & Lab. Testing
19630-E-001	Motor Control Center
19630-E-002	2.4kV Metal Clad Switchgear
19630-J-001	Continuous Emissions Monitoring System
19630-J-003	Stack Monitoring Platform
19630-J-006	Bucket Elevator Control panel
19630-M-002	Bucket Elevator
19630-TSC-001	#Environmental Monitoring Program

19630-TSC-002	#Instrument Calibration, Testing & Maint.
19630-TSC-003	#Boiler Materials for Monitoring Inspection
19630-TSC-003A	#Boiler Tube Materials Monitoring Inspect.
19630-TSC-004	#Electrostatic precipitator Materials Monitoring Sys.
19630-TSC-005	#Engineering/Technical/Craft personnel, Etc.

Used in development of construction package for outside contractor. All other construction work performed within Project by Bechtel Construction or Riley Construction.

List of Balance of Plant Drawings

19630-C-012	Bucket Elevator Support Tower Plan, Sec. & Details
19630-C-013	Bucket Elevator and Inlet Loading Hopper Found.
19630-C-014	Structural Steel Framing partial plans
19630-C-015	Structural Steel Framing partial Plans
19630-C-016	Supplemental Steel Framing plan Views
19630-C-017	Supplemental Steel Framing Sections and Details
19630-C-018	Supplemental Steel Framing Sections and Details
19630-E-001	Motor Control Center Frame Spec.
19630-E-002	Modification Drawing Grounding Plan E1. 517'0
19630-E-003	Modification Dwg. Plan El. 526'0" Cable Tray
19630-E-004	Modification Drawing 480V One-Line Diagram Unit 1
19630-E-005	Modification Drawing Main One-Line Diagram
19630-E-010	Cable Tray layout Turbine Floor El. 540'-0" Unit 1
19630-E-020	lighting General Notes and Details Unit 1
19630-E-021	Lighting Layout Fuel Prep Bldg. Unit 1
19630-E-022	Lighting layout Fuel Prep Bldg. Unit 1
19630-POA-001	Ground Floor Plan @ El. 517'0", F.P. @ El. 526'0"
19630-POA-002	Turbine Floor Plan El. 540'-0"
19630-POA-003	Feeder Floor Plan @ El. 550'-0" @ El. 555'-4"
19630-POA-004	Floor Plan @ 568'-0"
19630-POA-005	Partial plans El. 568'-5 3/4". 599'-5 13/16"
19630-POA-006	Fuel preparation Building Section B-B
19630-POA-007	Fuel preparation Building Section C-C
19630-POA-008	Fuel preparation Building Section D-D
19630-SK-E-011	Scope of Work Single Line
19630-SK-M-001	Ground Floor Plan @ Elv. 517'0" Fl Plan @ Elv. 526'0"
19630-SK-M-002	Turbine Floor Plan @ Elv. 540'-0" Unit 1
19630-SK-M-003	Feeder Floor Plan @ Elv. 550'-0" & Elv. 555'4" Unit 1
19630-SK-M-006	Fuel Preparation Building Section B-B
19630-SK-M-007	Fuel Preparation Building Section C-C
19630-SK-M-008	Fuel preparation Building Section D-D
19630-SKC-001	Limestone Silo
19630-SKC-002	Fuel Additive Silo

19630-M74-BA01	Demonstration Program Test Data Acquisition Measurements
19630-M74-BA02	Demonstration Program Test Data Acquisition Measurements
19630-SK-M-001	Ground Floor Plans at El. 517'-0
19630-SK-M-002	Turbine Floor Plan El. 540'-0
19630-SK-M-005	Partial Plans El. 586'-3 5/16, & Section A-A
19630-A-001	Architectural Floor Plans El. 517'-0", El. 550'-0"
19630-A-002	Architectural Roof Plan, Door Schedule & Spec.
19630-A-003	Architectural Elevations
19630-A-004	Architectural Elevations
19630-A-005	Architectural Details and Sections
19630-C-001	Structural Steel Framing Plan El. 576'-49/16"
19630-C-002	Structural Steel Framing Plan El. 535'-9", Etc.
19630-C-003	Structural Steel Framing Els. @ Col. Lines 3 & 4
19630-C-004	Struct. Steel Framing Els. @ Col. Lines H1 & H2
19630-C-005	Structural Steel Framing Elevs. At Col. Lines J1 & J2
19630-C-009	Misc. Steel Platforms and Details
19630-C-010	Fuel Preparation Building Reinforced Concrete Plan
19630-C-011	Continuous Emissions Monitoring System

List of Piping Drawings

90528-7-1882-10	Coal Piping/Looking South
90528-7-1882-11	Coal Piping/Looking West
90528-7-1882-20	Coal Piping/Splitter-Burner
90528-7-1882-21	Coal Piping/Splitter-Burner
90528-7-1882-22	Coal Piping/Splitter-Burner
90528-7-1882-23	Coal Piping/Splitter-Burner
90528-7-1882-24	Coal Piping/Splitter-Burner
90528-7-1882-25	Coal Piping/Splitter-Burner
90528-7-1882-31	Coal Pipe - 75°Elbow
90528-7-1882-30	Coal Pipe - 90°Elbow
90528-7-1882-40	Coal Piping/Splitter-Burner
90528-7-1882-41	Coal Piping/Splitter-Burner
90528-7-1885-10	Seal Air System/Plan View
90528-7-1885-11	Seal Air System/Looking South
90528-7-1885-12	Seal Air System/Looking West
90528-7-1885-15	Seal Air Piping
90528-7-2361-10	Primary Air System
90528-7-2361-11	Primary Air System
90528-7-2361-12	Primary Air System
90528-7-2365-20	Coal Transport/Tempering Air
90528-7-2365-21	Coal Transport/Tempering Air

90528-7-2365-22	Coal Transport/Tempering Air
90528-7-2371-10	Overfire Air Duct
90528-7-2371-11	Overfire Air Duct
90528-7-2371-12	Overfire Air Duct
90528-7-2371-20	*Air Duct/LNS
90528-7-2371-25	*Air Duct/LNS
90528-7-2371-26	*Air Duct/LNS
90528-7-2371-30	*Air Duct
90528-7-2371-35	*Air Duct
90528-7-2371-36	*Air Duct
90528-7-2371-37	*Air Duct
90528-7-4035-10	Fuel Arrgmt./Feed Sys. Piping
90528-7-4035-11	Fuel Arrgmt./Feed Sys. Piping
90528-8-3451-10	Spring Hanger/LNS Burner

* Abbreviated title to make non-proprietary

List of Proprietary LNS Burner Drawings

90528-7-9000-10	LNS Burner Arrgmt.
90528-7-9000-20	Burner Injector Ass'y
90528-7-9000-21	LNS Burner Barrel
90528-7-9000-22	LNS/Barrel Plenum Section
90528-7-9000-23	Burner Perspective
90528-7-9000-24	LNS Burner

Boiler and Slag Screen Drawings

G-333	Water Wall Tubes
90528-5-0900-20	Overfire Air Openings
90528-5-0900-40	Slag Screen
90528-5-0900-41	Slag Screen
90528-5-0900-42	Slag Screen Tube List
90528-5-0900-90	Slag Screen/Bottom Cyclone
90528-5-0900-91	Slag Screen/Bottom Cyclone
90528-5-0900-92	Slag Screen/Bottom Cyclone

List of Vendor Drawings

90528-7-9000-90	Ignitor Layout
L-D8670	S-E-Co. Type VB Coal Valve
D27275	Hopper-Trans.
D27010	Schematic Diagram
D27011	Feeder Connection
D27012	Feeder Power Cabinet
D27013 -1	Additive Feeder Schematic

D27013 -2	Additive Feeder Schematic
D27014 -1	Additive Feeder Schematic
D27014 -2	Additive Feeder Schematic
D27014 -3	Additive Feeder Schematic
D27015 -1	Limestone Feeder Schematic
D27015 -2	Limestone Feeder Schematic
D27016 -1	Limestone Feeder Schematic
D27016 -2	Limestone Feeder Schematic
D27016 -3	Limestone Feeder Schematic
D27024	Additive Feeder
D27025	Limestone Feeder
D27026	Transfer Feeder
D27027	Feeder Arrangement
D27378	Feeder Connection
D27377	Feeder Connection
D27377	Feeder Connection
D27376	Feeder Connection
D27376	Feeder Connection
D24182	Coal Feeder Conversion
C19957	Airlock
C17154	Control Cabinet - NEMA 4

List of Instrumentation and Control Drawings

90528-4-4913-01	Instrument Data Sheets
90528-4-4913-02	Instrument Data Sheets
90528-4-4913-03	Instrument Data Sheets
90528-4-4913-04	Instrument Data Sheets
90528-4-4913-05	Instrument Data Sheets
90528-4-4913-06	Instrument Data Sheets
90528-4-4913-07	Instrument Data Sheets
90528-4-4913-08	Instrument Data Sheets
90528-4-4913-09	Instrument Data Sheets
90528-7-4900-10	Process Flow Control
90528-7-4900-20	Drawing Index
90528-7-4900-21	Process Symbols
90528-7-4900-22	Control Symbols
90528-7-4900-23	P & ID's/Air & Gas
90528-7-4900-24	P & ID's/Fuel Oil
90528-7-4900-25	P & ID's/Boiler Water
90528-7-4900-26	LNSB
90528-7-4900-27	Stack Instrumentation
90528-7-4908-01	Logic Diagrams
90528-7-4908-02	Logic Diagrams

90528-7-4950-01	Graphic Display
90528-7-4950-02	Graphic Display
90528-7-4950-03	Graphic Display
90528-7-4950-04	Graphic Display
90528-7-4950-05	Graphic Display
90528-7-4950-06	Graphic Display
90528-7-4950-07	Graphic Display
90528-7-4950-08	Graphic Diaplay

Appendix C

July 24, 1991

Dr. Gerard Elia
PETC Technical Project Manager
U.S. Department of Energy
Mail Stop 920-L
Building 120, Cochran Mill Road
Bruceton, PA
15236 USA

Dear Dr. Elia:

Subject: Cyclone Retrofit Project

The information below is provided as a supplement to the Continuation Application and Additional Funding Requirement for Budget Period II dated July 24, 1991. As we have discussed we want your office to have the benefit of our assessment of the technology as you determine your response to our Application for Continuance.

Factors influencing the prudency of continuing with the Project include:

1. We expected that a new partner would be participating with TransAlta in the Cyclone Retrofit Project and future LNS Burner developments. Despite significant efforts in this regard during the past year, we have been unable to attract a partner.

2. Costs for the Cyclone Retrofit Project doubled from an EAC of $13.6 million to our current EAC of $26.2 million.

3. Completion of the Project has been delayed two years from August 1991 to July 1993. This delay will reduce the market potential as the technology will not be demonstrated within the time frame that utility companies will be making compliance commitments under the Clean Air Act.

4. The cost differential between the LNS Burner and competing technologies has narrowed significantly as LNS Burner costs have risen and costs for competing technologies have gone down.

In addition, compliance options such as coal switching or blending appear for many utilities to be a more economic and preferred alternative than originally contemplated.

5. Our current evaluation of the potential market for the LNS Burner is much smaller than previously estimated and even this reduced market is uncertain.

6. Demonstration testing of the LNS Burner Heavy Oil Recovery Project (HOR) at Cold Lake, Alberta, Canada is approximately one year late. This has delayed the availability of information necessary to finalize the design of the LNS Burner for the Cyclone Retrofit Project, all of which have increased costs and delayed commercialization.

   Preliminary analysis of data from the HOR Project have not provided conclusive results supporting the basic theory of the technology.

7. A much larger demonstration project (say 200 - 500 MW) is still required before the technology would be commercial. Based on the above items, the cost of this larger demonstration would be higher than previously estimated and it would be more difficult to raise the necessary funds. The uncertainty of completing a larger demonstration further exacerbates the problem of having the technology commercially available in time to meet utility compliance needs under the Clean Air Act.

8. Successfully completing the Cyclone Retrofit Project would provide better information and additional time so as to attract a partner. This would maintain the potential to commercialize the LNS Burner.

We would appreciate any additional information you can provide to assist our assessment of the LNS Burner technology and, specifically, our Cyclone Retrofit Project.

Yours very truly,

A.C. Moon
Program Manager

Appendix D

Department of Energy
Pittsburgh Energy Technology Center
P.O. Box 10940
Pittsburgh, Pennsylvania 15236-0940

AUG 20 1991

Alan C. Moon
Program Manager
TransAlta Technologies, Inc.
110 12th Avenue S. W.
Box 1900
Calgary, Alberta T2P 2M1
Canada

Dear Alan:

This letter formalizes our discussions in response to your Continuation Application for the TransAlta LNS Burner Clean Coal Project.

DOE will be pleased to process the Continuation Application for transition into Budget Period 2. However, final approval for the transition is contingent upon the following:

First, DOE requires TransAlta's financial commitment to complete the project. Regarding the project cost growth, DOE is limited to funding an additional 25% over its original share. TransAlta must speak to the remaining funds necessary to continue the project via other funding partners.

Second, in light of the developments of the Pilot operation at Cold Lake, DOE requires reportable results of the completed and near term planned work for the technology. TransAlta can initiate this effort via discussions at PETC and/or the upcoming site visit to Cold Lake and Calgary.

I will be happy to discuss this situation with you at any time.

Sincerely,

Gerard G. Elia

Gerard G. Elia
Office of Clean Coal Technology

Appendix E

September 10, 1991

Dr. Gerard Elia
PETC MS 902-L
U.S. Department of Energy/PETC
Pittsburgh Energy Technology Center
Building 120, Cochran Mill Road
P.O. Box 10940
Pittsburgh, PA 15236-0940
USA

Dear Dr. Elia:

Subject: Cooperative Agreement No. DE-FC22-90PC89661 between TransAlta Technologies, Inc. ("TransAlta") and the U.S. Department of Energy ("DOE")

This letter is in response to your letter dated August 20, 1991 and subsequent discussions during your site visit to Cold Lake and Calgary. You advised TransAlta that DOE funding of the increased cost of the Cyclone Boiler Retrofit Project is limited to a maximum of 25% above DOE's original share. You also indicated that DOE approval of TransAlta's continuation application was contingent upon the following:

1. A financial commitment from TransAlta to complete the Project, which commitment must cover funding for the increased costs of the Project.

2. The submission by TransAlta to DOE of successful results of the low NOx/SOx Burner - Coal Application Pilot ("LNS-CAP") Project at Cold Lake, Alberta.

The cost estimate for the Cyclone Boiler Retrofit Project has increased from $15.3M U.S. to $26.2M. You have indicated that additional funding from the DOE is limited to $1.7M of the $10.9M cost increase. TransAlta would not be able to obtain the additional $9.2M of funding as required under the first condition shown above.

With respect to the second condition, the basic design of the LNS Burner for the LNS-CAP Project is similar to the LNS Burner to be installed as part of the Cyclone Boiler Retrofit Project. The LNS-CAP Project began

demonstration testing approximately one year ago. Over the past year, a number of technical and operating problems have been encountered. These problems delayed the LNS-CAP Project by approximately one year. The Project is now coming to a close and the performance of the technology has not yet been confirmed in that we have not been able to find sulfur in the slag, and we have not been able to close the sulfur balance.

As a result of our requirement for DOE funding above the 25% to which you indicate the DOE is limited, and the fact that the performance of the technology at our LNS-CAP Project has not been confirmed, we must terminate the Cyclone Boiler Retrofit Project at the end of Budget Period 1 (September 30, 1991).

TransAlta is proceeding with the activities necessary to return the host unit to normal operating status. Site work will commence October 1, 1991.

If you require additional information, please contact me at (403)267-7312 or Bryan Simonson at (403)267-3654.

Yours very truly,

A.C. Moon
Program Manager

Appendix F

DOE NEWS

NEWS MEDIA CONTACT:
Carole Beeman, 202/586-5810

FOR IMMEDIATE RELEASE
September 17, 1991

DOE ANNOUNCES HALT TO ACTIVITY AT TRANSALTA CLEAN COAL PROJECT; CITES LARGE COST GROWTH AND DISAPPOINTING TEST RUN DATA

Major cost increases and mixed results from ongoing pilot tests have led to the termination of a Clean Coal Technology project sponsored by TransAlta Technologies, Inc., of Calgary, Alberta, Canada.

The project -- selected in 1988 in the second round of Clean Coal competition held under a previous administration -- was halfway through construction when TransAlta decided not to continue the demonstration effort. The project would have demonstrated an innovative coal burner on a boiler at the Southern Illinois Power Cooperative's generating station near Marion, IL. The TransAlta burner, called "LowNOxSOx" (LNS), was designed to reduce both sulfur and nitrogen oxide emissions within the combustion chamber, avoiding the need for add-on pollution control equipment.

The Energy Department's agreement with TransAlta, signed in June 1990, called for the replacement of two cyclone burners on a 33-megawatt boiler with the LNS burners. The Energy Department agreed to pay $6.8 million of the project's total $15.3 million cost.

(MORE)

Following completion of the project's initial phase, the project ran into cost increases of more than 70%, raising the total project cost to $26.2 million. By law, the Energy Department can add a maximum of 25% of its original contribution to each project, or in this case, $1.7 million, which would have brought the total DOE contribution to $8.5 million. TransAlta and its project partners were unable to raise the remaining funds.

The cost increases were due mainly to delays in engineering and construction and other schedule problems. The pilot-scale tests of the LNS burner, underway on a plant (1/4 the scale of the planned Clean Coal project) in Cold Lake, Alberta, have experienced both technical and scheduling problems. These tests are part of a privately-funded heavy oil recovery project also sponsored by TransAlta. Test results so far have been inconsistent and unable to satisfactorily verify the expected performance of the LNS Burner.

To date, approximately $11.1 million had been spent on the project. Of this total, the Energy Department had provided about $4 million.

Remaining funds set aside for the TransAlta project ($2.8 million) will now be available for the Clean Coal Technology Program's reserve fund.

-DOE-

R-91-195

END