APPENDIX E - TASK 1.5.2 - PROCESS ECONOMICS STUDY - OUTLINE
4 PAGES

Process Economics Study - Outline
LPM as an add-on to IGCC for Coproduction

Part One - Coproduction

1. Introduction

1.1. LPM Process Design Options.

- Develop plant design options for the LPM process, for design variables such as: a) feed gas pressure, b) feed gas compositions, and c) % syngas conversion.

2. LP Methanol Process advantage versus Gas Phase Methanol.

2.1. Syngas Conversion Cost for Methanol Production from CO-Rich syngas. (LP vs. GP).

- For the various LPM process design options (from 1.1) develop plant capital and conversion costs for a 500 t/d LPM plant, derived from the Kingsport Project costs and design basis,

- Summarize in a series of graphs, conversion costs, in cents per gallon over the range of syngas conversion from 15% (LP - Once-thru) to 94% (GP), for baseload annual coproduction operation. This will show LP's advantage at lower conversions; highlight process design or development
  - **2.1.1. 1000 psi, 5 ppm S, syngas; 500 t/d Plant size**
  - **2.1.2. 500 psi, 5 ppm S, syngas; 500 t/d Plant size**
  - **2.1.3. Impact of Plant Size on Conversion Costs**
    - Summarize in a graph, conversion cost versus plant size, for 2.1.1 and 2.1.2 above. *Include plant size impact on product distribution (freight) cost, assuming that local markets are served. Freight cost will increase with plant size, as the distribution radius increases.*

2.2. Methanol Product Purification Cost. (LP Vs GP).

- Develop capital and operating costs for product purification design alternatives. Summarize LP's advantage (in cents per gallon), especially for MTBE and Fuel Grade from CO-rich gas at low conversions, Vs GP process.
  - **2.2.1. MTBE Grade; Over the above range of syngas conversion**
  - **2.2.2. Fuel Grade**
  - **2.2.3. Chem. Grade**

2.3. Feedgas (Syngas) Composition Variations: (Impact on LP vs. GP).

- Higher Sulfur content in the feedgas will have a negative cost impact on LP at low syngas conversion, relative to GP at high conversions. Conversely, higher feedgas inert content will have a negative relative cost impact on GP.
  - **2.3.1. Sulfur content variation; over the above range of syngas conversion**
  - **2.3.2. Inert gas content variation; over the above range of syngas conversion**

2.4. Syngas ~~Utilization~~ Usage (Btu per Gallon) - (Impact on LP vs. GP).

- Summarize differences in syngas ~~utilization~~ usage (Btu per gallon of methanol), and in mass flow loss to the combustion turbine (kwh production loss per gallon of methanol); for the cases in 2.1 above.

Process Economics Study - Outline
LPM as an add-on to IGCC for Coproduction

Part One - Coproduction (Cont'd.)

2.5. Summary of Cost Advantage(s) - (LP Vs GP).

- Summarize the cost impact (cents per gallon) of the above design variables and syngas utilization differences. Show the impact of methanol plant size on the conversion costs. *Also (separately show) the impact of 90%, 80%, and 70% annual load utilization for use with Section 5. "Intermediate Load Coproduction and Stored Energy" of this Economics Study.*

- Recommend areas for process design value engineering work; and areas for demonstration at Kingsport.

3. Coproduction - Impact on Electric Power Cost -

3.1. Baseload Coproduction with Methanol Sales

3.1.1. 2 T/D methanol per MW (20% conversion)
3.1.2. 4 T/D methanol per MW (33% conversion)
3.1.3. 8 T/D methanol per MW (50% conversion)

For baseload coproduction, the gasifier must be sized for both the power and methanol products.. A matrix of power plant and methanol plant sizes of interest, is show in the following tables.

- For a given gasifier size (base is about 2160 x 10^6 Btu/hr. in this example); the methanol plant size and power plant size would change:

Methanol to Power Size	Power Plant Size	Methanol Plant Size	Syngas Conversion	Gasifier Size
0 T/D per MW	300 MW	0 T/D	0 %	Base
2 T/D per MW	250 MW	500 T/D	20%	Base
4 T/D per MW	200 MW	800 T/D	33%	Base
8 T/D per MW	150 MW	1200 T/D	50%	Base

- For a given baseload power plant size; the gasifier and methanol plant size is adjusted:

Methanol to Power Size	Power Plant Size	Methanol Plant Size	Syngas Conversion	Gasifier Size
0 T/D per MW	150 MW	0 T/D	0 %	0.50 x Base
2 T/D per MW	150 MW	300 T/D	20%	0.625 x Base
4 T/D per MW	150 MW	600 T/D	33%	0.75 x Base
8 T/D per MW	150 MW	1200 T/D	50%	1.00 x Base

- The impact of coproduction on electric costs should be shown in graphs of electricity cost Vs. methanol net back price, for both of these matrix tables..

End of Part One.

Process Economics Study - Outline
LPM as an add-on to IGCC for Coproduction

Part Two - Coproduction for Intermediate Electric Load Following.

4. Intermediate Load Coproduction and Stored Energy.

4.1. Syngas Value.

4.1.1.Syngas value as a function of (time of day) Power Value.

- Our earlier load following work indicates that an LPM coproduction add-on optimizes for intermediate peak-load power in the 1000 to 2500 hr./yr. range. This means the methanol plant operates during "off--peak" power in the 7760 (88% utilization) to 6260 (71% utilization) hr./yr. range (8760 hr./yr. = 100% = total hr./yr.), with up to 200 annual daily stop/start operations for the daily on/off peaks.
  - *Time of day example: A given Lambda Curve might provide data at 2000 and 1500 peak hr./yr. such as: a)* 2.7 cent off-peak power (6760 hr.) plus 6.6 cent intermediate-peak power (2000 hr.) equals 3.6 cent baseload power (8760 hr.). b). 2.9 cent off-peak (7260 hr.) plus 7.0 cents intermediate-peak power (1500 hr.) equals 3.6 cent baseload power (8760 hr.). Time of day syngas values can be derived, based on the alternative value of using syngas for power (in CC or CT power plants).

4.1.1.1. Syngas value as function of seasonal opportunity fuels/feeds.

- *Natural gas may be available seasonally, for use in the CC power plant, allowing syngas to be used for conversion in an LPM add-on. Other feeds?*

4.1.2.Syngas value as function of cost to produce incremental quantity..

- ***Defer this for later study.*** We should await other CCT project (e.g. Tampa, Wabash River) projections of future IG facility fuel gas (syngas) costs, and/or electric power costs.

4.2. Intermediate Load Coproduction - for Methanol Sales.

- ***Defer this for later study.*** For all intermediate load coproduction cases, redundant investment to utilize syngas on/off-peak is required; so that when the methanol plant shuts down during peak power periods, all of the syngas can be converted to electric power. There are many intermediate load coproduction power plant design choices; a) CC power plant turned down, or b) CC power plant baseload with CT power plant for peak; which may be combined with many methanol plant choices of size/% conversion. To do these studies properly, we need to have good time of day power values (also called Lambda Curves) as well as the Section 2. (above) Methanol Plant design choices completed.

Methanol may also be used as backup fuel for enhanced power plant availability,.

4.3. Intermediate Load Stored Energy Production, with Methanol Fuel for Peak Power Production.

- ***Defer this for later study.*** The design optimization for this is quite complex. The IGCC/OTM plant design has an additional variable: the peaking power plant size and hours of operation is an independent variable. We may be able to use the \ . ; study with a published paper as goal. An alternative study option is to compare ourselves (IGCC/OTM) to the various published EPRI (IG-Cash, et. al.) studies, which have some favorable Lambda Curves examples for energy storage.

4.4. Intermediate Load Stored Energy Production, with Methanol for Dispersed Energy.

- Methanol transported to remote **existing** or new power plants on the Utilities grid system.

End of Part Two.

Process Economics Study - Outline
LPM as an add-on to IGCC for Coproduction

Part Three - Methanol Fuel Applications

5. Premium Methanol Fuel Applications

- At 40 cents per gallon, methanol as a fuel ($6.00 per mmBtu) will not compete with oil in most applications ($20/bbl crude = $3.30/mmBtu; $24/bbl diesel = $4.00 /mmBtu). However, methanol coproduced at a central IGCC power station, may be a valuable premium fuel for two evolving developments: as an economical Hydrogen source for small fuel cells, and as an environmentally advantaged fuel for dispersed electric power.

- "Central clean coal technology processing plants, making coproducts of electricity and methanol; to meet the needs of local communities for dispersed power and transportation fuel" - meets the DOE Clean Coal Technology Program's objectives. Serving (initially) small local fuel markets also builds on LP's (the LPMEOH™ process) strengths; good economics at small methanol plant sizes, fuel grade product distillation savings, and a freight advantage in local markets vis a vis large off-shore remote gas methanol. Baseload methanol coproduction studies show that (40) cent per gallon methanol can be provided from an abundant, non-inflationary local fuel source.. *We need to show when (at what oil price) we can compete, and to arrange fuel tests to confirm the dispersed energy environmental advantage.*

5.1. Hydrogen Source for Fuel Cells

- Hydrogen fuel cells, being developed for transportation applications, can achieve 65% system efficiency, as compared to 45% for diesel IC engines and 32% for gasoline IC engines. Methanol is a storable, transportable liquid fuel which can be reformed under mild conditions to provide H2. For small H2 applications, *and at low utilization factors,* methanol reforming is a more economical source of hydrogen than : a) natural gas reforming, b) distillate (oil) reforming; and is cheaper than LH_2.

5.1.1. Fuel Cells for Transportation

5.1.2. Fuel Cells for Stationary Power

(See also dispersed power below).

5.1.3. Industrial Applications - Small Hydrogen Plants

Small pressurized methanol reformers for transportation applications may be suitable for adapting to meet the needs of small commercial hydrogen gas requirements.

5.2. Dispersed Power

- Dispersed power is getting a lot of favorable publicity. . The world wide package (0.2 MW to 10 MW) power plant market is large. A variety of technologies (combustion turbine, internal combustion engine, fuel cell) are being packaged to provide power and heat locally, at the use point. Environmental and Economic advantages include Methanol for Fuel Cells = clean stationary local power; no need for natural gas pipelines; no new high voltage power lines.

5.3. Dimethyl Ether as an Enhancement to Methanol in Premium Fuel Applications

Can coproduced mixtures of methanol and dimethyl ether improve upon methanol, in the above?

End of Part Three.

APPENDIX F - TASK 1.5.4 - PROJECT REVIEW MEETING (June 5/6)
12 PAGES

NOTES FROM MEETING

AIR PRODUCTS

DISTRIBUTION (NAME/ORGANIZATION) *Unable to attend. **Chairman		COPIED FOR INFORMATION ONLY
William C. Jones - EMN	Barry Street - EMN*	Frank Frenduto - APCI
Bill Brown - APCI*	Dave Drown - APCI*	Tom Dahl - APCI
Ed Heydorn - APCI	Bob Moore - APCI	Dan Canning - APCI
Van Eric Stein - APCI	Bob Kornosky - DOE*	Barry Halper - APCI
Laurie Paulonis - EMN*	Bill O'Dowd - DOE*	Bernie Toseland - APCI
* with attachments		

FROM	ORGANIZATION	EXTENSION	TODAY'S DATE
Bill Brown WRB 6/20/96	APCI LPMEOH Prog. Mgr.	17584	19 June, 1996

DATE OF MEETING	WEEKDAY	TIME STARTED	TIME ENDED	LOCATION Eastman (EMN), Kingsport
June 5, 1996	Wednesday	3:00 pm	5:30 pm	Building 310, Room 112 and
June 6, 1996	Thursday	8:30 am	1:00 pm	Construction Site

SUBJECT AND/OR PURPOSE
Project Review Meeting with DOE, Eastman, and Air Products

ITEM NO.	RESPONSIBLE PERSON (INITIALS)	TARGET DATE	DISCUSSION
1	DPD	7/18	• The meeting (Agenda attached) started at 3:00 p.m., Wednesday, June 5 with a review of project design, procurement, construction cost and schedule by Dave Drown. (see attachment 1-1 thru 1-11) The reactor is now expected to ship the week of June 10 (in fact, 14 June!) and to be on-site in late June. Dec. 2nd is the anticipated completion of construction, with turn-over of the site to operations for commissioning and start-up (Dec. 27th). The overall project cost (Phases 1, 2, and 3) is on target. A cost forecast (DPD) for Phase 1 and 2 is to be completed in mid-July; after the reactor has been erected and the insulation bids are received (e.g., the major remaining cost and schedule variables are done). • The attendee's adjourned to the LPMEOH plant site to review construction progress. Major steel was being erected; and piping and electrical work being done in specific plant areas. Steel and reactor delivery are on the critical path. Good progress is being made with peak construction staffing (about 100) anticipated from July through September. • The meeting reconvened on Thursday, June 6, with a review of the training, commissioning and start-up plans (ECH/BTS). Attachment 2-1 shows the overall Eastman operations support plan and schedule. Operator training will start in mid-October for 1 week/crew by 4 crews. Water batching checks will start Dec. 2nd; which will mark the transition of the site from construction control to operations control. Catalyst reduction (9 Batches of about 1 Ton each) will start in early January; with methanol production in late January.

FORM 3684 (REV. 5/89)
MN006 - wrb

NOTES FROM MEETING
CONTINUATION

ITEM NO.	RESPONSIBLE PERSON (INITIALS)	TARGET DATE	DISCUSSION
2 3	RMK/WJO'D ECH	6/14 6/28	• The Demonstration Test Plan, and the status of the syngas (trailer) tests were reviewed. The latest draft of the DTP looks to be in good shape. The syngas tests indicate catalyst life should be good. The DOE owes comments (Item No. 2) and Ed Heydorn (Item No. 3) a revised final draft of the DTP.
4 5	WRB WRB	6/28 8/28	• The DOE Reports are shaping up. Quarterly's in the format and form of #4 will be submitted by the end of June (Item No. 4). The Project Management Plan should be updated for Phase 3 (Item No. 5).
6	RBM	7/30	• Other Phase 1, Task 5 tasks were reviewed. An outline of the Process Economics Study (Attachment 3-1 thru 3-4) was reviewed, and Bob Moore reviewed his progress to date on Section 1 and 2.1. An initial release of Part One of the Study will be issued by the end of July. Page 3-4 of the attachment outlines premium methanol fuel applications (Fuel Cells, Dispersed Power) which will be the target for off-site fuel use demonstrations (Phase 3, Task 4) in 1998-99. The DME milestone decision plan and status of Design Verification Testing (Attachments 4-1 and 4-2) was reviewed. The Laboratory R & D verification has had positive results to date; and market verification is underway. Plans for a LaPorte PDU run in 1997 are being made, in anticipation of a positive decision in Dec. 1996.
7	WRB	7/30	• Plans for the Continuation Application and for a June 19 (subsequently changed to June 28th) meeting at DOE-HQ were discussed. The only issue is whether to seek Budget Period #3 approval by 30 Sept, or whether to extend B.P. #2 to 30 Nov and delay approval. The Continuation Application will be submitted July 30, if timely 30 Sept approval is opted for.
8	ALL	Sept. 4-5	• The next project review meeting will be held (noon to noon) on Sept 4 and 5 (Wed. - Thurs.) in Kingsport. **Please Note!**

Meeting Notes

MEETING NOTICE

AIR PRODUCTS

☐ Check if this meeting was scheduled through Schedule+

PLEASE NOTE: Security badges required for visitors in all buildings and employees in R&D buildings.

DISTRIBUTION (NAME/ORGANIZATION) *(If unable to attend, contact originator)*		COPIED FOR INFORMATION ONLY
William C. Jones - EMN	Barry Street - EMN *	Frank Frenduto - APCI
Bill Brown - APCI*	Dave Drown - APCI *	Tom Dahl - APCI
Ed Heydorn - APCI	Bob Moore - APCI	Dan Canning - APCI
Van Eric Stein - APCI	Bob Kornosky - DOE *	Barry Halper - APCI
Lauri Paulonis - EMN*	Bill O'Dowd - DOE*	Bernie Toseland - APCI
~~Andy Wang - APCI~~	* with attachments	

FROM	ORGANIZATION	EXTENSION	TODAY'S DATE
Bill Brown WRB 5/24	APCI LPMEOH Prog. Mgr.	17584	24 May 1996

DATE OF MEETING	WEEKDAY	TIME FROM	TIME TO	LOCATION
June 5, 1996	Wednesday	3:00 pm	5:30 pm	Eastman (EMN), Kingsport, Building 310, Room 112 and Construction Site.
June 6, 1996	Thursday	8:30 am	1:00 pm	

SUBJECT AND/OR PURPOSE

Project Review Meeting with DOE, Eastman, and Air Products

DESIRED RESULTS/OUTCOMES

Review Budget Period #2 status; and prepare for Continuation Application for Budget Period #3.

REFERENCE MATERIAL/OTHER

AGENDA

A. Tour Site 3:00 PM - Wednesday June 5.

Plant construction site tour and Syngas Poisons Trailer tour. *(DOE arriving on 1:30 PM flights; they will meet us, or we them, about 3:00)*

B. End of (work) Day - 5:30 PM?

Dinner (?) & early to bed!

C. Status Updates: on B.P. #2 Tasks: 8:30 am - Thursday, June 6.

1. Design, Procurement, Construction (Schedule/Cost F/C) Status — DPD
2. Training, Commissioning & Startup Plan/Schedule — BTS/ECH/VES/DPD
3. Four year Demonstration Test Plan for Phase 3, Task 2 - Operations — ECH
4. DOE Reports
   a. Due for B.P. #2 (EMP, Quarterlies #5,6,7,8; etc.) — WRB/DPD
   b. Phase 3 Reports/Reporting Plan — ECH/VES
5. Phase I, Task 5 Tasks - Status
   a. Fuel-use test plan update — WRB
   b. DME DVT Status/Milestone Plan — ECH/WRB
   c. Process Economic Study - Outline and 1.1 & 2.1 (partial) Outline - BP3 — WRB/RBM
6. Syngas (Trailer) Testing update. — VES ~~AWW~~
7. Plans for: a) June 19th meeting at HQ — (all)
   b) Next Project Meeting 4-5 Sept., Noon : Noon
   c) Continuation Application Draft

(The DOE have return flights; leaving about 2:00 PM on 6 June.)

FORM 3683 (REV. 2/91)

WKB
DOE Meeting
June 5-6
1996
@ Kingsport

KINGSPORT LPMEOH DEMONSTRATION PROJECT
JUNE 6, 1996 DOE STATUS OVERVIEW

DESIGN

95% COMPLETE DETAIL DESIGN
INSTRUMENT AND ELECTRICAL PACKAGE ISSUED

PROCUREMENT

REACTOR TO SHIP BY RAIL THIS WEEK — probably ~~6/10~~ June 10th week now Rail Car repairs!
C-120 VENT STACK AWARDED TO JOHN ZINC
89% OF PREFAB PIPE ON SITE
PROCESS BUILDING STRUCTURAL STEEL BEGAN ARRIVING ON SITE 5/28/96

CONSTRUCTION

30% COMPLETE OVERALL ON CONSTRUCTION
INSTRUMENT/ ELECTRICAL WORK STARTED

COST FORECAST

PHASE 1& 2 -POST MOD 3 - $36.5 MM

SCHEDULE

PLANT MECHANICALLY COMPLETE 12/02/96
BEGAN CARBONYL BURNOUT 12/27/96

LPMEOH PROJECT

DESIGN STATUS - 5 JUNE 1996

PROCESS ENGINEERING
- Complete except for startup and operations issues.

P&ID
- Rev 2 "As Designed" released end of May.

PROCESS CONTROLS
- Hardware---carbonyl analyzer remains to be purchased
- EMN now has all data necessary for programming the DCS
- Reviewing Logic Diagrams prepared by EMN
- Working on identifying Commissioning activities and schedule
- Working on identifying IT needs for APCI on-site personnel and tie-ins to TTown.

VALVES AND MATERIALS
- Working on Pressure Test Flowsheet .

PIPING/LAYOUT
- Will send Bulletin #5 to Mechanical Contractors today
- Preparing documents for Insulation Bid Package
- Final piping dimensions to C-120 Vent Stack to be completed

CIVIL STRUCTURAL
- Reviewing Catalyst Building drawings from Steel Detailer(this is the final package from the Detailer)
- Completing a few drawings for Fireproofing of Structural Steel
- Foundation for C-120 to be completed
- Preparing Final Grading & Paving drawings

EQUIPMENT ENGINEERING
- Essentially complete except for C-120 vendor prints

ELECTRICAL/INSTRUMENT DESIGN
- Completed Rev. 0 (released for construction) package.
- Awarded Analyzer Bldg. Design to ICS; expect mid August delivery
- Loop Diagrams promised for July

REMAINING BID PACKAGES
- Insulation- Out for Bids June 12, Award by end of July.
- Painting- Out for Bids in July, Award in August.
- Final Grading & Paving-Out for Bids in August, Award in September

LPMEOH PROJECT

STATUS OF FIELD MATERIALS - 5 JUNE 1996

PROCESS BUILDING STRUCTURAL STEEL

- All First Tier of Steel is on-site.
- Steel for second Tier and main stair tower is in fabrication.
- Third Tier will be released for fabrication by 5 June.
- Catalyst Building Steel will be released for Fabrication by 12 June.

PREFAB PIPE

- 630 Spools total - 561 Spools on-site(89%)
  - 24 spools delayed until 8/25
  - Awaiting delivery of balance- no impact on schedule

MANUAL VALVES

- Approximately 95% of all valves are on site

INSTRUMENTS

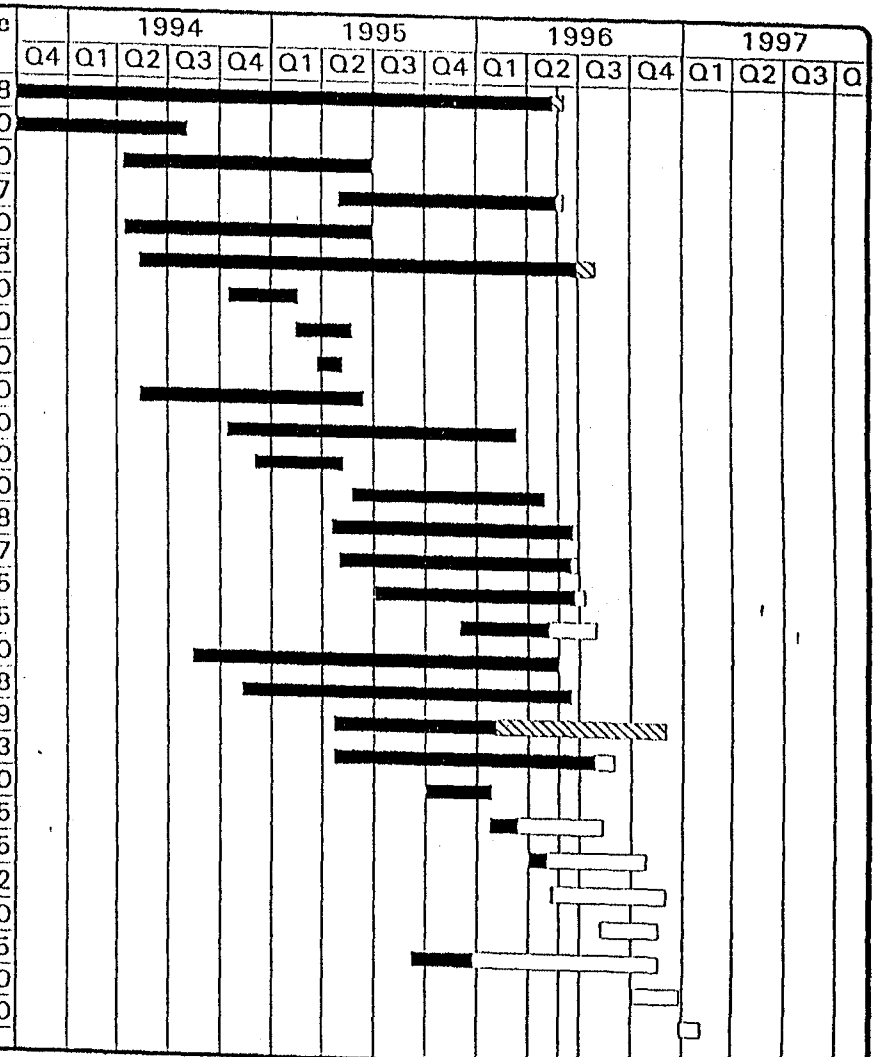
- All Flow Elements are on site.
- All control valves are on-site.
- Analyzer building scheduled to ship in mid August.
- DCS on-site and being programmed by EMN
- Instrument Panels still in vendor shops.

ELECTRICAL MATERIALS

- All Bulk Materials(cable, cable trays, lighting fixtures, terminal boxes)are on-site

LPMEOH DEMONSTRATION PROJECT
PHASE 1-2 SUMMARY SCHEDULE

Task Name	Start	End	Perce Com
PROCESS DESIGN	Oct/01/93	Jun/03/96	98
PFD/HEAT & MAT'L BALANCE	Oct/01/93	Aug/05/94	100
PROCESS EQUIPMENT SPECS	Apr/13/94	Jun/30/95	100
REVIEW DETAIL DESIGN	May/01/95	Jun/03/96	97
NEPA FONSI REVIEW	Apr/15/94	Jun/30/95	100
DETAILED DESIGN	May/11/94	Jul/29/96	96
P&ID'S, REV. PC	Oct/17/94	Feb/17/95	100
OPERABILITY/HAZARDS REVIEWS	Feb/13/95	May/24/95	100
P&ID'S, REV. P1	Mar/23/95	May/08/95	100
PROCESS EQUIP. MECH. SPECS	May/11/94	Jun/13/95	100
EQUIPMENT VENDOR PRINTS	Oct/14/94	Mar/12/96	100
EQUIPMENT ARRANGEMENTS	Dec/01/94	May/08/95	100
INSTRUMENT SPECS	May/22/95	Apr/29/96	100
CIVIL/STRUCTURAL DESIGN	Apr/17/95	Jun/28/96	98
PIPING DESIGN	May/01/95	Jun/28/96	97
INSTRUMENT/ELECTRICAL DESIGN	Jul/03/95	Jul/10/96	95
DCS PROGRAMMING	Dec/01/95	Jul/29/96	65
EQUIPMENT PROCUREMENT	Aug/12/94	May/23/96	100
REACTOR DELIVERY	Nov/08/94	Jun/27/96	98
CONSTUCTION	Apr/21/95	Nov/29/96	49
EASTMAN OSBL WORK	Apr/21/95	Aug/30/96	93
CIVIL/UNDERGROUND	Oct/02/95	Jan/26/96	100
STEEL & EQUIPMENT ERECTION	Jan/22/96	Aug/09/96	25
MECHANICAL	Apr/01/96	Oct/25/96	15
INSTRUMENT/ELECTRICAL	May/09/96	Nov/29/96	2
INSULATION & FIRE PROOFING	Aug/05/96	Nov/15/96	0
PROCEDURES/TRAINING	Sep/05/95	Nov/15/96	25
CHECK-OUT/COMMISSIONING	Oct/01/96	Dec/24/96	0
START-UP	Dec/26/96	Jan/31/97	0



Printed: May/24/96
Page 1

Milestone △ Summary Fixed Delay ----

Dec 2 = EMN sub
no "Const" sub. | for commissioning.

1-5

SCHEDULE FOR EASTMAN OPERATIONS SUPPORT
LIQUID PHASE METHANOL PROJECT(6/6/96)

6/6/96
Handout to DOE
Proj. Rev. Mtg
(Barry Street)

DATE	ACTIVITY	STAFFING
May	SOP Std Op Procedure	1 Eng., 1 Opr.
June	SOP	1 Eng., 1 Opr.
July 1	SOP, Checklists, Lesson plans	1 Eng., 1 Opr.
July 29	Lesson plans, piping PCO (Physical Check Out)	2 Eng., 1 Opr.
August 12	FCO procedure, Piping PCO (Functional Check Out)	2 Eng., 1 Opr.
September 3	FCO procedure, Piping PCO	2 Eng., 2 Opr.
September 23	FCO procedure, Piping PCO, Continuity checks	2 Eng., 2 Opr., 2-3 E & I
September 30	PCO, Continuity checks, Pre-Training	2 Eng., 4 Opr., 2-3 E & I
October 14	PCO, Loop Checks, operator training*	2 Eng., 4 Opr., 4-6 E & I
December 2	Start water checks - FCO Days only	2 Eng., 4 Opr., 4-6 E & I
December 11	Final FCO ESD/Interlock test	2 Eng., 4 Opr., 2-3 E & I
Dec.27	Carbonyl burnout, Hot tests - FCO	1 Eng/shift, 2 - 3 Opr/shift, 1/2 to 1 E&I/shift
Jan. 6	Catalyst Reduction Batches	1 Eng/shift, 3 Opr/shift
Jan. 26	Ready for plant startup	1 Eng/shift, 3 Opr/shift

*Operator training will consists of 4 operators/crew in training for 1 week/crew or 4 weeks total.

Attach 2-1

Process Economics Study - Outline
LPM as an add-on to IGCC for Coproduction

Part One - Coproduction

1. Introduction

1.1. LPM Process Design Options.

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2. LP Methanol Process advantage versus Gas Phase Methanol.

2.1. Syngas Conversion Cost for Methanol Production from CO-Rich syngas. (LP vs. GP).

- For the various LPM process design options (from 1.1) develop plant capital and conversion costs for a 500 t/d LPM plant, derived from the Kingsport Project costs and design basis,

- Summarize in a series of graphs, conversion costs, in cents per gallon over the range of syngas conversion from 15% (LP - Once-thru) to 94% (GP), for baseload annual coproduction operation. This will show LP's advantage at lower conversions; highlight process design or development

  2.1.1. 1000 psi, 5 ppm S, syngas; 500 t/d Plant size

  2.1.2. 500 psi, 5 ppm S, syngas; 500 t/d Plant size

  2.1.3. Impact of Plant Size on Conversion Costs

  - Summarize in a graph, conversion cost versus plant size, for 2.1.1 and 2.1.2 above. *Include plant size impact on product distribution (freight) cost, assuming that local markets are served. Freight cost will increase with plant size, as the distribution radius increases.*

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  2.2.1. MTBE Grade; Over the above range of syngas conversion

  2.2.2. Fuel Grade

  2.2.3. Chem. Grade

2.3. Feedgas (Syngas) Composition Variations: (Impact on LP vs. GP).

- Higher Sulfur content in the feedgas will have a negative cost impact on LP at low syngas conversion, relative to GP at high conversions. Conversely, higher feedgas inert content will have a negative relative cost impact on GP.

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  2.3.2. Inert gas content variation; over the above range of syngas conversion

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Attach 3 - 1

Process Economics Study - Outline
LPM as an add-on to IGCC for Coproduction

Part One - Coproduction (Cont'd.)

2.5. Summary of Cost Advantage(s) - (LP Vs GP).

- Summarize the cost impact (cents per gallon) of the above design variables and syngas utilization differences. Show the impact of methanol plant size on the conversion costs. *Also (separately show) the impact of 90%, 80%, and 70% annual load utilization for use with Section 5. "Intermediate Load Coproduction and Stored Energy" of this Economics Study.*

- Recommend areas for process design value engineering work; and areas for demonstration at Kingsport.

3. Coproduction - Impact on Electric Power Cost -

3.1. Baseload Coproduction with Methanol Sales

3.1.1. 2 T/D methanol per MW (20% conversion)
3.1.2. 4 T/D methanol per MW (33% conversion)
3.1.3. 8 T/D methanol per MW (50% conversion)

For baseload coproduction, the gasifier must be sized for both the power and methanol products.. A matrix of power plant and methanol plant sizes of interest, is show in the following tables.

- For a given gasifier size (base is about 2160 x 10^6 Btu/hr. in this example); the methanol plant size and power plant size would change:

Methanol to Power Size	Power Plant Size	Methanol Plant Size	Syngas Conversion	Gasifier Size
0 T/D per MW	300 MW	0 T/D	0 %	Base
2 T/D per MW	250 MW	500 T/D	20%	Base
4 T/D per MW	200 MW	800 T/D	33%	Base
8 T/D per MW	150 MW	1200 T/D	50%	Base

- For a given baseload power plant size; the gasifier and methanol plant size is adjusted:

Methanol to Power Size	Power Plant Size	Methanol Plant Size	Syngas Conversion	Gasifier Size
0 T/D per MW	150 MW	0 T/D	0 %	0.50 x Base
2 T/D per MW	150 MW	300 T/D	20%	0.625 x Base
4 T/D per MW	150 MW	600 T/D	33%	0.75 x Base
8 T/D per MW	150 MW	1200 T/D	50%	1.00 x Base

- The impact of coproduction on electric costs should be shown in graphs of electricity cost Vs. methanol net back price, for both of these matrix tables. .

End of Part One.

Process Economics Study - Outline
LPM as an add-on to IGCC for Coproduction

Part Two - Coproduction for Intermediate Electric Load Following.

4. Intermediate Load Coproduction and Stored Energy.

4.1. Syngas Value.

4.1.1.Syngas value as a function of (time of day) Power Value.

- Our earlier load following work indicates that an LPM coproduction add-on optimizes for intermediate peak-load power in the 1000 to 2500 hr./yr. range. This means the methanol plant operates during "off--peak" power in the 7760 (88% utilization) to 6260 (71% utilization) hr./yr. range (8760 hr./yr. = 100% = total hr./yr.), with up to 200 annual daily stop/start operations for the daily on/off peaks.
    - *Time of day example: A given Lambda Curve might provide data at 2000 and 1500 peak hr./yr. such as: a)* 2.7 cent off-peak power (6760 hr.) plus 6.6 cent intermediate-peak power (2000 hr.) equals 3.6 cent baseload power (8760 hr.). b). 2.9 cent off-peak (7260 hr.) plus 7.0 cents intermediate-peak power (1500 hr.) equals 3.6 cent baseload power (8760 hr.). Time of day syngas values can be derived, based on the alternative value of using syngas for power (in CC or CT power plants).

4.1.1.1. Syngas value as function of seasonal opportunity fuels/feeds.

- *Natural gas may be available seasonally, for use in the CC power plant, allowing syngas to be used for conversion in an LPM add-on. Other feeds?*

4.1.2.Syngas value as function of cost to produce incremental quantity..

- ***Defer this for later study.*** We should await other CCT project (e.g. Tampa, Wabash River) projections of future IG facility fuel gas (syngas) costs, and/or electric power costs.

4.2. Intermediate Load Coproduction - for Methanol Sales.

- ***Defer this for later study.*** For all intermediate load coproduction cases, redundant investment to utilize syngas on/off-peak is required; so that when the methanol plant shuts down during peak power periods, all of the syngas can be converted to electric power. There are many intermediate load coproduction power plant design choices; a) CC power plant turned down, or b) CC power plant baseload with CT power plant for peak; which may be combined with many methanol plant choices of size/% conversion. To do these studies properly, we need to have good time of day power values (also called Lambda Curves) as well as the Section 2. (above) Methanol Plant design choices completed.

Methanol may also be used as backup fuel for enhanced power plant availability,.

4.3. Intermediate Load Stored Energy Production, with Methanol Fuel for Peak Power Production.

- ***Defer this for later study.*** The design optimization for this is quite complex. The IGCC/OTM plant design has an additional variable: the peaking power plant size and hours of operation is an independent variable. We may be able to use the ( ) study with a published paper as goal. An alternative study option is to compare ourselves (IGCC/OTM) to the various published EPRI (IG-Cash, et. al.) studies, which have some favorable Lambda Curves examples for energy storage.

4.4. Intermediate Load Stored Energy Production, with Methanol for Dispersed Energy.

- Methanol transported to remote **existing** or new power plants on the Utilities grid system.

End of Part Two.

Process Economics Study - Outline
LPM as an add-on to IGCC for Coproduction

Part Three - Methanol Fuel Applications

5. Premium Methanol Fuel Applications

- At 40 cents per gallon, methanol as a fuel ($6.00 per mmBtu) will not compete with oil in most applications ($20/bbl crude = $3.30/mmBtu; $24/bbl diesel = $4.00 /mmBtu). However, methanol coproduced at a central IGCC power station, may be a valuable premium fuel for two evolving developments: as an economical Hydrogen source for small fuel cells, and as an environmentally advantaged fuel for dispersed electric power.

- "Central clean coal technology processing plants, making coproducts of electricity and methanol; to meet the needs of local communities for dispersed power and transportation fuel" - meets the DOE Clean Coal Technology Program's objectives. Serving (initially) small local fuel markets also builds on LP's (the LPMEOH™ process) strengths; good economics at small methanol plant sizes, fuel grade product distillation savings, and a freight advantage in local markets vis a vis large off-shore remote gas methanol. Baseload methanol coproduction studies show that (40) cent per gallon methanol can be provided from an abundant, non-inflationary local fuel source.. *We need to show when (at what oil price) we can compete, and to arrange fuel tests to confirm the dispersed energy environmental advantage.*

5.1. Hydrogen Source for Fuel Cells

- Hydrogen fuel cells, being developed for transportation applications, can achieve 65% system efficiency, as compared to 45% for diesel IC engines and 32% for gasoline IC engines. Methanol is a storable, transportable liquid fuel which can be reformed under mild conditions to provide H2. For small H2 applications, *and at low utilization factors,* methanol reforming is a more economical source of hydrogen than : a) natural gas reforming, b) distillate (oil) reforming; and is cheaper than LH_2.

5.1.1. Fuel Cells for Transportation

5.1.2. Fuel Cells for Stationary Power
(See also dispersed power below).

5.1.3. Industrial Applications - Small Hydrogen Plants
Small pressurized methanol reformers for transportation applications may be suitable for adapting to meet the needs of small commercial hydrogen gas requirements.

5.2. Dispersed Power

- Dispersed power is getting a lot of favorable publicity. . The world wide package (0.2 MW to 10 MW) power plant market is large. A variety of technologies (combustion turbine, internal combustion engine, fuel cell) are being packaged to provide power and heat locally, at the use point. Environmental and Economic advantages include Methanol for Fuel Cells = clean stationary local power; no need for natural gas pipelines; no new high voltage power lines.

5.3. Dimethyl Ether as an Enhancement to Methanol in Premium Fuel Applications
Can coproduced mixtures of methanol and dimethyl ether improve upon methanol, in the above?

<u>End of Part Three.</u>

APPENDIX G - TASK 1.5.4 - PROJECT REVIEW MEETING (June 28th)
14 PAGES

WRB
for 6/28

Agenda For 28 June 1996

LPMEOH™ Project Review Meeting
@ DOE - HQ

Start 10:15

			Start Time
•	Introductions	All	10:15 ✓
•	Phase 1, 2, and 3 - Overview Agreements, Cost Plan, Statement of Work - Still Valid*	WRB	10:30
•	Phase 1 and 2 - Project Status (Pictures, Schedule, PETC/EMN/APCI relationships)	DPD	10:45 1035 ✓
•	Phase 3 - Plans	WRB	11:00
•	Commercialization	WRB	
•	Issues = None	WRB	
•	Continuation Application Approved By 30 September		11:30 11:20
	• DOE Review/Approval Processes	DOE (HQ-PETC)	
	• Timing Required For Approval:	DOE (HQ-PETC)	
	• Expectations/Recommendations	WRB/All	
•	Conclusion/Wrap-up		12:00

Attendee's: Air Products - Barry Halper, Dave Drown, Bill Brown, Eastman - Bill Jones, DOE/PETC - Bob Kornosky and Bill Mundorf DOE/HQ - Lowell Miller, George Lynch, Doug Archer

* Conclusion: Costs, Plan, Scope have not changed, except 90-day front-end slip.

Agenda3 - wrb
6/25/96

Phase 1, 2 and 3 Overview - (WRB)

Ref Clean Coal Today Article

+ "Success Factors"

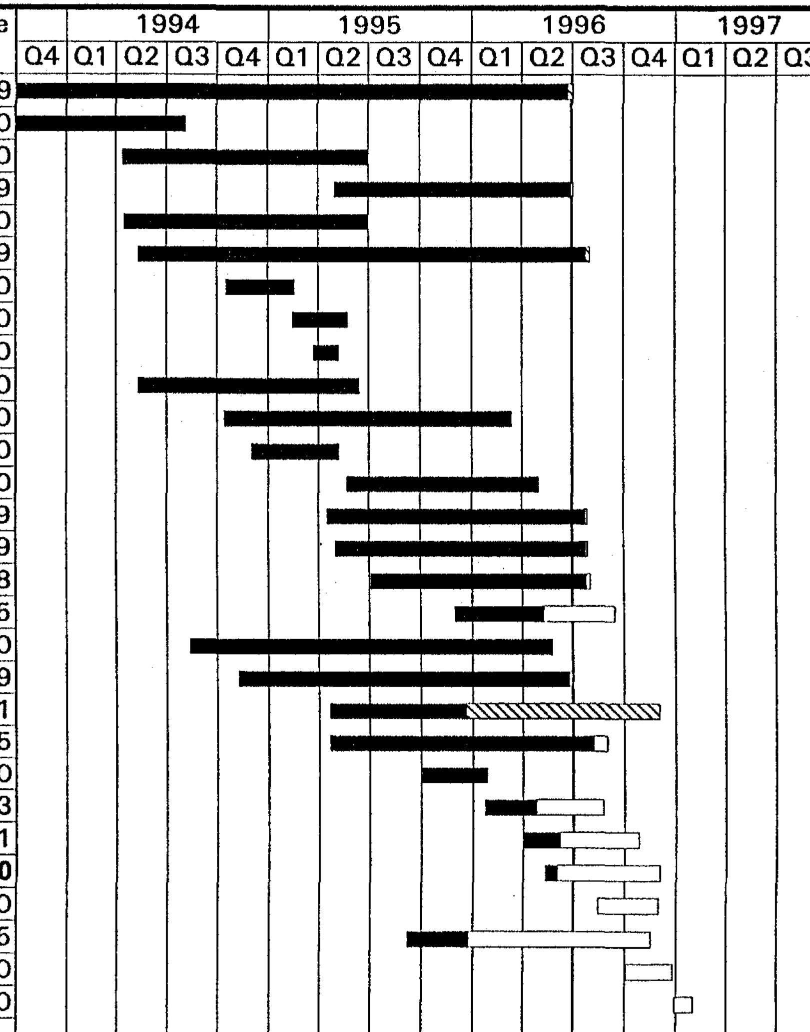
- Agreements, Commitments - Still Valid
- Cost Plan - Still Valid
  - Oct. '94 vs June '96 Plan - Same total and end date.
  - (About a 2 to 3 month slip in Phase 2 and Phase 3 Start).
- Phase 3 Statement of Work - Still Valid
  - Environmental Monitoring Plan - Done
  - Demonstration Test Plan - Done 37 Tests ✓ Good DOE input Catalyst Temperature Control Life
  - DME is still an option -
    - Dec. '96 Decision Milestone still valid.

Phase 1 and 2 - Project Status (DPD)

- **Design and Procurement -**
  - Done
- **Construction Status (Pictures)**
  - Mechanical Completion = Dec. 2
- **Schedule**
  - Reactor at site, All Major Construction bids - Done (by July 15)
  - Remaining uncertainties are small
  - Construction Productivity - Normal
  - Training, Commissioning and Startup Plans- Done
- **Participant Relationships - Good**
  - DOE-PETC + Eastman + Air Products
  - "Success Factors" - Mid-term Report Card = A!

LPMEOH DEMONSTRATION PROJECT
PHASE 1-2 SUMMARY SCHEDULE

Task Name	Start	End	Perce Com
PROCESS DESIGN	Oct/01/93	Jul/01/96	99
PFD/HEAT & MAT'L BALANCE	Oct/01/93	Aug/05/94	100
PROCESS EQUIPMENT SPECS	Apr/13/94	Jun/30/95	100
REVIEW DETAIL DESIGN	May/01/95	Jul/01/96	99
NEPA FONSI REVIEW	Apr/15/94	Jun/30/95	100
DETAILED DESIGN	May/11/94	Jul/31/96	99
P&ID'S, REV. PC	Oct/17/94	Feb/17/95	100
OPERABILITY/HAZARDS REVIEWS	Feb/13/95	May/24/95	100
P&ID'S, REV. P1	Mar/23/95	May/08/95	100
PROCESS EQUIP. MECH. SPECS	May/11/94	Jun/13/95	100
EQUIPMENT VENDOR PRINTS	Oct/14/94	Mar/12/96	100
EQUIPMENT ARRANGEMENTS	Dec/01/94	May/08/95	100
INSTRUMENT SPECS	May/22/95	Apr/29/96	100
CIVIL/STRUCTURAL DESIGN	Apr/17/95	Jul/26/96	99
PIPING DESIGN	May/01/95	Jul/26/96	99
INSTRUMENT/ELECTRICAL DESIGN	Jul/03/95	Jul/31/96	98
DCS PROGRAMMING	Dec/01/95	Sep/13/96	55
EQUIPMENT PROCUREMENT	Aug/12/94	May/23/96	100
REACTOR DELIVERY	Nov/08/94	Jun/28/96	99
CONSTUCTION	Apr/21/95	Dec/02/96	41
EASTMAN OSBL WORK	Apr/21/95	Aug/30/96	95
CIVIL/UNDERGROUND	Oct/02/95	Jan/26/96	100
STEEL & EQUIPMENT ERECTION	Jan/22/96	Aug/22/96	43
MECHANICAL	Apr/01/96	Oct/25/96	31
INSTRUMENT/ELECTRICAL	**May/09/96**	**Dec/02/96**	**10**
INSULATION & FIRE PROOFING	Aug/12/96	Nov/29/96	0
PROCEDURES/TRAINING	Sep/05/95	Nov/15/96	25
CHECK-OUT/COMMISSIONING	Oct/01/96	Dec/24/96	0
START-UP	Dec/27/96	Jan/31/97	0



Printed: Jun/27/96
Page 1

Milestone △ Summary
Fixed Delay - - - -

Phase 3 - Plans (WRB)

- **Operations take over of plant - Dec. 2, 1996**
- **Catalyst Reduction and Startup - January 1997**
- **Demonstration/Operational Testing - 1997 - 2000**
- **Off-site Fuel Testing - 1998 - 1999**
- **DME Implementation Decision - March 1998**
  - Interim Decision for LaPorte PDU Testing - Dec. 1996.
- **Final Report(s) - Dec. 28, 2001**

PROJECT EVALUATION PLAN
FOR
BUDGET PERIOD NO. 2
Status

Show PEP

A. PHASE 1 DESIGN AND PHASE 2 CONSTRUCTION OF THE LPMEOH PROCESS DEMONSTRATION FACILITY

PHASE/TASK	Status	Comments
1.2 Permitting		
x Issue Final EIV	Done	Final being released, for printing.
x Obtain Construction and Operation Permits	Done	
1.3 Design Engineering		
x Complete the design engineering	Done	(98% Complete)
x Prepare the Environmental Monitoring Plan	Done	Final being issued
2.1 Procurement		
x Procure all equipment and materials	Done	
2.2 Construction		
x Complete mechanical construction; so that checkout and commissioning can be started in Budget Period No. 3.	Forecast: 12/2/96	About 41% complete, as of 6/21/96.
x (ready for checkout, etc.)	(")	
x (manage construction)	(")	
2.3 Training and Commissioning		
x Prepare four year test plan for Phase 3, Task 2-Operation.	Done	Final comments received, will release 7/3/96.
x Prepare operating manual, initiate operator training.	On-schedule.	Operator training in October.
1.5 & 2.5 Administration		
x Submit all Project status, etc. reports as required by the Cooperative Agreement.	x	Monthlies Done - Quarterlies catching up.
x Prepare annually an updated plan for remaining activities.	One Done On Schedule	The second plan provides the basis for the B.P. No. 3 Cost Plan.

Completion of the above work activities will essentially ready the LPMEOH Process Demonstration Facility for commissioning, startup, and operation to begin in the final Budget Period No. 3.

PROJECT EVALUATION PLAN
FOR
BUDGET PERIOD NO. 2
Status

B. Other Planning, Administration and DME Verification Testing tasks.

PHASE/TASK	Status	Comments
1.4 & 2.4 Off-site Testing.		
x Prepare the fuel-use plan for Phase 3, Task 4: Off-site product tests.	Underway	The task 2.3 Demo Test Plan, now indicates mid 1998 thru 1999 test time frame. Fuel cell and dispersed power applications are being targeted.
1.5 Planning, Administration and DME Verification Testing.		
x Update product-use plan.	Underway	*Part of 1.4, above.*
x Complete economic studies of commercial aspects. Provide input to op. test plan.	Underway	Outline issued. First draft about 7/30. Input to op. test plan has been provided.
x Perform Testing for Dimethyl Ether (DME)	On Schedule	For Dec. 1996 Decision.
x Laboratory R & D. DVT/ Design Verification Testing	"	Promising results.
x Market Economic DVT	"	" "

"At the time the Project Evaluation Report for Budget Period No. 2 is submitted with the Continuation Application; Air Products will also prepare an update on the expected technical and economic performance of the mature unit. This update will demonstrate the commercial potential to enhance IGCC electric power generation with coproduct methanol. This IGCC enhancement is expected to reduce the cost of electricity for retrofit, repowering, replacement, and new application for electric power generation from coal."

PROJECT EVALUATION PLAN
FOR
BUDGET PERIOD NO. 2
Status

Recommendations for Budget Period No. 3 Submittal.

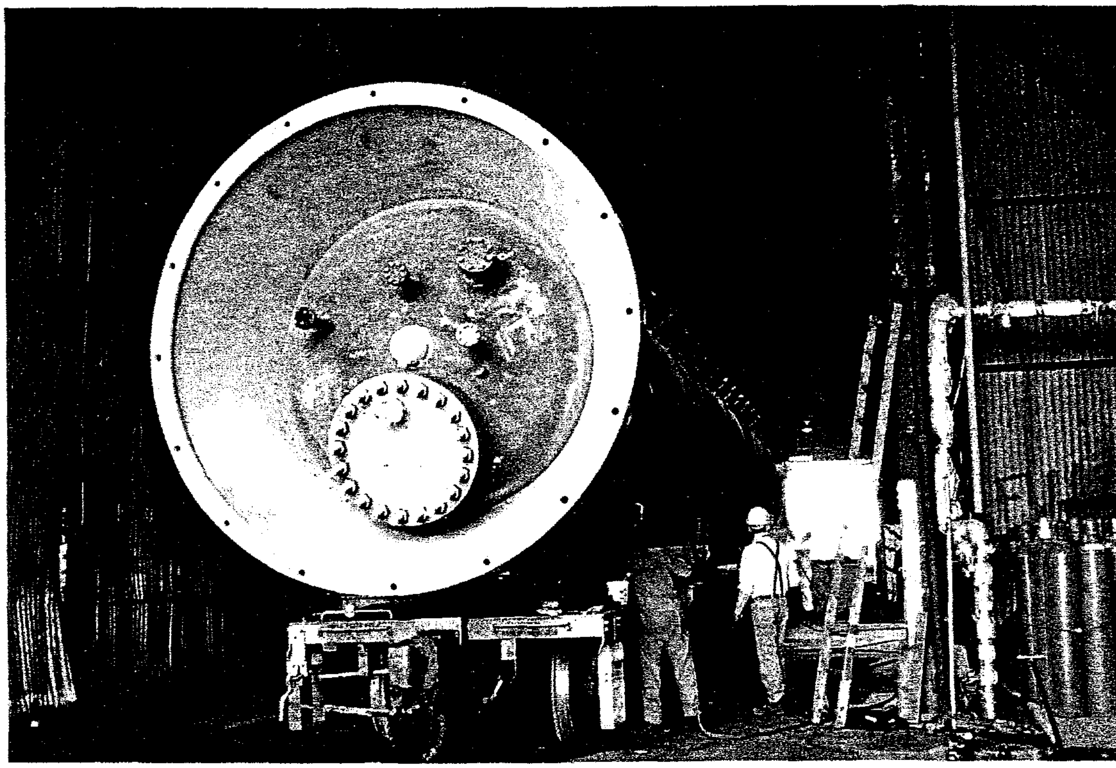
1. Submit Continuation Application for Budget Period No. 3, in time for 30 Sept. 1996 approval.

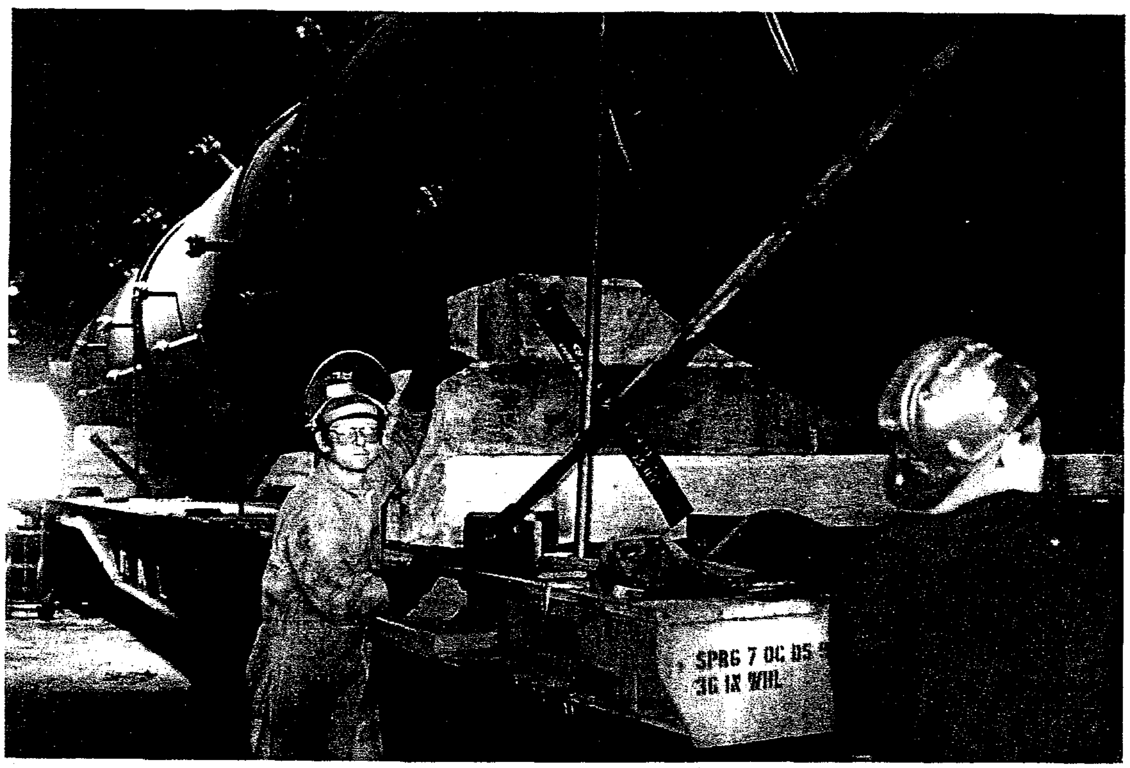
2. Consider contingent approval, such as the following:

   "DOE funds may not be expended by the Participant on tasks under Phase 3: Operation unless and until the Contracting Officer notifies the Participant in writing that the Contracting Officer"s Technical Representative has verified that construction of the Liquid Phase Methanol Demonstration Facility has been mechanically completed."

3. The Participant should submit the Continuation Application documentation by Aug 1 (date).

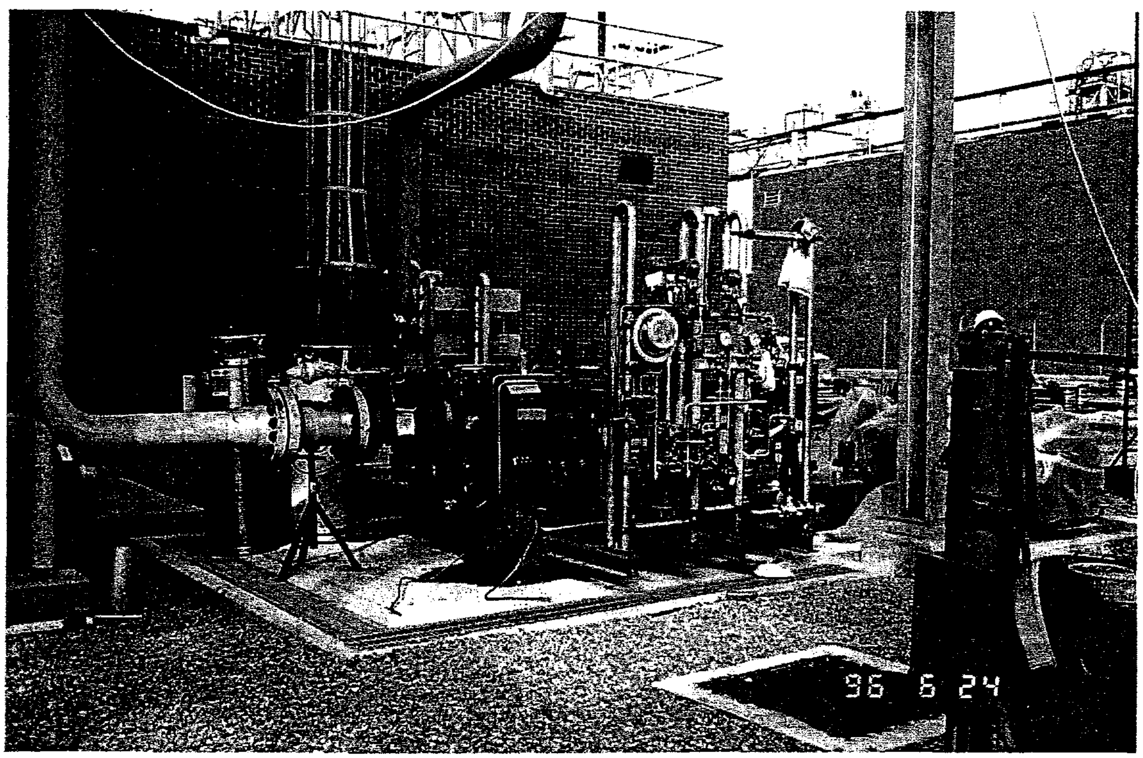
KINGSPORT LPMEOH DEMONSTRATION PROJECT





REACTOR LEFT JOSEPH OAT'S SHOP, CAMDEN, NJ 6/14/96

KINGSPORT LPMEOH DEMONSTRATION PROJECT



6/24/96

1) Reactor At Kingsport
2) Recycle Compressor

KINGSPORT LPMEOH DEMONSTRATION PROJECT
6/4/96 STATUS

Outline 6/27 for notes (HQLP_.DOC)

COMMERCIALIZATION

IGCC Coproduction with Liquid Phase Technology

Outline Form The Handout ...

Bill Brown - Air Products - 6/28/96.

References / Attachments

Concepts Costs

Page ① ② ③

Why Liquid Phase Technology for Coproduction?

- **Liquid Phase "Once-Through" Methanol from coal is economic.**
  - Gas Phase Technology is not.
  - "All-Methanol" is not.
- **Coproduced liquids from coal (versus from off-shore gas) is economic.**
- **Liquid Phase Technology makes coproduction viable.**

(Ref. a.)

Why Coproduction?

- **Reduce Electric Power Costs** Page ③
  - When power demand is cyclical
  - When methanol valued at > 50 to 60 cents/gallon
- **Hasten IGCC Penetration**
  - With Environmental Benefits
- **Cost effectively serve moderate size regional markets**
  - Energy and Chemical markets;
  - with locally produced goods.
- **Reduce Oil imports**

(Ref. b.)

When, in U.S.?

- **IGCC Forecast is Large**
  - 150,000 MWe in 20 years
  - Additions, Replacements
  - Repowering old Steam Plants
  - Natural Gas (CC plant) Conversions
- **But, has slipped a Decade**
  - Since our 1989 CCT-3 proposal

(Ref. c.)

Impact

- **IGCC Forecast for U.S.:**
  - 150,000 MWe in initial two decades.
- **Methanol Plant Sizes; for IGCC coproduction:**
  - @ 250 MWe (2T/D per MWe); 150,000 Gal. per Day
  - @ 250 MWe (4T/D per MWe); 300,000 Gal. per Day
  - @ 500 MWe (4T/D per MWe); 600,000 Gal. per Day
  - For Reference:
    - Kingsport Demo is 80,000 Gal. per Day; with higher hopes.
    - Off-shore world scale is 750,000 Gal. per Day.

World Meth Capacity ~ 75,000 T/ 22,000,000 Gal/

- **Two Decade Impact;** (at 3T/D per MWe; on 50% of IGCC)
  - Gallons of Methanol per Day: 67,500,000 = 220,000 T/D (3 x's worlds' use now)
  - Bbl per Day, Oil Equivalent: 800,000 (4.4% of oil use)
    - About 8 % of U. S. Oil Imports
  - At 6 T/D Methanol per MW ?!

(Ref. d.)

When, Elsewhere?

- **Refineries -**
  - Europe, Pacific Rim
- **Coal -**
  - India, China, Pacific Rim, East Europe, Australia

(Ref. e.)

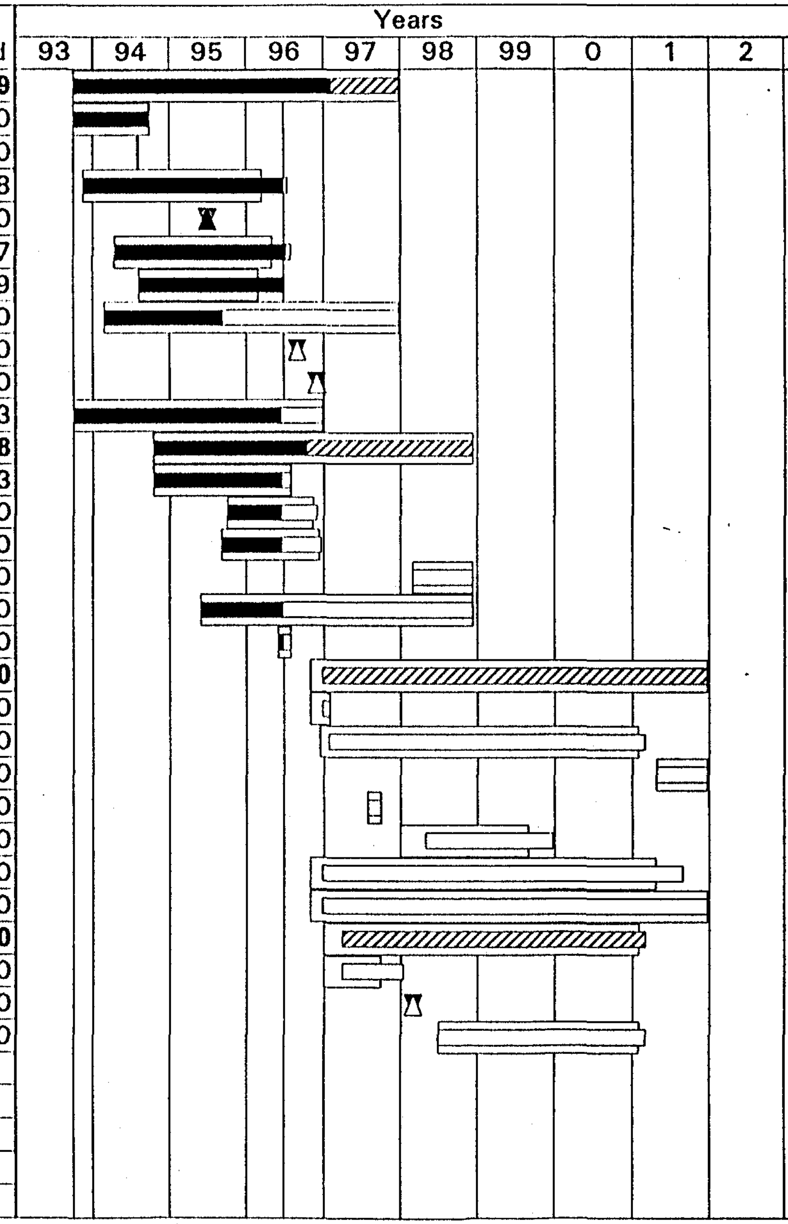
Conclusion

- **Big Impact Potential for Coproduction with IGCC**
- **Liquid Phase Technology can make coproduction happen.**
- **The Demonstration is essential for Commercialization**
- **Timing is just right.**
  - Ready when IGCC is ready.
  - First Decade(s) of 21st Century - .

APPENDIX H - MILESTONE SCHEDULE AND COST FORECAST
2 PAGES

MILESTONE SCHEDULE STATUS REPORT
LIQUID PHASE METHANOL DEMONSTRATION
DE-FC22-92PC90543

Task Name	Duration	Start	End	% Comp	% Sched
PHASE 1: DESIGN	**51.20 m**	**Oct/01/93**	**Dec/30/97**	**97**	**79**
PROJECT DEFINITION(TASK1)	12.04 m	Oct/01/93	Sep/30/94	100	100
CONTINUATION APPLICATION(B.P.#2)	9.00 d	Aug/02/94	Aug/10/94	100	100
PERMITTING(TASK 2)	32.07 m	Nov/17/93	Jul/15/96	98	98
NEPA FONSI APPROVAL	0.00 d	Jun/30/95	Jun/30/95	100	100
DESIGN ENGINEERING(TASK 3)	27.71 m	Apr/15/94	Aug/01/96	98	97
VENDOR ENGINEERING	22.83 m	Aug/10/94	Jul/01/96	99	99
OFF-SITE TESTING(TASK 4)	46.35 m	Feb/25/94	Dec/30/97	10	40
UPDATED FUEL TEST PLAN APPROVAL	0.00 d	Aug/31/96	Aug/31/96	0	0
DECISION TO CONTINUE DME TESTING	0.00 d	Dec/01/96	Dec/01/96	0	0
PLANNING, ADMIN & DME DVT(TASK 5)	39.16 m	Oct/01/93	Dec/30/96	95	83
PHASE 2: CONSTRUCTION	**50.18 m**	**Oct/17/94**	**Dec/15/98**	**60**	**48**
PROCUREMENT(TASK1)	21.61 m	Oct/17/94	Aug/01/96	98	93
CONSTRUCTION(TASK 2)	14.12 m	Oct/02/95	Dec/02/96	41	60
TRAINING & COMMISSIONING(TASK 3)	15.70 m	Sep/05/95	Dec/23/96	25	60
OFF-SITE TESTING(TASK 4)	9.57 m	Mar/01/98	Dec/15/98	0	0
PLANNING & ADMINISTRATION(TASK 5)	42.69 m	Jun/01/95	Dec/15/98	30	30
CONTINUATION APPLICATION(B.P.#3)	2.08 m	May/31/96	Aug/01/96	40	40
PHASE 3: OPERATION	**60.31 m**	**Dec/27/96**	**Dec/28/01**	**0**	**0**
START-UP(TASK 1)	1.22 m	Dec/27/96	Feb/01/97	0	0
METHANOL OPERATION(TASK 2.1)	49.52 m	Jan/26/97	Mar/06/01	0	0
DISMANTLE PLANT(TASK 2.3)	7.98 m	May/01/01	Dec/28/01	0	0
ON-SITE PRODUCT USE DEMO(TASK 3)	2.08 m	Aug/01/97	Oct/02/97	0	0
OFF-SITE PRODUCT USE DEMO(TASK 4)	20.02 m	May/01/98	Dec/28/99	0	0
DATA ANALYSIS/REPORTS(TASK 5)	56.35 m	Dec/27/96	Aug/30/01	0	0
PLANNING & ADMINISTRATIVE(TASK 6)	60.31 m	Dec/27/96	Dec/28/01	0	0
PROVISIONAL DME IMPLEMENTATION	**47.41 m**	**Apr/01/97**	**Mar/07/01**	**0**	**0**
DME DVT(PDU TESTS)(TASK 3.6)	9.57 m	Apr/01/97	Jan/15/98	0	0
DECISION TO IMPLEMENT	0.00 d	Mar/01/98	Mar/01/98	0	0
DESIGN, MODIFY & OPERATE(TASK 3.2.2)	32.36 m	Jul/01/98	Mar/07/01	0	0



Printed: Jun/27/96

Milestone △ Summary

DOE F 1332.9
(11-84)

U.S. DEPARTMENT OF ENERGY
COST MANAGEMENT REPORT

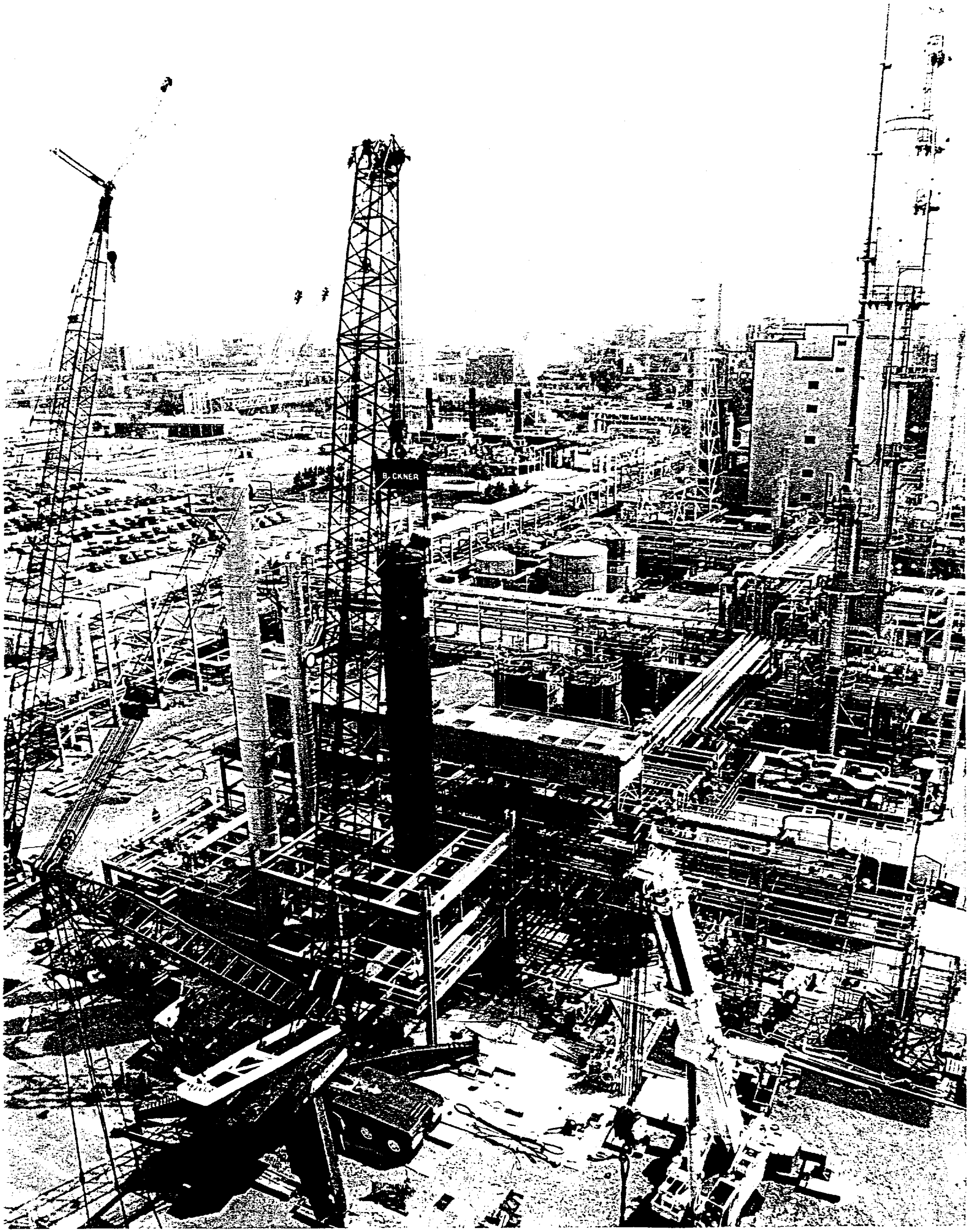
FORM APPROVED
OMB 1910-1400

1. TITLE Liquid Phase Methanol Demonstration	2. REPORTING PERIOD June 01, 1996 through June 30, 1996	3. IDENTIFICATION NUMBER DE-FC22-92PC90543
2. PARTICIPANT NAME AND ADDRESS Air Products Liquid Phase Conversion Co., L.P. 7201 Hamilton Boulevard Allentown, PA 18195-4911	5. COST PLAN DATE October 01, 1995	6. START DATE January 1, 1990 7. COMPLETION DATE December 31, 2001

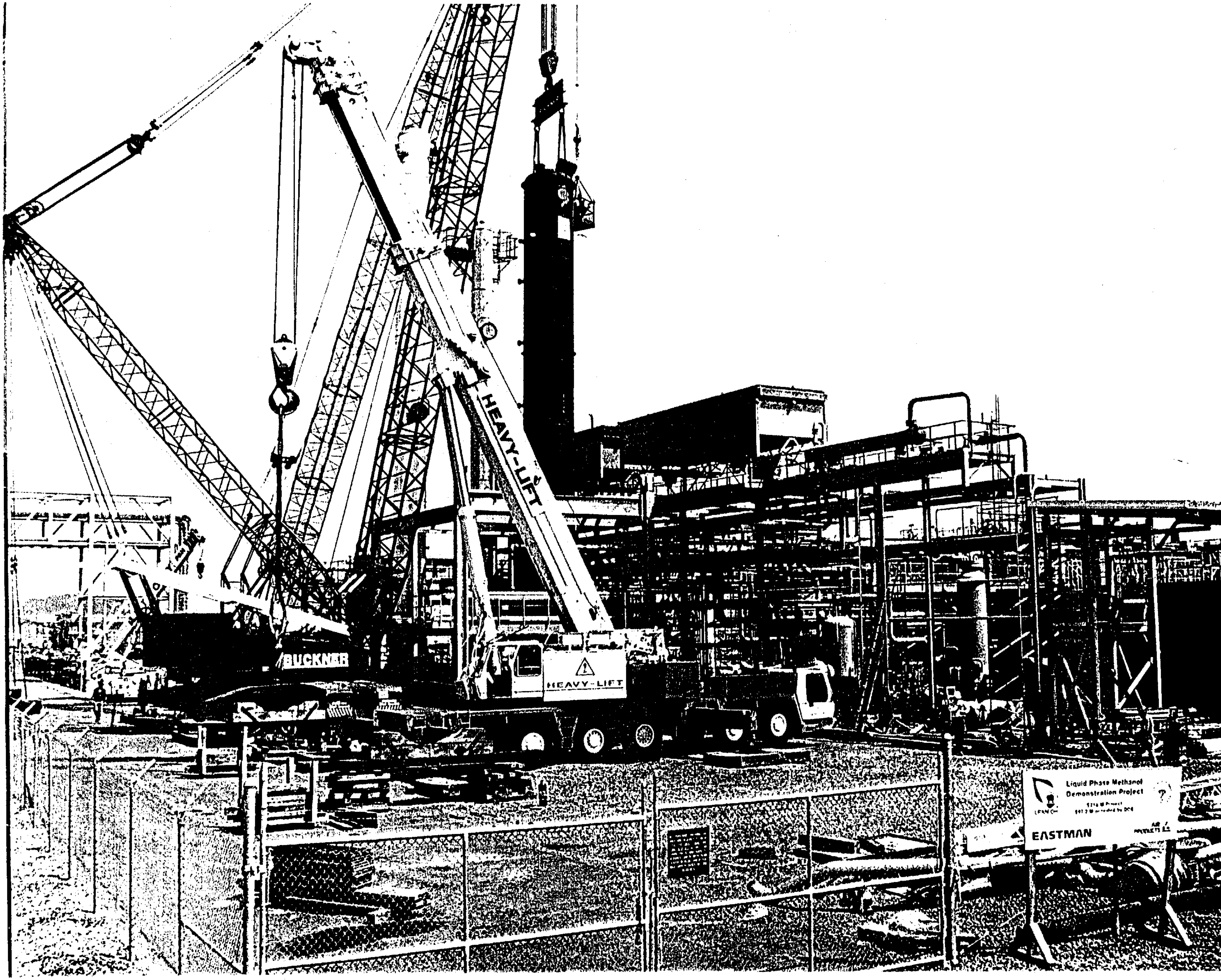
8. ELEMENT	9. REPORTING ELEMENT	10. ACCRUED COSTS				11. ESTIMATED ACCRUED COSTS							12.	13.
		Reporting Period		Cumulative to Date		a. Subsequent Reporting Period	b. Balance of Fiscal Year	c. FY 1997 (1)	FY 1998 (2)	FY 1999 (3)	d. Subsequent FY's (4)	e. Total	Total Contract Value	Variance
		a. Actual	b. Plan	c. Actual	d. Plan									
	Prior to Mod 2	0	0	16,289	16,289	0	0					16,289	16,289	0
1.1.1	Project Definition	0	0	1,044	1,021	0	0	0	0	0	0	1,044	1,021	23
1.1.2	Permitting	2	0	237	246	0	0	0	0	0	0	237	246	(9)
1.1.3	Design Engr.	346	339	9,300	9,169	200	290	600	0	0	0	10,390	9,960	430
1.1.4	Off-site Testing	0	8	12	58	8	54	246	0	0	0	320	320	0
1.1.5	Planning, Admin, & DME Verif. Testing	147	43	2,403	1,766	61	60	0	0	0	0	2,524	1,892	632
1.2.1	Procurement	1,157	691	8,219	7,413	163	325	700	0	0	0	9,407	9,783	(376)
1.2.2	Construction	734	923	3,936	7,938	1,654	3,308	1,602	0	0	0	10,500	11,200	(700)
1.2.3	Train. & Commissioning	0	149	1	717	200	396	600	0	0	0	1,197	1,197	0
1.2.4	Off-Site Test - Proc. & Constr.	0	0	0	0	0	0	180	81	0	0	261	261	0
1.2.5	Planning & Admin	78	46	318	475	40	72	251	0	0	0	681	681	0
1.3.1	Startup	0	0	0	0	0	0	3,435	0	0	0	3,435	3,435	0
1.3.2	Operations													0
1.3.2.1	Methanol Operation	0	0	0	0	0	0	33,753	36,822	36,822	39,890	147,287	147,287	0
1.3.2.2	DME Design, Mod., Oper.	0	0	0	0	0	0	351	509	680	800	2,340	2,340	0
1.3.2.3	LPMEOH Dismantlement	0	0	0	0	0	0	0	0	0	425	425	425	0
1.3.3	On-Site Product Use Demo	0	0	0	0	0	0	0	0	2	2	4	4	0
1.3.4	Off-Site Product Use Demo	0	0	0	0	0	0	427	2,773	340	300	3,840	3,840	0
1.3.5	Data Analysis & Reports	0	0	0	0	0	0	385	380	500	661	1,926	1,926	0
1.3.6	Planning & Admin.	0	0	0	0	0	0	245	252	260	836	1,593	1,593	0
14. TOTAL		2,463	2,199	41,760	45,092	2,326	4,505	42,775	40,817	38,604	42,914	213,700	213,700	0

15. DOLLARS EXPRESSED IN: Thousands	16. SIGNATURE OF PARTICIPANT'S PROJECT MANAGER AND DATE D. P. Drown 7/2/96 DATE	17. SIGNATURE OF PARTICIPANT'S AUTHORIZED FINANCIAL REPRESENTATIVE AND DATE Susan J. Kasmecz 7/29/96 S. J. Kasmecz DATE

APPENDIX I - TASK 2.2 - SITE CONSTRUCTION PHOTOS
2 PAGES



7/12/96


HEAVY-LIFT
BUCKNER
HEAVY-LIFT
Liquid Phase Methanol
Demonstration Project
EASTMAN

7/2/96.

APPENDIX J - TASK 2.3 - DEMONSTRATION TEST PLAN
4 PAGES

TABLE 5-1 - DEMONSTRATION TEST PLAN

Test Run #	Test Run Description	Temp (Deg C)	Wt% Cat	H2/CO Ratio at Inlet	Space Velocity (Sl/hr-kg)	MeOH (tpd)	Fresh Feed Balanced (KSCFH)	Fresh Feed CO Gas (KSCFH)	Fresh Feed H2 Gas (KSCFH)	Recycle Gas (KSCFH)	Inlet Sup. Velocity (ft/sec)	Time Period (weeks)	Elapsed Time (incl. outages) (weeks)	Start of Test
Task 2.1.1 - Process Shakedown and Catalyst Aging:														
1.	Initial Shakedown; and	250	28	2.42	8,000	260	900	50	40	1,800	0.64	6	6	Feb-97
	Design Production Tests						(varies, to maintain syngas utilization.)							
2.	Gassed Slurry Level	Part of other tests										Ongoing		
3.	Reactor Feed: Texaco-	250	28	0.67	9,240	202	650	95 (*)	0	2,612 (*)	0.77	2	9	Mar-97
	Type Syngas													
4.	Early Testing @ High	250	28	2.54	10,300	TBD	1,200 (**)	50	40	2,520 (*)	0.88	2	12	Apr-97
	Superficial Velocity													
5.	Check @ Test 1	250	28	2.42	8,000	< 260	900	50	40	1,800	0.64	2	15	Apr-97
	Conditions													
6.	Catalyst Addition and	250	28 - 40	2.51	Dec. from	237	765	40	45	Max	0.79	18	41	May-97
	Aging	or less		2.30	8,000	260	900	50	40	(2,700)	TBD	6		to
	(Note: Kingsport Complex Outage during this test)													Nov-97
7.	Free-Drain Entrained/	250	28 - 40	2.51	Dec. from	237	765	40	45	Max	0.79	During		
	Condensed Oil to	or less			8,000							Test 6		
	Reactor													
8.	Operation @ Design	250	40	2.42	4,000	260	900	50	40	1,800	0.64	2	43	Nov-97
	Feed Gas Rates													
9.	Check for Limitation on	250	> 40	2.51	Varies	TBD	765	40	45	Max	0.79	6	50	Nov-97
	Catalyst Slurry Concentration									(2,700)				
10.	Catalyst Addition to	250	Target	2.49	3,320	256	765	40	45	2,605	0.79	12	68	Jan-98
	Reach Max Productivity	or less	45	2.29	3,500	293	900	50	40	2,520	0.81	2		
				TBD	TBD	TBD	1,110 (**)	50	40	2,520	0.86	2		

TABLE 5-1 - DEMONSTRATION TEST PLAN

Test Run #	Test Run Description	Temp (Deg C)	Wt% Cat	H2/CO Ratio at Inlet	Space Velocity (Sl/hr-kg)	MeOH (tpd)	Fresh Feed Balanced (KSCFH)	Fresh Feed CO Gas (KSCFH)	Fresh Feed H2 Gas (KSCFH)	Recycle Gas (KSCFH)	Inlet Sup. Velocity (ft/sec)	Time Period (weeks)	Elapsed Time (incl. outages) (weeks)	Start of Test
Task 2.1.2 - Process Operational Test Phase:														
	Note: At this time, need to produce some "typical" product methanol for off-site fuel tests. Also need to reassess the optimum operating conditions for the remaining tests (e.g. feed gas allocation for commercial design/optimal performance).													
11.	Catalyst Addition/ Withdrawal Test	250	Target 45	2.49	3,320	256	765	40	45	2,605	0.79	6	74	May-98
12.	Test 11 Conditions with No CO Make-up	250	Target 45	4.97	3,282	229	765	0	45	2,605	0.78	2	76	Jul-98
13.	Test 11 Conditions with No H2 Make-up	250	Target 45	1.98	3,277	252	765	40	0	2,605	0.78	2	79	Jul-98
14.	Test 11 Conditions with No H2 or CO Make-up	250	Target 45	5.03	3,238	232	765	0	0	2,605	0.77	2	81	Aug-98
15.	Repeat of Test 11 Conditions	250	Target 45	2.49	3,320	256	765	40	45	2,605	0.79	2	83	Aug-98
16.	Design Fresh Feed Operation Test	250	Target 45	2.29	3,500	293	900	50	40	2,520	0.81	2	86	Sep-98
17.	Testing @ High Superficial Velocity	250	Target 45	TBD	TBD	TBD	1,110 (**)	50	40	2,520	0.86	2	88	Sep-98
18.	Turndown and Ramping	250	Target 45	3.30	1,825	151	450	25	60	1,364	0.44	4	92	Oct-98
19.	Load-Following, Cyclone, & On/Off Tests		Target 45	Balanced, CO-Rich	To be Defined							6	99	Nov-98
20.	Reactor Feed: Texaco-Type Syngas	250	Target 45	0.69	2,870	207	650	85 (**)	0	2,195	0.67	4	103	Dec-98

TABLE 5-1 - DEMONSTRATION TEST PLAN

Test Run #	Test Run Description	Temp (Deg C)	Wt% Cat	H2/CO Ratio at Inlet	Space Velocity (Sl/hr-kg)	MeOH (tpd)	Fresh Feed Balanced (KSCFH)	Fresh Feed CO Gas (KSCFH)	Fresh Feed H2 Gas (KSCFH)	Recycle Gas (KSCFH)	Inlet Sup. Velocity (ft/sec)	Time Period (weeks)	Elapsed Time (incl. outages) (weeks)	Start of Test
21.	Reactor Feed: Destec-Type Syngas	250	Target 45	1.01	2,770	215	670	65 (***)	0	2,147	0.67	3	106	Jan-99
22.	Reactor Feed: BGL-Type Syngas	250	Target 45	0.52	2,165	137	485	200 (***)	0	1,568	0.43	3	109	Feb-99
23.	Repeat of Test 15 Conditions	250	Target 45	2.49	3,320	256	765	40	45	2,605	0.79	2	112	Mar-99
24.	Reactor Feed: Nat. Gas Reformer-Type Syngas	250	Target 45	4.98	1,978	197	765	0	30	1,264	0.48	3	115	Mar-99
25.	Reactor Feed: Shell-Type Syngas with Steam Injection and 1:1 Recycle	250	Target 45	0.53	1,471	101	238	400 (***)	50	842	0.35	3	118	Apr-99
26.	Repeat of Test 15 Conditions	250	Target 45	2.49	3,320	256	765	40	45	2,605	0.79	2	121	May-99
27.	Repeat of Test 16 Conditions	250	Target 45	2.29	3,500	293	900	50	40	2,520	0.81	2	123	May-99
28.	Reactor Operation @ 260 deg C	260	Target 45	2.51	3,320	248	765	40	45	2,605	0.79	2	125	May-99
29.	Repeat of Test 15 Conditions	250	Target 45	2.49	3,320	256	765	40	45	2,605	0.79	2	127	Jun-99
30.	Reactor Inspection - Then, Continue Operational Tests - with Alternative Catalyst):											4	131	Jun-99
31.	Plant Shakedown	240	TBD	2.42	TBD	260	900	50	40	Max(TBD)	TBD	6	137	Jul-99
32.	Reactor Feed: Texaco-Type Syngas	240	TBD	0.67	TBD	202	650	95 (*)	0	2,612 (*)	0.77	2	140	Aug-99

Test Run #	Test Run Description	Temp (Deg C)	Wt% Cat	H2/CO Ratio at Inlet	Space Velocity (Sl/hr-kg)	MeOH (tpd)	Fresh Feed Balanced (KSCFH)	Fresh Feed CO Gas (KSCFH)	Fresh Feed H2 Gas (KSCFH)	Recycle Gas (KSCFH)	Inlet Sup. Velocity (ft/sec)	Time Period (weeks)	Elapsed Time (incl. outages) (weeks)	Start of Test
33.	Catalyst Aging	240	TBD	2.50	TBD	237	765	40	45	2,605		16	162	Sep-99
				2.31	TBD	260	900	50	40	2,520	TBD	4		
34.	Catalyst Addition/ Withdrawal to Achieve Target Slurry Concentration	240 - 250	Target 45	Balanced	To be defined					Max(TBD)		6	168	Feb-00
35.	Reactor Feed: Texaco-Type Syngas	250	Target 45	0.69	2,870	207	650	85 (**)	0	2,195	0.67	4	173	Mar-00
Task 2.1.3 - Extended Optimum Operation:														
36.	Stable Operation	250	Target	2.49	3320	256	765	40	45	2605	0.79	16	200	Apr-00
		250	45	2.29	3500,	293	900	50	40	2520	0.81	6		
		250		TBD	TBD	TBD	1,110 (**)	50	40	2520	0.86	2		
37.	DME Demo (Task 2.2)		Balanced and CO-Rich									TBD		Nov-00
	or													to
	Commercial Test Run (Task 2.1.3)		Target 45	2.49	3320	256	765	40	45	2605	0.79	8	208	Mar-01
	Syngas Outages (5%, including Kingsport complex outage during Test 6)											10		
	Planned LPMEOH Outages (including Reactor Inspection and Fresh Catalyst Charge in Test 28)											12		
	Unplanned LPMEOH Outages (10/yr @ 8 hrs.)											2		

Notes:

(*) - 700 HP motor on 29K-01 Compressor allows higher recycle gas flow than design basis.

(**) - 1200 KSCFH of Fresh Feed Syngas can be made available for testing (per Eastman debottlenecking of gasification area). Final decision on test will depend upon carbonyl concentrations in Balanced Gas and CO Gas, since 29C-40 Carbonyl Guard Bed will have to be bypassed. For this condition, test execution is subject to availability of CO Gas.

(***) - Subject to availability of CO Gas.

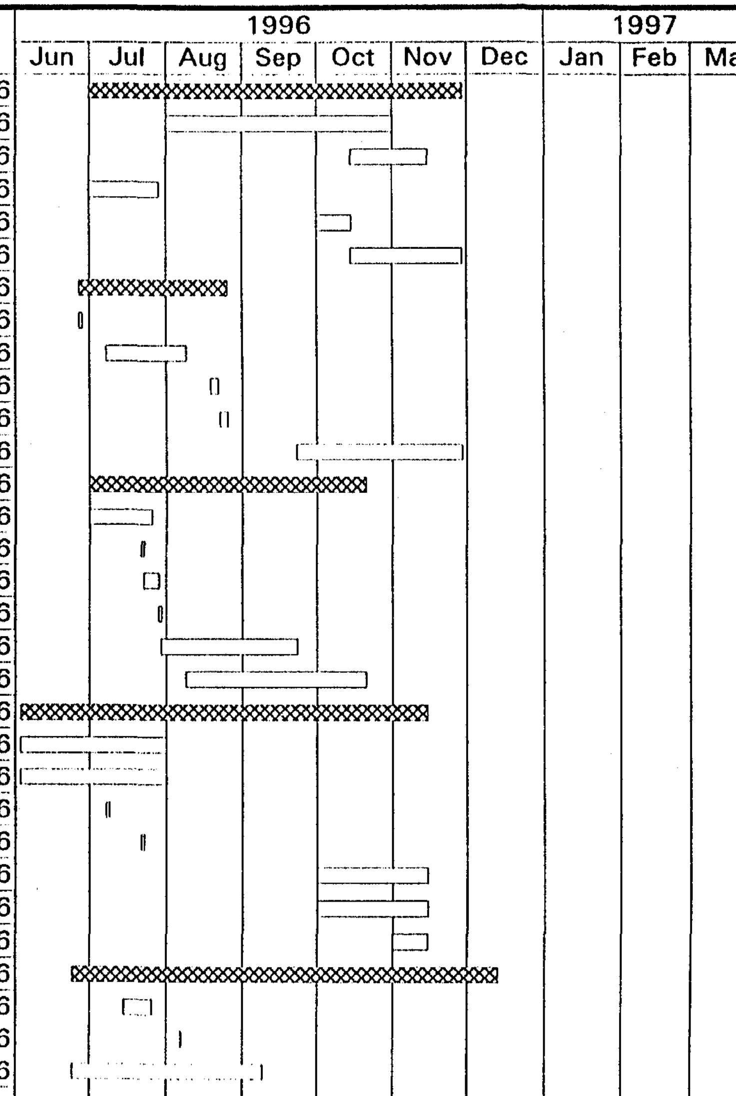
APPENDIX K - TASK 2.3 - COMMISSIONING AND STARTUP SCHEDULE
5 PAGES

and

PHASE 1-2 SUMMARY SCHEDULE

LPMEOH COMMISSIONING & STARTUP SCHEDULE

Task Name	Duration	Start	End
PRECOMMISSIONING WORK	21.00 w	Jul/01/96	Nov/29/96
PIPING PUNCH LISTING(EMN)	13.00 w	Aug/01/96	Nov/01/96
INSTRUMENTATION PUNCHLISTING(EMN)	4.60 w	Oct/15/96	Nov/15/96
LUBRICATION OF MACHINERY(APCI)	4.00 w	Jul/01/96	Jul/29/96
ALIGNMENT CHECKS(APCI)	2.00 w	Oct/01/96	Oct/15/96
ELECTRICAL PUNCHLISTING(EMN)	6.40 w	Oct/15/96	Nov/29/96
PASSIVATE REACTOR	8.40 w	Jun/27/96	Aug/26/96
SET REACTOR	0.40 w	Jun/27/96	Jun/28/96
FINISH CAT BLDG STEEL INSTALLATION	5.00 w	Jul/08/96	Aug/09/96
SET-UP EQUIPMENT FOR PASSIVATION	0.80 w	Aug/19/96	Aug/22/96
PASSIVATE REACTOR	0.40 w	Aug/23/96	Aug/26/96
INSTR. & ELECT. CONTINUITY CHECKS*	9.40 w	Sep/23/96	Nov/29/96
DCS WORK	15.60 w	Jul/01/96	Oct/21/96
TEMPORARY HVAC & FINISHED ROOF	3.80 w	Jul/01/96	Jul/26/96
CALIBRATE/TEST FM200 SYSTEM	0.40 w	Jul/22/96	Jul/23/96
INSTALL DATA HIGHWAY(EMN)	1.00 w	Jul/23/96	Jul/29/96
RELOCATE DCS CABINETS(EMN)	2.00 d	Jul/29/96	Jul/30/96
TERMINATE TO DCS	7.80 w	Jul/30/96	Sep/23/96
TEMPORARY POWER TO DCS	10.00 w	Aug/09/96	Oct/21/96
INSTRUMENT CALIBRATION	23.20 w	Jun/03/96	Nov/15/96
CHECK PSV'S SETTING(EMN)	8.60 w	Jun/03/96	Aug/01/96
TRANSMITTERS(EMN)	8.60 w	Jun/03/96	Aug/01/96
ABB ANALYZERS AT FACTORY	2.00 d	Jul/08/96	Jul/09/96
ANALYZER BLDG STUFF @ SHOP	2.00 d	Jul/22/96	Jul/23/96
LEVEL DIAPHRAM dP'S, CHECK FE'S	6.40 w	Oct/01/96	Nov/15/96
SKID INSTRUMENTS	6.40 w	Oct/01/96	Nov/15/96
NDG'S(T-01 & T-02)	2.00 w	Nov/01/96	Nov/15/96
AP-EMN JV OFFICE TRAILER SET-UP	24.00 w	Jun/24/96	Dec/13/96
ELECTRICAL & WATERHOOK-UP(EMN)	2.00 w	Jul/15/96	Jul/26/96
FURNITURE - ORDER & INSTALL	1.00 w	Aug/01/96	Aug/07/96
COMPUTER H/W - ORDER & INSTALL	10.80 w	Jun/24/96	Sep/09/96



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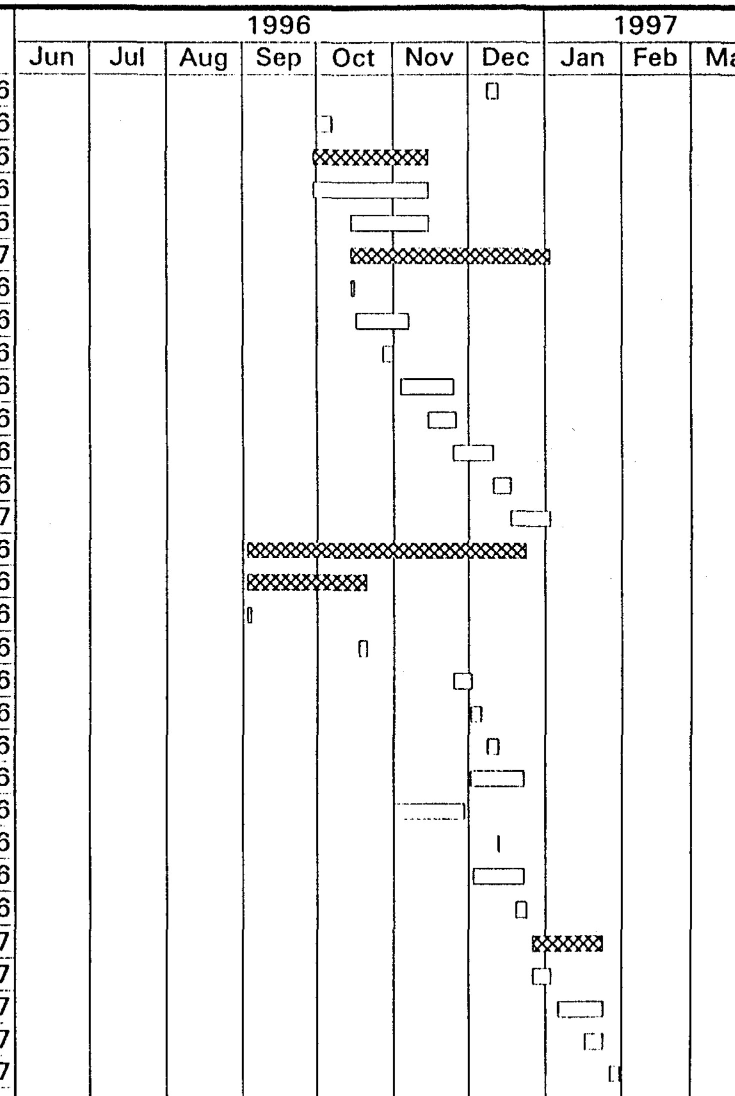
Milestone △ Summary

LPMEOH COMMISSIONING & STARTUP SCHEDULE

Task Name	Duration	Start	End
CHECK-OUT TOTAL PLANT SYSTEM	1.00 w	Dec/09/96	Dec/13/96
CHECK-OUT APCI COMMUNICATION LIN	1.00 w	Oct/01/96	Oct/07/96
OPERATOR TRAINING	6.60 w	Sep/30/96	Nov/15/96
EMN TRAINING SESSIONS	6.60 w	Sep/30/96	Nov/15/96
APCI INVOLVEMENT	4.60 w	Oct/15/96	Nov/15/96
INSTRUMENT LOOP CHECKING**	10.85 w	Oct/15/96	Jan/03/97
ENERGIZE MCC	0.40 w	Oct/15/96	Oct/16/96
EAST OF COLUMN "C"	3.08 w	Oct/17/96	Nov/07/96
OTHER UTILITIES	1.00 w	Oct/28/96	Nov/01/96
DISTILLATION AREA	3.00 w	Nov/04/96	Nov/25/96
CATALYST PREP AREA	1.50 w	Nov/15/96	Nov/26/96
REACTOR AREA	2.25 w	Nov/25/96	Dec/11/96
FINAL FUNCTION TESTING	1.00 w	Dec/11/96	Dec/18/96
POUR CONDUIT SEAL OFFS	2.00 w	Dec/18/96	Jan/03/97
COMMISSIONING(PHASE 2)	15.60 w	Sep/03/96	Dec/24/96
COMMISSION INSTR. AIR HEADER	34.00 d	Sep/03/96	Oct/21/96
EAST OF COLUMN "C"	2.00 d	Sep/03/96	Sep/04/96
REMAINING PLANT AREAS	2.00 d	Oct/18/96	Oct/21/96
COMMISSION OTHER UTILITIES	1.00 w	Nov/25/96	Dec/02/96
LOAD CATALYST GUARD BED(EMN)	1.00 w	Dec/02/96	Dec/06/96
FILL D-30 WITH MINERAL OIL	1.00 w	Dec/09/96	Dec/13/96
WATER BATCHING	3.20 w	Dec/02/96	Dec/23/96
K-01 LUBE OIL FLUSH(EMN)	3.80 w	Nov/01/96	Nov/29/96
TURNOVER MCC & I/O BLDG.	1.00 d	Dec/13/96	Dec/13/96
ANALYZER CALIBRATION	3.00 w	Dec/03/96	Dec/23/96
TEST FIRE SPRINKLER DELUGE SYSTEM	3.00 d	Dec/20/96	Dec/24/96
PLANT START-UP(PHASE 3-TASK 1)	3.80 w	Dec/27/96	Jan/24/97
CARBONYL BURNOUT	1.00 w	Dec/27/96	Jan/03/97
REDUCE CATALYST BATCHES	2.80 w	Jan/06/97	Jan/24/97
START DISTILLATION	1.00 w	Jan/17/97	Jan/24/97
BEGIN PLANT OPERATION(TASK 2.1)	1.00 w	Jan/27/97	Jan/31/97



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Milestone △ Summary

LPMEOH COMMISSIONING & STARTUP SCHEDULE

Task Name	Duration	Start	End	1996							1997		
				Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Ma
* 340 manhour estimate	1.00 w	Jun/03/96	Jun/07/96										
** durations based on 3 men @50 hrs/w	1.00 w	Jun/03/96	Jun/07/96										

Milestone △ Summary

uRB 1
6/6/96
Handout to DOE
Proj. Rev. Mtg
(Exam Sheet)

SCHEDULE FOR EASTMAN OPERATIONS SUPPORT
LIQUID PHASE METHANOL PROJECT(6/6/96)

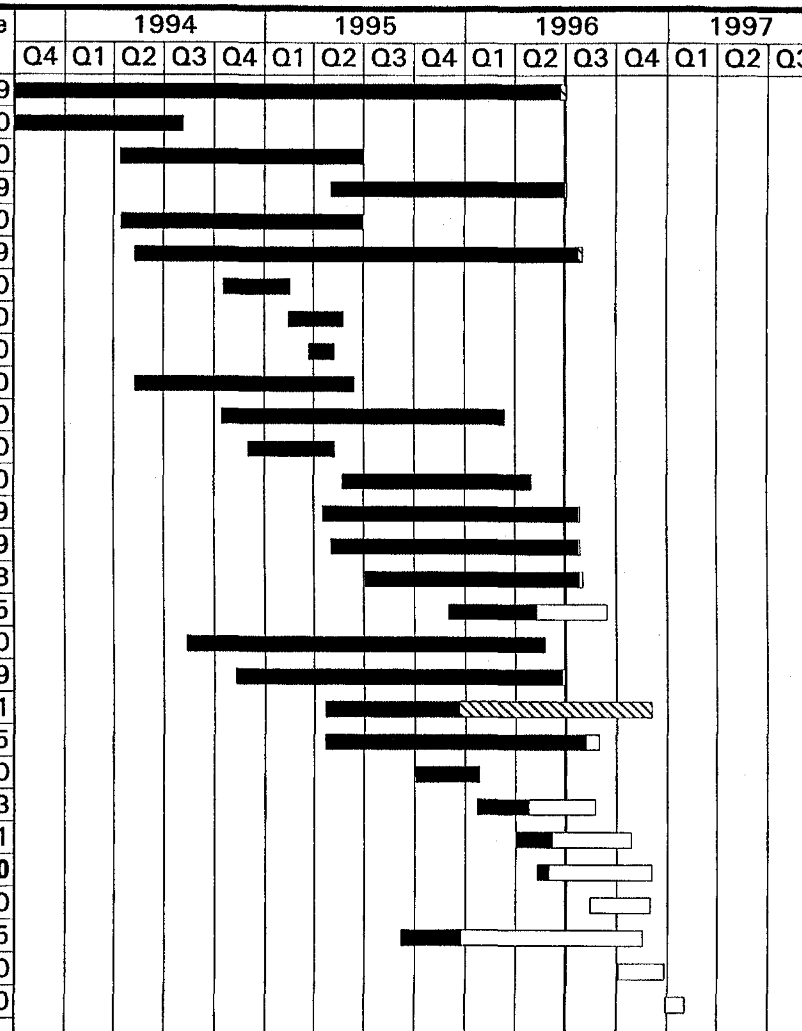
DATE	ACTIVITY	STAFFING
May	SOP (Std Op Procedure)	1 Eng., 1 Opr.
June	SOP	1 Eng., 1 Opr.
July 1	SOP, Checklists, Lesson plans	1 Eng., 1 Opr.
July 29	Lesson plans, piping PCO (Physical Check Out)	2 Eng., 1 Opr.
August 12	FCO procedure, Piping PCO (Functional Check Out)	2 Eng., 1 Opr.
September 3	FCO procedure, Piping PCO	2 Eng., 2 Opr.
September 23	FCO procedure, Piping PCO, Continuity checks	2 Eng., 2 Opr., 2-3 E & I
September 30	PCO, Continuity checks, Pre-Training	2 Eng., 4 Opr., 2-3 E & I
October 14	PCO, Loop Checks, operator training*	2 Eng., 4 Opr., 4-6 E & I
December 2	Start water checks - FCO (Days only)	2 Eng., 4 Opr., 4-6 E & I
December 11	Final FCO ESD/Interlock test	2 Eng., 4 Opr., 2-3 E & I
Dec.27	Carbonyl burnout, Hot tests - FCO	1 Eng/shift, 2 - 3 Opr/shift, 1/2 to 1 E&I/shift
Jan. 6	Catalyst Reduction Batches	1 Eng/shift, 3 Opr/shift
Jan. 26	Ready for plant startup	1 Eng/shift, 3 Opr/shift

*Operator training will consists of 4 operators/crew in training for 1 week/crew or 4 weeks total.

Attach 2-1

LPMEOH DEMONSTRATION PROJECT
PHASE 1-2 SUMMARY SCHEDULE

Task Name	Start	End	Perce Com
PROCESS DESIGN	Oct/01/93	Jul/01/96	99
PFD/HEAT & MAT'L BALANCE	Oct/01/93	Aug/05/94	100
PROCESS EQUIPMENT SPECS	Apr/13/94	Jun/30/95	100
REVIEW DETAIL DESIGN	May/01/95	Jul/01/96	99
NEPA FONSI REVIEW	Apr/15/94	Jun/30/95	100
DETAILED DESIGN	May/11/94	Jul/31/96	99
P&ID'S, REV. PC	Oct/17/94	Feb/17/95	100
OPERABILITY/HAZARDS REVIEWS	Feb/13/95	May/24/95	100
P&ID'S, REV. P1	Mar/23/95	May/08/95	100
PROCESS EQUIP. MECH. SPECS	May/11/94	Jun/13/95	100
EQUIPMENT VENDOR PRINTS	Oct/14/94	Mar/12/96	100
EQUIPMENT ARRANGEMENTS	Dec/01/94	May/08/95	100
INSTRUMENT SPECS	May/22/95	Apr/29/96	100
CIVIL/STRUCTURAL DESIGN	Apr/17/95	Jul/26/96	99
PIPING DESIGN	May/01/95	Jul/26/96	99
INSTRUMENT/ELECTRICAL DESIGN	Jul/03/95	Jul/31/96	98
DCS PROGRAMMING	Dec/01/95	Sep/13/96	55
EQUIPMENT PROCUREMENT	Aug/12/94	May/23/96	100
REACTOR DELIVERY	Nov/08/94	Jun/28/96	99
CONSTUCTION	Apr/21/95	Dec/02/96	41
EASTMAN OSBL WORK	Apr/21/95	Aug/30/96	95
CIVIL/UNDERGROUND	Oct/02/95	Jan/26/96	100
STEEL & EQUIPMENT ERECTION	Jan/22/96	Aug/22/96	43
MECHANICAL	Apr/01/96	Oct/25/96	31
INSTRUMENT/ELECTRICAL	**May/09/96**	**Dec/02/96**	**10**
INSULATION & FIRE PROOFING	Aug/12/96	Nov/29/96	0
PROCEDURES/TRAINING	Sep/05/95	Nov/15/96	25
CHECK-OUT/COMMISSIONING	Oct/01/96	Dec/24/96	0
START-UP	Dec/27/96	Jan/31/97	0



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Milestone △ Summary
Fixed Delay - - - -