Control Copy No. 1

FEED MATERIALS PRODUCTION CENTER

FINAL PHASE-IN REPORT

DOE/OR/21620--T1-Vol.8

VOLUME 8 OF 15

ENGINEERING AND CONSTRUCTION

(Period October 25, 1985 thru December 31, 1985)

TO: U. S. DEPARTMENT OF ENERGY

Contract No. DE-AC05-860R21620

January 17, 1986

Prepared By: Len Elikan

L. Elikan, Manager
Technical Services

Approved By: R Boswell

M. B. Boswell
President
WMCO

WESTINGHOUSE MATERIALS COMPANY OF OHIO

7400 WILLEY ROAD

FERNALD, OHIO 45030

DISCLAIMER

FEED MATERIALS PRODUCTION CENTER

FINAL PHASE-IN REPORT VOLUME LISTING

VOLUME NO.	TITLE
1	Operation and Maintenance
2	Human Resources
3	Community Involvement
4	Environment, Safety & Health
5	Security & Safeguards
6	Finance
7	Legal & Contracts Management
8	Engineering & Construction
9	Management Control System
10	Quality Assurance
11	Waste Management
12	Productivity Retention Program
13	Purchasing
14	Liaison with Customers of FMPC (Users) and DOE
15	Nine Month Program Plan

TABLE OF CONTENTS

8.ENGINEERING AND CONSTRUCTION

8.1 Background

8.1.1 Scope of Transition Study

This transition task focused on a review of the engineering and construction activities at FMPC with the objectives of:

(1) Understanding the current organization, its work load, its strengths and weaknesses, and its effectiveness in accomplishing its work.

(2) Recommending improvements in organization, training, personnel and interfacing with the DOE.

(3) Developing the procedures to be utilized in managing construction work to be carried out under the new Westinghouse/Rust contract that is to take effect upon take over by Westinghouse.

This study included Line Item Projects General Plant Projects (GPP), Capital Projects, and Action Requests received by Project Engineering from Maintenance -- both for design services and for procuring and following work by outside contractors on certain maintenance jobs. Other engineering services, provided primarily by the Production Technology Department, include direct support of production operations, customer liaison, resolution of product quality problems, and product development. These activities were not reviewed in detail during the transition due to the higher priority on improving Project Engineering performance. Waste Management Projects are reviewed separately in Section 11 of this report.

8.1.2 Current Situation

NLO currently does the bulk of design work on GPP, Capital, and Action Requests in house. Most of the construction work on these projects is subcontracted with procurement, construction management, and inspection of completed work handled by NLO. Funding obligations for GPP and Capital Projects were approximately $1.8 million in 1983, $2.3 million in 1984, and $4.1 million in 1985. A dramatic increase in funding is anticipated in these areas to approximately $15 million in 1986 and $20 million in 1987.

NLO involvement in Line Item Projects has been fragmented and ineffective. Conceptual Design Reports have been generated primarily by outside A/E's with no day-to-day involvment of NLO; the primary method of providing NLO inputs and review of the resulting reports has been via meetings attended by Project Engineering, Operations, ES and H, Production Technology and other interested groups at the site. Completing Development work recommended by the conceptual design reports is the responsibility of Production

Technology. It appears that much of the work recommended either is not done at all, or is done too late for the results to be incorporated in the design criteria. Engineering is carried out by outside A/E's under the direction of DOE Engineering at ORO. NLO appears to provide support as requested by DOE and the A/E's but does not act as the Integrating Contractor. Construction is carried out by Rust under contract to, and primarily under the direction of, the Construction Group at ORO. Startups on Line-Item Projects have been singularly unsuccessful, as evidenced by the reduced capacity of the UF6 to UF4 Pilot Unit and the need to redesign the Biodenitrification Plant before construction was complete. Funding available for line item projects is approximately $20 million in 1986 and $66 million in 1987. The bulk of this spending is planned on the Productivity and Radiological Improvement (Package I) and Productivity Retention Packages II and III. Design efforts are behind schedule on Packages I and II. Design on Package III is scheduled to start in 1987.

8.1.3 Desired Situation

DOE desires that Westinghouse act as the Integrating Contractor for all Engineering and Construction Projects at FMPC. This requires Westinghouse to act as the Project Manager, from the initiation of conceptual design through successful startup, for each project. Eventually these projects will be managed through the DOE FMPC Site Manager, rather than by ORO. The plan is to effect a gradual transition from DOE/ORO project management lead to Westinghouse project management lead, allowing time for Westinghouse and the DOE Site Manager to build up the management and engineering skills required. The transition will start with Construction where Rust will be retained as a subcontractor to Westinghouse for all FMPC construction management activities.

Westinghouse agrees with the DOE for Westinghouse to become the Integrating Contractor for all Engineering and Construction Projects at FMPC. Westinghouse considers this to be absolutely necessary for the success of the project and will act to achieve this as quickly as possible.

8.1.4 Scope of this Report

This report covers workload and staffing (Task 8G), organization, and technical expertise (Task 8D), the interface between Westinghouse and Rust for construction management (Task 8H) and the interfacing between Westinghouse and the DOE with regard to engineering and construction work (Task 8A).

Two (2) other sub-tasks relating to Transition Task 8,

(1) Task 8B: Prepare an expanded and integrated CAD Implementation Plan, and

(2) Task 8F: Interface with product users, including visits to user sites,

are now scheduled for completion in 1986 and will be reported on at that time.

8.2 Findings

8.2.1 Overall Performance (Subtask 8E)

(1) NLO appears to be generally behind schedule on Line Item Projects. Their performance vs. plan for GPP and Capital projects could not be easily determined due to our inability to locate planned completion milestones, projected spending rates (by month), and other elements essential to a work plan.

(2) One must have a concern as to whether the objectives of improved environmental control, safety, and productivity will actually be achieved when the facilities currently being designed are installed. This concern is based upon the reduced capacity achieved by the UF6 to UF4 Pilot Plant, the serious design problems identified in Biodenitrification when construction was nearing completion, and the apparent difficulty in developing definitive design criteria for ongoing design activities.

(3) The quality of the documentation appears poor. This statement applies to conceptual design reports, design criteria documents, minutes of internal design reviews, signoffs on key documents, and specific recommendations to the DOE concerning project problems and direction.

8.2.2 Staffing and Capabilities (Subtask 8E and 8G)

(1) There are currently 64 people in Project Engineering (P.E.) who are essentially dedicated to the project activities covered in Task 8. In addition, based upon the team concept developed by NLO in 1984 (N.R. Leist, letter dated 12/15/84), team members from Production, Technical, H & S and Maintenance are identified to provide technical support to each line-item subproject on a first priority basis. Of the 64 people in P.E., only 33 are performing engineering functions and of these only about 2/3 are degreed engineers. The breakdown of people is:

Managers & Supervisors	6
Clerical	7
Drafters	9
Administrative Group	9
Engineers	33
	64

(2) Fewer than half of the engineers have been with NLO more than 3 years.

(3) The Project Engineering Organization needs to add more than 40 people now to handle its load. Based upon handling approximately 20 million dollars in GPP and Capital Projects per year plus approximately $50 million dollars per year in Line Item Projects, and providing approximately 10 man-years per year of engineering support for action requests, the following manpower needs are projected:

Engineers & Managers

° Small projects (15% to 20% of total spending) and a costing rate of $80,000/yr

$$\frac{\$20,000,000 \times (.175)}{\$80,000/\text{man years}} = 44$$

(About 1/2 of this would be for project management and 1/2 for engineering services)

° Line Item Projects (project management only) $1.5 million/year/engineer

$$\frac{\$50,000,000}{\$1,500,000} \quad 33$$

° Action Requests 10

87

Clerical, Drafting, and Administrative (Leave at current levels) 25

Total Project Engineering 112

(4) The most pressing needs in Project Engineering at present appear to be:

Experienced Project Managers and Project Engineers (at least 8)
Instrumentation and Control Engineers (3 or 4)
Estimators (2)
HVAC Engineers (2)
Process Engineers (at least 6)

(5) Production Technology currently provides (together with a few Production Engineers) essentially all process engineering inputs into the projects including carrying out development tasks, evaluation of A/E designs from a process perspective, preparation of test plans for project debug and startup, and engineering manpower support for startup. This group projects a need to add eight engineers in fiscal 1986. This would appear to be a minimum need in view of the time to train new engineers and the significant number of startups anticipated in 1986 and 1987.

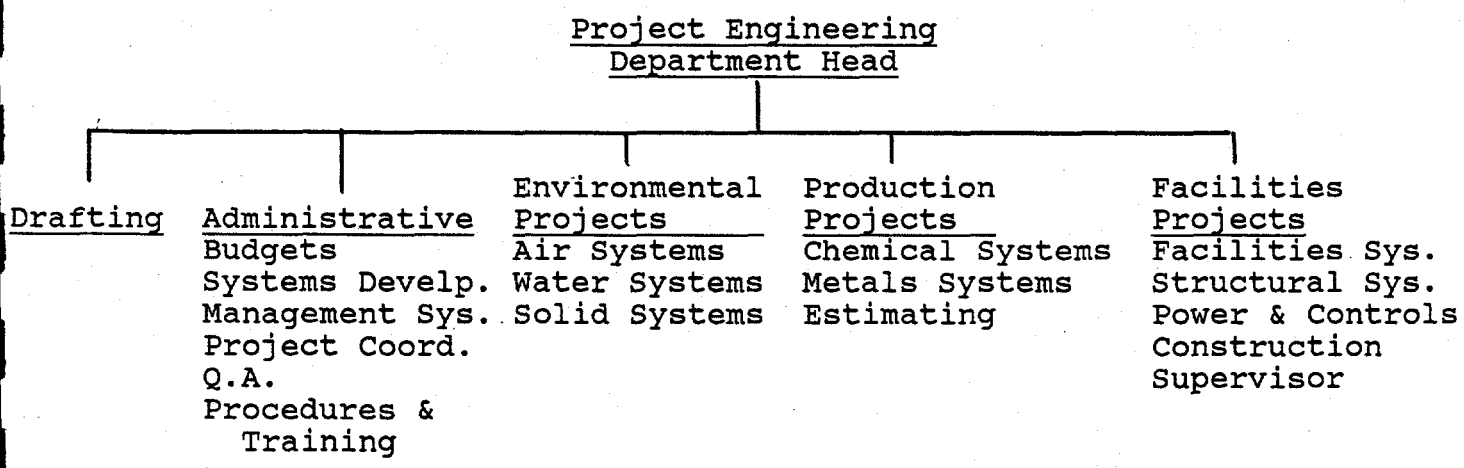
(6) Pay for engineers and managers at NLO is below average. For engineers, the problem appears to result from most people being payed below the median within their pay ranges, rather than in appropriate ranges. For the first level managers, the cause of the problem appears to be that they are considered "supervisors" rather than managers.

(7) The low existing salaries puts the organization in a Catch 22 situation: If they offer new people salaries comparable to existing personnel, they cannot get good people. If they offer the new people enough to get them on board, current employees will become dissatisfied and the best can be expected to leave.

(8) Minimal use of personal computers is made for process design calculations, project management, and the preparation of reports and presentations.

8.2.3 Organization

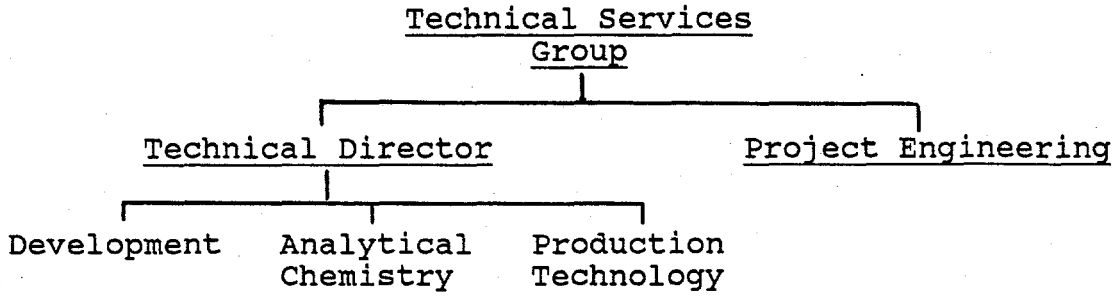
(1) The current organization of Project Engineering (on paper) is:



(2) In reality the organization does not function as shown above. For example, Mr. Al Foster, Supervisor, Production Projects, is responsible for managing the Productivity Retention Program (PRP). There are currently 12 different lead engineers assigned to the 24 subprograms that make up Packages I and II of PRP. Of these 12 lead engineers, 8 report to the supervisor of Environmental Projects, one reports to the Facilities Projects Supervisor, and only 3 report directly to Al Foster. Thus, each engineer has 2 or 3 "bosses", and the "bosses" really don't control either their own projects or their own people.

(3) Similar confusion exists in the management of Facilities Projects and Environmental Projects.

(4) The overall organization of the Technical Services Group (less Quality Assurance) under Dick Leist is:



While Mr. Leist has done much to improve coordination between project engineering and other organizations within NLO, coordination between Project Engineering and Production Technology is still not as good as it should be. This is especially true in identifying what development work is needed early enough that it can be completed prior to the start of Title I Engineering. Also, Development Group does not appear to be well integrated into the Project work. In fact, the manager of that group had only a limited awareness of what the PRP projects are, and project engineering personnel seemed mostly unaware of the projects being done by the Development Group.

(5) No one in the existing organization appears to be responsible for project integration beyond the preparation of "Site Development and Facilities Utilization Plan" by the Planning and Control Division. Important integration functions include (but are not limited to):

a) Avoiding production - construction conflicts.
b) Accounting for planned changes in production systems and throughput in designing future treatment systems.
c) Standardizing components (such as pumps, motors, control systems) to the extent possible to enhance maintainability and minimize spare parts.
d) Avoiding undesirable side effects upstream or downstream of new processes.
e) Facilitating good material flow, security, and safety during construction as well as after completion.
f) Sequencing projects to minimize temporary systems and structures. Also saving space in a given area for a planned future project.
g) Recommending the right place to solve a problem (For example, by doing something to increase yield rather than building a bigger system to process rejects.)
h) Being sure that adequate utilities will be in place to support the new production and environmental systems.
i) Coordinating various projects planned within a single plant, but which are part of different projects (ie. GPP, Package I, Package II, E S & H, etc.)
j) Providing an attractive overall plant and site appearance (Internal and external color coordination, building shapes

and heights, landscaping, etc.).

k) Being sure that the same standards and general specifications are employed by different outside contractors.

8.2.4 Construction Management (Subtask 8H)

(1) For GPP and Capital projects as well as certain maintenance work, the Facilities Project Group, under Paul Randall, currently plays the engineering lead in preparing the bid packages for construction, supervises the subcontractors while they perform the work, and coordinates NLO acceptance of the subcontractor work.

(2) Construction on Line Item projects is currently coordinated by DOE Construction, ORO. No NLO organization was found which felt any significant responsiblility in the performance of this construction work, except the Project Engineering Administrative Group, which does collect construction cost information monthly and incorporates it into its reports.

(3) The Project Engineers and Project Managers must be trained to properly direct the construction activities of Rust Engineering. This training can be based upon the agreed upon "Interfacing Procedures" as well as tutorial efforts by DOE Construction, ORO.

8.2.5 NLO/DOE Interfacing (Subtask 8A)

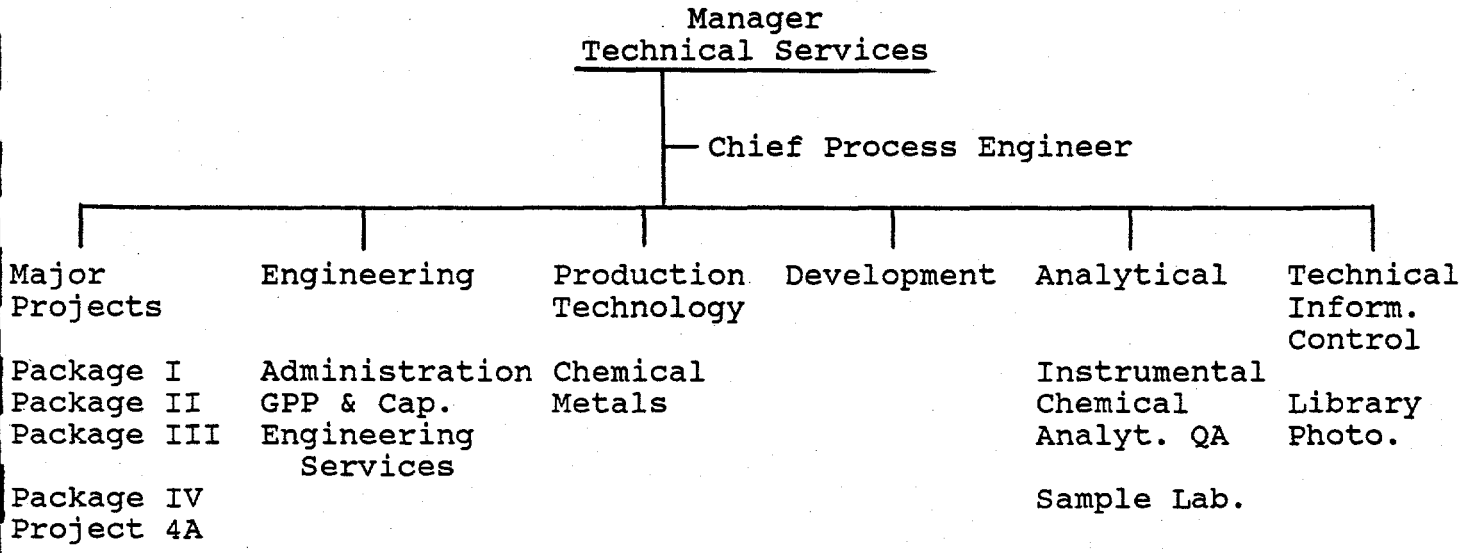
(1) DOE Engineering is currently acting as the Project Managers on all Line Item projects. This approach appears to have been necessitated by a lack of adequate staffing and strong leadership at NLO when these projects were initiated.

(2) Martin Marietta has valuable skills to contribute to FMPC while Westinghouse is building up its own engineering capability. These skills are currently used to point out to FMPC engineers what they've done wrong. A more effective use of these skills would be to help FMPC "do it right the first time" by being a part of the team that generates design criteria and later directs the A/E's efforts.

8.3 RECOMMENDATIONS (Task 8C, 8D, 8H)

(1) A "catchup" raise for all engineers and managers whose performance is good to excellent and whose pay is below the national average for people with the same degree and years of experience. The amount of this raise should be determined by Personnel, based upon all factors involved. Action within 3 months of Westinghouse takeover is essential if the staffing plans discussed below are to be achieved. (Subtask 8C)

(2) Reorganization of the Technical Services Group is recommended. (Subtask 8D) The new organization would focus more attention on line item projects, provide for increased coordination and team work between the different departments, and within Project Engineering would reduce matrixing -- giving each manager distinct objectives and the resources to accomplish those objectives. The proposed organization is:



In the reorganized group the Development, Production Technology and Analytical organizations would remain essentially the same as at present.

The Major Projects Department would consist of a Program Manager for each Major Line Item Project (Plus one for the 4A Project.) Reporting to each Project Manager would be several project engineers, a process engineer, a schedule and control person and an instrumentation and control engineer who would work full time as a team on the Project Managers Project. Others from Production, ES & H, Maintenance, QA, and Waste Mangement would support the team on a first priority basis.

The Engineering Department would (a) provide project managment for GPP and Capital Projects, (b) provide engineering services (Structural, Electrical, HVAC, Instrumentation and Control, and Drafting) to do design work and to support the project teams, (c) prepare engineering procedures and manuals, (d) manage the PA process, (e) provide project cost summaries to all project teams, and (f) carry out engineering action requests from other parts of the organization.

The Technical Information Control Group -- to be formed late in 1986 -- would spearhead the effort to develop a common data base for all technical activities, integrate the library documents into the common data base, provide assistance to users of Technical Information -- including the procurement of Personal computers and

software and the formation of Users Groups. (Subtask 8D) The Chief Process Engineer would lead the integration efforts within Technical Services including functions b, c, d, g, and h of Section 8.2.3. He would also act as an important interface with Planning and Control where other project integration efforts would be centered.

(3) To build up the Major Projects Department quickly with experienced project people, and to avoid overhiring from a long term point of view, it is recommended that about 20 of the initial team members be provided by outside contractors. Resources to be considered for this effort would include, but not be limited to, Martin Marietta, Lockwood Green, engineering firms based in Cincinnati, the Westinghouse Productivity and Quality Center, Westinghouse R & D, and other engineering firms who have experienced people with the talents we need. Under this concept, each Project team would consist of a combination of existing NLO persons, new hires, and engineers hired from outside contractors. (Subtasks 8D, 8G)

(4) Priority should be given to hiring:

10 Experienced Project Engineers & Managers
4 Instrumentation and Control Engineers and Technicians
6 Process Engineers
2 HVAC Engineers
2 Estimators
(Subtask 8D)

(5) Training courses on "Project Management" and "How to Conduct a Technical Meeting" should be brought to FMPC to allow maximum participation with a minimum loss of productive time. (Subtask 8D)

(6) Westinghouse should focus its initial efforts in assuming the integrating contractor role on: (Subtask 8A)

(a) Bringing together an FMPC proposal -- with inputs from all effected groups -- before a meeting is called with the DOE, outside A/E's, or other outside contractors. (Drawing reviews, design criteria reviews, etc).

(b) Preparing a set of uniform specifications which all A/E's doing work for the site should conform to.

(c) Doing the Design Criteria right the first time for Package III.

(d) Working with DOE Engineering to set up formal review of ongoing work at A/E's by Westinghouse & DOE.

(e) Placing responsible engineers at the A/E's office on critical projects.

(7) A work plan should be established for GPP and Capital Projects for the second half of Fiscal 1986 which includes milestones for approval, design completion and construction completion for each job as well as a projected spending rate by month. (Subtask 8E)

(8) More of the Development work at FMPC should be focused on defining the appropriate technology for use on Line Item Projects. A process to have all effected groups participate in the selection and periodic review of development projects is needed. (Subtask 8G)

(9) A "Procedure for Westinghouse-Rust Interfacing on Construction Work at FMPC" has been prepared. Review and approval of this document should be carried out on a priority basis by DOE Engineering and Construction at ORO, as well as by the DOE Site Manager. (Subtask 8H)

(10) A formal signoff process should be implemented for important documents including Conceptual Design Reports, Design Criteria, Drawings, Specifications, etc. where concurrence from a number of plant-wide groups is desired before proceeding. Care should be taken to limit signatures to the essential ones. If too many people signoff, no one feels responsible. (Subtask 8E)

(11) In an effort to improve communications, the Manager of Technical Services should hold a weekly staff meeting. Each of the Departments within Technical Services should hold a meeting at least monthly. (Subtask 8E)

(12) To facilitate communication of priorities and to get commitment to the 9 month action plan, each manager and professional in Technical Services will be asked to prepare, and have his manager agree to, a set of objectives to be accomplished in Fiscal 1986. (Subtask 8E)

(13) Westinghouse, working with DOE engineering, should prepare itself to take the lead in setting up design reviews for Line Item Projects before the end of Fiscal 1986. (Subtask 8A)

(14) Correspondence from Westinghouse concerning Engineering should be directed to the DOE Site Manager with a copy to DOE Engineering; that concerning construction should be directed to the DOE Site Manager. All directives for engineering and construction from DOE should be directed to the Vice-President and Technical Director, WMCO. (Subtask 8A)

(15) An agenda for the bi-weekly construction meeting should be provided to the DOE Site Construction Engineer. It is anticipated that he will attend most meetings in 1986, but that his attendance in future years will depend upon the agenda items. (Subtask 8A)

(16) DOE requests for assistance and information should be made to the Manager of Technical Services or higher where providing the assistance or information will require more than two (2) hours of effort. (Subtask 8A)

8.4 Short Term Corrective Actions

The following actions will be initiated in the first three (3) months after takeover and completed by July 31, 1986.

Short Term Corrective Actions

Milestone Descriptions	Milestone Schedule Date
(1) Put organization in place to effectively handle $36 million in capital projects in 1986 and $71 million in 1987.	7/86
- Identify Project Managers, outside consultants and outside engineering sources.	4/86
- All key personnel in-place, including space for them to work in.	6/86
- Complete Project Management Training.	7/86
(2) Establish monthly spending targets for GPP and capital programs.	4/86
(3) Generate a do-able plan for Project 4A.	3/86
(4) Develop effective procedures for directing the construction efforts of Rust Engineering and train personnel to use this resource effectively. (Subtask 8H)	5/86
(5) Prepare training plan for Technical Services Group.	7/86
(6) Complete expanded and integrated CAD system plan.	5/86
(7) Initiate formal Management-by-Objectives approach.	5/86
(8) Work with QA to define signoff sheets for various drawings, specifications, conceptual designs etc.	4/86
(9) Complete computerized system for planning and monitoring capital projects. (EMICS)	5/86
(10) Rewrite Project Engineering Procedures Manual.	6/86
(11) Visit major engineering subcontractors.	5/86
(12) Initiate Weekly Technical Services Staff Meeting.	1/86

8.5 Longer Term Corrective Actions

It is anticipated that most of the longer term corrective actions will be identified in the first half of 1986 and included in the 1987 Work Plan. Some which have been identified now are:

		Milestone Date
(1)	Establish charter for and name manager for Technical Information Control.	9/86
(2)	Continue plan for salary catchup.	9/86
(3)	Establish Quality Improvement Targets for 1987.	9/86
(4)	Develop procedure for selecting and monitoring progress on development work. Establish development milestones for '87.	9/86
(5)	Begin Westinghouse conduct of design reviews for Line Item projects.	7/86
(6)	Improve cost effectiveness of Engineering and Construction Subcontractors.	'87
(7)	Complete visits to all user sites to better understand their needs.	9/86

APPENDIX A - TRANSITION ACTIONS

FEED MATERIALS PRODUCTION CENTER PHASE - IN PLAN MASTER SCHEDULE FOR 75 DAY PHASE - IN

ACTIVITY	W/O	RESPONSIBILITY	1985 OCTOBER 21	28	NOVEMBER 4	11	18	25	DECEMBER 2	9	16	23
B. ENGINEERING AND CONSTRUCTION		ELIKAN										
A. DEFINE METHODS OF INTERFACING BETWEEN TECHNICAL DIVISION PERSONNEL AND THEIR COUNTERPARTS IN DOE				XXXXXXXXXXXXXXXXXX								
B. PREPARE A CAD IMPLEMENTATION PLAN BASED ON DRAWING STATUS, USE, AND NEEDS									XXXXXXXXXXXXXXXXXXXXXX			
C. TAKE AGGRESSIVE ROLE IN MAKING RECOMMENDATIONS TO DOE BASED ON WESTINGHOUSE MANAGEMENT & ENGINEERING EXPERIENCE						XXXXXXXXXXXXXXXXX						
D. REVIEW ENGINEERING PERSONNEL EXPERTISE AND RECOMMEND APPROPRIATE ORGANIZATION AND TRAINING PROGRAMS FOR ANTICIPATED DESIGN EFFORTS				XXXXXXXXXXX								
E. SURVEY ENGINEERING STAFF FOR DETERMINATION OF PROBLEMS WHICH AFFECT THEIR PRODUCTIVITY						XXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX						
F. REVIEW LIAISON PROCESS AND EXPERIENCE WITH FMPC PRODUCT USERS (Y-12 OAK RIDGE, THE SAVANNAH ROVER PLANT, ROCKY FLATS, AND HANFORD)					XXXXXXXXXXX							
G. ASSESS STATUS AND WORK LOAD & STAFFING FOR ALL OF ENGINEERING AND CONSTRUCTION					XXXXXXXXXXXXXXXXXXXXXXXXXXXXXX							
H. CONSTRUCTION MANAGEMENT-DEVELOP PROCEDURES/ INTERFACE BETWEEN WESTINGHOUSE AND KELLOGG RUST						XXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX						