FINAL REPORT

Executive Summary

ENERGY ENGINEERING ANALYSIS PROGRAM — FORT POLK LA.

U S Army Corps of Engineers
Fort Worth District
FORT WORTH, TEXAS

CONTRACT NO. DACA63-80-C-0166

March 1986

CRS GROUP, INC.
HOUSTON TEXAS

ENERGY ENGINEERING ANALYSIS PROGRAM
FORT POLK, LOUISIANA

FINAL REPORT

EXECUTIVE SUMMARY

Prepared for

Department of the Army
Corps of Engineers
Fort Worth District
Fort Worth, Texas

Prepared by

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Houston, Texas

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EXECUTIVE SUMMARY

GENERAL TABLE OF CONTENTS

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1. INTRODUCTION

The CRS Group, Inc. is pleased to submit this Final Report covering Increments A, B, E, and G of the Energy Engineering Analysis Program (EEAP) for Fort Polk, Louisiana (work accomplished under Contract DACA63-80-C-0166 plus modifications with the Fort Worth District, Corps of Engineers).

1.1 Scope of Final Report

The work presented in these volumes presents the results in which 32 energy conserving measures (ECM's) have been investigated for ECIP potential for Increments A (existing buildings including Family Housing) and B (existing utilities and energy distribution systems and a centralized Energy Monitoring and Control System-EMCS). Additionally, five scenarios for implementation of a Central Energy Plant (CEP) were studied under Increment E and an analysis of using waste POL as a fuel source in three scenarios was made. Four projects were analyzed under Increment G to identify additional energy savings.

1.1.1 The Fort Polk EEAP was originally contracted based upon the 5 November 1979 EEAP Scope of Work (SOW) and the 7 November 1977 ECIP Guidance. Modifications to the contract has been made to incorporate the 22 September 1982 EEAP SOW and the 31 December 1982 ECIP Guidance as well as some specific changes requested by Fort Polk.

1.1.2 TABLE ES1 on the following page summarizes the present completion of the increments of the Fort Polk EEAP where:

- Phase I : Data gathering and field inspections;
- Phase II : Analysis, project identification, technical feasibility and economic evaluations;
- Phase III: Preparation of DD Forms 1391 and PDB's, final documentation of results and recommendations.

TABLE ES1

COMPLETION PERCENTAGE OF FORT POLK EEAP

Increment	Phase	I	II	III
A	Buildings	100%	100%	100%
B	Utilities/EMCS	100%	100%	100%
C	Solar Energy	*	*	*
D	TE & SE	*	*	*
E	Central Boiler Plant	100%	100%	N/A
F	FE Projects	**	**	**
G	Maintenance/Repair	100%	100%	100%

* Not funded under this contract.

** Funded to a different A/E.

1.1.3 All increments funded under this contract of the Fort Polk, Louisiana EEAP are complete.

1.2 Overview

This Report consists of five volumes in which the EEAP results to date are presented. Previously, a set of appendices which contain building data were published in a final form in September 1984. The calculational routines for ECM's are presented in two steps: First, under an Energy Analysis section which presents the specific methodology and steps used to calculate savings, and second, as Energy Calculations which incorporate real data to derive the actual savings. The purpose of the presentation is to allow others to follow the procedures in a straight-forward manner. Costs of implementing an ECM are also shown, broken out by labor and material, referenced and adjusted to the Fort Polk market. An applicability list is presented which shows where the ECM is to be implemented, and a Life Cycle Cost Analysis Summary sheet is included. A brief description of the contents of each volume is presented below.

1.2.1 Volume I presents general information used throughout the program. The EEAP objectives are reviewed and progress is reported. As no data base existed which was suitable for use in calculating potential energy savings, one was created. The methodology employed and results obtained are summarized in Volume I. One important check of the general accuracy of the data base was the comparison of calculated basewide electric and natural gas consumption to actual records. The calculated electric consumption was within 2.2% of the billed value, and calculated gas consumption was within 0.3% of the billed value. (The data base itself is presented as Appendix B.) A detailed Baseline Assessment of Fort Polk was carried out which covered previous work, local climate, energy consumption history, energy costs and end uses. Factors which could impact the implementation of an ECM were investigated. A summary of results is presented, which is also reproduced in this Executive Summary. Finally, applicable References, Abbreviations and Acronyms are presented.

1.2.2 Volume II contains the methodology, analysis and summary of the ECM's investigated for Increment A: Buildings including Family Housing. Also included is a section on metering of individual buildings.

1.2.3 Volume III contains the Increment B work. Covered in this volume are the methodology, a baseline assessment and analysis of ECM's relevant to the utilities and distribution systems at Fort Polk. The EMCS methodology, analysis and results are also presented for North Fort and South Fort Polk separately.

1.2.4 Volume IV presents the work done under Increment E and contains an introduction, the methodology, the analysis and a summary of results relating to the Central Energy Plant (CEP) study. Also, results on using waste POL as a fuel source are presented.

1.2.5 Volume V presents the work done under Increment G and contains an introduction, the methodology, the analysis, and a summary of results relating to the analysis of energy saving projects which did not meet ECIP criteria but were felt to have reasonable potential for implementation.

1.2.6 The Appendices (published as a Final Report in September 1984) contain the Fort Polk EEAP data base consisting of:

Appendix A: Fort Polk Master Building List
Appendix B: Index Building List
Appendix C: Duplicate Building List
Appendix D: Special Energy Use List
Appendix E: Low Energy Use List
Appendix F: Planned/Demolished Building List
Appendix G: Planned/New Building List
Appendix H: EWIT Computer Program Description

2. EXISTING ENERGY CONSUMPTION

The vast majority of consumed energy at Fort Polk consists of electricity and natural gas. In FY75, Fort Polk used 561,428 source MBtu (millions of Btu) or 48,399,000 metered kWh of electricity at a cost of over $600,000. During that same period, 806,899 source MBtu of natural gas (782,637 MCF) was purchased for $484,000. The total FY75 energy use was 1,368,327 source MBtu. Additionally, liquid petroleum products were also used at Fort Polk. The records indicate that significant amounts of the following fuels were consumed during FY75:

- JP-4 (aviation turbine fuel): 0.01 trillion Btu's
- Motor gasoline: 0.07 trillion Btu's
- Diesel fuel: 0.02 trillion Btu's
- Aviation gas: 0.001 trillion Btu's

2.1 Basewide Consumption FY83

A significant increase in all fuels except natural gas and aviation gas can be noted in FY83. In FY83, 1,709,585 source MBtu (147,378,000 metered kWh) of electricity at a cost of over $6.7 million were used. During that same period, 642,245 source MBtu of natural gas (622,934 MCF) were purchased for over $3.1 million. The total FY83 energy use was 2,351,830 MBtu (see Figure ES1).

2.1.1 The use of other liquid petroleum products in FY83 is shown below:

- JP-4 (aviation turbine fuel): 0.06 trillion Btu's
- Motor gasoline: 0.13 trillion Btu's
- Diesel fuel: 0.18 trillion Btu's
- Aviation gas: 0.0002 trillion Btu's

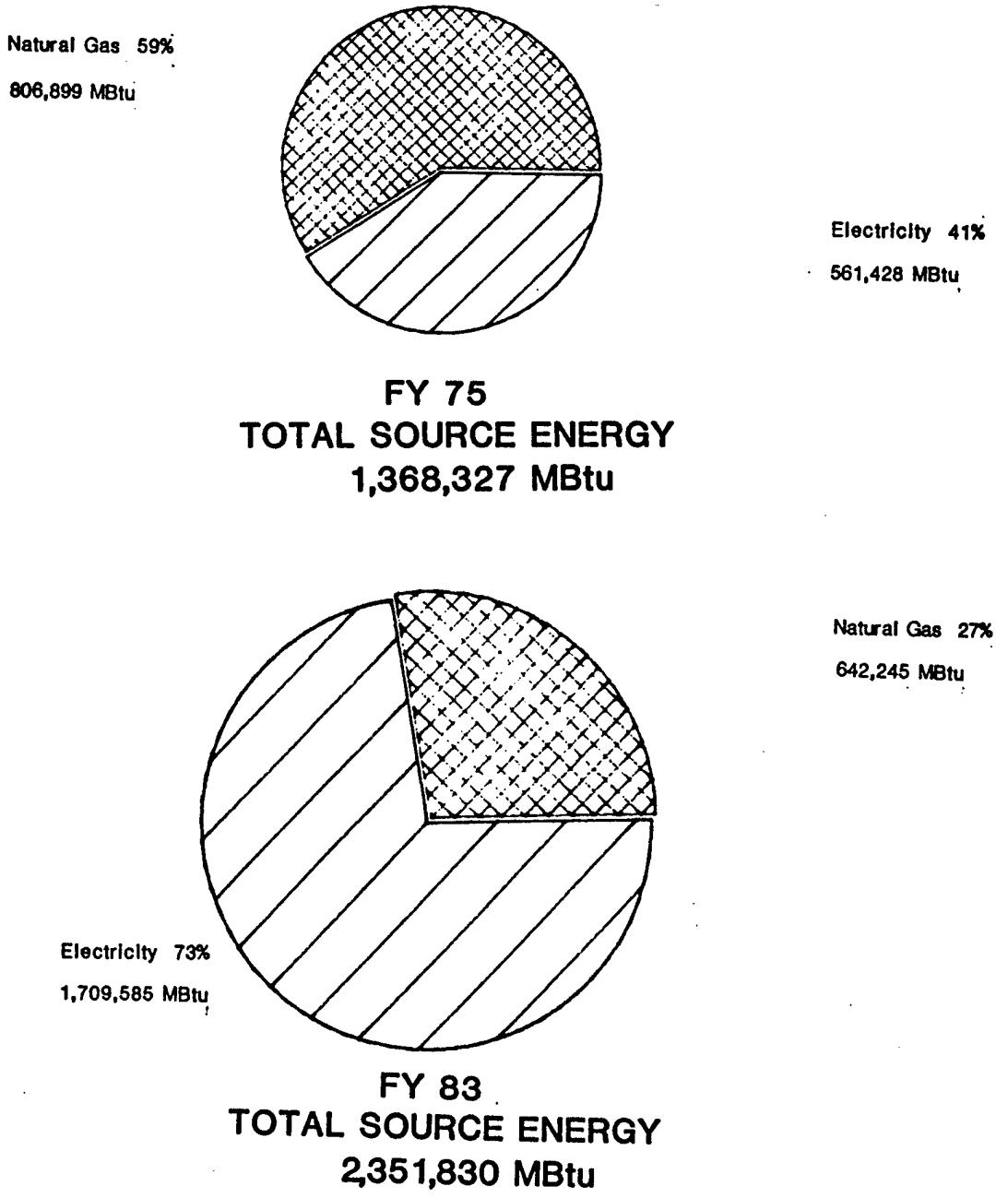

Figure ES1 Comparison of FY75 and FY83 Energy Consumption

2.1.2 While energy consumption has increased significantly from FY75 to FY83, it must be noted that Fort Polk is a military installation which has grown dramatically during that time. Although much of the new construction replaces old temporary buildings, the new buildings are air conditioned which was not the case before. Also, there has been a major increase in Family Housing at Fort Polk. (Currently, about one-quarter of the square footage is Family Housing.)

3. ENERGY CONSERVING MEASURES DEVELOPED (INCREMENTS A AND B)

Thirty-two energy conserving measures (ECM's) were investigated for implementation at Fort Polk, Louisiana for Increments A and B.

3.1 ECM Summary

A summary of each measure is given below, broken out by Increment and Category, with projects meeting ECIP criteria first, followed by projects which did not meet ECIP criteria.

3.1.1 Increment A - The following Increment A ECM's were analyzed.

3.1.1.1 Load Reducing ECM's

Non-Family Housing Load Reducing Projects (ECIP) T-100

Roof Insulation

Energy Savings	:	5,748 MBtu/yr Natural Gas
	:	+ 11,738 MBtu/yr (source) Electricity
Total Energy Savings	:	17,486 MBtu/yr Energy
Base Construction Cost (FY86)	:	$ 425,597
Total Net Discounted Savings	:	$ 805,592
Simple Payback	:	7.4 years
SIR	:	1.72

Automatic Setback Thermostats

Energy Savings	:	16,562 MBtu/yr Natural Gas
Total Energy Savings	:	16,562 MBtu (source) Energy
Base Construction Cost (FY86)	:	$ 34,815
Total Net Discounted Savings	:	$ 350,888
Simple Payback	:	0.6 years
SIR	:	9.18

Flow Restricting Showerheads in Barracks & BOQ's

Energy Savings	:	11,211	MBtu/yr Natural Gas
	:	+ 780	MBtu/yr(source)Electricity
Total Energy Savings	:	11,991	MBtu (source) Energy
Base Construction Cost (FY86)	:	$ 110,492	
Total Net Discounted Savings	:	$ 610,291	
Simple Payback	:	2.8	years
SIR	:	5.03	

Totals for ECIP

Energy Savings	:	33,521	MBtu/yr Natural Gas
	:	+ 12,518	MBtu/yr (source) Electricity
Total Energy Savings	:	46,039	MBtu/yr (source) Energy
Base Construction Cost (FY86)	:	$ 570,904	
Total Net Discounted Savings	:	$2,219,262	
Simple Payback	:	3.7	years
SIR	:	3.54	

Additionally, the following ECM was investigated which did not meet ECIP criteria:

Domestic Hot Water Tank Insulation:

SIR = 0.54

3.1.1.2 System and Plant ECM's

Boiler Alterations (ECIP) T-102

Turbulators in Fire Tube Boilers

Energy Savings	:	8,980 MBtu/yr Natural Gas
	: +	3,564 MBtu/yr Fuel Oil
Total Energy Savings	:	12,544 MBtu/yr Energy
Base Construction Cost (FY86)	: $	135,595
Total Net Discounted Savings	: $	326,207
Simple Payback	:	2.4 years
SIR	:	2.19

Flue Gas Analyzers with Feedback Trim

Energy Savings	:	5,965 MBtu/yr Natural Gas
	: +	4,247 MBtu/yr Fuel Oil
Total Energy Savings	:	10,212 MBtu/yr Energy
Base Construction Cost (FY86)	: $	149,000
Total Net Discounted Savings	: $	555,555
Simple Payback	:	4.3 years
SIR	:	3.39

Totals for ECIP

Energy Savings	:	14,945 MBtu/yr Natural Gas
	: +	7,811 MBtu/yr Fuel Oil
Total Energy Savings	:	22,756 MBtu/yr Energy
Base Construction Cost (FY86)	: $	284,595
Total Net Discounted Savings	: $	1,179,467
Simple Payback	:	3.9 years
SIR	:	3.77

Additionally, an investigation was made of replacing heating systems in North Fort Barracks for energy reduction. The conclusion reached was that the incremental savings do not justify the cost.

3.1.1.3 Family Housing ECM's

Energy Conserving Projects for Family Housing (ECIP)

Four specific measures were identified which individually met ECIP criteria:

ECM1 Automatic Setback Thermostats,
ECM2 Restricted Flow Showerheads,
ECM3 Hot Water Heater Insulation Jackets,
ECM4 Conversion from Incandescent Lighting to Fluorescent Lighting in Kitchens.

This original Family Housing ECIP was funded in 1983 and completed in 1985 under the old (E/C, B/C) ECIP criteria.

This is a summary of the results:

	ECM Number				
	1	2	3	4	ECIP
Number of Applications	760	760	All	All	----
Source Elec. Savings (MBtu/yr)	-0-	342	5,584	5,772	11,168
Gas Savings (MBtu/yr)	2,033	6,755	748	-0-	9,536
Total Source Energy Savings (MBtu/yr)	2,033	7,097	6,332	5,772	21,234
CWE (FY85)	----	----	----	----	525,785
Annual $ Savings	----	----	----	----	121,167
E/C	15	207	38	41	42
B/C	1.0	13.8	2.5	2.0	2.8
Payback	----	----	----	----	4.3

Additionally, the following seven ECM's were investigated which did not meet ECIP criteria:

Storm Windows
SIR = 0.64 (largest savings)

Solar Domestic Hot Water
SIR = 0.27

Floor Insulation
SIR = 0.44

Wall Insulation
N/A

Roof Insulation
N/A

Energy Conserving Measures for New Family Housing which did not meet ECIP criteria:

- Automatic Setback Thermostats
  SIR = 0.88
- Water Heater Insulating Jackets
  SIR = 0.44

3.1.1.4 Controls for Family Housing ECM's

Thermostat Controls and Flow Restricting Showerheads (ECIP) T-101

Family Housing Automatic Thermostat Override

Energy Savings	:	806 MBtu/yr Natural Gas
	:	+ 9,089 MBtu/yr (source) Electricity
Total Energy Savings	:	9,895 MBtu/yr (source) Energy
Base Construction Cost (FY85)	:	$ 284,328
Total Net Discounted Savings	:	$ 436,712
Simple Payback	:	8.9 years
SIR	:	1.40

Restricted Flow Showerheads - New FH

Energy Savings	:	2,085 MBtu/yr (source) Electricity
Total Energy Savings	:	2,085 MBtu/yr (source) Energy
Base Construction Cost (FY85)	:	$ 42,596
Total Net Discounted Savings	:	$ 90,678
Simple Payback	:	6.3 years
SIR	:	1.94

Totals for ECIP

Energy Savings	:	806 MBtu/yr Natural Gas
	:	+ 11,174 MBtu/yr (source) Electricity
Total Energy Savings	:	11,980 MBtu/yr (source) Energy
Base Construction Cost (FY88)	:	$ 326,924
Total Net Discounted Savings	:	$ 609,530
Simple Payback	:	8.2 years
SIR	:	1.70

FM Controls for Family Housing A/C Units (ECIP) T-105

Energy Savings	:	22,038 MBtu/yr (source) Electricity
Total Energy Savings	:	22,038 MBtu/yr (source) Energy
Base Construction Cost (FY86)	:	$ 520,639
Total Net Discounted Savings	:	$ 896,241
Simple Payback	:	7.9 years
SIR	:	1.57

3.1.2 Increment B

Conversion of Existing Incandescent Athletic Flood Lights to High-Efficiency Luminaires (ECIP) T-104

Energy Savings	:	14,657 MBtu/yr (source) Electricity
Total Energy Savings	:	14,657 MBtu/yr (source) Energy
Base Construction Cost (FY85)	:	$ 492,921
Total Net Discounted Savings	:	$ 836,798
Simple Payback	:	7.5 years
SIR	:	1.55

Energy Monitoring and Control System - South Fort Polk (ECIP) T-103

Energy Savings	:	28,040 MBtu/yr (source) Electricity
	:	+ 1,821 MBtu/yr Gas
Total Energy Savings	:	29,861 MBtu.yr (source) Energy
Base Construction Cost (FY85)	:	$ 409,100
Total Net Discounted Savings	:	$1,147,549
Simple Payback	:	5.0 years
SIR	:	2.55

Energy Monitoring and Central System - North Fort Polk.
Per request of Fort Polk, this project was not developed as an ECIP.

Energy Savings	:	13,668 MBtu/yr (source) Electicity
	:	+ 704 MBtu/yr Gas
Total Energy	:	14,372 MBtu/yr (source) Energy
Base Construction Cost (FY85)	:	$ 300,600
Total Net Discounted Savings	:	$ 517,506
Simple Payback	:	8.3 years
SIR	:	1.57

Additionally, the following seven ECM's investigated for Increment B did not meet ECIP criteria:

Transformer Replacement
SIR = 0.38 (largest savings)

Replacement of Overhead Conductors
SIR = 0.10

Electric Demand Reduction
SIR = 0.0

Conversion to High-Efficiency Motors for Water Pumping
SIR = 0.50

Conversion to High-Efficiency Motors in Sanitary Disposal System
SIR = 0.89 (largest savings)

Conversion of Existing Mercury Vapor Lamps in Street Lighting to High-Pressure Sodium Lamps
SIR = 0.79

Conversion of Existing Incandescent Lamps in Street Lighting to High-Pressure Sodium Lamps
SIR = 0.37

4. ENERGY AND COST SAVINGS

A summary of results of ECIP implementation is presented in this section.

4.1 Basewide Consumption After ECIP Implementation

While it is somewhat difficult to predict the actual Fort Polk consumption in the future due to the ongoing and future growth, it is clear that consumption of energy will increase. This increase is not due to poor energy use practices as much as it is due to increased square footage and the increased use of air conditioning. Even on a per square foot basis, the amount of energy use at Fort Polk has increased since FY75. This is due to the use of mechanical refrigeration for air conditioning in new structures. Note that the increase is from increased electric use - natural gas consumption has actually decreased due to newer construction being more thermally tight from better insulation. Therefore, Fort Polk's use of energy today is not simply related to increased use or square footage but to a distinct change in the building stock and interior conditions in the new buildings.

4.1.1 Thus, if all other things were held static, the implementation of the recommended ECIP's plus the already funded Family Housing ECIP would result in a reduction of 8% of FY75 gas use and 18% of FY75 electric use (see Figure ES2). Note, however, that the ECIP's analyzed cover temporary buildings also. If these buildings are not to be included, the savings would be reduced.

4.1.2 At this time it is difficult to forecast the future energy use at Fort Polk as mentioned earlier. What is clear is that as new construction continues, energy use will increase. Fort Polk is in a unique position in that virtually the entire post is being rebuilt with new, modern structures. The opportunity to include energy conserving concepts into the designs should not be ignored - much more energy can be saved if it is designed in rather than retrofitted on and at a much

reduced cost. In this light, Fort Polk is to be congratulated. Not only are most new structures incorporating energy into the design, but their enthusiasm for solar applications is an added plus. At a time when many demonstration solar projects are being dismantled, Fort Polk is working to make their solar applications viable. To do this, funds for training and maintenance must continue to be made available.

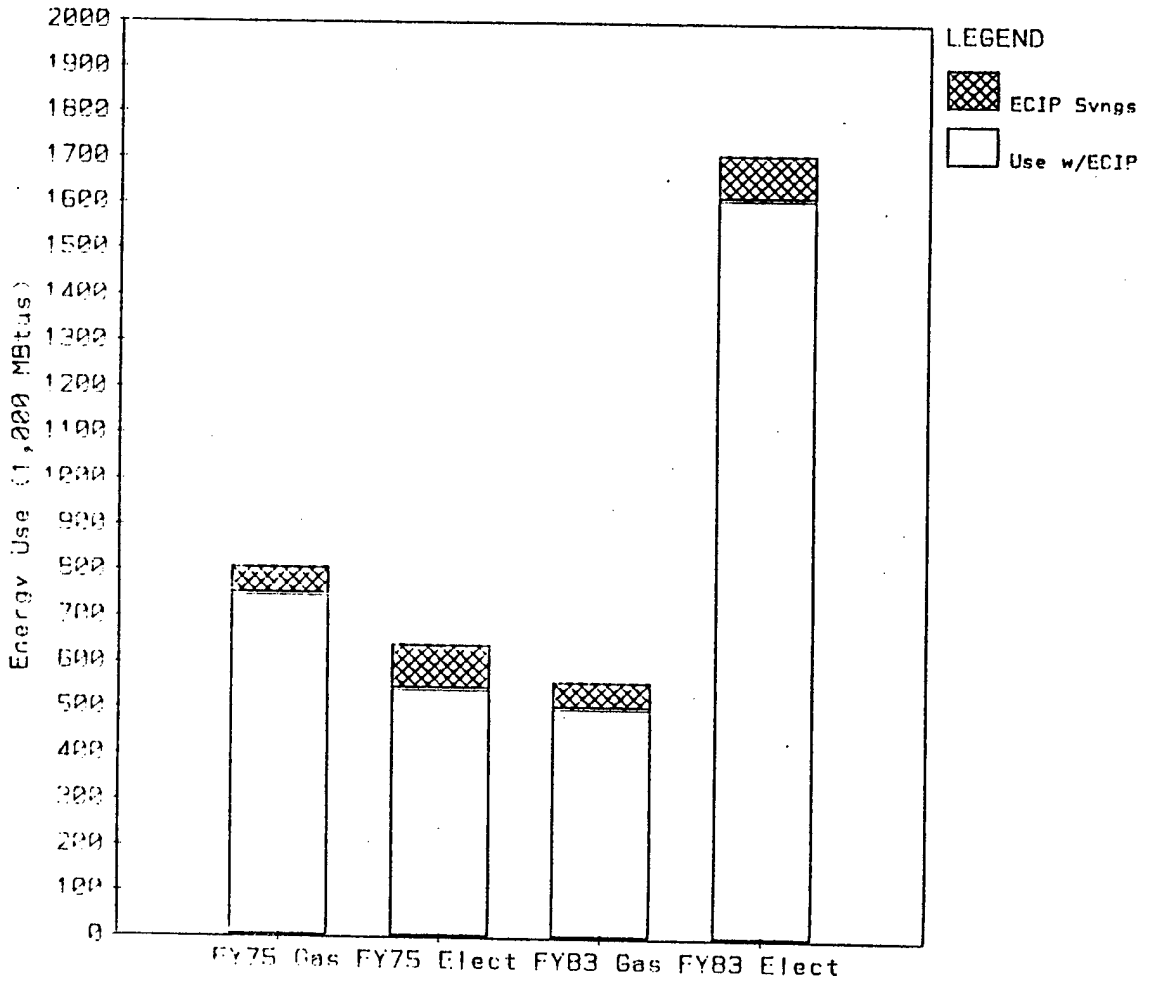

Figure ES2 Energy Reductions

5. INCREMENT E - CENTRAL BOILER PLANTS

Increment E is a study of central boiler plant energy generation and distribution using solid fuels. The primary Army objective is to reduce energy dependency on petroleum fuels and natural gas by changing to coal. Schemes analyzed encompassed one mid-range sized central plant for South Fort Polk and a similar plant for North Fort Polk. These two plants could supply heating energy to buildings located adjacent to each facility, and they could also supply heating energy to temporary buildings and to Family Housing.

5.1 Central Plants

A geographic grouping of buildings was the conceptual tool used to evaluate central energy plant feasibility for each analysis scheme. Successive building programs at Fort Polk have clustered facilities of similar function, so that subgroups of administrative, operations and residential buildings are well defined. The subgroups at Fort Polk consist mainly of family housing, permanent buildings and temporary buildings.

5.1.1 Five basic steps comprised the determination of central energy plant feasibility at Fort Polk, Louisiana, for each analysis scheme. They were:

- A baseline assessment of the need for a central plant,
- A cost estimate of the plant and other central facilities,
- A cost estimate of piping and other distributed facilities,
- A life-cycle cost estimate of the central plant and associated facilities, and
- Life cycle cost analysis of the central plant and associated facilities.

5.2 Results

The results of the coal-fired central plant are summarized in TABLE ES2. As can be seen, no central energy plant scenario was cost effective when analyzed using the methodology outlined in Part I of ETL 1110-3-332. Clearly, then, construction of a central plant to replace the current heating systems is not cost effective and cannot be recommended. Additionally, it should be noted that the use of a coal-fired central energy plant would save no energy - it is simply the displacement of fuel types. It should be noted, however, that the use of central plants as a retrofit is not cost effective, but no conclusions have, or should be reached regarding cost effectiveness of new construction from these analyses. In new construction, virtually all of the parameters change and the results will be different.

TABLE ES2

COAL-FIRED CENTRAL PLANT RESULTS

Application	Net Life Cycle Cost*
South Fort Central Energy Plant to Supply Supply Energy to the Existing CEP's	$13,900,000
South Fort Temporary Buildings CEP to Supply Energy to Six Temporary Buildings	$100,000 (Incremental Addition)
Family Housing CEP to Supply Energy to 2,872 Family Housing Units	$20,600,000 (Incremental Addition)
North Fort Polk CEP to Supply Energy to All North Fort Buildings	$27,400,000
Combined CEP for All of Fort Polk	$7,100,000 (Incremental Addition)

* Rounded values. A positive value implies a net cost and no cost effectiveness.

5.2.1.2 The use of waste POL as a fuel source shows promise. The detailed analysis indicated a negative Net Life Cycle Cost that was sufficiently large enough to remove doubts about limits on feasibility (see Table ES3). This project involved adding a waste POL burner to each of two boilers at Building 2271. Along with the fuel oil already used, the waste POL could provide up to 25% of the energy output required from this plant. Actually, no energy will be saved since the waste POL is replacing fuel oil. However, the waste POL is not charged against the Fort so the total MBtu usage would be reduced by about 18,700 MBtu/yr if the waste POL were burned to supplement fuel oil.

TABLE ES3
WASTE-POL SCENARIOS

Application	Net Life Cycle Cost*
Provide DHW to 8000 Block, North Fort	$ 898,000
Burn Waste POL along with #2 fuel oil in Building 2271	$ -1,439,000
Generate electricity with Waste POL	$ 275,000

*Rounded values. A positive value implies a net cost and no cost effectiveness. A negative value implies savings and implementation should be considered.

6. Increment G

6.1 Increment G projects were selected to achieve additional energy savings to help meet the AFEP goal of energy reduction compared to FY75. The methodology used in the initial selection of Energy Conservation Measures (ECM's) is given in detail in Volume II of the Energy Engineering Analysis Program for Fort Polk, Final Report, March 1986. In part, the projects selected for consideration for Increment G are projects that did not meet ECIP criteria but were felt to have reasonable potential for saving energy as maintenance, repair or minor construction projects. In addition, it was requested that analysis of a systematic maintenance and repair program be done. Recognizing that the quantitative analysis of such a project comes under the scope of Increment F which is not part of the SOW, a set of qualitative guidelines was presented to help organize such a project.

6.2 The results of the projects analyzed are presented in TABLE ES4 showing Natural Gas and Source Electric savings and annual dollar savings Base Construction Costs (FY86), Total Net Discounted Savings, and Savings to Investment Ratios (SIR's).

TABLE 6.3

SUMMARY OF INCREMENT G PROJECTS COMPLETED UNDER CONTRACT MODIFICATION P00001

ECM	Natural Gas Savings (MBtu/yr)	Electric Savings-Source (MBtu/yr)	Total Source Savings (MBtu/yr)	Energy Dollar Savings	Base Cost (FY86$)	Total Net Discounted Savings	SIR
4.1 DHW Heat Pumps for FH (single unit)	------	21.3	21.3	925	934	785	0.84
4.2 Electronic Ignition (single unit)	1.44	-----	1.44	74	132	74	0.56
4.3 Powered Attic Ventilation (single unit)	______	-0.98	-0.98	-42	----	----	----
4.4 Wind Driven Attic Ventilation (single unit)	------	1.51	1.51	66	132	66	0.50

7. ENERGY PLAN

7.1 Matrix of Actions and Savings

The totals for the implementation of the ECM's meeting ECIP criteria are shown in TABLE ES5 and are summarized below:

Energy Savings:	88,427	MBtu/yr (source) Electric
	51,093	MBtu/yr (Natural) Gas
	+ 7,811	MBtu/yr Fuel Oil
Total Energy Savings:	147,331	MBtu/yr (source) Energy
Base Construction Cost:	$2,604,983	(FY86)
Total Net Discounted Savings:	$6,888,847	
SIR:	2.64	

The summary above does not include the original Family Housing ECIP which was completed under old ECIP criteria (E/C, B/C). That ECIP has been funded and designed. It also does not include the EMCS for North Fort which was not pursued by request of the Post.

7.1.1 The savings from these new ECIP projects represent a reduction of 6% of FY75 gas use, and 16% of FY75 electric use, and 39% of FY75 diesel fuel use, for a total reduction of 10%. For FY85, the ECIPs represent a reduction of 8% in FY83 gas use, 5% in FY83 electricity use, and 4% in FY83 diesel fuel use for a total reduction of 5%.

7.1.2 It should be noted that the projects developed include all applicable buildings, permanent and temporary, except those planned for demolition. Included buildings were obtained from a list of desired buildings provided by the Installation. In those cases where temporary buildings are involved, it is expected that the Base Commanding Officer would specify that the expected life of the structures is greater than 10 years or the life of the project whichever is greater as required for ECIP funding.

TABLE ES5

SUMMARY OF ECM'S MEETING ECIP CRITERIA FOR INCREMENT A & B

ECIP	Source Energy Savings (MBtu/yr) Natural Gas	Electric	Diesel*	Total	Base Construction Cost (FY85)	Total Net Discounted Savings	SIR	Simple Payback (Years)
T-100 Non-Family Housing Load Reducing Projects (ECIP)								
Roof Insulation	5,748	11,738	-	17,486	$425,597	$ 805,592	1.72	7.4
Automatic Setback Thermostats (5-yr Lifetime)	16,562	-	-	16,562	$ 34,815	$ 350,888	9.18	0.6
Flow-Restricting Showerheads in Barracks & BOQ's	11,211	780	-	11,991	$110,492	$ 610,291	5.03	2.8
Total for ECIP	33,521	12,518	-	46,039	$570,904	$2,219,262	3.54	3.7
T-102 Boiler Alterations (ECIP)								
Turbulators in Fire Tube Boilers (5-yr Lifetime)	8,980	-	3,564	12,544	$135,595	$ 326,207	2.19	2.4
Flue-Gas Analyzers w/Feedback Trim	5,965	-	4,247	10,212	$149,000	$ 555,555	3.39	4.3
Total for ECIP	14,945	-	7,811	22,756	$284,595	$1,179,467	3.77	3.9
T-101 Thermostat Controls and Flow Restricting Showerheads (ECIP)								
Restricted Flow Showerheads-New FH	-	2,085	-	2,085	$ 42,596	$ 90,678	1.94	6.3
Family Housing Automatic Thermostat Override	806	9,089	-	9,895	$284,328	$ 436,712	1.40	8.9
Total for ECIP	806	11,174	-	11,980	$326,824	$ 609,530	1.70	8.2
T-104 Conversion of Existing Incandescent Athletic Field Flood Lights to High-Efficiency Luminaires (ECIP)	-	14,657	-	14,657	$492,921	$ 836,798	1.55	7.5
T-103 EMCS-South(ECIP)	1,821	28,040		29,861	$409,100	$1,147,549	2.55	5.0
T-105 FM Controls	-	22,038	-	22,038	$520,639	$ 896,241	1.57	7.9
EMCS - North	704	13,668	-	14,372	$300,600	$ 517,506	1.57	---
Original Family Housing Setback Thermostats Flow Restricting Showerheads DHW Tank Insulation Lighting Conversion	9,536	11,698	-	21,234	$525,785 (CWE)	* E/C=42 B/C=2.8		

* This project was completed and funded under the old ECIP guidelines.

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