FORT SILL ARMY BASE

ENERGY ENGINEERING ANALYSIS PROGRAM (EEAP)

CONTRACT NO. DACA 63-82-C-0173

FINAL REPORT

VOLUME I

EXECUTIVE SUMMARY

1982

PREPARED BY

ENERGY MASTERS CORPORATION

13154 COIT ROAD SUITE 105

DALLAS, TX., 75240

DEPARTMENT OF THE ARMY
CONSTRUCTION ENGINEERING RESEARCH LABORATORIES, CORPS OF ENGINEERS
P.O. BOX 9005
CHAMPAIGN, ILLINOIS 61826-9005

REPLY TO
ATTENTION OF: TR-I Library

17 Sep 1997

Based on SOW, these Energy Studies are unclassified/unlimited.
Distribution A. Approved for public release.

Marie Wakefield,
Librarian Engineering

E X E C U T I V E S U M M A R Y

ENERGY ENGINEERING ANALYSIS PROGRAM (EEAP)

INCREMENTS F AND G

CONTRACT NO DACA63-82-C-0173

FINAL SUBMITTAL

FOR FORT SILL ARMY BASE
LAWTON OK

ENERGY MASTERS CORPORATION
13154 COIT ROAD SUITE 105
DALLAS TX 75240

214-669-8801

TABLE OF CONTENTS

TABLE OF CONTENTS
PAGE TWO

I INTRODUCTION

Included in this summary are the data and results of the first five energy analysis and study increments (A, B, C, D and E) which were developed under a previous contract to provide a Basewide Energy Systems Plan for the Fort Sill Army Base at Lawton, Oklahoma. Also included in this Summary are the data and results of increments F and G that are the responsibility of Energy Masters Corporation.

The primary goals outlined in the scope of work for this study are as follows:

1. Develop low cost energy conservation projects within the Facilities Engineer Funding Authority.
2. Update and modify, as required, energy conservation projects developed in Increments A, B, C, D, and E.
3. Combine all proposed energy conservation projects into one comprehensive list.
4. List the recommended projects in an order of priority based on each project's savings investment ratio (SIR). Also schedule the construction of the recommended projects.
5. Calculate energy and cost savings and project basewide energy consumption after implementation of recommended projects.

This submittal is based on work done for Increments F and G as outlined in the Prenegotiation Meeting and Manual DAEN-MPE-E entitled Scope of Work for Energy Engineering Analysis Program (EEAP); paragraphs 3.5.6 and 3.5.7. See page 1 Appendix for complete text of Prenegotiation Meeting.

II EXISTING ENERGY CONSUMPTION

The Energy Use Analysis of existing and proposed facilities are herewith analyzed and are based on field investigation data, building load calculations and meter readings.

1 Source Energy consumption

Source energy consumption will be based on year 1975.

			Dollar Cost	BTU
Electricity	113.3 m̄	KWH/Yr	$ 619,300	1314.419 (10^9)
Natural Gas	1582.5 m̄	CF/Yr	1,139,600	1631.552 (10^9)

2 Total Annual Energy Used

The chart that follows shows the Three Year Load (1975-1977) Profiles on Energy Consumption.

3 Building Group Source Energy Consumption

The second chart that follows shows the 1977 One Year Energy Consumption Load Profiles.

2 Total Annual Energy Used

ENERGY CONSUMPTION - THREE YEAR LOAD PROFILES

	FY '75			FY '76			FY '77		
	sq ft x 10^6	BTU x 10^9	Avg BTU / sq ft x 10^3	sq ft x 10^6	BTU x 10^9	Avg BTU / sq ft x 10^3	sq ft x 10^6	BTU x 10^9	Avg BTU / sq ft x 10
(1) Gas:									
A. Heating		1226.4			1411.3			1157.8	
B. Cooking		35.5			40.8			33.5	
C. DHW		146.8			169.0			138.6	
Subtotals: (1)	12.3±	1408.7	114.5	12.3±	1621.1	131.8	12.3	1329.9	108.1
(2) Electricity:									
A. Cooling		238.7			279.7			303.9	
B. Lights		365.2			428.1			465.0	
C. Misc.		197.2			231.1			251.1	
Subtotals: (1)	12.3±	801.1	65.1	12.3±	938.9	76.3	12.3	1020.0	82.9
TOTALS:	12.3±*	2209.8	179.6	12.3±*	2560.0	208.1	12.3*	2349.9	191.0
Energy Cost: (K$)									
Gas		$1139.6			$1509.2			$1423.0	
Electricity		619.3			842.2			1060.8	
TOTALS:		$1758.9			$2351.4			$2483.8	

*Not additive.

Defense Energy Information System (DEIS)

(1) HQ TRADOC shows total facilities energy consumption as follows:

	1975
Electricity (BTU x 10^9)	1208.870
Natural Gas (BTU x 10^9)	1495.454
	2704.324

LPG usage is not included in these figures because it is relatively minor (1.453 x 10^9 BTU). The natural gas and electricity energy totals for FY 1976 & 1977 from DEIS HQ TRADOC are similarly different than the figures in the above chart. The DEIS HQ TRADOC figures for FY 1975 are used in % energy reduction calculation - page 22

3 Building Group Source Energy Consumption

ENERGY CONSUMPTION - ONE YEAR (1977) LOAD PROFILES **

	Nonreimbursable +			Nonappropriated ++			Post Exchange			Commissary			Housing		
	Area x 10^6	BTU x 10^9	Avg BTU / sq ft x 10^3	Area x 10^6	BTU x 10^9	Avg BTU / sq ft x 10^3	Area x 10^6	BTU x 10^9	Avg BTU / sq ft x 10^3	Area x 10^6	BTU x 10^9	Avg BTU / sq ft x 10^3	Area x 10^6	BTU x 10^9	Avg BTU / sq ft x 10^3
(1) Gas:															
A. Heating		636.7			12.7			17.8			7.5			483.1	
B. Cooking	--	7.9	--	--	0.06	--	--	0.53	--	--	--	--	--	25.0	--
C. DHW	--	18.6	--	--	2.3	--	--	0.95	--	--	1.0	--	--	115.7	--
Subtotals:	5.50	663.2	120.6	0.135	15.1	111.6	0.184	19.3	104.9	0.11	8.5	77.3	6.36	623.8	98.1
(2) Electricity:															
A. Cooling		114.2			6.4			0.8			2.8			169.7	
B. Lights	--	204.2		--	2.5		--	6.4		--	7.2		--	244.6	
C. Misc.	--	87.5		--	1.5		--	4.7		--	8.7		--	148.8	
Subtotals:	5.50	405.9	73.8	0.135	10.4	77.0	0.184	21.9	119.0	0.11	18.7	170.1	6.36	563.1	88.6
TOTALS:	5.50*	1069.1	194.4	0.135*	25.5	188.6	0.184*	41.2	223.9	0.11*	27.2	247.4	6.36*	1186.9	186.7

* Not Additive.

** Figures in this table don't agree with Defense Energy Information System (DEIS) records.

\+ Non-reimbursable - facilities funded for operations from appropriated funds.

++ Non-appropriated - facilities for moral, welfare and recreation funded from non-appropriated funds.

4 Typical Building Energy Consumption

A Load Calculation

Scheduled herein are calculations for heating and cooling loads including lighting and miscellaneous loads. It is a general estimation of total capacities and energy consumptions of the structures; it should not be used for equipment sizing.

B U-Values

U-Values were determined through results of our field investigations and are in accordance with ASHRAE Standards. Glass and door U-Values are generally the same throughout; i e, glass is considered to be single pane everywhere at 1.1; two types of doors are considered: Wooden doors at 0.5 and metal doors at 1.0. U-Values for floors, roofs and walls are as scheduled for each building.

C Design Heating (KBH) and Cooling (Tons) Loads

Areas, U-Values, temperature differences for walls, floors, glass, etc, with sensible and latent loads for people, lights and infiltration were considered to produce an estimated heating and cooling load for each building. These totals also include a 10% safety factor. (ASHRAE Fundamentals, 1977; Section IV, Chapter 24.)

D Lighting, Yearly Consumption (KWH/LIT)

Lighting consumption for each building is in KWH per year and is not an hourly load. Consumption was estimated by calculating a KWH/SF.Yr factor for each type of building based on typical maximum demand/SF, hours of Operation/Yr and load factors. (IEEE Recommended Practice for Electric Power Systems in Commercial Buildings, Standard 241, 1974, Chapter 2.)

E Miscellaneous, Yearly Consumption (KWH/MISC)

Miscellaneous consumption, which consists of appliances and miscellaneous motor loads other than HVAC and lighting, was also estimated in a similar manner, by taking into consideration the hours of operation/Yr, type and size of loads. (IEEE Recommended Practice for Electric Power Systems in Commercial Buildings, Standard 241, 1974, Chapter 2.) Units are in Kilowatt Hour/Year (KWH/Yr).

F Design Conditions

1	Latitude	34°
2	Longitude	98°
3	Elevation	1187 Ft
4	Summer	
a	Outdoor Dry Bulb	99° F
b	Outdoor Wet Bulb	76° F
c	Indoor Dry Bulb	78° F
d	Indoor Relative Humidity	50%
e	Outdoor Temperature Range	21° F

FORT SILL ENERGY CONSUMPTION BASED ON YEAR 1977

FORT SILL EEAP
INCREMENTS F AND G
CONTRACT NO DACA63-82-C-0173

Cat.	Area (Ft^2)	Design Heating Load (BTUH x 10^3)	Design Cooling Load (Tons)	Lights (KWH/yr.)	Miscellaneous (KWH/yr.)
(1) Non-Reimbursable	5,344,353.0	293,135.0	6,120.8	22,959,173.0	9,751,275.0
(2) Non-Appropriated	134,888.0	5,926.0	269.9	289,800.0	166,979.0
(3) PX	179,937.0	8,208.5	459.6	720,060.0	525,894.0
(4) Commissary	109,976.0	3,402.6	151.4	831,539.0	996,214.0
(5) Housing:					
a. Family Housing	2,362,630.0	81,942.5	4,982.7	9,922,590.0	5,906,374.0
b. Barracks w/o Mess	2,336,982.0	95,518.2	2,150.1	10,607,603.0	5,734,528.0
c. Barracks w/ Mess	1,280,608.0	38,442.5	1,822.5	6,403,040.0	4,738,237.0
Total Housing:	5,980,220.0	215,903.2	8,955.3	26,933,233.0	16,379,139.0
GRAND TOTAL:	11,749,374.0*	526,575.3	15,957.0	51,733,805.0	27,819,501.0

*-Vacant buildings account for: 210,116 Ft^2

5 Winter

a	Outdoor Dry Bulb	16° F
b	Outdoor Wet Bulb	16° F
c	Indoor Dry Bulb	65° F
d	Degree Day	2899 (1977)*
		3367 (10 Yr.Avg)

* 2899 Degree days were used for the basewide energy consumption profile which is based on the 1977 utility data.

III ENERGY CONSERVATION MEASURES DEVELOPED

1 The chart on the following two pages details the following for each project investigated under each increment (A-G):

Project (listed from highest SIR to lowest)

Increment (that project was developed under)

Construction Cost ($)

Total Initial Investment Cost (includes SIOH, Design Cost, Energy Credit & Salvage Value)

Annual Savings ($/Yr)

Annual Energy Savings (MBTU/Yr)

Labor Manhours (by worker classification)

SIR (Calculated Savings Investment Ratio)

Funding Classification

Year Initiated (Projected Project Start Date)

Year Completed (Projected Project Completion Date)

Calculation Page Numbers (Back-Up Material)

FORT SILL EEAP

PROJECTS RECOMMENDED FOR FUNDED

PROJECT	Increment	Construction Cost $	Total Initial Investment $	Annual Savings $ / Year	Annual Energy Savings M BTU/Year	Labor MHrs (1)	SIR (3)	Funding (2)	Year Initiated	Year Completed	Calculations Vol II, Pages
Unoccupied Cycle	F	12,160	11,844	56,914	25,003	256 B	53.77	A	1984	1985	68,69
Reset Mixed Air	F	2,240	2,259	7,959	3,039	112 A	44.3	A	1984	1984	70,71
Unoccupied Cycle Bldg 3040	F	20,710	24,444	38,864	15,568	315 A	17.62	A	1984	1985	72,73
Tuning Boilers	A(F)	45,172	42,846	41,592	16,000	N/A	12.11	4	4	4	41,42
Economizer Lockout	F	65,780	68,676	64,325	26,745	572 B	11.88	A	1984	1985	74,75
Pump Impeller Bldg 3040	F	860	850	737	296	8 B	9.54	A	1984	1985	76,77
Calibrate Controls/ Restore Economizer	F	105,490	100,790	71,643	39,616	1424 B	8.34	A	1983	1984	78,81
De-Energize Ballasts	F	12,940	11,650	5,380	2,159	838 C	5.08	A	1984	1985	82,83
Chiller Optimizer	F	45,440	44,990	20,347	8,169	256 B	4.98	A	1985	1986	84-93
Heat Reclaim Bldg 1719	A(F)	29,500	26,340	9,276	3,724	N/A	3.88	A	1985	1986	27,28
Controls/Dampers Bldg 3040	F	16,010	16,857	4,745	1,854	197	3.34	A	1984	1985	94,95
Chiller Bldg 3040	F	136,927	138,023	25,642	7,566	N/A	2.19	A	1984	1985	96,97
Relighting Bldg 730	A(F)	50,010	47,400	6,063	1,304	N/A	1.3	A	1984	1985	29,30
Replace Chiller Bldg 462	A(F)	136,927	138,023	13,265	4,674	N/A	1.29	A	1986	1987	31,32
Modular Boilers w/o mess	F	720,310	739,035	71,139	20,050	N/A	1.22	A	1986	1988	98,99
with mess	F	847,330	869,319	82,056	23,507	N/A	1.19	A	1986	1988	100,101
Hot Water Heater Bldg 3040	F	6,400	6,210	606	238	64 B	1.14	A	1984	1985	102,103
Wall Insulation Blown-In	A	256,523	258,582	22,308	8,651	N/A	1.04	B	1985	1986	(5)

(1) Increment F Projects Only. The letters represent worker classification: A = Equipment Maintenance; B = HVAC and C = Electric.

(2) Funding Thru: A - Facilities Engineer Funding Authority or B - Energy Conservation Investment Program (ECIP)

(3) SIR (Savings Investment Ratio) is calculated per ECIP Guidance (See Volume II Page 32 for typical calculation). This calculation insures that the maximum non-energy savings used is 25% of the energy savings.

(4) Tuning Boilers Project is already in progress.

(5) Detailed Analysis is in separate ECIP Analysis.

FORT SILL EEAP

PROJECTS NOT RECOMMENDED

PROJECT	Increment	Construction Cost $	Total Initial Investment $	Annual Savings $ / Year	Annual Energy Savings M BTU/Year	Labor M-Hrs (1)	SIR (3)	Funding (2)	Year Initiated	Year Completed	Calculations Vol II, Pages
Steam Boilers w/o mess	F	305,950	313,920	42,297	12,650	N/A	1.69	None	-	-	119,120
with mess	F	391,545	404,118	44,926	15,213	N/A	1.55	None	-	-	119,121
CEP 3400	E	2,224,770	2,105,670	238,096	46,145	N/A	0.97	None	-	-	58,59
CEP 1815	E	5,935,607	5,548,000	468,131	128,192	N/A	0.95	None	-	-	60,61
Hanger Alterations	A	148,453	140,810	10,440	3,980	N/A	0.84	None	-	-	33,34
AHU Speed Reduction	F	30,960	30,564	2,076	822	N/A	0.75	None	-	-	106,107
Lamp Replacement	A	2,087,000	1,991,000	50,930	20,445	N/A	0.37	None	-	-	39,40
Low Leakage Dampers	F	65,535	66,059	5,270	2,064	N/A	0.70	None	-	-	104,105
CEP 800	E	7,081,999	6,818,960	465,164	117,140	N/A	0.70	None	-	-	62,63
Wall Insulation Built-Up	A	2.94/ft^2	3.17/ft^2	0.223/ft^2	0.0685/ft^2	N/A	0.70	None	-	-	35,36
Trim Pump Impellers	F	3,720	4,023	252	101	N/A	0.69	None	-	-	108,109
Storm Windows	A	445,720	425,210	17,435	6,715	N/A	0.50	None	-	-	37,38
Solar DHW Bldg 5678	C	218,000	219,740	1,750	669	N/A	0.10	None	-	-	49,50
Solar DHW Artil. Village	C	943,700	951,250	7,030	2,684	N/A	0.09	None	-	-	51,52
Gas/Elec. Metering	B	This Project is not Feasible.									45
EMCS	B	This Project Requires further Investigation.									46
CEP RDF 5900 Area	D	" " " " "									55
Shutoff Return Fans	F	This Project is not Feasible.									110
Lower DHW Temp.	F	" " " " "									111
Flow Restrictors	F	" " " " "									112
Two-Stage Cooling	F	" " " " "									113
Boiler Turbulators	F	" " " " "									114
Boiler Stack Recovery	F	" " " " "									115
Water Treatments	F	This Project Requires further Investigation.									116
COG-Type V-Belts	F	" " " " "									117,118

2 POLICY CHANGES/RECOMMENDATIONS

A RECOMMENDATIONS

We recommend that a new classification be formed in Public Works to specialize in planned maintenance and repair of pneumatic and electric control systems.

We estimate that this will require an additional two qualified control mechanics. These mechanics can eventually become the base crew to also be responsible for maintenance on the Energy Management Control System that is being planned for Fort Sill. Servicing the control systems and the EMC System will eventually require a crew of 6 to 8 mechanics.

Assuming they would be in the same wage scale as air conditioning repairmen, the initial cost to develop the new classification is approximately $63,000 per year.

B A previous study pointed out that the heating and RVAC shops are undermanned and we concur with this observation. These classifications are short of manpower as follows:

1 Heating Shop - 12 people.

2 RVAC - 14 people.

We suggest that consideration be given to increasing the budget for Public Works to provide sufficient personnel to properly maintain the equipment at Fort Sill. The cost of adding the above mentioned increase would be approximately $ 810,000 per year including overhead.

This change in policy would enable Public Works to implement a Planned Maintenance Program (PMP) and maintain the schedule for the PMP.

An increase in staffing will reduce energy consumption as well as equipment repair cost. However, the additional staffing should not be justified by energy savings since it is required to properly maintain the equipment controls.

IV. ENERGY AND COST SAVINGS

1. Projected Basewide Consumption

	(Actual) 1983	(Projected) 1985		(Projected) 1990	
Energy Usage (MBTU/Yr) (4)					
Electricity	1,504,566.4	1,458,637.4	(1)(2)	1,396,353.4	(2)
Natural Gas	1,199,276	1,053,029	(1)(2)	1,046,542	(2)
Fuel Oil	1,343	1,343	(1)(2)	1,343	(2)
Total	2,705,185.4	2,513,009.4		2,444,238.4	
Fuel Cost					
Electricity($/kwh)	0.0318	0.0367	(3)	0.0591	(3)
Natural gas(1,000cf)	2.97	3.43	(3)	5.52	(3)
Fuel Oil($/gal)	0.726	0.84	(3)	1.353	(3)
Fuel Cost ($/yr)					
Electricity	4,124,587	4,417,763		7,114,180	
Natural Gas	3,454,752	3,481,707		5,603,212	
Fuel Oil	7,030	8,131		13,101	
Total	7,586,369	7,907,601		12,730,493	

(1) Planned facility changes include 3 buildings to be added and 114 buildings to be demolished/mothballed before F.Y. 1986.

(2) Includes Projected Energy Savings from Projects scheduled before the appropriate date (1985 or 1990).

(3) Projected fuel cost has an annual 10% increase.

(4) Basewide consumption includes Fort Sill Base and Reserve Center.

2. Allocation of energy conservation project savings.

	Annual Energy Savings MBTU/Yr	
	Electricity	Natural Gas
Administrative/Classrooms[1]	74,114	52,596
Family Housing	2,730	5,917
Commissary	3,724	-
3400 Area (Barracks)	(4,830)[2]	48,387
Building 3040 Administrative/Classrooms	16,049	9,472

(1) Projects that affect the whole base (tuning boiler, etc) are grouped under Administrative/Classrooms since that group will receive the majority of the energy savings.

(2) Number in "( )" indicates an increase in energy consumption.

V INCREMENT C - RENEWABLE ENERGY, PRINCIPALLY SOLAR AND BIOMASS

1 Scope

The AE shall analyze the possibility of utilizing renewable energy sources for space heating, space cooling, domestic hot water and/or process heat.

NOTE The Scope of Work for EEAP (Energy Engineering Analysis Program), DAEN - MPE - E, Revised 22 September 1982, Increment C, is included in the Appendix Pages 10-12.

2 Results and Recommendations

A Solar

Perhaps the most promising renewable energy source in the world today is solar energy.

Though the marketing of solar collectors and systems is varied at this point in time there is a question as to performance reliability. The actual results (based on the DOE Conference held in Denver 28 November to 1 December 1978, show the average efficiencies to be 20% (total insolation to usable energy). This report will show that efficieicies based upon this amount will not recover the initial investmtnet during the life of the project. It is to be expected that through better development and quality control there will be practical and economical justifications for solar plants at Fort Sill.

B Wind

Energy from wind is another field that is slow in development. Experimentation is bringing the results of wind energy closer to practical use; however, this again should be left to private concerns, especially since the basic conversions of this energy is to electricity and for Fort Sill the present and future rates of purchased electricity are relatively inexpensive.

C Biomass

Biomass is not analyzed in this report.

VI INCREMENT D - COGENERATION AND SOLID WASTE

1 Scope

Determine the feasibility of new cogeneration and solid waste plants utilizing solid fuels supplemented with refuse derived fuels (RDF) and waste oil fuels. NOTE The Scope of Work for EEAP (Energy Engineering Analysis Program), DAEN - MPE - E Increment D, is included in the Appendix Pages 12-14.

2 Results and Recommendations

A central energy plant (CEP) utilizing refuse derived fuel (RDF) was investigated in an earlier project titled: RDF 5900 CEP. While updating this project, the following was noted:

A Separate hauling of combustible and noncombustible was recommended, yet the hauling costs were assumed to decrease.

B The current situation was not accurately presented. Combustible waste is now sold, not buried as assumed in the previous analysis.

Therefore, further analysis is required before any recommendations can be made.

VII INCREMENT E - CENTRAL BOILER PLANTS

1 Scope

Determine the feasibility of installing central boiler plants firing solid fuels serving all or discrete parts of the base. NOTE The Scope of Work for EEAP (Energy Engineering Analysis Program), DAEN-MPE-E, Increment E, in included in the Appendix Pages 14 and 15.

2 Results and Recommendations

Three central boiler plants have been proposed by a previous analysis. After updating and analyzing the proposals per Army Manual DAEN-ZCF-U, Energy Conservation Investment Program (ECIP) Guidance, none of the proposals meet ECIP standards.

3400 Central Heating Plant

1815 Central Energy Plant

800 Central Energy Plant

However, as part of Increment G, two other boiler options were considered. They are as follows:

A Install a new steam boiler with modulating burner for the heating load and separate gas fired domestic hot water heater.

B Remove existing boilers and install modular high efficiency boilers and convert steam heating system to hot water.

Option A and Option B were found to be viable solutions. However, it is recommended that Option B be implemented since hot water heating is more desirable.

VIII INCREMENT F - FACILITY ENGINEER CONSERVATION MEASURES

The purpose of this Increment is to provide recommendations for modifications and changes in system operation which are within the facilities engineer funding authority ($200,000 for alteration type work; $500,000 for maintenance and repair type work) and management control. See Appendix Pages 15-18 for complete general scope of work.

1 Energy Conservation Modifications Accomplished since 1975.

S U M M A R Y

	NO BUILDINGS	
1980		
STORM WINDOWS	55	
RESIDING	84	139
1981		
SIDING	74	
UNDERSKIRT	109	
NIGHT SETBACKS	290	
INSULATION	313	
STORM WINDOWS	417	
RESIDING	566	1,769
1982		
STORM WINDOWS	36	
SIDING	122	158
T O T A L		2,066

NOTE: See complete listing of projects in Appendix pages 114 through 131B.

2 Energy Use Estimate for Planned Facilities Changes.

Total Planned Facility Changes to 1985 are as follows:[1]

	Electricity	Natural Gas	Area
3 Buildings Added:	(11,530)	(4,294)	(60,356)
114 Buildings Removed[2]:	27,956	40,656	394,980
Total Reduction	16,426 MBTU/Yr	36,362 MBTU/Yr	334,624 Ft^2

(1) Details in Volume VI Appendix Pages 132-149.

(2) 30 Buildings demolished, 84 Buildings mothballed.

IX ENERGY PLAN

1. ENERGY USAGE REDUCTIONS

	(Base Year) 1975	(Projected) 1985	(Projected) 1990
Energy Usage (MBTU/yr (1)	2,704,324	2,513,009.4	2,444,238.4
Active Building Area (Ft^2) (1)	12,300,000	11,964,000	11,964,000
% Energy Reduction from 1975	-	7.1	9.6
Energy Usage Per Ft^2 (KBTU/yr/ft^2)	219.9	210.0	204.3

(1) Analysis includes Fort Sill Base and Reserve Center

2. Schedule of Energy Conservation Projects.

The following projects should be initiated immediately.

Calibrate and Restore Controls throughout Base

This project has a high SIR value (8.34) and other projects with higher SIR values cannot be initiated until this project is completed.

Reset Mixed Air Temperature

Deenergize Ballasts of Delamped Light Fixtures

Building 3040 Projects

These projects all have a relatively high SIR value; therefore, should be implemented before projects with lower SIR values.

The following projects should be initiated in 1984:

Provide Unoccupied Cycle for AHUs on 14 Buildings Surveyed in Increment F

This project has the highest SIR value (53.77) but cannot be initiated until the project "Calibrate and Restore Controls throughout Base" is completed.

Heat Reclaim Building 1719

Install Economizer Lockout Control

These projects have a relatively low SIR value and cannot be initiated until the project "Calibrate and Restore Controls throughout Base" is completed.

The following projects should be initiated in 1985:

Install Chiller Optimizers

Relighting Corridors Building 730

Install Wall Blown-In Insulation

These projects have a relatively low SIR value; therefore, should be implemented after projects with higher SIR values.

The following projects should be initiated in 1986:

Replace Chiller Building 462

Install Modular Boilers

These projects have a relatively low SIR value; therefore, should be implemented after projects with higher SIR values.