DEPARTMENT OF THE ARMY
EUROPEAN DIVISION CORPS OF ENGINEERS

ENERGY ENGINEERING ANALYSIS PROGRAM EUROPE

VILSECK MILITARY SUBCOMMUNITY

SEVENTH ARMY TRAINING COMMAND

WEST GERMANY

Final Submittal

VOLUME I

EXECUTIVE SUMMARY

UNITED STATES ARMY
CORPS OF ENGINEERS
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FEBRUARY 1983

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FY 80 ENERGY ENGINEERING ANALYSIS PROGRAM, EUROPE

FINAL SUBMITTAL

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THE FINAL SUBMITTAL CONSISTS OF TWO SEPARATE VOLUMES:

- VOLUME I EXECUTIVE SUMMARY
- VOLUME II ENERGY REPORT

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FY 80 ENERGY ENGINEERING ANALYSIS PROGRAM, EUROPE

VILSECK

FINAL SUBMITTAL

VOLUME I

EXECUTIVE SUMMARY

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EXECUTIVE SUMMARY

VILSECK

1. INTRODUCTION

The Energy Engineering Analysis Program for the three U. S. Military Subcommunities of Vilseck, Hohenfels and Vilseck in West Germany, has been authorized by the Department of the Army European Division, Corps of Engineers under Contract No. DACA90-80-C-0093 dated September 29, 1980, and subsequent Modifications:

P00001 dated April 27, 1981,
P00002 dated September 29, 1981, and
P00003 dated September 30, 1981.

1.1 OBJECTIVES OF THE ENERGY STUDY

The objectives of this contract, as explained in detail in Schedule of Title I Services for Energy Engineering Analysis Program, Europe dated September 18, 1981, are as follows:

a. Develop a systematic plan of projects that will result in the reduction of energy consumption in compliance with the objectives set forth in the Army Facilities Energy Plan.

b. Use and incorporate applicable data and results of related studies, past and current, as feasible.

c. Develop a coordinated basewide energy study.

d. Prepare Program Development Brochures (PDB), DD Forms 1391, and supporting documentation for feasible energy conservation projects.

e. Include all methods of energy conservation which are practical (in so far as the state-of-the-art is reasonably firm) and economically feasible in accordance with guidance given.

f. List and prioritize all recommended energy conservation projects.

1.2 INCREMENTS OF WORK

The work to be performed under the contract has been divided into four Increments: A, B, F and G.

Increment A - Energy conservation investigations for buildings and processes.

Increment B - Energy conservation investigations of utilities and energy distribution systems, Energy Monitoring and Control Systems (EMCS), and existing energy plant investigations.

Increment F - Facilities Engineer conservation measures.

Increment G - Projects identified in Increments A and B that do not meet the ECIP criteria of E/C> 13, but may qualify as OMA or MMCA Projects.

1.3 PHASES OF WORK

Increments A, B, F and G have been divided into three phases of work:

Phase I Data gathering and field trips.

Phase II Analysis of data, identification of potential projects, performance of feasibility and economic studies, and preparation of first page of DD Form 1391.

During this phase, all potential projects which produce energy and/or dollar savings should be identified and evaluated as to technical and economic feasibility.

Projects determined to be technically and economically feasible shall be combined into projects and ranked according to highest E/C ratio.

For FY 84, the minimum E/C = 13 MBtu/kS

Phase III Preparation of DD Form 1391 and Project Development Brochures (PDBs); and preparation of documents presenting the results and recommendations of the study.

DD Forms 1391 and PDB's are nor required for Increment F.

As a result of Modifications P00002 dated 29 September 1981, and P00003 dated November 2, 1981, it was negotiated that the Interim Submittal would not contain the Phase II effort of the EMCS study, nor the Phase I and Phase II efforts of Increment F. These would be included in the Prefinal Submittal, after additional required data is obtained by surveying all three subcommunities in early 1982.

1.4 PRESENT STATUS OF THE PROJECT

1.4.1 SURVEY

Prior to the commencement of Phase I of the project, a meeting was held between the A-E and the Corps of Engineers, and out of the approximately 160 energy consuming buildings at Vilseck, 61 buildings were selected to be surveyed in detail.

It was agreed that the sample selected was representative of the entire community; and that the results of the survey and subsequent analysis of energy consumption and energy savings based on a representative building per type at each community could be extrapolated to obtain the energy consumption, energy savings and implementation cost for the entire community, based on the total square foot area of all buildings of each given type.

By this extrapolation method, values of basewide energy consumption, energy savings, and implementation costs could be estimated; and basewide ECIP projects determined.

1.4.2 PRELIMINARY SUBMITTAL

The work listed below was accomplished and presented in the Preliminary Submittal:

a. Compilation and analysis of the data and information received from each subcommunity.

b. Review of the actual energy consumption of each subcommunity based on the energy consumption data collected; as well as a presentation of the projected energy consumption goals for each subcommunity based on the Army Facilities Energy Plan.

c. Summarized tabulations of the survey data.

d. Data of the surveyed buildings was input on Computer Program AXCESS.

e. As a "sample-pilot" ECIP analysis, one building type was selected and analyzed for energy conservation in detail.

f. The feasibility of Central Boiler Plant Projects was investigated.

The presentation of the Preliminary Submittal for Vilseck was made on 10 July, 1981 at Grafenwoehr.

Review comments on the Preliminary Submittal were forwarded to the AE by the Project Manager in his letter dated 15 October, 1981.

1.4.3 INTERIM SUBMITTAL

The work listed below was accomplished and presented in the Interim Submittal:

a. The data received from the Subcommunity was updated.

b. Review of the actual energy consumption of the Subcommunity based on the energy consumption data collected; and a presentation of the energy consumption goals for the Subcommunity based on the Army Facilities Energy Plan.

c. We presented an updated list of the representative buildings of each type selected for detailed energy conservation analysis.

d. The Computer Program AXCESS was used to model and analyze all the buildings surveyed at the Subcommunity. Quantitative results of monthly energy consumption for space heating, domestic hot water, lighting and miscellaneous electricity usage has been obtained for each type of building.

e. Increment A: Each of the buildings types was analyzed for energy conservation opportunities (ECOs) that involved modifying, improving or retrofitting the architectural features, HVAC systems, plumbing systems and lighting.

ECOs determined to be technically and economically feasible (E/C>13, B/C>1) were combined into Energy Conservation Projects (ECP's), and extrapolated to Energy Conservation Investment Projects (ECIP's).

f. Increment G: Projects considered in Increment A that did not meet the E/C>13 criteria and yet had a B/C>1 were recommended for implementation under OMA or MMCA funding.

A complete DD Form 1391 and complete PDB-I were presented for approval.

DD form 1391s and PDBn are not required for Increment F.

g. Increment B: Information obtained on utilities and energy distribution systems, and existing energy plants (boilers) was presented and possible energy conservation measures analyzed.

1.4.4 MODIFICATIONS P00002 AND P00003

These two modifications were negotiated and signed in September 1981.

It was agreed that the AE would perform a walk-through survey of every building in the community for Increment F's requirement to "provide recommendations for modifications and changes in system operation which are within the Facilities Engineer funding authority and management control", as well as for Increment B's EMCS analysis.

Only buildings larger than 5,000 GSF in area and consuming greater than 7500 gal/yr. of oil or 45 m-ton of coal or having a minimum 10 kw connected electrical load would be analyzed for EMCS feasibility.

The survey effort would be performed in early 1982.

1.4.5 PREFINAL SUMBITTAL, INCREMENT F

157 sets of field survey forms were reviewed and from these a computer input sheet for each building surveyed was prepared. A computer data library was created storing all information gathered in the field which could be relevant to recommendations under investigation.

Tables 6-1 and 6-2 of Volume 2, the Energy Report, list the relevent data.

Computer aided manual calculations were used to obtain unescalated energy and cost savings and implementation costs. A computerized economic analysis program was used to produce E/C and B/C ratios.

Recent American and German Manufacturer's catalog data was obtained and included in the Appendices, Volume 7 of the Prefinal Submittal.

1.4.5.1 RECOMMENDATIONS

All recommended energy conserving modifications were presented in Sections 7 and 8 of the Increment F Narrative, Prefinal Submittal. These sections are now Sections 8.7 and 8.8 of Volume 2, Energy Report.

A summary sheet for each Section 7 recommendations (Modification to Building Systems) includes the following:

a. A brief description of reasons for the modification.

b. Instructions for accomplishing the modification.

c. An estimate of labor and material costs.

d. An estimate of man-hours listed by trade, where relevant.

e. The estimated dollar and energy savings.

f. The results of an economic analysis: E/C AND B/C ratios.

The analyses of Section 8 recommendations (Modifications to M/O Systems) are contained within the Increment F Narrative, Prefinal Submittal.

A Summary of all modifications for Increment F listing costs, man-hours, dollar and energy savings was prepared and is presented in Table 2-1 of the Increment F Narrative, Prefinal Submittal. A copy can be found in Section 4 of this Volume. The Table lists the modfications in order from highest to lowest E/C ratio.

All energy conserving projects from Increments A, B and C and recommendations from Increment F have been consolidated, priority ranked and presented in Table 10-1 of the Increment F Narrative. Order of priority is from highest to lowest I/C ratio. A copy can be found at the end of this section.

Energy related areas of operation for which additional training of Facilities Engineering personnel is recommended has been listed in Section 12 of the Increment F Narrative.

Expendable equipment which should be changed to higher efficiency types when the next replacement occurs has been investigated. Recommendations are included in Section 13 of the Increment F Narrative, Prefinal Submittal.

1.4.6 PREFINAL SUBMITTAL, INCREMENT B

Work listed below was accomplished and submitted for Increment B, excluding EMCS:

a. We have obtained information on and studied in significant detail the subcommunities electrical system, street lighting system, potable water system, sewage collection and treatment system, hot water and steam distribution system; as well as existing energy plants consisting of Central Boiler Plants and Local-Building Boiler Plants.

b. We have recommended several projects that require the modification of boiler plant controls such as installation of OA RW reset control, night set-back control and installation of time-clock. These projects however, have been presented under Increments A or C.

c. We have developed electricity and fuel consumption load profiles for the past three years and presented them in Section 3.

d. Graphical profiles of hourly KW demand occuring on a weekday, weekend and peak demand day have been developed, presented and discussed in Paragrpah 7.2.4 for each month of FY 80. We have discussed existing peak demand limiting systems, and will investigate if the EMCS is feasible for further demand limiting.

e. Based on the AXCESS analysis of each building type, we have estimated the annual energy consumption and cost per square foot of each building type for Electricity, Fuel, Space Heating, Domestic Hot Water, Lighting and Miscellaneous Equipment. We have also projected these FY 80 to FY 84. Tabulated cost data has been presented in Section 5.

Work listed below was accomplished and submitted for Increment B, EMCS:

a. Supplement the site investigation with "as built" drawings, as well as sound engineering judgment.

b. Interview administrative personnel to determine operating hours and procedures relative to the surveyed buildings.

c. Identify EMCS energy conserving programs and strategies which might be appropriate for each of the buildings, listing the points required.

d. Evaluate by computer analysis, energy conserved by these programs as well as their implementation costs in accordance with Energy Conservation Investment Program (ECIP) requirements.

e. Make recommendations which may include in the EMCS some systems, points and/or programs which, while not directly related to energy savings, would provide management information and centralized control, making for more efficient facility operation.

1.4.7 FINAL SUBMITTAL

During the period January 13, 1983 through February 12, 1983, the Preliminary, Interim and Prefinal Submittals have been compiled into a Final Submittal. A description of the compilation is as follows:

a. For Sections 1 through 7 of the Final Submittal, the Interim Narrative was used as the basic text. Relevant material from the Preliminary was included.

b. Section 8 incorporates Section 1 through 8 and 12 through 14 of the Increment F Narrative.

c. Sections 9 through 11 incorporates Sections 9 through 11 of the Increment F Narrative.

d. Section 12 incorporates the Increment B, EMCS Feasibility Study of the Prefinal Submittal.

The Final Submittal Executive Summary is made up of the Interim and the Prefinal Executive Summaries. These summaries have been adapted and brought up to date where necessary. The Final Submittal Executive Summary has been compiled as follows:

a. For Sections 1 through 4, the Prefinal Executive Summary Sections 1 through 4 have been used.

b. For Sections 5 through 8, the Interim Executive Summary Sections 2 through 5 have been used.

1.5 CONCLUSIONS

1.5.1 SAVINGS RESULTING FROM IMPLEMENTED ECO'S

The effects, in energy and cost savings, of implementing all Increment A, B, C, & G projects are summarized in Table 10-1, a copy of which is included hereafter. The percent savings for these projects are obtained using the known consumption for FY 75 from Table 3.3-2. This table is presented in Section 7. The total consumption for that year is 358,834 MBtu.

Increment A projects save 18,348 MBtu/yr, or 5% of the FY 75 total consumption. Increment B projects save 29,265 MBtu/yr, or 8% of the FY 75 total consumption. Increment F projects save 54,643 MBtu/yr, or 15% of the FY 75 total consumption. Increment G projects save 19,243 MBtu/yr, or 5% of the FY 75 total consumption. The total savings for all projects is 121,500 MBtu/yr, or 34% of the total FY 75 consumption.

The effect of Increments A, B, G & F in terms of FY 84 dollars is as follows. Increment A projects will save $215,420 per year and will cost $597,081. Increment B projects will save $333,202 per year and will cost $1,904,648. Increment F projects will save $570,794 per year and will cost $535,556. Increment G projects will save $223,156 per year and will cost $549,094. The projected cost of energy in 1984 is itemized in Table 3.3-1. Escalation rates and conversion factors are given in the Attachment to Table 3.3-1. The table and attachment can be found in Section 7.

TABLE 10-1

INCREMENTS A, B, F, AND G PROJECT SUMMARY
VILSECK SUBCOMMUNITY

PROJECT ID	MODIFICATION	APPLICABLE BUILDINGS	INCREMENT	B/C RATIO	PAYBACK PERIOD	FIRST COST $	ANNUAL SAVINGS ENERGY (MBTU)	ANNUAL SAVINGS $ (DOLLARS)
[illegible]	Energy Saving Doors	Various Buildings	F	-	Immediate	-	-	-
[illegible]	Energy Saving Motors	Various Buildings	F	-	Immediate	-	-	-
F [illegible]	Consolidate Partially Used Barracks	Barracks	A	-	Immediate	-	[illegible]	[illegible]
[illegible]	Use Cold Water Cleaning Chemical In Dishwasher Wash Cycle	Mess Halls	A	309.0	0.5	[illegible]	[illegible]	[illegible]
F [illegible]	Boiler Water Treatment	Various Buildings	A	408.9	0.8	[illegible]	[illegible]	[illegible]
F [illegible]	Repair Existing Heat Recovery Wheel	[illegible]	A	203.2	0.8	[illegible]	[illegible]	[illegible]
[illegible]	Day/Night Thermostat For Hot Unit, Heating On/Off Control, Thermostatic Radiator Valves	Theatre	G	814.0	0.6	[illegible]	[illegible]	[illegible]
A [illegible]	Upgrade Centrotherm Control Systems	Various Buildings	F	133.2	0.6	[illegible]	[illegible]	[illegible]
[illegible]	Automatic-Vent Damper Controls On Oil Fired Boilers	Various Buildings	F	107.7	0.6	[illegible]	[illegible]	[illegible]
[illegible]	Steam Trap Replacement	Various Buildings	F	80.6	1.0	[illegible]	[illegible]	[illegible]

TABLE 10-1

INCREMENTS A, B, F, AND G PROJECT SUMMARY
(Block Submittal)

PROJECT ID	MODIFICATION	APPLICABLE BUILDINGS	INCREMENT	E/C RATIO	PAYBACK PERIOD	FY84 CWE $	ANNUAL SAVINGS ENERGY (MBTU)	ANNUAL SAVINGS FY84 (DOLLARS)
CMA V2	Ceiling Insulation, Weather Seal Doors	Hotwents	G	82.8	1.2	49,664	3,098	48,348
ECIP V11	Steam Pipe Insulation, Heating On/Off Control, Thermostatic Radiator Valves, Ceiling Insulation, Weather Seal Doors	Motor/Tank Repair Shops	A	54.6	8.7	102,698	5,152	80,391
F V13	Insulate Heated No. 6 Oil Storage Tank	V-269	F	53.8	5.9	7,250	190	3,880
CMA V22	Thermostatic Radiator Valves, Ceiling Insulation	Telephone Exchange Buildings	G	58.5	3.7	4,735	201	1,304
CMA V1	Day/Night Setback Control, Thermostatic Radiator Valves, Weather Seal Doors	Barracks	G	89.1	2.3	79,702	3,935	33,965
A V2	Reduce Space Temperature In Unoccupied Dining Rooms	V-227	F	88.9	2.3	10,289	931	8,958
CMA V19	Thermostatic Radiator Valves, Attic Floor Insulation, Night Setback Control	Open Mess NCO/Club	G	86.9	1.7	40,253	1,868	29,290

TABLE 10-1

INCREMENTS A, B, F, AND G PROJECT SUMMARY
VILSECK SUBCOMMUNITY

PROJECT ID	MODIFICATION	APPLICABLE BUILDINGS	INCREMENT	E/C RATIO	PAYBACK PERIOD	FY89 CWE $	ANNUAL SAVINGS ENERGY (MBTU)	ANNUAL SAVINGS FY89 (DOLLARS)
OMA V13	O.A. Hot Water Reset With Night Setback, Thermostatic Radiator Valves, Ceiling Insulation	Post Chapel	G	45.1	1.7	12,985	588	7,664
ECIP VC1	Thermostatic Radiator Valves, Ceiling Ins. (3 in. & 5 in.), Pipe Ins., Roof Ins., Spare T-Stat, Night Setback, Ceiling Heat Recovery, High Pressure Sodium Lighting	Combined ECIP	A	44.9	2.1	150,019	6,736	64,096
OMA V16	Thermostatic Radiator Valves, Heating On-Off Control, Pipe Insulation, Weather Seal Doors	Bowling Alley	G	43.4	1.8	13,180	572	7,457
OPA V5	Fan On/Off Control, Thermostatic Radiator Valves, Ceiling Insulation	EM Mess	G	39.8	1.9	39,050	1,555	20,229
OMA V10-1	Weather Seal Doors	Storehouses/Warehouses	G	35.0	2.2	11,668	408	5,324
PA V1?	Ceiling Waste Heat Recovery, Thermostatic Radiator Valves For Steam and Hot Water	Motor/Tank Repair Shop	?	34.9	2.2	20,103	702	9,189

TABLE VII-1

INCREMENTS A, B, F, AND G PROJECT SUMMARY
VESSELS SIMULTANEITY

PROJECT ID	SPECIFICATION	APPLICABLE BUILDINGS	INCREMENT	E/C RATIO	PAYBACK PERIOD	FIRM Cost $	ANNUAL SAVINGS ENERGY (MBTU)	ANNUAL SAVINGS FIRM (DOLLARS)
CMA 814	Thermostatic Radiator Valves, Spare Thermostat, Insulate Attic Floor	Retail Stores/Laundromats	G	38.0	2.2	29,200	1,005	13,557
CMA 820	Thermostatic Radiator Valves	Dispensary	G	31.8	2.3	4,837	92	1,194
CMA 810	Ceiling Insulation, Weather Seal Entrance Doors and Windows	Laundry	G	32.0	2.4	8,163	219	4,855
CMA 87	D.H. Hot Water Reset With Night Setback, Thermostatic Radiator Valves, Ceiling Insulation	Dependents Grade School	G	32.5	2.0	47,852	1,524	19,900
CMA 811	Retrofit Interior Fluor. Lighting With Low Energy Lamps and Ballasts	Various Buildings	F	59.1	3.7	155,662	6,150	60,900
CMA 814	Night Setback Control, Thermostatic Radiator Valves, Ceiling Ins Fur Heat Recovery, Insulate Ceiling	Fire Station	F	28.6	2.1	8,570	296	3,250
CMA 85	Insulate Attic Floor, Convert Manual D.H. Hot Water Reset With Night Setback to Automatic D.H. Hot Water Reset With Night Setback	Family Housing	G	26.3	7.0	87,986	3,158	9,250

TABLE 10-1

INCREMENTS A, B, F, AND G PROJECT SUMMARY
DILLARD UNIVERSITY

PROJECT ID	MODIFICATION	EFFICIENCY BUILDINGS	INCREMENT	E/C RATIO	PAYBACK PERIOD	ANNUAL SAVINGS $	ENERGY (MBTU)	FY84 (DOLLARS)
F 89	Waste Heat Recovery System for Refrigeration Equipment	W-227 & W-273	F	25.8	8.3	20,078	625	7,690
SPA F 81	Street Lighting Timer Control	Street Lighting	B	20.3	9.7	17,925	380	3,791
F 811	Reduce The Amount Of Heated Space By Building A Partition	W-122	F	17.0	8.3	8,243	76	989
ECIP 1% 5	EMCS Feasibility Study	Various Buildings	B	16.6	5.3	1,886,723	31,019	357,219
ECIP 81?	Thermostatic Radiator Valves, Insulate Ceiling	Applied Instruction Buildings	A	16.3	6.7	330,360	5,060	78,155
F 84	Install Vehicle Exhaust System	Motor Repair Shops	F	14.2	5.4	20,811	390	4,420
F 85	Improve Kitchen Hood Exhaust System	W-227 & W-831	F	10.6	9.9	53,725	569	5,804
FMS 818-2	Insulate Ceiling	Warehouses/Warehouses	G	7.2	10.7	43,590	658	9,947
CMS 79-2	Ceiling Fans for Heat Recovery	Theaters	G	6.8	11.8	3,265	21	387
CMS 17-2	Multiple Zone Control, Insulate Walls	Applied Instruction Buildings	G	5.8	15.2	64,865	325	9,235
F 712	Replace Damaged Vehicle Doors With Insulated Type	W-122, W-300 & W-362	F	2.8	27.5	10,850	109	1,815

TABLE 10-1

INCREMENTS A, B, F, AND G PROJECT SUMMARY
Vinnell Corporation

PROJECT ID	MODIFICATION	APPLICABLE BUILDINGS	INCREMENT	S/C RATIO	PAYBACK PERIOD	FY84 CWE $	ANNUAL SAVINGS ENERGY (MBTU)	ANNUAL SAVINGS FY84 (DOLLARS)
F 814	Time Clock Controls On Laundry Equipment For Night Tariff Operation	Barracks, Family Housing	F	-	11.3	18,029	0	924
	Subtotal	A = 1 Projects				597,981	18,348	205,429
		B = 7 Projects				1,903,648	29,285	333,202
		F = 30 Projects				539,554	50,643	570,794
		G = 19 Projects				549,098	19,793	223,146
	Totals	58 Projects				3,586,379	124,500	1,392,572

1.5.2 PROJECTED CONSUMPTION

Table 1.5 shows the known FY 75 total energy consumption. The projected energy consumption after energy conservation projects is identified in the table under the column heading, 1985 MBTU (PROJECTED). It assumes that all the projects in Table 10-1 are completed by 1985. This projected energy consumption is the known FY 75 consumption times (1 - % reduction). It is the amount of energy that the buildings we studied will consume in 1985 after the energy conservation projects have been implemented.

The known consumption and the projected consumption are also given on a square foot basis. The quantity under the column heading, 1975 KBTU/SF (KNOWN), uses the 1975 gross floor area, from Table 3.2-1 and the quantity under the column heading, 1985 KBTU/SF (PROJECTED) uses the 1985 gross floor area.

New construction is accounted for in Table 1.5 under the column heading, 1987 MBTU FUTURE CONSTRUCTION; an estimate for the energy that will be consumed by Vilseck in 1987 is obtained by adding the expected energy consumption of new construction (based on Design Energy Budgets which are based on AR 415-28) to the 1985 MBTU (PROJECTED). A detailed treatment of future energy use resulting from facilities changes can be found in Section 4.7.

1.5.3 GOALS

The goal of the U. S. Army is a 20% reduction of energy consumption for building area constructed before FY 75. The goals have been calculated for the Vilseck ATC and presented in Table 3.2-1. A copy of which is included hereafter.

Table 1.5 presents the projected consumption for Vilseck. It will be compared to Table 3.2-1 and it will be shown that the goals are met. From line 3 of Table 3.2-1 a FY 85 consumption of 298,592 MBtu has been set for Building Area In Use Constructed Before FY 75. This is the building area that was studied for the Energy Report. From Table 1.5, the FY 85 consumption will be 236,831 MBtu if all of the recommendations in Table 10-1 have been implemented by that time. The goal is met by a margin of 61,761 MBtu. The consumption goals on a square foot basis are met by a correspondingly large margin. The goal is 176 kBtu/sf in FY 85. From Table 1.5, the projected 1985 consumption is 140 kBtu/sf, a margin of 36 kBtu/sf.

VILSECK SUBCOMMUNITY

TABLE 1.5

PROJECTED TOTAL ENERGY CONSUMPTION MBTU/YEAR						
1975 KBTU/SF (KNOWN)	1975 MBTU (KNOWN)	% REDUCTION	1985 KBTU /SF (PROJECTED)	1985 MBTU (PROJECTED)	% INCREASE FUTURE CONST.	1987 MBTU FUTURE CONST.
212	358,835	34	140	236,831	27	300,775

TABLE 1.2-1 ENERGY CONSUMPTION: PROGRESS AND GOALS FOR FY 85: WILBUR

		UNITS	FY75	FY80	FY85
1a.	Electricity	MBTU	66,238	70,838	
b.	Coal	MBTU	44,741	50,660	37,417 Goal (-10%)
c.	Fuel Oil # 2	MBTU	208,866	183,756	
d.	Fuel Oil # 6	MBTU	47,010	61,612	
e.	Solar Energy	MBTU		-	3,745 Goal (-1%)
f.	Total Energy	MBTU	358,835	330,352	-
2a.	Goal: Total Energy Reduced 25%: (0.75 x 1f$_{FY75}$)	MBTU	-	-	269,126
b.	Goal: Energy Per Sq. Ft. Reduced 20% by ECIPS and Mgmt., and 5% by More Efficient Bldgs (1a = 2c) + (2a = 4b)	MBTU	-	-	376,169
3a.	Building Area in use, Constructed before FY '78	SQ.FT.	1,632,207	1,710,718	1,696,262
b.	Energy Per Sq. Ft. (1f ÷ 3a)	KBTU/SQ. FT.	220	-	-
c.	Goal: Energy Per Sq. Ft. Reduced 20% by ECIPS (1220), and Mgmt (8%); (0.8 x 2b$_{FY75}$)	KBTU/SQ. FT.	-	-	176
d.	Total Energy	MBTU	350,835	-	229,592
4a.	Building Area in use, constructed after FY '78	SQ.FT.	-	89,561	625,019
b.	Goal: Energy Per Sq. Ft. Reduced 45% by Efficient Design (0.55 x 3b$_{FY75}$)	KBTU/SQ. FT.	-	121	121
c.	Total Energy	MBTU	-		75,627
5a.	Gross Floor Area (3a + 4a)	SQ.FT.	1,632,207	1,800,279	2,321,281
b.	Energy Per Sq. Ft (1f ÷ 5a)	KBTU/SQ. FT.	220	183	
c.	Goals: 25% Reduction (0.75 x 5b$_{FY75}$)	KBTU/SQ. FT.	-	-	165
d.	Goal: Navy Facilities Energy Plan, Annex B-5	KBTU/SQ. FT.	-	-	136.9
6a.	Heating Degree Days	DEG F - DAYS	6,986	7,149	
7a.	Populations		2,735	3,365	5,470

When accounting for future construction and demolition, the goal for FY 85 is 374,167 MBtu. The estimate of future consumption, taking into account new construction, is 300,775 MBtu in FY 87. (Refer to Table 1.5). The goal is met by 73,394 MBtu/yr. This figure is conservative because the additional construction between 1985 and 1987 increases the estimated consumption.

2. INCREMENTS A AND C

2.1 REQUIREMENTS

Increment A deals with energy conservation investigations for buildings and processes. It deals with the investigation of ECIP projects which involve modifying, improving or retrofitting existing buildings, (including family housing), to include architectural and structural features, HVAC systems, plumbing systems, interior or exterior building and parking facilities lighting.

Increment C deals with projects developed in Increment A which result in energy savings but do not qualify under ECIP criteria.

A list of Energy Conservation Opportunities (ECO's) that we investigated is presented in Table 2.1.

2.2 SUMMARY OF RESULTS

For a project to qualify as an FY 84 ECIP project, it must have an E/C > 13, B/C > 1, and a Project Cost > $100,000. In Table 6.1, Interim Submittal we have summarized all feasible ECIP projects. A copy is included hereafter.

Energy conservation projects with E/C < 13 or Project Cost < $100,000 which cannot qualify as FY 84 ECIP projects, but which we feel are suitable for implementation from non-ECIP funding sources such as OMA or MMCA Programs, have also been included in Table 6.1 as OMA projects.

As indicated in Table 6.1, we have recommended 3 ECIP Projects and 19 OMA Projects for implementation.

The original Interim Submittal version of Table 6.1 listed the projects by building type. As a result of a suggestion by the Subcommunity, to consider the combining of smaller OMA projects, the present version of Table 6.1 groups projects by type (ECIP or OMA) and within each group lists projects by E/C ratio, highest to lowest.

The combining of projects eliminates the consideration of projects by building type. What is gained is an additional ECIP project. A copy of revised Table 6.1 is used in this volume.

Table 2.1

LEGEND PROPOSED ECOS

1.....ATTIC FLOOR INSULATION
2.....ROOF INSULATION
3.....WALL INSULATION
4.....INSTALL STORM WINDOWS
5.....WEATHER SEAL GARAGE DOORS
6.....WEATHER SEAL ENTRANCE DOORS
7.....INSTALL RADIATOR A/C VALVE
8.....INSTALL O.A. RESET SYSTEM
9.....INSTALL NIGHT SETBACK
10....CONVERT STEAM TO H.W. HEATING
11....CONVERT TO CENTRAL BOILER
12....INSTALL PIPE INSULATION
13....INSTALL NEW BOILER(S)
14....REPL. INCANDESCENT LIGHTING WITH HIGH PRESSURE SODIUM
15....REPL. MANIFOLD W/AUTOFIRED BOILER
16....REPL. H.W. STORAGE TANK
17....WEATHER SEAL WINDOWS
18....INSTALL CEILING FAN FOR HEAT RECOVERY
19....INSTALL SPACE THERMOSTAT
20....INSTALL FAN ON/OFF CONTROL
21....CONVERT FROM MANUAL OR HW RESET TO AUTOMATIC
22....INSTALL HEATING ON/OFF CONTROL
23....INSTALL NIGHT SETBACK WITH OR HW RESET
24....INSTALL MULTIPLE ZONE CONTROL

TABLE 6.1

ECIP/SIOH PROJECT SUMMARY
VILSECK SUBCOMMUNITY

BUILDING TYPE NO.	BUILDING TITLE	PROJECT TYPE	E/C RATIO	B/C RATIO	FY88 CWE (DOLLARS)	ANNUAL ENERGY SAVINGS NO. 2 OIL MBTU	COAL MBTU	ELECT. MBTU	TOTAL MBTU	FY88 COST SAVINGS (DOLLARS)
11	Motor/Tank Repair Shop	ECIP 811	50.6	8.9	102,000	8,951.7	-	-	8,951.7	89,000
-	Operation, Administration Buildings and Building No. 109	ECIP 821	88.9	7.6	150,313	3,829.0	2,973.0	347.0	8,750.0	84,000
17	Applied Instruction Buildings	ECIP 817	16.3	6.1	330,359	5,960.0	-	-	5,960.0	81,955
6	Theatre	CMA 89-1	139.0	22.0	9,181	1,228.6	-	67.1	1,295.7	18,000
7	Hutments	CMA 87	62.0	10.2	49,665	3,697.6	-	-	3,697.6	46,360
22	Telephone Exchange Building	CMA 422	58.5	2.8	8,736	-	288.6	-	288.6	3,000
9	Barracks	CMA 81	49.1	5.3	79,782	81,910.5	-	-	3,910.5	33,000
10	Open Mess, NCO/Club	CMA 819	48.1	7.5	60,753	1,863.9	-	-	1,863.9	29,000
13	Post Chapel	CMA 813	45.3	7.6	17,985	588.1	-	-	588.1	8,000
14	Bowling Alley	CMA 814	43.4	8.9	13,150	572.2	-	-	572.2	7,000
8	BX Mess	CMA 83	39.8	6.5	39,000	1,582.0	-	13.4	1,595.4	26,000

* BX & PX

TABLE 6.1

ECIP/CMA PROJECT SUMMARY
WELSICK SUBCOMMUNITY

BUILDING TYPE NO.	BUILDING TITLE	PROJECT TYPE	E/C RATIO	M/C RATIO	FY89 CMR (DOLLARS)	ANNUAL ENERGY SAVINGS				FY89 ECIP DOLLARS (DOLLARS)
						NO. 2 OIL MBTU	COAL MBTU	ELECT. MBTU	TOTAL MBTU	
49	Storehouses/Warehouses	CMR 910-1	35.0	4.8	11,668	988.3	-	-	988.3	9,321
44	Motor/Tank Repair Shop	CMR 911	38.9	8.4	28,989	782.0	-	-	782.0	9,098
45	Retail Stores/Commissaries	CMR 915	38.4	5.6	29,203	1,805.0	-	-	1,805.0	13,692
21	Dispensary	CMR 921	33.6	5.5	2,787	91.9	-	-	91.9	1,190
18	Laundry	CMR 918	32.6	5.3	6,723	219.1	-	-	219.1	2,852
7	Dependent Grade Schools	CMR 61	32.5	5.3	47,032	1,527.7	-	-	1,527.7	19,587
20	Fire Station	CMR 929	28.6	4.7	8,570	255.2	-	(-110.0	145.2	1,888
5	Family Housing	CMR 95	26.3	2.0	42,988	-	1,031.0	-	1,031.0	8,031
9	Theatre	CMR 99.2	6.0	1.7	3,265	25.0	-	(-38.5	28.5	364
47	Applied Instruction Buildings	CMR 917.2	5.0	1.3	48,485	325.0	-	-	325.0	4,232
	Subtotal	ECIP + 3			597,081	15,011.1	2,572.0	382.0	18,388.1	215,870
		CPS + 19			549,098	16,903.6	1,372.0	85.6	19,292.7	224,190
	Totals	22 Projects			1,196,173	31,938.7	3,945.0	467.6	37,550.8	438,560

TABLE 4.1a

SUMMARY OF PROJECT ECOs

VILSECK SUBCOMMUNITY

Building No.	Building Title	Project Type	Attic Floor Insulation	Roof Insulation	Wall Insulation	Install Storm Windows	Weather Seal Garage Doors	Weather Seal Entrance Doors	Install Radiator Air Valve	Install O.A. Reset System	Install Night Setback	Convert Steam to H.W. Heating	Convert to Central Boiler	Install Pipe Insulation	Install New Boiler(s)	Repl. from Incandescent to High Pressure Sodium Lighting	Repl. Handfired W/Autofired Boiler	Repl. H.W. Storage Tank	Weather Seal Windows	Install Ceiling Fan for Heat Recovery	Install Space Thermostat	Install Fan On/Off Control	Convert from Manual OA HW Reset to Automatic	Install Heating On/Off Control	Install Night Setback with OA HW Reset	Install Multiple Zone Control			
11	Motor/Tank Repair Shop	ECIP V33	●					●	●					●										●					
	Combined ECIP	ECIP VC1	●	●					●		●			●		●				●	●								
1.	Applied Instruction Bldg.	ECIP V17	●						●																				
5	Theatre	UMA V9-1							●												●			●					
	Natatorium	UMA V2	●					●																					
7	Telephone Exchange Bldg	UMA V22	●						●																				
3	Barracks	UMA V1						●	●		●																		
[illegible]	[illegible]	UMA V29	●						●		●																		
[illegible]	Post Chapel	UMA V13	●						○																●				
[illegible]	Bowling Alley	UMA V14	●					●	●					●										●					

TABLE 6.3c

SUMMARY OF PROJECT TYPE

VILSECK SUBCOMMUNITY

BUILDING TYPE NO.	BUILDING TITLE	PROJECT TYPE	ATTIC FLOOR INSULATION	ROOF INSULATION	WALL INSULATION	INSTALL STORM WINDOWS	WEATHER SEAL GARAGE DOORS	WEATHER SEAL ENTRANCE DOORS	INSTALL RADIATOR AIR VALVE	INSTALL O.A. RESET SYSTEM	INSTALL NIGHT SETBACK	CONVERT STEAM TO H.W. HEATING	CONVERT TO CENTRAL BOILER	INSTALL PIPE INSULATION	INSTALL NEW BOILER(S)	REPL. INCANDESCENT TO HIGH PRES. SODIUM	REPL. HANDFIRED W/AUTOFIRED BOILER	REPL. H.W. STORAGE TANK	WEATHER SEAL WINDOWS	INSTALL CEILING FAN FOR HEAT RECOVERY	INSTALL SPACE THERMOSTAT	INSTALL FAN ON/OFF CONTROL	CONVERT FROM MANUAL OR HW RESET TO AUTOMATIC	INSTALL HEATING ON/OFF CONTROL	INSTALL NIGHT SETBACK WITH OA HW RESET	INSTALL MULTIPLE ZONE CONTROL			
1	EM Mess	OMA V3	●						●		●											●							
12	Stockhouses/Warehouses	OMA V18-1						●																					
11	Motor/Tank Repair Shop	OMA V12							●											●									
15	Retail Stores/Commissaries	OMA V15	●						●												●			●					
21	Dispensary	OMA V21							●																				
10	Laundry	OMA V10	●					●											●										
7	Dependent Grade Schools	OMA V7		●					●																●				
20	Fire Station	OMA V20	●						●		●									●									
5	Family Housing	OMA V5	●																						●				
18	Stockhouses/Warehouses	OMA V18-2	●																										
9	Theater	OMA V9-2																		●									
17	Applied Instruction Bldg.	OMA V17-2			●																					●			

A new summary, Table 6.1A, Interim Submittal was created to indicate the types of ECOs included in each project. A copy of Table 6.1A is included hereafter.

If all these projects are implemented at a CWE FY 84 of $1,146,175, the subcommunity will save 37,590.8 MBtu of energy, which is approximately 11% of its total energy consumption. The annual dollar savings will be $458,576.

2.3 PROGRAM DOCUMENTS

A complete set of Program Documents, DD Form 1391s and PDB-1s, plus attachments, for each ECIP and OMA project are included in the Interim Submittal, Volume 5, Books 1 and 2.

3. INCREMENT B

3.1 REQUIREMENTS

Increment B requires the following:

a. Study the existing utilities and energy distribution systems, and existing energy plants; identify and analyze possible energy conservation projects.

b. Determine the feasibility of an EMCS for building electrical, and mechanical systems and utility distribution.

c. Develop a load profile for the past three years indicating the quantities of each energy source procured (heating oil, coal, electricity, etc.); and the peak demand loads, and essential loads.

d. Develop graphic presentation of hourly KW demand for peak load/demand days. Develop procedures to reduce peak demand by load shedding.

e. Project energy costs three years from the date of Contract award, and estimate the heating, lighting and other costs per square foot per year.

3.2 SUMMARY OF RESULTS

Our investigation of potential Increment B projects resulted in two recommendations: a Street Lighting OMA project and an EMCS ECIP project. The combined energy savings amounts to 31,019 MBtu/yr with an equivalent dollar savings of $357,239/yr. This represents a 8.5% reduction of FY 80 basewide energy consumption.

The major savings come from the EMCS recommendation. The Street Lighting project is documented in the Prefinal Submittal, Volume 5, OMA SL1. The EMCS is described in Volume 8 of this Pre-Final Submittal. A summary of the EMCS study is presented in Section 3.1 of this narrative.

The Interim Submittal describes our investigation of Increment B projects, excluding the EMCS study, and is summarized as follows:

a. We have obtained information on and studied in significant detail the subcommunities electrical system, street lighting system, potable water system, sewage collection and treatment system, hot water and steam distribution system; as well as existing energy plants consisting of Central Boiler Plants and Local-Building Boiler Plants.

b. We have recommended several projects that require the modification of boiler plant controls such as installation of OA HW reset control, night set-back control and installation of time-clock. These projects however, have been presented under Increments A or G.

c. We have developed electricity and fuel consumption load profiles for the past three years and presented them in Section 3 of the Interim Submittal.

d. Graphical profiles of hourly kw demand occuring on a weekday, weekend and peak demand day have been developed, presented and discussed in Paragrpah 7.2.4 of the Interim Submittal, for each month of FY 80. We have discussed existing peak demand limiting systems, and will investigate if the EMCS is feasible for further demand limiting.

e. Based on the AXCESS analysis of each building type, we have estimated the annual energy consumption and cost per square foot of each building type for Electricity, Fuel, Space Heating, Domestic Hot Water, Lighting and Miscellaneous Equipment. We have also projected these FY 80 to FY 84. Tabulated cost data has been presented in Section 5 of the Interim Submittal.

3.3 INCREMENT B - EMCS FEASIBILITY STUDY

3.3.1 PURPOSE

The purpose of this study is to determine the technical and economic feasibility of utilizing Energy Monitoring and Control System (EMCS) techniques at the Vilseck Subcommunity, Vilseck, West Germany.

This effort is to develop a systematic plan to reduce energy consumption in compliance with the objectives put forth in the Army Facilities Energy Plan. Within the scope of this study, recommendations for the possible implementation of those objectives will be investigated.

3.3.2 PARAMETERS OF THE FEASIBILITY STUDY

Of the 160 buildings in the subcommunity, 104 are considered. Inclusion is based on engineering judgment for potential economic payback.

3.3.3 SCOPE OF WORK

a. Supplement the site investigation with "as built" drawings, as well as sound engineering judgment.

b. Interview administrative personnel to determine operating hours and procedures relative to the surveyed buildings.

c. Identify EMCS energy conserving programs and strategies which might be appropriate for each of the buildings, listing the points required.

d. Evaluate by computer analysis, energy conserved by these programs as well as their implementation costs in accordance with Energy Conservation Investment Program (ECIP) requirements.

e. Make recommendations which may include in the EMCS some systems, points and/or programs which, while not directly related to energy savings, would provide management information and centralized control, making for more efficient facility operation.

3.3.4 SUMMARY

It was determined that 96 of the buildings in the Vilseck Subcommunity are technically feasible while meeting the ECIP guidelines for EMCS installation. Total cost estimate for implementation is $1,945,596.

The estimated energy savings with the recommended EMCS are 780 MBtu of electricity (lighting) and 30,239 MBtu of heating fuel. This represents a 8% reduction of FY 80 basewide energy consumption.

ECIP Summary

CWE	$ 1,886,723
Design Cost	$ 58,873
Total	$ 1,945,596

Total Benefits	$ 4,604,185
Discounted Benefit/Cost Ratio (>1)	2.4
Total Annual Energy Savings	31,019 MBtu
E/C Ratio	16.4
Annual $ Savings	$ 857,239
Payback Period	5.3 yr

The proposed new EMCS equipment is to be designed to meet the requirements of the Inter-Agency Guide Specification, a document developed to standardize government procurement of strategies for centralized computer control for energy conservation. To meet this objective a small sized EMCS, according to Specification CEGS-13949, is recommended.

Buildings not recommended either did not meet initial criteria or were determined to be an ineffective application upon physical inspection.

3.3.5 EXCLUDED FROM SCOPE OF INVESTIGATION

The scope of the analysis and site investigation is limited only to those considerations which impact on energy. Excluded from consideration are all process, manufacturing or laboratory equipment and systems, as well as fire alarms and security.

3.3.6 CONCLUSIONS

In analyzing the 96 applicable buildings in the Vilseck Subcommunity, the installation reflects a total Benefit/Cost ratio of 2.4, an Energy/Cost ratio of 16.4 and payback period of 5.3 years.

Results are in accordance with ECIP B/C >1 and E/C >13 prerequisites for ECO implementation and payback period of less than 15 years.

Strategies in order of cost effectiveness:

a. Reducing fuel consumption during the heating season by means of temperature setback during unoccupied hours.

b. Optimized control of boilers.

c. Lighting reduction/shutdown during unoccupied periods.

3.3.7 RECOMMENDATIONS

a. Implement the installation of an Energy Monitoring and Control System in the Vilseck Subcommunity, Vilseck, West Germany.

b. The system will consist of one control room to accommodate the facility.

c. Install the EMCS at the estimated construction cost of $1,945,596.

d. Provide a system configuration, programs, and strategies as described in this study.

e. Note that possible further savings can be realized by the use of EMCS to provide remote controlled space temperatures during normal occupancy periods. Additional savings may be achieved when the EMCS is used to its full potential to provide management reports and maintenance information. These have not been included in the ECIP calculations since they imply future changes in operating procedures which may not be realized.

4. INCREMENT F

4.1 OBJECTIVES

The objectives of Increment F are summarized as follows:

a. To recommend modifications and changes in system operation which are within the Facilities Engineer funding authority and management control. Recommendations shall be in the form of specific, practical instructions for the use of Facilities Engineer personnel.

b. To summarize and establish the priority of all energy conservation measures and projects from Increments A, B, F and G for use of the Community Commander and Facilities Engineer in developing their energy management plans.

The Scope of Work (Schedule of Title Services Rev) is included in Appendix 1-A, Volume 7 of the Prefinal Submittal.

4.2 MODIFICATIONS INVESTIGATED

A total of 32 potential modifications were investigated from which we developed twenty-seven recommendation for Building and Maintenance/Operations systems.

Sixteen of the twenty-seven recommendations relate to Building Equipment Systems and are based on an analysis of building field survey data.

Eleven recommendations relate to the Maintenance and Operation (M/O) procedures in use by the Facilities Engineer Division of the Vilseck Subcommunity. The analysis of existing M/O procedures is based on field data consisting of answers to questions put to the Facilities Engineer and members of his staff.

4.2.2 Two investigations were developed into recommendations concerning expendable equipment.

4.2.3 Two investigations developed into non-recommendations.

4.2.4 One investigation did not fall under the Facilities Engineer management control but because it has an easily understandable effect on energy conservation, we have included it as a miscellaneous recommendation.

4.3 SUMMARY

The projects investigated are listed, as follows:

4.3.1 MODIFICATIONS TO BUILDING SYSTEMS

S&H PROJECT NO.	DESCRIPTION
F V1	Correct the Installation of the Existing Heat Recovery Wheel.
F V2	Reduce Space Temperatures in Unoccupied Dining Rooms.
F V3	Install Automatic-Vent Damper Controls On Oil-Fired Boilers.
F V4	Boiler Water Treatment.
F V5	Improve Kitchen Hood Exhaust System.
F V6	Install Vehicle Exhaust System.
F V7	Use Cold Water Cleaning Chemical in Dishwasher Wash Cycle.
F V8	Use Cold Water Detergent For Washing Clothes.
F V9	Install Waste Heat Recovery for Refrigeration Equipment.
F V10	Insulate Heated #6 Oil Storage Tank.
F V11	Reduce the Amount of Heated Space by Building A Partition.
F V12	Replace Damaged Vehicle Doors with Insulated Types.
F V13	Retrofit Interior Fluorescent Lighting With Low Energy Lamps and Ballasts.
F V14	Install Time Clock Control on Laundry Equipment to Allow Only Night Tariff Operation.
F V15	Lower Domestic Hot Water Temperature.

F V16 Change Burner Nozzles for Off-Peak Operation.

4.3.2 MODIFICATIONS TO MAINTENANCE/OPERATIONS SYSTEMS

F V17 Preventive Maintenance Program.

F V18 Temperature Control Technician.

F V19 Reduction of Space Heating Temperatures.

F V20 Interior Lighting Control.

F V21 Window Operation.

F V22 Door Operation.

F V23 Cooking Equipment Warmup.

F V24 Upgrade Centratherm Control System.

F V25 Steam Trap Replacement.

F V26 DHW Circulating System.

F V27 Resize Primary Heating Equipment.

4.3.3 EXPENDABLE EQUIPMENT

F V28 Energy Saving Ovens.

F V29 Energy Saving Motors.

4.3.4 PROJECTS NOT RECOMMENDED

F V30 Installation of Low Energy Fluorescent Lamps and Ballasts to Replace Burned-Out Interior Lighting.

F V31 Use Warm Water Detergent in Dishwasher Wash Cycle.

The above projects are not recommended because they are alternative approaches to ECO's that are recommended. The recommended ECO's have higher E/C ratios. For a detailed analysis see the Energy Report, Final Submittal, Volume 2, Section 8.11.1. The recommended project for alternative F V30 is "Retrofit Interior Fluorescent Lighting With Low Energy Lamps and Ballasts" F V13. The recommended project for alternative F V31 is "Use Cold Water Cleaning Chemical In Dishwasher Wash Cycle", F V7.

4.3.5 MODIFICATION NOT UNDER FE MANAGEMENT CONTROL

F V32 Consolidate Partially Used Barracks.

4.4 INVESTIGATION CONCLUSIONS

The effects, in energy and cost savings, of implementing the above listed modifications are summarized in Table 2-1 of Volume 6 of the Prefinal Submittal, a copy of which is included hereafter.

4.4.1 BUILDING SYSTEMS

Building systems modifications would result in annual energy savings of 29,398 MBtu/yr. and equivalent annual dollars savings of $294,037/yr (FY 84 escalated). This represents a 9% reduction of FY 80 basewide energy consumption. Implementation costs would amount to $474,.62. The overall payback period is 1.61 years.

4.4.2 MAINTENANCE/OPERATIONS SYSTEMS

Of the eleven M/O systems modifications five have calculable energy and cost savings, and the remaining six are recommendations without calculable savings.

The five modifications having calculable savings (F V18, F V19, F V24, F V25 and F V27), if implemented, would yield a total annual energy savings of 30,060 MBtu/yr and equivalent annual dollar savings of $342,753/yr. This represents a 9.1% reduction in FY 80 basewide energy consumption.

The energy and cost savings for the six recommendations without calculable savings (F V17, F V20, F V21, F V22, F V23, F V26), are not easily defined. Exact factual data such as hours of occurrence (e.g. how many hours are lights left on in unoccupied spaces or rolling doors left open) could not be determined during a three week survey period. Therefore, these recommendations are general in nature and are made because of their obvious energy savings result.

Of the five modifications with calculable savings, F V19 is a no-cost implementation, F V24, F V25, F V26 have calculable implementation costs, and F V18, F V27 have no calculable implementation costs. Therefore, an overall payback period cannot be calculated for these three recommendations.

TABLE 7-1

IMPLEMENT F PROJECT SUMMARY
VILLOCK SIMULATIONS

PROJECT ID	MODIFICATION	APPLICABLE BUILDINGS	S/C RATIO	PAYBACK PERIOD (YEARS)	IMPLEMENTATION COST		ANNUAL SAVINGS	
					CWE + T&M ($1,000's)	P.E. (MAN HOURS)	ENERGY ($1,000)	O&M ($1,000's)
F 015	Lower Domestic Hot Water Temperature	Barracks, Mess Halls	2,552.4	Immediate	649	53	4,161	17,570
F 016	Change Burner Nozzles for Off-Peak Operation	Various Buildings	2,175.3	Immediate	291	31 Per Yr.	933	7,847
F 08	Use Cold Water Detergent for Washing Clothes	Barracks, Laundromats Family Housing	1,091.3	Immediate	2,540	84	2,120	23,954
F 017	Preventive Maintenance Program	All Buildings	-	Immediate	-	-	-	-
F 018	Temperature Controls Recalibration	Various Buildings	-	Immediate	-	2,080	1,050	8,400
F 019	Reduction of Space Heating Temperature	All Types Except Type 21 Dayrooms	-	Immediate	-	-	14,358	120,570
F 020	Interior Lighting Control	Various Buildings	-	Immediate	-	-	-	-
F 021	Window Operation	All Buildings	-	Immediate	-	-	-	-
F 022	Door Operation	All Buildings	-	Immediate	-	-	-	-
F 023	Cooking Equipment Warm-up	Various Buildings	-	Immediate	-	-	-	-
F 024	Domestic Hot Water Circulating System	Various Buildings	-	Immediate	-	-	-	-

TABLE 7-1

INCREMENT 9 PROJECT SUMMARY
[illegible]

PROJECT NO.	MODIFICATION	APPLICABLE BUILDINGS	B/C RATIO	PAYBACK PERIOD (YEARS)	IMPLEMENTATION COST: CWE FY8[illegible] (DOLLARS)	IMPLEMENTATION COST: PE (Man Hours)	ANNUAL SAVINGS: ENERGY (MBtu)	ANNUAL SAVINGS: $ [illegible] (DOLLARS)
F [illegible]	Resize Primary Heating Equipment	Various Buildings	-	Immediate	-	-	[illegible]	[illegible]
F [illegible]	Energy Saving Drums	Various Buildings	-	Immediate	-	-	-	-
F [illegible]	Energy Saving Motors	Various Buildings	-	Immediate	-	-	-	-
F [illegible]	Consolidate Partially Used Barracks	Barracks	-	Immediate	-	-	[illegible]	[illegible]
F [illegible]	Use Cold Water Cleaning Chemical in Dishwasher Wash Cycle	Mess Halls	300.0	0.5	3,951	110	1,06[illegible]	[illegible]
F [illegible]	Boiler Water Treatment	Various Buildings	238.9	0.3	10,1[illegible]	-	[illegible]	[illegible]
F [illegible]	Upgrade Centralized Control Systems	Various Buildings	133.2	0.6	10,7[illegible]	2[illegible]	[illegible]	[illegible]
F [illegible]	Repair Existing Heat Wheel Recovery Wheel	[illegible]	783.2	0.4	1,919	-	398	[illegible]
F [illegible]	Install Automatic-Vent Damper Controls on Oil-Fired Boilers	Various Buildings	107.7	0.0	66,8[illegible]	-	[illegible]	[illegible]
F [illegible]	Steam Trap Replacement	Various Buildings	80.6	1.0	30,650	5[illegible]	[illegible]	[illegible]

TABLE 2-3

INCREMENT F PROJECT SUMMARY
VILLAGE SUBCOMMUNITY

PROJECT ID	MODIFICATION	APPLICABLE BUILDINGS	E/C RATIO	PAYBACK PERIOD (YEARS)	IMPLEMENTATION COST CWE FY84 (DOLLARS)	IMPLEMENTATION COST FE (MAN HOURS)	ANNUAL SAVINGS ENERGY (MBTU)	ANNUAL SAVINGS FY84 (DOLLARS)
F V16	Insulate Heated No. 6 Oil Storage Tank	V-246	53.8	1.9	7,256	-	390	3,800
F V2	Reduce Space Temperature in Unoccupied Dining Rooms	V-221	48.1	2.3	10,211	-	491	4,850
F V13	Retrofit Interior Fluo. Ltg. w/Low Energy Lamps & Ballasts	Various Buildings	31.7	3.2	193,662	2,695	6,133	60,300
F V9	Install Waste Heat Recovery System for Refrig. Equipment	V-227 & V-273	25.8	0.3	24,118	-	625	7,690
F V11	Reduce the Amount of Heated Space by Building a Partition	V-122	17.9	7.3	5,201	-	70	709
F V6	Install Vehicle Exhaust Systems	Motor Repair Shops	10.2	5.8	28,011	-	306	4,820
F V5	Improve Kitchen Hood Exhaust System	V-227 & V-433	10.6	9.9	53,125		569	5,900
F V12	Replace Damaged Vehicle Doors with Insulated Types	V-122, V-408 & V-352	2.6	27.5	58,850	-	129	1,315
F V18	Install Time Clock Controls on Laundry Equipment for Night Tariff Operation	Barracks, Family Housing.	-	11.3	10,929	910	0	920
	Total	30 Projects		0.9	535,556	6,346	59,663	570,190

The recommendation for a Temperature Control Technician (F V16) was based on an analysis of a single type of inoperative control condition. Therefore, since more types of inoperative controls are normally encountered, the calculated energy savings are minimal. The uncertainty of the type and amount of inoperative controls that could develop from year to year make it impossible to calculate exact savings.

4.4.3 EXPENDABLE EQUIPMENT

The energy savings for expendable equipment (F V28, F V29) are caluclated for a single piece of equipment since no one can predict how many pieces of equipment will fail at a given time. Implementation costs are also on a piece basis and are incremental costs since this is a replacement recommendation, not a retrofit.

4.4.4 MISCELLANEOUS

A practical approach to energy conservation requiring no equipment changes is suggested by the recommendation Consolidate Partially Used Barracks (F V32). This recommendation can produce considereble savings at practically no cost and for these reasons is included in our list of recommendations. Our analysis of four buildings indicates a potential annual energy savings of 1,335 MBtu/yr and an equivalent annual dollar savings of $11,335/yr (FY 84 escalated).

4.5 ENERGY CONSERVATION MODIFICATIONS SINCE 1975

A complete listing of energy conservation related projects is given. The listing was updated in April 1982 and is current as of this date.

Many of the projects were not established as specific energy conservation projects. They were the result of normal repair projects that incorporated energy saving features. Therefore they qualified as energy conservation modifications.

The list contains two ECIP projects and fifty seven OMA projects.

4.5.1 GENERAL

A visit was made to the Engineering and Planning Division at Grafenwoehr to obtain data on energy conservation modifications at the Vilseck Subcommunity

since 1975. A review of records uncovered some additional projects. These changes have modified the list of previous energy related projects compiled for the Interim Submittal, presented in Section 2.3.1, Volume 1, of the Interim Submittal. The modified listing is presented in the following section.

4.5.2 PROJECT LISTING

ECIP PROJECTS

7T-0173-80*	Attic insulation/installation of thermostatic radiator valves in FH Facilities, 7ATC.
7T-0155-84*	Automatic Controls with sensors, motorized valves, wiring and small items.

OMA PROJECTS

7T-105-73	Repair/replace Heating System, Building No. 333.
7T-034-74	Repair/replace Heating System, Building No. 308.
7T-363-74	Repair/replace Heating System, Building No. 344.
7T-0161-76	Repair/replace Heating System, Building No. 343.
7T-0162-76	Repair/replace Heating System, Building No. 338.
7T-0191-76	Repair/replace Heating System, Building No. 201.
7T-0199-76	Upgrade Central Heating and Electrical Systems, Building No. 432.
7T-0265-76	Repair/replace Heating System, Electrical System and Long Distance Lines, Buildings No. 131, 132, 133.
7T-0307-76	Replacement of Radiator Valves, Buildings No. 475 through 478.
7T-0308-76	Repair/replace Heating System, Building No. 332.

77T-0319-76	Replace Windows, Doors and Entrance Doors, Building No. 416.
7T-0041-77	Repair/replace Heating System, Buildings No. 306, and 316.
7T-0042-77	Repair/replace Heating System, Buildings No. 307 and 317.
7T-0043-77	Repair/replace Heating System, Buildings No. 303 and 313.
7T-0044-77	Repair/replace Heating System, Buildings No. 304 and 314.
7T-0136-77	Replace Windows, Buildings No. 414, 424, 425, 433 and 434.
7T-3406-77	Building No. 112. Add ceiling insulation. No documents available.
7T-0088-78	Repair/replace Heating System, Building No. 431.
7T-0173-78	Repair/replace Heating System, Buildings No. 273, 274, and 275.
7T-0270-78	Rehab. heating Building No. 256. Received specifications.
7T-0098-79	Roof repair of Buildings No. 252 through 256.
7T-0099-79	Received work request and specification.
7T-0130-79	Repair doors and insulate ceiling in Building No. 308. Received work request and specification.
7T-0138-79	Rehab. heating Building No. 224. Design in preparation. No documents available.
7T-0439-79	Rehab. of Building No. 427. Received work request and specification.
7T-0010-80	Rehab. heating Building No. 339. Design in preparation. No documents available.
7T-0036-80	Repair leaky windows in Fitzhum Village. Received work request.

7T-0103-80	Central heating of Buildings No. 103, 104, 114 through 117 and 134. Received work request. Design in preparation. No documents available.
7T-0122-80	Rehab. heating system in Building No. 322 (Laundry). Received work request and specification.
7T-0150-80	Rehab. four mess halls in "1,000 man camp". Seen specifications.
7T-0279-80	Replace air conditioning system Building No. 113. Received work request.
7T-0318-80	Replace front doors in Building No. 354 (Theatre). Received work request.
7T-0361-80	Rehab. heating Building No. 324. Seen specification.
7T-0357-80	New lights in Building No. 323 (Gymnasium). Received work request and specification.
7T-0411-80 7T-0144-80 7T-0413-80	Rehab. of heating system in Buildings No. 345 and 346; and connect to heating plant in Building No. 355. Received work request and specification.
7T-0412-80	Rehab. heating Building No. 260 area. No documents available.
WO-3151-80	Building No. 336 Rehab. Building and heating system, connect to Building No. 355. No documents available.
WO-3156-80	Building No. 224. Replace windows. No documents available.
WO-3179-80	Building No. 264. Install ceiling and wall insulation. No documents available.
WO-3212-80	Building No. 202. Install ceiling insulation, replace windows. No documents available.
WO-3294-80	Building No. 341, 342. Replace roof, add external wall insulating cement. No documents available.

7T-0077-81	Building No. 225 New Windows, New Heating System, Connect to Boiler in Building No. 248. Received work request.
7T-0119-81 7T-0120-81 7T-0121-81 7T-0124-81 7T-0129-81	Replace single pane windows with double pane thermal glass in the 16 billets and 4 mess halls of "1,000 man camp", and replace old exterior plaster by insulating plaster in the 16 billets. Received copy of work request.
7T-0306-81	Buildings No. 233 and 234. Replace roof, add external wall insulating plaster. No documents available.
7T-0315-81	Buildings No. 231 and 232. Replace roof, add external wall insulating plaster. No documents available.
7T-0316-81	Rehab. heating, Buildings No. 243 and 244. No documents available.
7T-0320-81	Rehab. of Building No. 221. No documents available.
7T-0327-81	Buildings No. 273, 274 and 275. Replace windows. No documents available.
7T-0429-81	Building No. 301: Rehab. heating system, new windows, wall and ceiling insulation, connect to Building No. 355. Building No. 354: Convert steam heating system to hot water, add blowers. No documents available.
WO-3274-81	Building No. 431: Rehab building. No documents available.
WO-3294-81	Building No. 121: Rehab building. No documents available.

* Project is unfunded or subject to available funds.

4.6 INCREMENT PROJECTS BY E/C RATIO

Table 10-1, Volume 6 of the Prefinal Submittal, ranks all the recommended Increment A, B, F and G projects by E/C ratio. A copy is included in this Summary.

4.7 FUTURE ENERGY CONSUMPTION

4.7.1 GENERAL

In this Section we have analyzed the effect of future facility changes on the energy consumption of the Vilseck Subcommunity. Tables 11-1, 11-2 and 11-3 list the changes in construction in two categories: New Constructions and Demolitions. These tables are included in Appendix 11-B, Volume 7, Prefinal Submittal.

4.7.2 AVAILABLE DATA

Vilseck did not have a formalized Master Plan so we developed our estimated future energy use from other data made available to us. The data consisted of:

a. 7ATC MCA Project Status Report, dated 10 February, 1982.

b. Building floor areas from 7ATC Master Planning Section, Grafenwoehr.

c. Design Energy Budgets listed in ETL 1110-3-295.

Since the average heating degree days (HDD) at Vilseck is more than 7,000 per year, Climatic Region No. 1 was selected and used to determine the Design Energy budgets appropriate to the proposed facility changes.

4.7.3 ANALYSIS

The estimated energy usage of 1,403,666 SF of new construction is 91,359 MBtu/yr. This is equivalent to 28% of the total energy consumption of FY 80.

The estimated energy reduction from 13,904 SF of demolitions is 998 MBtu/yr. This is equivalent to 0.3% of the total energy consumption of FY 80.

Therefore, the net estimated future energy consumption for the Vilseck Subcommunity is 90,361 MBtu/yr and results from all facilities changes planned up to and including FY 86. This is equivalent to a 27% increase in total energy consumption of FY 80.

It is assumed that all new construction will incorporate required energy conservative features in their designs.

4.8 TRAINING COURSES

We have presented in Section 12, Volume 6 of the Prefinal Submittal recommendations on Government and Commercial sponsored training courses. We recommend these courses as additional training for the Vilseck Facilities Engineer Division.

It is not our intent to suggest that this additional training be considered as basic training but rather as refresher or familiarization courses. Training is required to update current knowledge and to learn new technology.

The one course we strongly recommend is the Preventive Maintenance Seminar.

5. ENERGY CONSUMPTION ANALYSIS USING AXCESS COMPUTER PROGRAM (INCREMENT A & C ONLY)

5.1 MODELING OF SURVEYED BUILDINGS

Each of the surveyed buildings has been modeled on the AXCESS Input Data Sheets, using field survey data, weather data supplied by EUD, occupancy schedules, building construction data, etc; and the model verified against historical energy use (when available) and adjusted until reasonable agreement is obtained.

5.2 COMPUTER OUTPUT

Each Output consists of three parts:

a. Input data

b. Design day space heat gain calculation, (based on 18°C outside air temperature).

c. Result of the hour-by-hour AXCESS energy consumption calculations. The Result consists of a two page output.

The first page shows the month-by-month consumption values of:

1.	Total Source Energy	: MBtu
2.	Electricity	: kwh
3.	Anthracite Coal	: m-tons
4.	Fuel Oil No. 2	: gal
5.	Fuel Oil No. 6	: gal
6.	Interior Lights	: kwh
7.	Equipment	: kwh
8.	Misc. Equipment	: kwh
9.	Fan Power	: kwh
10.	Domestic Hot Water	: MBtu (source energy)

The second page shows the month-by-month consumption values of all the above 10 quantities in kBtu/yr/sf of building area.

It also indicates the annual percent of total energy consumption by each of the above 10 quantities.

5.3 UTILIZATION OF AXCESS RESULTS

As a result of making an AXCESS analysis of buildings of every type, the average kBtu/yr/sf of each building type has been determined.

Knowing the square foot area of all buildings of each type, energy consumed by all buildings of a given type has been calculated by extrapolation.

By analyzing all types of buildings, the energy consumed by all the buildings in the subcommunity has been estimated.

5.4 AVERAGE ENERGY CONSUMPTION PER BUILDING TYPE

Based on the analysis of the surveyed buildings, the weighted average values of annual source energy consumption per square foot by each of the building types for space heating, domestic hot water, lighting and miscellaneous electric power, are shown in Table 5-1. In Table 5-2, the above values have been expressed as percentages of the total source energy per building type.

5.4.1 GENERAL COMMENTS

We observe that the average total source energy consumption is 190 kBtu/yr/sf of which 34 units (18%) are electrical and 156 units (82%) are fuel.

On an average, a building consumes 136 units for space heating, 20 for DHW, 16 for lighting and 19 for miscellaneous electrical equipment.

Three building types consume more than 200 kBtu/yr/sf for space heating; and as a result of the recommended energy conservation projects, these values will be significantly lowered.

ENERGY ENGINEERING ANALYSIS PROGRAM, ELROPE 29-SEP-82

PROGRAM LIST7

ENERGY CONSUMPTION : SUMMARIZED RESULTS OF AIDES PROGRAM Table 5-1

VILSECK SUBCOMMUNITY

- AVERAGE ENERGY CONSUMPTION BY BLDG TYPE -
- KBTU PER SQUARE FOOT PER YEAR -

DESCRIP	TYP	QNT	TOTAL ENERGY	FUEL	ELEC	SPACE HEAT	DHW	LIGHT	MISC	MISC LT/EQP	BOILER AUX	ACTUAL FUEL	
-1-	-2-	-3-	-4-	-5-	-6-	-7-	-8-	-9-	-10-	-11-	-12-	-13-	
EM/BOQ	1	399272.	139.3	114.3	25.0	84.7	29.7	15.5	9.4	1.1	0.3	131.6	
MAINTENANCE	2	55296.	116.2	113.5	2.7	113.5	0.0	2.7	0.0	0.0	0.0	100.4	
EM MESS	3	44899.	294.2	260.1	34.1	176.0	90.1	12.7	21.4	0.0	21.4	275.2	
FAM HSNG	5	225148.	243.9	190.9	53.0	154.4	36.6	22.9	30.1	26.6	3.5	190.4	
FR HSG M	6	37920.	146.9	97.6	49.3	73.5	24.1	19.3	30.0	11.7	18.3	107.0	
SCHOOL	7	32461.	195.3	167.0	28.3	163.7	3.3	21.9	6.4	0.0	6.4	172.3	
THEATER	9	10403.	293.9	252.3	41.6	231.5	0.8	7.9	33.7	19.7	14.0	252.2	
LAUNDRY	10	11184.	260.5	203.1	57.4	175.6 *	27.5	4.2	53.2	42.4	10.8	213.8	
POST REC	11	105936.	294.4	262.7	31.7	256.9	5.8	15.7	16.0	4.4	11.6	267.8	
GYMNASIUM	12	37539.	322.5	302.2	20.3	277.4	24.8	13.6	6.7	0.0	6.7	293.3	
CHAPEL	13	4431.	177.7	152.2	25.5	151.5	0.7	10.4	15.1	0.0	15.1	151.3	
BOWLING	14	11741.	222.3	181.3	42.0	180.7	0.6	7.9	34.1	27.7	6.4	171.1	
COMMISARY	15	40858.	296.0	190.2	105.8	177.9	2.3	24.3	71.5	56.7	14.8	190.8	
ADMINISTRA	16	84187.	153.6	127.5	31.2	114.6	12.9	12.7	12.9	0.0	12.9	64.4	
APPL INS	17	225452.	179.2	160.2	19.0	158.9	0.7	10.3	9.7	0.7	9.0	167.2	
WAREHSE	18	84531.	166.0	145.8	20.2	144.3	1.5	4.2	15.9	1.0	15.0	149.5	
OFF MESS	19	38727.	270.9	175.7	95.2	153.1	22.6	32.7	62.5	53.6	8.9	209.4	
FIRE MSE	20	6378.	218.6	161.7	56.9	157.5	4.2	17.4	39.5	0.0	39.5	153.2	
DISPENSARY	21	7456.	114.3	80.3	34.0	78.1	2.2	17.2	16.8	0.0	16.8	106.2	
TELECOMM	22	6222.	275.0	170.0	105.0	176.0	0.0	22.0	83.0	61.0	22.0	138.9	
FR MSG M	24	126738.	148.4	94.9	53.5	69.2	34.7	17.4	34.1	27.2	6.9	91.1	
WEIGHTED AVERAGE			190.4	152.5	35.0	134.4	21.1	15.7	19.3	10.4	8.9	169.5	0.2

* NOTE: Space heating includes dryer energy consumption.

ENERGY ENGINEERING ANALYSIS PROGRAM, EUROPE 29-SEP-82

PROGRAM LIST7

ENERGY CONSUMPTION : SUMMARIZED RESULTS OF ACCESS PROGRAM Table 5-2

WILSECK SUBCOMMUNITY

- PERCENT ENERGY CONSUMPTION BY BLDG TYPE -

DESCRIP -1-	TYP -2-	OSF -3-	TOTAL ENERGY -4-	FUEL -5-	ELEC -6-	SPACE HEAT -7-	DHW -8-	LIGHT -9-	MISC -10-	MISC LT/EQP -11-	BOILER AUX -12-	ACTUAL FUEL -13-
ENLISTED	1		100.0	82.1	17.9	60.8	21.3	11.1	6.8	0.8	6.0	100.9
AUTHENTS	2		100.0	97.7	2.3	97.7	0.0	2.3	0.0	0.0	0.0	86.4
EM MESS	3		100.0	88.4	11.6	57.8	20.6	4.3	7.3	0.0	7.3	93.5
FAM HSNG	5		100.0	78.3	21.7	63.3	15.0	9.4	12.3	10.9	1.4	78.1
PR MGT H	6		100.0	66.4	33.6	36.0	16.4	13.1	20.6	8.0	12.5	72.8
SCHOOL	7		100.0	85.5	14.5	83.8	1.7	11.2	2.3	0.0	2.3	48.2
THEATER	9		100.0	85.8	14.2	65.4	0.3	2.7	11.5	6.7	4.8	65.8
LAUNDRY	10		100.0	78.0	22.0	67.4	10.6	1.6	20.4	16.3	4.1	82.1
MOTR POOL	11		100.0	89.2	10.8	87.3	2.0	5.3	5.4	1.5	3.9	84.2
GYMNASIUM	12		100.0	93.7	6.3	86.0	7.7	4.2	2.1	0.0	2.1	109.3
CHAPEL	13		100.0	85.6	14.4	85.3	0.4	5.9	8.5	0.0	8.5	85.1
BOWLING	14		100.0	81.2	18.8	80.9	0.3	3.5	15.3	12.4	2.9	76.6
CURIS/ART	15		100.0	63.0	37.0	62.2	0.8	12.0	25.0	19.8	5.2	64.7
ADMINSTRA	16		100.0	80.3	19.7	72.2	8.1	11.6	8.1	0.0	8.1	41.8
APPL ING	17		100.0	89.4	10.6	88.9	0.5	5.7	4.9	0.4	4.5	93.3
MAINTENCE	18		100.0	87.9	12.1	87.0	0.9	2.5	7.6	0.6	9.0	90.1
OFF MESS	19		100.0	64.9	35.1	56.5	8.3	12.1	23.1	19.8	3.3	77.3
FIRE HSE	20		100.0	76.0	24.0	72.0	1.9	9.0	18.1	0.0	18.1	70.1
DISPNSRY	21		100.0	70.3	29.7	68.3	1.9	15.0	14.7	0.0	14.7	144.7
TELECOMM	22		100.0	61.8	38.2	61.8	0.0	8.0	30.2	22.2	8.0	99.5
EN HSG H	24		100.0	65.3	34.7	40.6	24.7	11.7	23.0	18.3	4.6	61.4
AVERAGE PERCENT			100.0	81.6	18.4	70.5	11.1	8.2	10.1	5.5	4.7	85.9

HEADING DEFINITIONS

Tables 5-1 and 5-2

COLUMN		EXPLANATION
-1-	DESCRP	: DESCRIPTION OF BUILDING TYPE
-2-	TYP	: DESIGNATED TYPE NUMBER FROM INCREMENT 'A'
-3-	GSF	: TOTAL GROSS SQUARE FOOTAGE FOR BUILDINGS OF THE PARTICULAR TYPE
-4-	TOTAL	: TOTAL ENERGY CONSUMPTION PER TYPE (KBTU/SF) PER YEAR COLUMN (5) + COLUMN (6)
-5-	FUEL	: TOTAL FUEL CONSUMPTION PER TYPE (KBTU/SF) PER YEAR COLUMN (7) + COLUMN (8)
-6-	ELEC	: TOTAL ELECTRICITY CONSUMPTION PER TYPE (KBTU/SF) PER YEAR COLUMN (9) + COLUMN (10)
-10-	MISC	: MISCELLANEOUS CONSUMPTION OF ELECTRICITY COLUMN (11) + COLUMN (12)
-11-	LT/EQP	: INCLUDES EXTERIOR LIGHTING AND EQUIPMENT SUCH AS LAUNDRY MACHINES, COOKING EQUIPMENT, AND MISCELLANEOUS HOUSEHOLD EQUIPMENT.
-12-	BOILER HT	: INCLUDES BOILER PUMPS, BURNER MOTORS, UNIT HEATER FANS AND FURNACE FANS.
-13-	ACTUAL FUEL	: ACTUAL KBTU/SF FUEL CONSUMPTION. DOES NOT INCLUDE ELECTRICITY.

5.5 TOTAL ENERGY CONSUMPTION PER BUILDING TYPE AND BY ENTIRE SUBCOMMUNITY

The annual values of total fuel (coal or oil) consumption (MBtuF), electricity consumption (MWH and equivalent source (MBtuE)) as well as total energy (fuel and electricity consumption (MBtuT)) by each type of building have been determined, as shown in Table 5-3, using the average values per building type and the GSF area of the type.

The "miscellaneous" consumption consists of the consumption by items such as Street Lighting, Sewage Treatment Plant and Water Pump Station.

Table 5-3 also shows the percent of total fuel, total electricity and total energy, consumed by each of the building types.

5.5.1 GENERAL COMMENTS

5.5.1.1 FUEL CONSUMPTION

We observe that the topmost consumers of fuel (coal and oil) are the following building types:

Family Housing	= 24.2%
EM Barracks w/o Mess	= 17.8%
Applied Instruction	= 14.0%
Motor/Tank Repair	= 13.2%

These building types consume 70% of the total fuel.

5.5.1.2 ELECTRICITY CONSUMPTION

The leading consumers of electricty are the following building types:

Family Housing	= 35.5%
EM Barracks w/o Mess	= 16.1%
Applied Instruction	= 6.9%
Commissary	= 6.7%
Motor/Tank Repair	= 6.6%

ENERGY ENGINEERING ANALYSIS PROGRAM, EUROPE
PROGRAM LISTS
VILSECK SUBCOMMUNITY

: MISSILE EXTRAPOLATED ENERGY CONSUMPTION
20-FEB-82
Table 5-3

TYP NO. -1-	-2-	OSF -3-	AVG PER SF/YR NSTUF -4-	NSTLF -5-	NSTUT -6-	TOTAL, PER YR NSTUF -7-	NSTLF -8-	NSTUT -9-	FUEL -10-	ELEC -11-	TOTAL -12-	OSF -13-	DESCRIP -14-
1	24.	399272.	114.3	25.0	139.3	45645.	9962.	55607.	17.6	15.7	17.2	23.7	ENVIRO
2	16.	55096.	113.5	2.7	116.2	6276.	149.	6425.	2.4	0.2	2.0	3.3	NUTRIENTS
3	6.	46899.	240.1	34.1	294.2	12198.	1599.	13798.	4.7	2.5	4.3	2.8	EM MESS
4	18.	225148.	195.9	53.0	249.9	44099.	12440.	57360.	17.3	19.7	17.8	14.0	FAM HSNG
5	3.	37920.	97.6	49.3	146.9	3701.	1869.	5570.	1.4	3.0	1.7	2.3	FM HSG M
6	2.	32461.	167.0	28.3	195.3	5421.	919.	6340.	2.1	1.5	2.0	1.9	SCHOOL
7	1.	10485.	252.3	41.6	293.9	2645.	436.	3082.	1.0	0.7	1.0	0.6	THEATER
8	1.	11186.	203.1	57.4	260.5	2272.	642.	2914.	0.9	1.0	0.9	0.7	LAUNDRY
9	11.	105934.	262.7	31.7	294.4	27827.	3356.	31183.	10.7	5.3	9.7	6.3	MOTR POR
10	2.	37539.	302.2	20.3	322.5	11344.	762.	12106.	4.4	1.2	3.8	2.2	GYMNASIUM
11	1.	6431.	152.2	25.5	177.7	1009.	169.	1178.	0.4	0.3	0.4	0.4	CHAPEL
12	1.	11741.	181.3	42.0	223.3	2129.	493.	2622.	0.8	0.8	0.8	0.7	BOWLING
13	4.	40858.	180.2	105.8	286.0	7362.	4322.	11684.	2.8	6.8	3.6	2.4	COMISARY
14	19.	84187.	127.5	31.2	158.6	10727.	2629.	13346.	4.1	4.2	4.1	5.0	ADMINSTRA
15	23.	233452.	160.2	19.0	177.2	37433.	4446.	41880.	14.4	7.0	13.0	13.9	APPL SVS
16	8.	66531.	145.6	20.1	166.0	12919.	1744.	14362.	4.9	2.8	4.5	5.1	WAREHSE
17	3.	28727.	175.7	95.2	270.9	6805.	3695.	10490.	2.6	5.8	3.3	2.3	OFF MESS
18	1.	6278.	161.7	94.9	256.6	1031.	343.	1374.	0.4	0.6	0.4	0.4	FIRE HSE
19	1.	7454.	80.9	24.0	114.3	599.	254.	852.	0.3	0.4	0.3	0.4	DISPENSRY
20	1.	6222.	170.0	105.0	275.0	1058.	653.	1711.	0.4	1.0	0.5	0.4	TELECOMM
21	8.	166091.	96.9	51.5	143.4	16076.	8554.	24443.	4.2	13.5	7.6	9.9	FM HSG M
22	0.	0.	0.0	0.0	0.0	0.	3851.	3851.	0.0	6.1	1.2	0.0	MISCELL
	153.	1677401.	153.9	37.6	191.5	259105.	63313.	322422.	100.0	100.0	100.0	100.0	ESTIMATE
			147.9	42.8	190.7	256054.	74118.	330152.	100.0	100.0	100.0	100.0	EST 1990

TYP NO. -1-	-2-	OSF -3-	NSTUF -4-	NSTLF -5-	NSTUT -6-	NSTUF -7-	NSTLF -8-	NSTUT -9-	FUEL -10-	ELEC -11-	TOTAL -12-	OSF -13-	DESCRIP -14-

HEADING DEFINITIONS

1. TYP : BUILDING TYPE AS DEFINED BY INCREMENT 'A'

2. NO. : TOTAL NUMBER OF BUILDINGS PER TYPE

3. GSF : TOTAL GROSS SQUARE FOOTAGE PER TYPE

4. KBTUF : AVERAGE YEARLY CONSUMPTION OF FUEL (COAL/OIL) ON A PER SQUARE FOOT BASIS IN KBTU (BTU*1000)

5. KBTUE : AVERAGE YEARLY CONSUMPTION OF ELECTRICITY ON A PER SQUARE FOOT BASIS IN KBTU (BTU*1000)

6. KBTUT : AVERAGE YEARLY ENERGY CONSUMPTION ON A PER SQUARE FOOT BASIS IN KBTU (BTU*1000)
COLUMN (4) + COLUMN (5)

7. MBTUF : TOTAL YEARLY FUEL (COAL/OIL) CONSUMPTION IN MBTU (BTU*1000000)
COLUMN (3) X COLUMN (4)

8. MBTUE : TOTAL YEARLY ELECTRICITY CONSUMPTION IN MBTU (BTU*1000000)
COLUMN (3) X COLUMN (5)

9. MBTUT : TOTAL YEARLY ENERGY CONSUMPTION IN MBTU (BTU*1000000)
COLUMN (3) X COLUMN (6)

PERCENTAGE :

10. FUEL : PERCENT OF FUEL CONSUMED IN RELATION TO TOTAL BASE CONSUMPTION
COL. (7) X 100/COMMUNITY FUEL CONSUMPTION

11. ELEC : PERCENT OF ELECTRICITY CONSUMED IN RELATION TO TOTAL BASE CONSUMPTION
COL. (8) X 100/COMMUNITY ELEC. CONSUMPTION

12. TOTAL : PERCENT OF TOTAL ENERGY CONSUMED IN RELATION TO TOTAL BASE CONSUMPTION
COL. (9) X 100/TOTAL COMMUNITY ENERGY CONSUMPTION

13. GSF : PERCENT OF GROSS SQUARE FOOTAGE IN RELATION TO TOTAL BASE SQUARE FOOTAGE
COL. (3) X 100/COMMUNITY GSF

14. DESCRIP : DESCRIPTION OF BUILDING USE PER TYPE

Officers Mess/Club * 5.7%

Administration * 4.1%

These building types consume 82% of the total electricity consumption.

5.6 PRESENT AND PROJECTED ENERGY COSTS

Based on the average energy consumption values obtained we have developed and shown the present FY 80 as well as projected FY 84 energy costs (if no energy conservation actions are implemented) for space heating, DHW, lighting, miscellaneous, and total energy for each building type in Tables 5-4A and 5-4B.

5.6.1 GENERAL COMMENTS

We observe that on an average, the annual energy cost is 93 cents per square foot, of which 65 cents is for space heating, 10 cents is for DHW, 8 cents for lighting and 10 cents for miscellaneous electrical equipment such as boiler pumps, unit heater fans, washing machines and stoves.

Between FY 1980 and FY 1984, the energy cost will increase by a factor of 1.6 if no energy conservation measures are implemented; i.e., the annual energy cost will increase from approximately $1.2 million to $1.9 million.

ENERGY ENGINEERING ANALYSIS PROGRAM: EUROPE
PROGRAM LIST6
VILSECK SUBCOMMUNITY

30-SEP-82

Table 5-4A

ENERGY COST-1980: CENTS/SQ FT

FUEL COST : $ 4.81/MBTU ELECTRIC COST : $ 5.16/MBTU

BLDG TYPE	BLDG DESC	GSF	FUEL SPACE HEAT	FUEL DHW	ELECTRICITY LIGHTS	ELECTRICITY MISC	TOTAL
			CENTS/SQ FT, 1980				
1	EM/BOQ	399272.	41.	14.	8.	5.	68.
2	APTMENTS	55296.	55.	6.	1.	0.	56.
3	EM MESS	44899.	82.	43.	7.	11.	143.
5	FAM HSNG	225148.	74.	18.	12.	16.	119.
6	FM HSG M	77920.	35.	12.	10.	15.	72.
7	SCHOOL	32441.	79.	2.	11.	3.	95.
9	THEATER	10485.	121.	0.	4.	17.	143.
10	LAUNDRY	11186.	84.	19.	2.	27.	127.
11	MOTR POOL	105936.	124.	3.	8.	8.	143.
12	GYMNASIUM	37539.	133.	12.	7.	2.	154.
13	CHAPEL	6631.	73.	0.	5.	8.	86.
14	BOWLING	11741.	87.	0.	4.	18.	109.
15	COMMISARY	40853.	84.	1.	18.	37.	141.
16	ADMINISTRA	84197.	55.	6.	9.	7.	77.
17	APT. EMS	223452.	77.	0.	5.	5.	87.
18	HOUSE	84531.	69.	1.	2.	8.	81.
19	OFF MESS	39727.	74.	11.	17.	32.	134.
20	FIRE HSE	6378.	76.	2.	9.	20.	107.
21	DISPENSRY	7454.	38.	.	9.	9.	56.
22	TELEXCHN	4222.	82.	..	11.	43.	136.
24	FM HSG M	124922.	29.	18.	9.	18.	73.
	AVERAGE		45.	10.	8.	10.	73.

ENERGY ENGINEERING ANALYSIS PROGRAM, EUROPE
PROGRAM LIST6
VILSECK SUBCOMMUNITY

30-SEP-77

Table 5-48

ENERGY COST-1984: CENTS/SQ FT

FUEL COST : $ 7.84/MBTU ELECTRIC COST : $ 8.41/MBTU

BLDG TYPE	BLDG DESC	OFF	FUEL SPACE HEAT	FUEL DHW	ELECTRICITY LIGHTS	ELECTRICITY MISC	TOTAL
			CENTS/SQ FT, 1984				
1	ENLISTED	399272.	66.	23.	13.	8.	111.
2	MAINTENANCE	55296.	89.	0.	2.	0.	91.
3	ADMIN OFFICES	44899.	133.	71.	11.	18.	233.
5	FAMILY HOUSING	235140.	121.	29.	19.	25.	194.
6	OFFICERS HOUSING	37920.	58.	19.	16.	25.	118.
7	SCHOOL	32461.	128.	3.	18.	5.	155.
9	THEATER	10495.	197.	1.	7.	28.	233.
10	LAUNDRY	11186.	138.	22.	6.	45.	209.
11	MOTOR POOL	105936.	201.	5.	13.	13.	233.
12	DINING FACILITY	37539.	217.	19.	11.	6.	254.
13	CHAPEL	6631.	119.	1.	9.	13.	141.
14	BOWLING	11741.	142.	0.	7.	27.	177.
15	COMMISSARY	49858.	137.	2.	29.	60.	230.
16	RECREATION	84 27.	90.	10.	15.	11.	126.
17	APPL SHOP	23452.	128.	1.	9.	7.	142.
18	WAREHOUSE	86731.	113.	1.	4.	13.	131.
19	OPEN STORAGE	26727.	120.	18.	27.	55.	218.
20	FIRE STATION	6778.	123.	2.	15.	33.	173.
21	DISPENSARY	7454.	61.	2.	14.	14.	92.
22	TELEPHONE	4222.	122.	0.	19.	70.	222.
24	FAMILY HOUSING	126998.	47.	29.	15.	29.	119.
	AVERAGE		105.	17.	13.	16.	151.

6. INFORMATION RECEIVED FROM SUBCOMMUNITY

We have presented in Section 2 of the Energy Report details of the following:

a. Drawings

b. Utility and Fuel Bills

c. Information of Previous Studies

d. Building Information Schedule

e. Basic Utility System Maps

f. Facility Engineering Technical Data Report

g. Subcommunity Fixed Facility Energy Plan

h. Land Use Plan and Planned Physical Plant Expansion Data

i. Population Data

7. ENERGY CONSUMPTION DATA AND SUBCOMMUNITY GOALS

Presented herein are the following tables:

Table 3.3-1	Fuel and Electricity Prices
Table 3.3-2	Annual Energy Consumption and Cost Profile for FY 75, 78, 79 and 80
Table 3.2-1	Energy Consumption Goals for FY 85
Table 3.4	Vilseck Typical building Energy Consumption

VILSECK

Table 3.3-1

FY 84 FUEL PRICES, BASED ON FUEL PRICES IN FY 81

FUEL	UNIT	FY 81		FY 84	
		$/UNIT	$/MBTU	$/UNIT	$/MBTU
ELECTRICITY	KWH	0.08	6.896	0.12	9.950
COAL	m-TON	127	4.071	169	5.419
NO. 2 OIL	GAL	1.22	8.796	1.81	13.032
NO. 6 OIL	GAL	0.87	5.860	1.29	8.682
ELECTRIC DEMAND	KVA	9.50	--	13.707	--

CONVERSION FACTORS: $(10)^6 \frac{BTU}{MBTU}$

0.0116 $\frac{MBTU\ ELECTRICITY}{KWH}$

31.2 $\frac{MBTU\ COAL}{m\text{-}TON}$

0.1387 $\frac{MBTU\ NO.\ 2\ OIL}{GAL}$

0.1485 $\frac{MBTU\ NO.\ 6\ OIL}{GAL}$

ATTACHMENT TO TABLE 3.3-1

BACKUP - USEFUL DATA

ANNUAL ESCALATION RATES PER "ECIP"				
FUEL	FY 81	FY 82	FY 83	FY 84
ELECTRICITY	13%	13%	13%	13%
COAL	10%	10%	10%	10%
OIL	14%	14%	14%	14%

CONVERSION FACTORS
1 US DOLLAR = 2 DM
28.3 Mbtu/short ton of Anthracite Coal
1 short ton = 907.1847 kg
1 m-ton = 1000.0000 kg
1 gallon = 3.785 liters
1 US DOLLAR per gallon = 0.5284 DM per liter

TABLE 3.3-2

ANNUAL ENERGY CONSUMPTION AND COST PROFILE--VILSECK

FUEL	FROM SOURCE OR REGION	CONVERSION FACTOR	UNIT	CONSUMPTION IN UNITS				CONSUMPTION IN MBTU				CONSUMPTION COST IN U.S. DOLLARS			
				FY 75	FY 78	FY 79	FY 80	FY 75	FY 78	FY 79	FY 80	FY 75	FY 78	FY 79	FY 80
ELECTRICITY (GRIDS)		0.0036	KWH		5,119,640	6,031,980	6,653,892		59,367	53,931	51,600		320,999	293,640	266,605
					1,814,959	1,866,580	1,933,660		21,054	19,331	22,630		111,799	285,656	285,720
				5,308,582	6,934,572	6,298,607	6,389,522	66,210	80,441	73,062	86,010	432827	434,798	399,334	382,433
AVIS COAL		31.7			760	599	602		23,962	19,520	18,562		69,337	57,398	39,348
					3,330	3,334	3,222		47,634	36,005	38,836		126,614	99,837	319,689
				3536	3,394	3,587	3,634	46,781	71,636	69,525	58,668	100373	189,331	136,307	158,957
OIL NO. 2		43.5387	GAL		1,260,786	1,030,369	990,264		174,071	142,455	137,550		627,289	511,052	284,867
					893,199	1,301,179	800,365		36,793	28,862	26,684		94,109	95,178	150,870
				1948289	1,453,936	1,327,446	1,380,879	200366	201,644	190,497	163,754	904789	721,398	644,172	935,641
OIL NO. 6		0.1451	GAL	336,538	239,790	231,690	200,217	43810	35,618	36,396	41,632	25598	96,639	89,023	136,449
				336,538	239,790	231,690	200,217	43810	35,618	36,396	41,632	25598	96,639	89,023	136,449
TOTAL									293,030	264,090	243,392		1,186,864	970,933	1,221,364
									571,521	83,370	86,960		335,933	299,893	306,716
								550035	309,351	347,460	330,352	372689	1,441,986	1,270,826	1,643,560
ELECTRICITY PEAK DEMAND	POWER		MW	1120	1,209	1,056	1,150								
	WEEKEND						85								
	TOTAL														
	TOTAL														
ELECTRICITY PEAK DEMAND PER GROSS	POWER			0.896	0.964	0.941	0.953								
							0.953								

GROSS Floor Area (M²)	1633		1,900	
ENERGY	220		183	
POPULATION	2235		3,369	
ENERGY/POPULATION	130,201		90,310	

Remarks:

1. 1 MS Dollar = 2 MM

TABLE 3.2-1 ENERGY CONSUMPTION: PROGRESS AND GOALS FOR FY 85: WILDACRE

		UNITS	FY75	FY80	FY85	
1a.	Electricity	MBTU	66,218	78,910		
b.	Coal	MBTU	68,741	50,868	37,413	Goal (-10%)
c.	Fuel Oil # 2	MBTU	200,866	163,754		
d.	Fuel Oil # 6	MBTU	47,010	01,682		
e.	Solar Energy	MBTU		-	3,742	Goal (-1%)
f.	Total Energy	MBTU	358,835	330,152	-	
2a.	Goal: Total Energy Reduced 25%: (0.75 x 1f$_{FY75}$)	MBTU	-	-	269,126	
b.	Goal: Energy Per Sq. Ft. Reduced 20% by ECIPS and Mgmt. and 5% by New Efficient Bldgs (2a = 2c) + (2a x 0.05)	MBTU	-	-	374,269	
3a.	Building Area in use, Constructed before FY '78	SQ.FT.	1,632,287	1,710,710	1,694,262	
b.	Energy Per Sq. Ft. (1f ÷ 3a)	BTU/SQ. FT.	220	-	-	
c.	Goal: Energy Per Sq. Ft. Reduced 20% by ECIPS (12%), and Mgmt (8%): (0.8 x 3b$_{FY75}$)	BTU/SQ. FT.	-	-	176	
d.	Total Energy	MBTU	358,835	-	298,592	
4a.	Building Area in use, constructed after FY '78	SQ.FT.	-	89,569	625,019	
b.	Goal: Energy Per Sq. Ft. Reduced 45% by Efficient Design (0.55 x 3b$_{FY75}$)	BTU/SQ. FT.	-	121	121	
c.	Total Energy	MBTU	-		75,627	
5a.	Gross Plant Area (3a + 4a)	SQ.FT.	1,632,287	1,800,279	2,321,281	
b.	Energy Per Sq. Ft (1f ÷ 5a)	BTU/SQ. FT.	220	183		
c.	Goal: 25% Reduction (0.75 x 5b$_{FY75}$)	BTU/SQ. FT.	-	-	165	
d.	Goal: Army Facilities Energy Plan, Annex B-5	BTU/SQ. FT.	-	-	134.9	
6a.	Heating Degree Days	DEC F - DAYS	6,906	7,169		
7a.	Population		2,735	3,365	5,670	

TABLE 3.4
VILSECK TYPICAL BUILDING
ENERGY CONSUMPTION

TYPE	No.	DESCRIPTION	MBTU/YR ELEC	FUEL
1	252	EM BARRACKS W/O/MESS	237	2895
2	152	HUTMENTS	9	345
3	161	EM MESS	159	1285
5	433	FAMILY HOUSING	350	1025
6	429	FAMILY HOUSING (NEW)	623	1352
7	480	DEPENDENT GRADE SCHOOL	442	2690
9	354	THEATER	436	2644
10	322	LAUNDRY	642	2392
11	308	MOTOR/TANK REPAIR	975	9145
12	323	GYMNASIUM	456	7487
13	218	CHAPEL	169	1003
14	215	BOWLING	493	2008
15	217	RETAIL STORE/COMMISARY	1215	2865
16	265	ADMINISTRATION	95	1209
17	345	APPLIED INSTRUCTION	170	1783
18	134	STOREHOUSE/WAREHOUSE	231	1685
19	133	OPEN MESS/NCO	1261	2976
20	201	FIRE STATION	363	977
21	301	DISPENSARY	253	1403
22	422	TELEPHONE EXCHANGE	653	864
24	840	FAMILY HOUSING (OFF BASE)	170	3009

8. DATA COLLECTED BY BUILDING SURVEY AND SELECTION OF REPRESENTATIVE BUILDINGS (INCREMENTS A & G ONLY)

The following data has been presented in detail in the Energy report and was orignally presented in the Preliminary Submittal:

Building Envelope Construction Data.

Occupancy, Lighting, Equipment and DHW Data.

Terminal Heating Systems and Control Data.

Primary Heating Systems Data.

Possible Energy Conservation Opportunities.

We have presented in the following table an updated list of representative buildings of each type selected for detailed Energy Conservation Analysis. In some types, we have selected more than one building for analysis in order to obtain more realistic basewide extrapolated ECIP or CMA projects.

Table 4.8

REPRESENTATIVE BUILDINGS OF EACH TYPE

VILSECK

TYPE	BUILDING TYPE DESCRIPTION	BUILDING
1	EM BARRACKS W/O MESS, BOQ	252
2	HUTMENTS	152
3	EM MESS	161
5	FAMILY HOUSING	433
6	FAMILY HOUSING (NEW)	429
7	DEPENDENT GRADE SCHOOL	480
9	THEATRE	354
10	LAUNDRY	322
11	MOTOR/TANK REPAIR SHOP	205, 308
12	GYMNASIUM	323
13	CHAPEL	218
14	BOWLING CENTER	215
15	RETAIL STORE/COMMISSARY	217
16	ADMINISTRATION	265
17	APPLIED INSTRUCTION	343, 349
18	STOREHOUSE/WAREHOUSE	134
19	OPEN MESS NCO/CLUB	133
20	FIRE STATION	201
21	DISPENSARY	301
22	TELEPHONE EXCHANGE	422
24	FAMILY HOUSING (OFF-BASE)	840