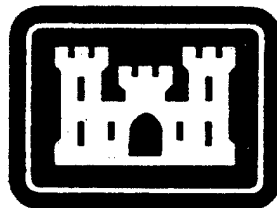


**EXECUTIVE SUMMARY**  
**ENERGY ENGINEERING ANALYSIS PROGRAM**  
**FOR**  
**U.S. ARMY GARRISON, HONSHU, JAPAN**

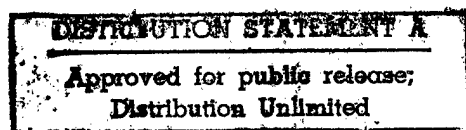
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Pacific Ocean Divison



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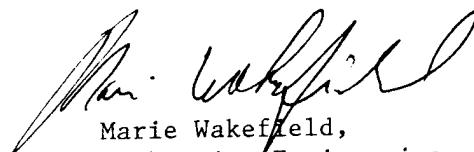


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## EXECUTIVE SUMMARY

### 1.0 INTRODUCTION

The purpose of the Energy Engineering Analysis (EEA) Program for the U.S. Army Garrison, Honshu (USAGH) installations is to develop a short-range Basewide Energy System Plan which includes policies and recommendations to systematically reduce energy consumption in compliance with the Army Facilities Energy Plan (AFEP). The USAGH, a subordinate command of U.S. Army, Japan (USARJ), has as its primary mission the support of all U.S. Army Units on Honshu. The four installations included in this study, Camp Zama, Sagamihara Dependent Housing Area (SDHA), Sagami General Depot and Yokohama North Dock (YND), are part of some one dozen installations under the command of USAGH.

The AFEP, dated 1 October 1978, established as the goal for USARJ a reduction in the average energy use per gross square foot of facility area by 20% using FY 75 as the base year. The average energy use in FY 75 was 167,700 Btu per square foot and therefore the FY 85 goal was 134,200 Btu per square foot.

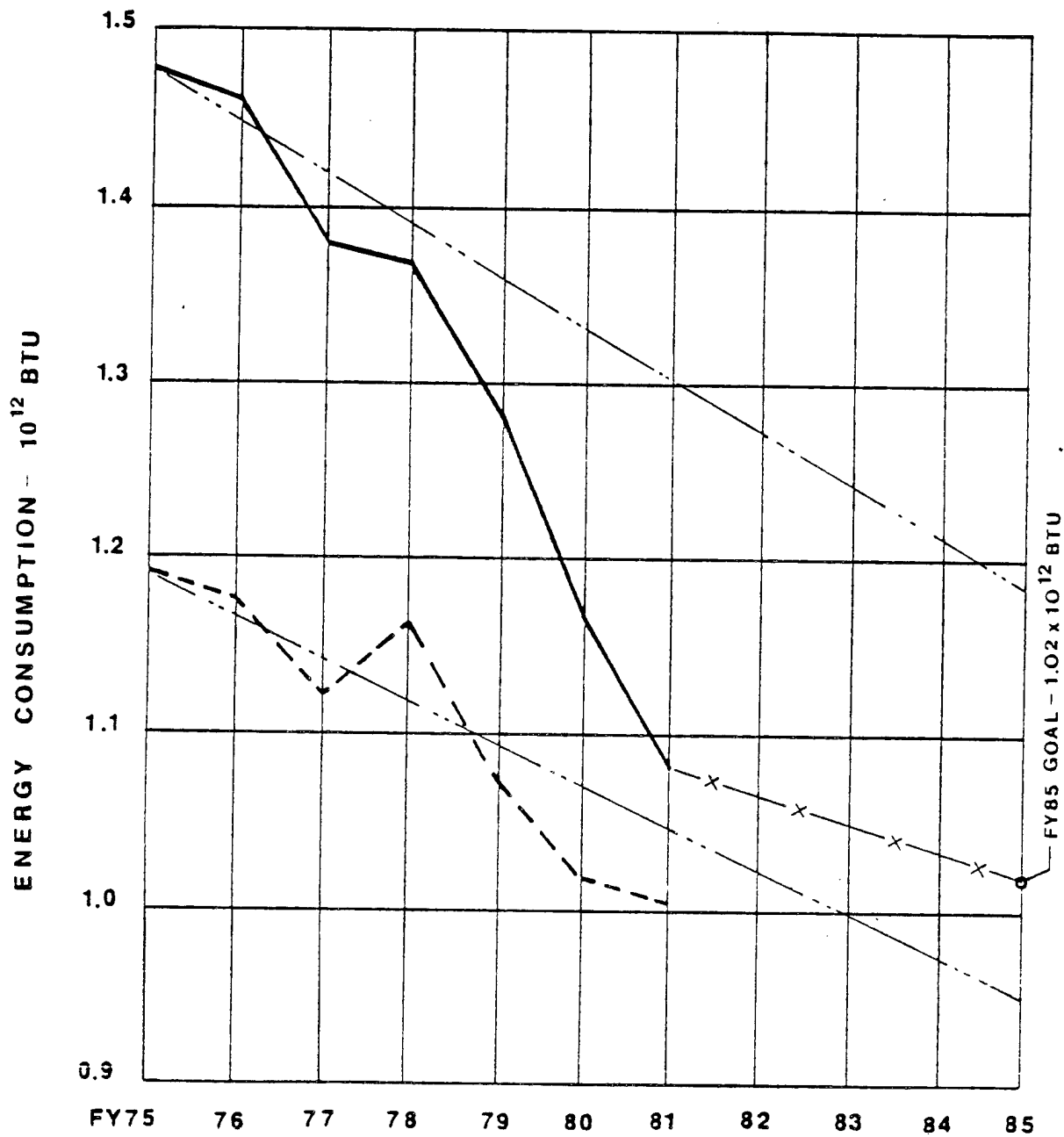
The AFEP, dated 15 October 1980, modified the goal previously expressed in Btu per gross square foot to total facilities energy consumption. The USARJ's goal was established at  $1.5 \times 10^{12}$  Btu per year for FY 85. This was subsequently modified in the AFEP, dated 26 October 1981, with a further reduction to  $1.2 \times 10^{12}$  Btu per year for FY 85. Based on this latest AFEP, USARJ has established the total facilities energy consumption goal for USAGH at 85% of the total for the Command, or  $1.02 \times 10^{12}$  Btu per year.

Using FY 75 as the base year, the total energy consumption by all USAGH installations was 1,478,000 MBtu. A 20% reduction of this consumption figure by FY 85 would be 1,182,000 MBtu. However, with the release of certain facilities, together with various energy conservation measures, the actual energy consumption by USAGH in FY 81 was approximately 1,080,000 MBtu. This would then be 60,000 MBtu above the currently established USAGH goal of 1,020,000 MBtu for FY 85. An average annual reduction of 1.5% per year during the next 4 years will permit USAGH to meet its FY 85 goal. (See Figure A.)

In FY 75, the total energy consumption by the four study bases was 1,191,000 MBtu which represented 81% of the total USAGH consumption. With the phasedown of some of the other facilities, the four study bases' share of the total consumption increased to over 90% in FY 81.

A careful review of the annual energy consumption by the four study bases will indicate that by using FY 80 and FY 81 consumption figures, these bases collectively are comfortably ahead of the goal of 2% per year reduction. Using the FY 81 consumption of 1,007,000 MBtu, a reduction of an additional 55,000 MBtu would meet the 20% reduction goal from FY 75 to FY 85. As previously stated, a 60,000 MBtu reduction would permit USAGH to meet the currently established goal of 1,020,000 MBtu for all installations.

Since the current assigned goal for USAGH covers all installations with no further breakdown by individual installation, it has been assumed for purposes of this study that a 20% reduction of these 4 study installations from FY 75 to FY 85 would be a desirable and reasonable target.



LEGEND

- USAGH
- - - 4 Study Bases
- · - · - 20% Reduction
- X-X- Army Goal

PAST ENERGY CONSUMPTION

This would also permit USAGH to meet its FY 85 goal even if the other installations have only nominal or no reduction in energy consumption between now and FY 85.

A review of individual bases as tabulated in Table I shows the comparative reduction between bases:

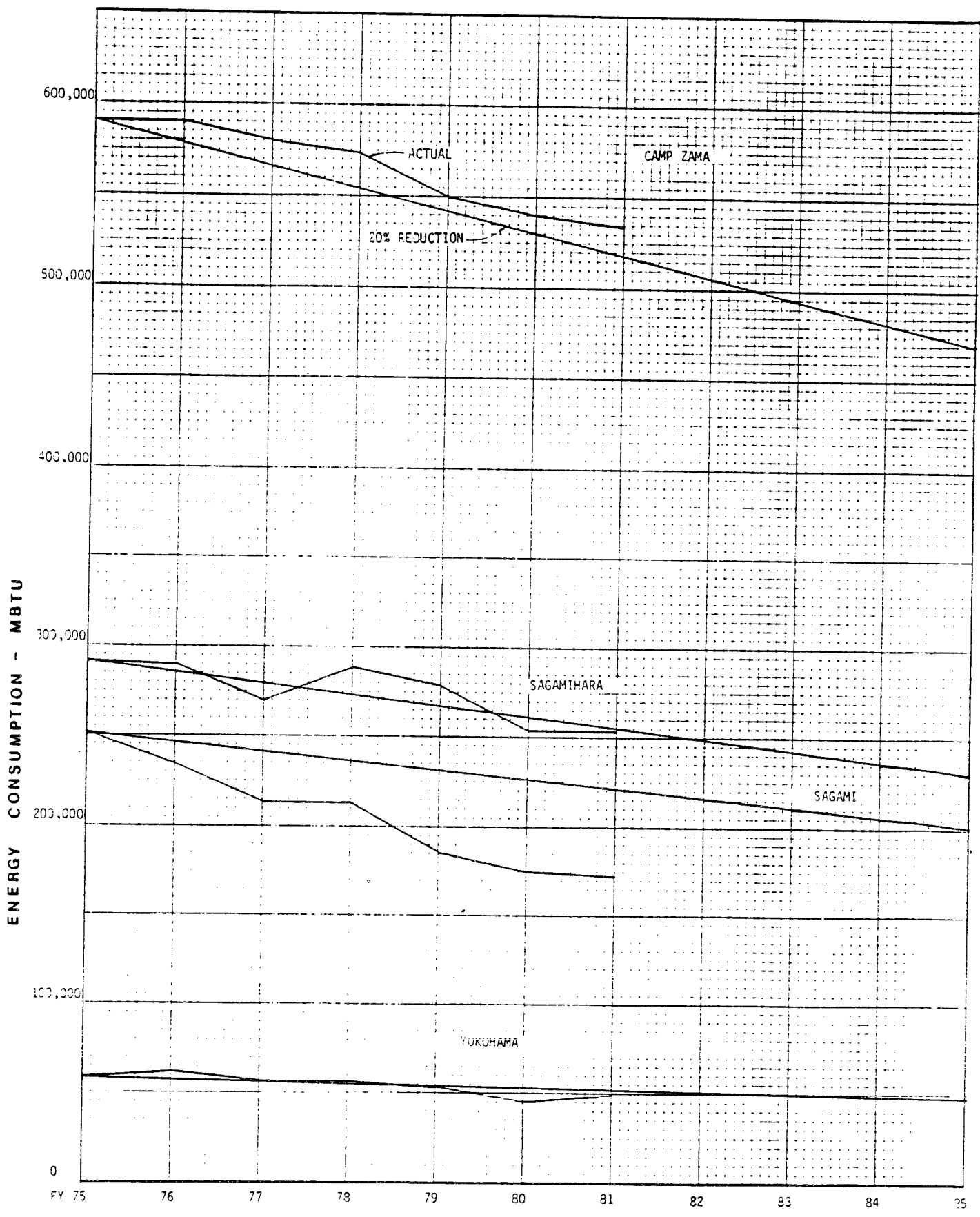
TABLE I

COMPARISON OF ENERGY CONSUMPTION & REDUCTION BY INSTALLATIONS

	<u>FY 75 (MBtu)</u>	<u>FY 81 (MBtu)</u>	<u>% Reduction</u>	<u>FY85 Goal* (MBtu)</u>	<u>Required Reduction (MBtu)</u>
Zama	588,277	531,942	9.6	470,622	61,320
SDHA	292,037	253,079	13.3	233,630	19,449
Sagami	251,363	172,971	31.2	201,090	-28,119
YND	59,151	49,364	16.5	47,321	2,043
TOTAL	1,190,828	1,007,356	15.4	952,663	54,693

\*Based on 20% reduction from FY 75 to FY 85.

From the above tabulation, it can be seen that Sagami has already met its FY 85 target and YND is only 4% away from meeting its target with 4 years remaining. SDHA has reduced its energy consumption over the past 6 years by 13% and thus is slightly ahead of schedule in meeting its target. Camp Zama, the largest energy consumer, has a 10% reduction over the past 6 years and therefore has the most "catching up" to do. (See Figure B.) Collectively, the reduction through FY 81 is 15% as compared to the required 12% to stay even with the schedule.



ENERGY CONSUMPTION BY INSTALLATION

## 2.0 EXISTING ENERGY CONSUMPTION

### 2.1 Source Energy Consumption

The two basic sources of energy consumed are fuel oil (diesel), used primarily for central heating plants, and electric power procured from Tokyo Electric Power Co., Inc. Since FY 75, there has been a steady decline in total energy consumption with fuel oil consumption contributing to most of the reduction. Electric power consumption has remained about the same since FY 75 with annual variations generally attributable to climatic conditions. (See Table II.)

TABLE II

FUEL OIL & ELECTRIC POWER CONSUMPTION

FUEL OIL (GALLON)

	<u>FY 75</u>	<u>FY 79</u>	<u>FY 80</u>	<u>FY 81</u>
Camp Zama	2,403,000	2,226,000	2,138,000	2,022,000
Sagamihara	1,152,000	1,207,000	1,088,000	1,047,000
Sagami Depot	1,363,000	1,002,000	970,000	930,000
Yokohama	262,000	221,000	183,000	204,000
TOTAL	<u>5,180,000</u>	<u>4,656,000</u>	<u>4,379,000</u>	<u>4,203,000</u>

ELECTRIC POWER (KWH)

	<u>FY 75</u>	<u>FY 79</u>	<u>FY 80</u>	<u>FY 81</u>
Camp Zama	19,814,000	20,511,000	20,984,000	21,688,000
Sagamihara	10,307,000	9,577,000	8,880,000	9,301,000
Sagami Depot	4,117,000	4,113,000	3,668,000	3,793,000
Yokohama	1,973,000	1,932,000	1,755,000	1,827,000
TOTAL	<u>36,211,000</u>	<u>36,533,000</u>	<u>35,287,000</u>	<u>36,604,000</u>

During the past 3 fiscal years; i.e., FY 79, 80 and 81, the total energy consumed has dropped each year, but the cost has increased tremendously due to increased energy costs. For example, the cost of fuel oil increased from 45¢/gal. in FY 79 to \$1.37/gal. in FY 81 and electric power increased from 6.1¢/KWH to 11¢/KWH. (See Table III.)

TABLE III

ANNUAL CONSUMPTION & COST

	FUEL OIL			ELECTRIC POWER			Total Cost
	Gals.	Cost/Gal.	Amount	KWH(000)	Cost/KWH	Amount	
<b>ZAMA</b>							
FY79	2,225,350	\$0.449	\$ 999,420	20,911	\$0.061	\$1,275,570	\$2,275,000
FY80	2,136,510	1.29	2,758,800	20,984	0.097	2,035,450	4,794,000
FY81	2,021,850	1.37	2,769,930	21,688	0.11	2,385,680	5,156,000
<b>SDHA</b>							
FY79	1,206,550	\$0.449	\$ 541,740	9,578	\$0.061	\$ 584,260	\$1,126,000
FY80	1,088,150	1.29	1,403,710	8,880	0.097	861,360	2,265,000
FY81	1,046,790	1.37	1,434,100	9,301	0.11	1,023,110	2,457,000
<b>SAGAMI</b>							
FY79	1,002,400	\$0.449	\$ 450,080	4,113	\$0.061	\$ 250,890	\$ 701,000
FY80	970,250	1.29	1,251,620	3,680	0.097	356,960	1,609,000
FY81	930,050	1.37	1,274,170	3,793	0.11	417,230	1,691,000
<b>YND</b>							
FY79	221,450	\$0.449	\$ 99,430	1,932	\$0.061	\$ 117,850	\$ 217,000
FY80	182,560	1.29	235,500	1,755	0.097	170,240	406,000
FY81	203,740	1.37	279,120	1,822	0.11	200,420	480,000

TOTAL ANNUAL COST

	<u>FY79</u>	<u>FY80</u>	<u>FY81</u>
ZAMA	\$2,275,000	\$4,794,000	\$5,156,000
SDHA	1,126,000	2,265,000	2,457,000
SAGAMI	701,000	1,609,000	1,691,000
YND	217,000	406,000	480,000
TOTAL	<u>\$4,319,000</u>	<u>\$9,074,000</u>	<u>\$9,784,000</u>

## 2.2 Building Group Energy Consumption

Source energy consumption by building groups was analyzed to obtain unit consumption rates on gross square footage of building area. Of the major building groups, the family housing has the highest unit consumption followed by BOQ, community facility, and office groups. The storage and maintenance facility groups generally have low unit consumption and therefore, installations with a large proportion of their building area consisting of these industrial type facilities have lower average unit consumption.

Sagamihara DHA has the highest unit consumption of over 240,000 Btu/sq. ft. of gross building area due to the predominance of the family housing group. Camp Zama, with over 210,000 Btu/sq. ft. energy consumption is the second highest, also due to the predominance of high energy consuming building groups. Sagami Depot and Yokohama ND both have low unit consumptions of 50,000 and 75,000 Btu/sq. ft., respectively, due to the predominance of industrial facilities. Tables IV-A & B show the source energy consumptions for each installation.

Building energy consumption; i.e., usable energy at the building, was also analyzed by building groups to determine unit consumption rates, which does not take into consideration the energy conversion and transmission losses as well as non-building uses of energy. This unit consumption rate thus reflects the estimated energy usage based on operating conditions and physical characteristics of the buildings. Tables V-A & B show the building energy consumed by various building groups as well as the average unit consumption rate for the total base.

TABLE IV-A  
SOURCE ENERGY CONSUMPTION

CAMP ZAMA

	FUEL OIL (MBTU)			ELECTRICITY (MBTU)				GRAND TOTAL	GROSS AREA(sf)	BTU/sf
	SPACE HTG.	WATER HTG.	TOTAL	LIGHTING	COOLING	OTHER	TOTAL			
<u>BLDG.</u>										
Office	42,640	9,880	52,520	22,650	23,165	22,040	67,855	120,375	578,132	208,210
Comm. Facil.	35,440	21,120	56,560	13,525	10,125	8,595	32,245	88,805	372,504	238,400
School	6,910	6,250	13,160	3,190	370	960	4,520	17,680	92,535	191,060
BOQ	46,170	30,840	77,010	12,380	3,190	14,115	29,685	106,695	448,227	238,040
Storage	5,290	-	5,290	2,120	140	-	2,260	7,550	188,456	40,060
Maint.	9,570	360	9,930	4,700	220	-	4,920	14,850	125,656	118,180
Other	5,070	2,850	7,920	3,480	9,755	3,550	16,785	24,705	99,212	249,010
Fam. Hsg.	<u>38,600</u>	<u>12,220</u>	<u>50,820</u>	<u>3,955</u>	<u>6,935</u>	<u>40,950</u>	<u>51,840</u>	<u>102,660</u>	<u>333,344</u>	<u>307,970</u>
Sub-Total	189,690	83,520	273,210	66,000	53,900	90,210	210,110	483,320	2,238,066	215,950
Laundry			24,960				-	24,960		
Boiler Plt.							10,460	10,460		
Utilities							13,090	13,080		
Ext. Ltg.							<u>9,930</u>	<u>9,930</u>		
Sub-Total			24,960				<u>33,480</u>	<u>58,440</u>		
TOTAL			298,170				243,590	541,760		

SAGAMIHARA DHA

	FUEL OIL (MBTU)			ELECTRICITY (MBTU)				GRAND TOTAL	GROSS AREA(sf)	BTU/sf
	SPACE HTG.	WATER HTG.	TOTAL	LIGHTING	COOLING	OTHER	TOTAL			
<u>BLDG.</u>										
Office	-	-	-	-	-	-	-	-	-	-
Comm. Facil.	4,850	770	5,620	2,900	680	5,500	9,080	14,700	90,800	161,890
School	4,960	560	5,520	2,010	100	-	2,110	7,630	62,987	121,140
BOQ	1,030	500	1,530	130	-	380	510	2,040	12,237	166,710
Storage	350	-	350	350	-	5,970	6,320	6,670	65,756	96,110
Maint.	-	-	-	-	-	-	-	-	-	-
Other	170	-	170	30	170	-	200	370	4,048	91,400
Fam. Hsg.	<u>79,490</u>	<u>58,230</u>	<u>137,720</u>	<u>8,360</u>	<u>13,410</u>	<u>58,580</u>	<u>80,350</u>	<u>218,070</u>	<u>789,246</u>	<u>276,300</u>
Sub-Total	90,850	60,060	150,910	13,780	14,360	70,430	98,570	249,480	1,025,083	243,380
Laundry										
Boiler Plt.							5,130			
Utilities							2,000			
Ext. Ltg.							<u>2,170</u>			
Sub-Total							<u>9,300</u>	<u>9,300</u>		
TOTAL			150,910				107,870	258,780		

TABLE IV-B  
SOURCE ENERGY CONSUMPTION  
SAGAMI DEPOT

	FUEL OIL (MBTU)			ELECTRICITY (MBTU)				GRAND TOTAL	GROSS AREA(sf)	BTU/sf
	SPACE HTG.	WATER HTG.	TOTAL	LIGHTING	COOLING	OTHER	TOTAL			
<u>BLDG.</u>										
Office	12,970	930	13,900	6,320	1,120	-	7,440	21,340	179,348	118,990
Comm. Facil.	5,250	930	6,180	1,160	1,020	580	2,760	8,940	97,492	91,700
School	-	-	-	-	-	-	-	-	-	-
BOQ	1,320	620	1,940	130	-	480	610	2,550	13,196	193,240
Storage	8,600	-	8,600	1,700	100	-	1,800	10,400	1,457,894	7,130
Maint.	32,890	930	33,820	10,980	610	-	11,590	45,410	767,038	59,200
Other	-	-	-	240	410	-	650	650	20,474	31,750
Fam. Hsg.	17,470	9,480	26,950	1,460	2,140	10,260	13,860	40,810	121,177	336,780
Sub-Total	78,500	12,890	91,390	21,990	5,400	11,320	38,710	130,100	2,656,619	48,970
Indust. Use			39,790				-	39,790		
Boiler Plt.			-				1,900	1,900		
Utilities							1,970	1,970		
Ext. Ltg.							5,300	5,300		
Sub-Total			39,790				9,170	48,960		
TOTAL			131,180				47,880	179,060		

YOKOHAMA N. D.

	FUEL OIL (MBTU)			ELECTRICITY (MBTU)				GRAND TOTAL	GROSS AREA(sf)	BTU/sf
	SPACE HTG.	WATER HTG.	TOTAL	LIGHTING	COOLING	OTHER	TOTAL			
<u>BLDG.</u>										
Office	11,430	4,830	16,260	4,510	1,390	1,000	6,900	23,160	121,491	190,630
Comm. Facil.	570	2,030	2,600	200	10	-	210	2,810	15,903	176,700
School	-	-	-	-	-	-	-	-	-	-
BOQ	-	-	-	-	-	-	-	-	-	-
Storage	1,190	-	1,190	1,960	110	-	2,070	3,260	314,851	10,350
Maint.	2,860	-	2,860	5,780	-	1,520	7,300	10,160	92,998	109,250
Other	890	660	1,550	130	360	540	1,030	2,580	9,572	269,540
Fam. Hsg.	-	-	-	-	-	-	-	-	-	-
Sub-Total	16,940	7,520	24,460	12,580	1,870	3,060	17,510	41,970	554,815	75,650
Laundry							-			
Boiler Plt.							540			
Utilities							580			
Ext. Ltg.							2,240			
Sub-Total							3,360	3,360		
TOTAL							20,870	45,330		

TABLE V-A  
BUILDING ENERGY CONSUMPTION  
CAMP ZAMA

BLDG.	FUEL OIL (MBTU)			ELECTRICITY (MBTU)				GRAND TOTAL	GROSS AREA (sf)	BTU/sf
	SPACE HTG.	WATER HTG.	TOTAL	LIGHTING	COOLING	OTHER	TOTAL			
Office	29,500	5,640	35,140	6,665	6,816	6,485	19,966	55,106	578,132	95,300
Comm. Facil.	21,800	8,955	30,755	3,979	2,980	2,529	9,488	40,243	372,504	108,030
School	4,250	2,650	6,900	938	109	283	1,330	8,230	92,535	88,940
BOQ	28,530	13,325	41,855	3,642	938	4,153	8,733	50,588	448,227	112,860
Storage	3,250	-	3,250	624	41	-	665	3,915	188,456	20,770
Maint.	6,190	155	6,345	1,382	65	-	1,447	7,792	125,656	62,010
Other	3,160	1,210	4,370	1,024	2,870	1,044	4,938	9,308	99,212	93,820
Fam. Hsg.	23,170	5,144	28,314	1,164	2,041	12,048	15,253	43,567	333,344	130,700
Sub-Total	119,850	37,079	156,929	19,418	15,860	26,542	61,820	218,749	2,238,066	97,740
Laundry			12,610				-	12,610		
Boiler Plt.							3,078	3,078		
Utilities							3,850	3,850		
Ext. Ltg.							2,921	2,921		
Sub-Total			12,610				9,849	22,459		
TOTAL			169,539				71,669	241,208		

SAGAMIHARA DHA

BLDG.	FUEL OIL (MBTU)			ELECTRICITY (MBTU)				GRAND TOTAL	GROSS AREA (sf)	BTU/sf
	SPACE HTG.	WATER HTG.	TOTAL	LIGHTING	COOLING	OTHER	TOTAL			
Office	-	-	-	-	-	-	-	-	-	-
Comm. Facil.	2,770	290	3,060	850	200	1,620	2,670	5,730	90,800	63,100
School	2,830	210	3,040	590	30	-	620	3,660	62,987	58,100
BOQ	590	190	780	40	-	110	150	930	12,237	76,000
Storage	200	-	200	100	-	1,750	1,850	2,050	65,756	31,200
Maint.	-	-	-	-	-	-	-	-	-	-
Other	100	-	100	10	50	-	60	160	4,048	39,530
Fam. Hsg.	45,350	21,930	67,280	2,460	3,950	17,240	23,650	90,930	789,246	115,210
Sub-Total	51,840	22,620	74,460	4,050	4,230	20,720	29,000	103,460	1,025,083	100,900
Laundry							-			
Boiler Plt.							1,500			
Utilities							590			
Ext. Ltg.							640			
Sub-Total							2,740	2,740		
TOTAL							31,740	106,200		

TABLE V-8  
BUILDING ENERGY CONSUMPTION  
SAGAMI DEPOT

	FUEL OIL (MBTU)			ELECTRICITY (MBTU)				GRAND TOTAL	GROSS AREA(sf)	BTU/sf
	SPACE HTG.	WATER HTG.	TOTAL	LIGHTING	COOLING	OTHER	TOTAL			
<u>BLDG.</u>										
Office	5,610	300	5,910	1,860	330	-	2,190	8,100	179,348	45,160
Comm. Facil.	2,270	300	2,570	340	300	170	810	3,380	97,492	34,670
School	-	-	-	-	-	-	-	-	-	-
BOQ	570	200	770	40	-	140	180	950	13,196	71,990
Storage	3,720	-	3,720	500	30	-	530	4,250	1,457,894	2,910
Maint.	14,100	300	14,400	3,230	180	-	3,410	17,810	767,038	23,090
Other	130	-	130	70	120	-	190	320	20,474	15,630
Fam. Hsg.	7,560	3,050	10,610	430	630	3,020	4,080	14,690	121,177	121,230
Sub-Total	33,960	4,150	38,110	6,470	1,590	3,330	11,390	49,500	2,656,619	18,630
Indust. Use			12,800				-	12,800		
Boiler Plt.			-				560	560		
Utilities			-				580	580		
Ext. Ltg.			-				1,560	1,560		
Sub-Total			12,800				2,700	15,500		
TOTAL			50,910				14,090	65,000		

YOKOHAMA N. D.

	FUEL OIL (MBTU)			ELECTRICITY (MBTU)				GRAND TOTAL	GROSS AREA(sf)	BTU/sf
	SPACE HTG.	WATER HTG.	TOTAL	LIGHTING	COOLING	OTHER	TOTAL			
<u>BLDG.</u>										
Office	7,190	2,850	10,040	1,320	410	290	2,020	12,060	121,491	99,270
Comm. Facil.	360	1,200	1,560	60	-	-	60	1,620	15,903	101,870
School	-	-	-	-	-	-	-	-	-	-
BOQ	-	-	-	-	-	-	-	-	-	-
Storage	750	-	750	580	30	-	610	1,360	314,851	4,320
Maint.	1,800	-	1,800	1,700	-	450	2,150	3,750	92,998	42,470
Other	560	390	950	40	110	160	310	1,260	9,572	131,630
Fam. Hsg.	-	-	-	-	-	-	-	-	-	-
Sub-Total	10,660	4,440	15,100	3,700	550	900	5,150	20,250	554,815	36,500
Laundry							-			
Boiler Plt.							160			
Utilities							170			
Ext. Ltg.							660			
Sub-Total							990	990		
TOTAL							6,140	21,240		

### 3.0 ENERGY CONSERVATION MEASURES DEVELOPED

The four study bases, not unlike most military installations, contain a mixture of a few relatively new buildings sprinkled amongst many older buildings, some of which are pre-WWII construction. The following highlights the general physical condition of the facilities and energy systems together with operating policies that can influence energy consumption.

1. Structures are mostly old, semi-permanent type with very few buildings provided with insulation.
2. All windows are operable types usually double-hung wood or sliding steel.
3. Most of the heating is provided by steam or hot water produced at oil-fired central boiler plants.
4. Cast-iron radiators with manual control valves are the predominant heating units.
5. Steam or hot water distribution systems have mostly been replaced in recent years.
6. Certain segments of the steam distribution system do not have condensate return lines.
7. Package air conditioning equipment are relatively small units and air-cooled.
8. Many buildings are cooled by privately-owned window A/C units.
9. None of the utility services are metered.

Given the above, it is understandable that energy consumption would be relatively high for the climate zone that these bases are located in.

Although the base engineering and operating staffs have done an

outstanding job of implementing various types of energy reducing measures, the continuing reduction required by the DA, not only to FY 85 but beyond, at an even faster rate, would dictate that basic improvements to building envelopes and energy systems be made for greater energy efficiency. These types of improvements are costly and, therefore, future energy saving measures can be expected to require major capital investments.

Since the primary objective of this study program is to develop a short-range Basewide Energy System Plan to meet the FY 85 energy goal, an attempt has been made to identify and develop retrofits that are cost-effective and readily implementable. For example, it is easy to install ceiling insulation where there is an existing suspended ceiling. However, to insulate a wall is much more difficult, costly and disruptive to the occupants. Therefore, mostly ceiling insulation projects are identified and proposed.

Another basic consideration of the study was to find practical and economical retrofits that would permit USAGH to continue reducing energy consumption in an orderly and planned basis. There are countless numbers of minor energy conservation measures of all types. Many of them are commonly known and described in any energy literature, and most of them would result in varying magnitudes of actual savings. The base personnel should be and are aware of these types of measures and are actively implementing them on a continuing basis.

Table VI summarizes the various energy saving projects identified and analyzed for each installation. Appropriate DD Form 1391s have been prepared and submitted for all projects, including supporting documents.

CAMP ZAMA					SAGAMIHARA				
PROJECT	Fund- ing	E/C	Savings MBTU	Cost (\$000)	PROJECT	Fund- ing	E/C	Savings MBTU	Cost (\$000)
<u>FY82</u>					<u>FY82</u>				
1. Elect. Hot Wtr. Heaters	OMA	96	1,115	12	1. Shower Flow Restrictor (FH)	OMA	51	1,660	33
2. Shower Flow Restrict. BOQ	OMA	83	1,640	20	2. Thermostatic Radiator Valves	OMA	19	380	20
3. Shower Flow Restrict. (FH)	OMA	73	880	12	3. Door Weatherstrip (FH)	OMA	18	1,200	67
4. HHW Temp. Control - BP 134	OMA	30	1,500	51					
5. Door Weatherstrip (FH)	OMA	19	570	29					
6. HHW Temp. Control - Heat Exchg.	OMA	14	1,260	89					
7. Repl. Int. HHW Piping - Bldgs. 101/102	OMA	8	9,000	1,203					
Sub-Total			(15,965)		Sub-Total			(3,240)	
<u>FY83</u>					<u>FY83</u>				
1. Ceiling Insul. (FH) Genls/Sgm Hills	OMA	16	1,250	77	1. HHW Temp. Control - BP134	OMA	37	3,000	81
2. Ceiling Insul. (FH) 900 Blk/Sgm Hill	OMA	8	760	93	2. Zone Temp. Controls	OMA	15	920	60
3. Ceiling Insul. (FH) Chapel Hill	OMA	7	670	93	3. Ceiling Insulation	OMA	6	340	54
4. Repl. Stm. Dist. Sys.	OMA	7	1,200	164					
Sub-Total			(3,880)		Sub-Total			(4,260)	
<u>FY84</u>					<u>FY84</u>				
1. Repl. Street Lights	MMCA	8	975	118	1. Ceiling Insulation (FH)	MCA	12	8,530	736
2. Ceiling Insul.	MMCA	6	2,970	498	2. Replace Street Lights	MMCA	8	870	106
3. Insulation (BOQ's)	MCA	4	2,820	753					
Sub-Total			(6,765)		Sub-Total			(9,400)	
<u>FY85</u>									
1. Remote Zone Temp. Contr. Sys.	ECIP	21	10,440	492					
2. Thermostatic Radiator Valves	ECIP	19	4,200	274					
3. Replace Street Lights	ECIP	15	2,430	160					
4. Heat Pump Hot Wtr. Htrs (FH)	ECIP	15	4,080	280					
5. Remote Elect. Equip. Controls	OMA	13	500	38					
6. Insulation Bldgs. 101/102	MCA	4	3,240	931					
7. Central Refrig. Plt. Bldg. 101/102	MCA	-	1,500	3,606					
Sub-Total			(26,490)						
TOTAL			53,100		TOTAL			16,900	

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TABLE VI  
PROPOSED ENERGY RETROFIT PROJECTS

Savings MBTU	Cost (\$000)	SAGAMI					YOKOHAMA NORTH DOCK		
		PROJECT	Fund- ing	E/C	Savings MBTU	Cost (\$000)	PROJECT	Fund- ing	E/C
1,660	33	<u>FY82</u>					<u>FY82</u>		
380	20	1. Shower Flow Restrictor (FH)	OMA	68	320	5	1. Thermo. Radiator Valve	OMA	33
1,200	67	2. Thermostatic Radiator Valves	OMA	42	1,650	39			
		3. Door Weatherstrip (FH)	OMA	24	260	11			
(3,240)		Sub-Total			(2,230)		Sub-Total		
3,000	81	<u>FY83</u>					<u>FY83</u>		
920	60	1. Zone Temp. Controls	OMA	75	6,730	90	1. Zone Temp. Control	OMA	35
340	54	2. Replace Street Lights	OMA	16	630	38	2. Replace Street Lights	OMA	16
		3. Ceiling Insulation(FH)Blks 80/90	OMA	9	520	56	3. Ceiling Insulation	OMA	7
		4. Repl.Stm.Dist.Sys(FH)Blk 70	OMA	8	1,825	219			
(4,260)		Sub-Total			(9,705)		Sub-Total		
8,530	736	<u>FY84</u>					<u>FY84</u>		
870	106	1. Ceiling Insul. (FH) Blk 70	MMCA	8	1,070	139	1. Suspended Ceiling & Insul-Bldg. 347	OMA	7
		2. Ceiling Insulation	MMCA	7	1,770	245			
(9,400)		Sub-Total			(2,840)		Sub-Total		
							<u>FY85</u>		
							1. Ceiling Insul - Bldg. 200	OMA	5
		Sub-Total					Sub-Total		
6,900		TOTAL			14,775		TOTAL		

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TABLE VI  
PROPOSED ENERGY RETROFIT PROJECTS

Cost (\$000)	YOKOHAMA NORTH DOCK				
	PROJECT	Fund- ing	E/C	Savings MBTU	Cost (\$000)
	<u>FY82</u>				
5 39 11	1. Thermo. Radiator Valve	OMA	33	1,120	34
	Sub-Total			(1,120)	
	<u>FY83</u>				
90	1. Zone Temp. Control	OMA	35	1,655	47
38	2. Replace Street Lights	OMA	16	1,090	67
56 219	3. Ceiling Insulation	OMA	7	310	43
	Sub-Total			(3,055)	
	<u>FY84</u>				
39 45	1. Suspended Ceiling & Insul-Bldg. 347	OMA	7	420	59
	Sub-Total			(420)	
	<u>FY85</u>				
	1. Ceiling Insul. - Bldg. 200	OMA	5	425	80
	Sub-Total			(425)	
	TOTAL			5,020	

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#### 4.0 ENERGY AND COST SAVINGS

##### 4.1 Projected Annual Energy Savings

In addition to the proposed retrofit projects identified from the EEAP study, a tabulation of existing FY 82 funded and unfunded projects, as well as those projects for which funding applications have been submitted, are shown in composite form in Table VII. The breakdown of the projected annual consumption by fuel oil and electric power is shown in Table VIII. Using the energy consumption figures of FY 81 as the base, or beginning point, the annual savings for all existing and proposed projects are taken into consideration and their effects on total consumption developed as projected consumptions for FY 82 through FY 86.

The projected annual consumption for each installation by fiscal year is plotted in Figure C. The projected FY 85 consumption for all 4 installations will be below the 20 percent reduction from FY 75 and also permit the FY 85 goal for USAGH to be met. This will provide flexibility for USAGH in deferring certain projects if demand for other non-energy projects have higher priority.

It should be noted that there are many projects in which E/C ratio is greater than 13, but due to the estimated costs being less than \$100,000, they do not qualify for ECIP funding. These projects have been indicated for OMA funding and programmed for earlier years beginning in FY 82. ECIP projects are all programmed for FY 85 funding since it takes 3 years after approval to obtain these funds.

CAMP ZAMA			SAGAMIHARA C-1A		
	Savings MBTU	Total Con- sumption MBTU		Savings MBTU	Total Con- sumption MBTU
FY81 CONSUMPTION		531,940	FY81 CONSUMPTION		253,080
• Projects Completed in FY81 Exist. FY81 Proj.	836		• Projects completed in FY81	--	
PROJECTED FY82 CONSUMPTION		531,110	PROJECTED FY82 CONSUMPTION		253,080
• Projects Completed in FY82 Exist. FY81 Proj.	800		• Projects Completed in FY82 Exist. FY81 Proj.	1,750	
Funded FY82	3,730		Proposed " "	3,240	
Proposed " "	4,205				
TOTAL SAVINGS	8,735		TOTAL SAVINGS	4,990	
PROJECTED FY83 CONSUMPTION		522,375	PROJECTED FY83 CONSUMPTION		248,090
• Projects Completed in FY83 Funded FY82 Proj.	2,600		• Projects Completed in FY83 Unfunded FY82 Proj.	4,000	
Unfunded " "	9,000		Proposed FY83 " "	4,260	
Proposed FY83 " "	3,880				
TOTAL SAVINGS	15,480		TOTAL SAVINGS	8,260	
PROJECTED FY84 CONSUMPTION		506,895	PROJECTED FY84 CONSUMPTION		239,830
• Projects Completed in FY84 Unfunded FY84 Proj.	5,450		• Projects Completed in FY84 Unfunded FY83 Proj.	21,700	
Proposed " "	6,765		Proposed FY84	9,400	
TOTAL SAVINGS	12,215		TOTAL SAVINGS	31,100	
PROJECTED FY85 CONSUMPTION		494,680	PROJECTED FY85 CONSUMPTION		208,730
• Projects Completed in FY85 Proposed FY85 ECIP Proj.	21,150				
" " Proj.	5,340				
TOTAL SAVINGS	26,490				
PROJECTED FY86 CONSUMPTION		468,190			

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TABLE VII  
PROJECTED ANNUAL ENERGY CONSUMPTION

	SAGAMI DEPOT		YOKOHAMA NO. DOCK	
	Savings MBTU	Total Con- sumption MBTU	Savings MBTU	Total Con- sumption MBTU
FY81 CONSUMPTION		172,970	FY81 CONSUMPTION	49,360
• Projects Completed in FY81	--		• Projects Completed in FY81	--
PROJECTED FY82 CONSUMPTION		172,970	PROJECTED FY82 CONSUMPTION	49,360
• Projects Completed in FY82			• Projects Completed in FY82	
Funded FY81 Proj.	390		Funded FY82 Proj.	80
Funded FY82 "	3,060		Proposed FY82 "	1,120
Proposed FY82 "	2,230			
TOTAL SAVINGS	5,680		TOTAL SAVINGS	1,200
PROJECTED FY83 CONSUMPTION		167,290	PROJECTED FY83 CONSUMPTION	48,160
• Projects Completed in FY83			• Projects Completed in FY83	
Proposed FY83 Proj.	9,705		Proposed FY83	3,055
PROJECTED FY84 CONSUMPTION		157,585	PROJECTED FY84 CONSUMPTION	45,105
• Projects Completed in FY84			• Projects Completed in FY84	
Unfunded FY84 Proj.	4,825		Proposed FY84 Proj.	420
Proposed FY84 "	2,840			
TOTAL SAVINGS	7,665			
PROJECTED FY85 CONSUMPTION		149,920	PROJECTED FY85 CONSUMPTION	44,685
			• Projects Completed in FY85	
			Proposed FY85 Proj.	425
			PROJECTED FY86 CONSUMPTION	44,260

(2)

TABLE VII  
PROJECTED ANNUAL ENERGY CONSUMPTION

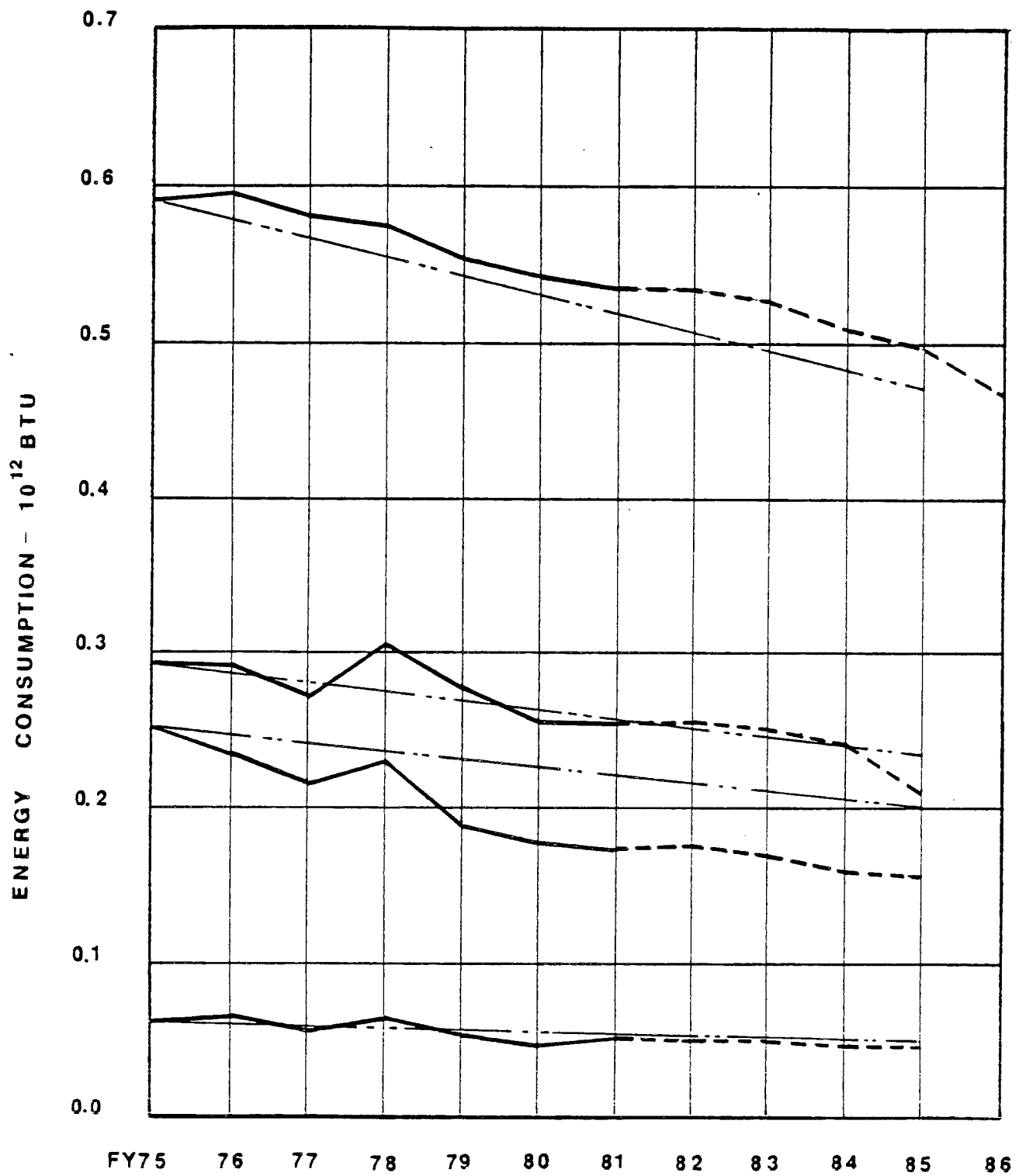
YOKOHAMA NO. DOCK		Total Consumption MBTU	Total Consumption Four Installations MBTU
CONSUMPTION		49,360	1,007,350
Projects Completed in FY81		--	
TED FY82 CONSUMPTION		49,360	1,006,520
Projects Completed in FY82			
ted FY82 Proj.	80		
osed FY82 "	<u>1,120</u>		
TOTAL SAVINGS		1,200	
TED FY83 CONSUMPTION		48,160	985,915
Projects Completed in FY83			
osed FY83	3,055		
TED FY84 CONSUMPTION		45,105	949,415
Projects Completed in FY84			
osed FY84 Proj.	420		
TED FY85 CONSUMPTION		44,685	892,015
Projects Completed in FY85			
osed FY85 Proj.	425		
TED FY86 CONSUMPTION		44,260	871,100

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TABLE VIII

PROJECTED ANNUAL CONSUMPTION FOR FUEL OIL & ELECTRIC POWER (Mbtu)

	FY81	FY82	FY83	FY84	FY85	FY86
<b>ZAMA</b>						
Fuel Oil	280,450	279,620	271,135	257,095	246,335	229,740
Elect.	251,580	251,580	251,330	250,170	248,715	238,820
Total	532,030	531,200	522,465	507,265	495,050	468,560
<b>SDHA</b>						
Fuel Oil	145,220	145,220	140,230	132,015	102,655	102,655
Elect.	107,890	107,890	107,890	107,845	106,105	106,105
Total	253,110	253,110	248,120	239,800	208,760	208,760
<b>SAGAMI</b>						
Fuel Oil	128,990	128,990	123,310	114,275	111,690	111,690
Elect.	44,000	44,000	44,000	43,330	43,075	43,075
Total	172,990	172,990	167,310	157,605	154,765	154,765
<b>YND</b>						
Fuel Oil	28,290	28,290	27,170	25,230	24,910	24,560
Elect.	21,140	21,140	21,140	20,025	19,925	19,850
Total	49,430	49,430	48,310	45,255	44,835	44,410
<b>TOTAL</b>						
Fuel Oil	582,950	582,120	561,845	528,615	485,590	468,645
Elect.	424,610	424,610	424,360	421,370	417,820	407,850
Total	1,007,560	1,006,730	986,205	949,985	903,410	876,495



LEGEND

— PAST CONSUMPTION  
 - - - PROJECTED " "  
 - · - · 20% REDUCTION

PAST & PROJECTED ENERGY  
CONSUMPTION BY INSTALLATION

## 4.2 Projected Cost Savings

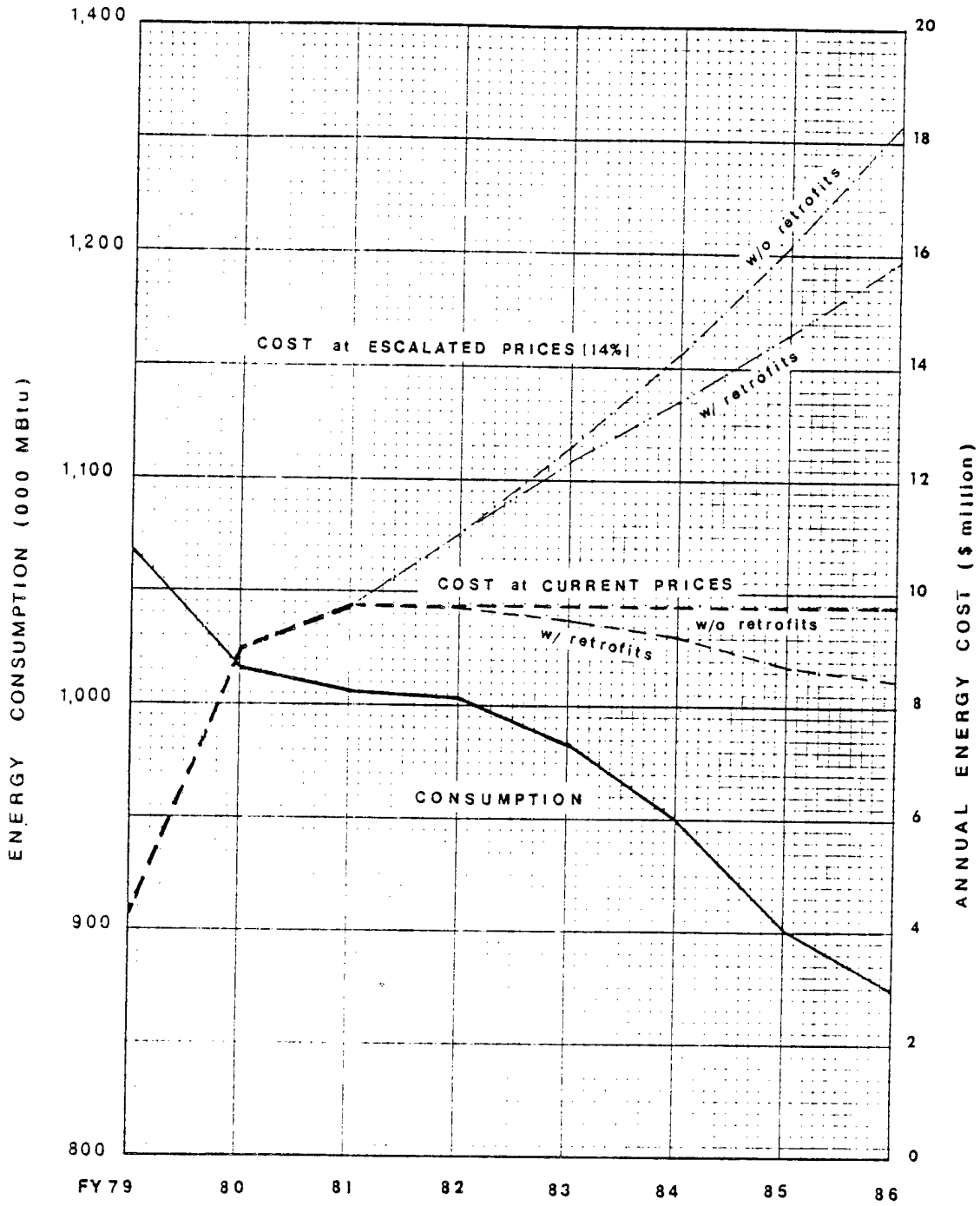
Although energy consumptions have been reduced since FY 75, energy cost has continuously increased due to increasing rates of energy cost. With a projected reduction in energy consumption of approximately 10 percent between FY 81 and FY 85, the energy cost savings would be approximately \$1-million assuming constant energy cost rates. This reduction in energy consumption is approximately 2.5 percent per year so any annual increase in energy cost rates greater than this amount would naturally result in increased total cost of energy. Figure D graphically portrays the range of projected energy costs between constant rates and increasing rates at 14 percent per year.

If all energy retrofit projects were implemented as shown on Table VI, the annual energy savings using FY 81 as the base are shown in Table IX.

TABLE IX

ANNUAL ENERGY COST SAVINGS

	Fuel Oil		Electric		Total Cost	Savings (From FY81)
	Annual Consumption (MBTU)	Annual Cost	Annual Consumption (MBTU)	Annual Cost		
FY 81	582,950	\$5,758,000	424,610	\$4,026,000	\$9,784,000	
FY 82	582,120	5,750,000	424,610	4,026,000	9,776,000	\$ 8,000
FY 83	561,845	5,550,000	424,360	4,024,000	9,574,000	210,000
FY 84	528,615	5,221,000	421,370	3,996,000	9,217,000	567,000
FY 85	485,590	4,796,000	417,820	3,962,000	8,758,000	1,026,000



PROJECTED ENERGY CONSUMPTION AND COSTS

FIGURE D

## 5.0 PAST ENERGY CONSERVATION MEASURES

Past energy conservation efforts by USAGH have obviously been effective in reducing energy consumption to a level which nearly matches the 1985 goal. These efforts have been accomplished basically in two areas, first by the cooperation of the resident and non-resident population of the installations and second, by the various energy conservation measures implemented to date.

As part of the energy conservation program, USAGH has adopted and followed the policies, responsibilities, and procedures for conservation of energy as prescribed in the USAGH Regulation No. 420-44. This regulation is supplemented by USAGH Pamphlet No. 420-44-1 and No. 420-44-2 entitled, "Fuel & Utilities Conservation in Living Quarters" and "Fuel & Utilities Conservation," respectively.

Various energy conservation measures have been implemented since FY 75 which have contributed immeasurably to overall energy reduction. Table X lists the energy conservation projects implemented and/or funded through FY 82 with the dollar value of these projects by installation, as follows:

o Camp Zama	\$2,607,000
o Sagamihara DHA	\$2,731,000
o Sagami General Depot	\$1,046,000
o Yokohama No. Dock	\$1,080,000

As can be seen from Table X, the large expenditures have been in repair/replacement of distribution system piping.

CAMP ZAMA		Cost (\$000)	SAGAMIHARA		Cost (\$000)
<u>FY75</u>	Upgrade BPS 501&1028	2	Repl. 5 oil burners BP 134	58	
	Repl. hot water generator Bldg. 9750	2	Rebrick boilers & smoke flues BP 134	18	
	Repl. Stm.Distr.Sys. P-1 thru P-4	6	Repl. atm drum insul. & con. FW sys. BP 134	2	
			Repl. pumps & compression BP 134	10	
<u>FY76</u>	Repl. 2 Kewanee boilers - BP 350	52	Repair combustion chambers BP 134	4	
	Repair pkg. boilers BP 350	3			
	Repl. HHW & DHW distr. sys.	216			
	Rebrick boilers - BP 350	22			
	Adjust fuel burning equip.-all BPs	4			
	Interconnect BP 950&350	45			
<u>FY77</u>	Alter equip. BP 1024	35	Repair windows 67 FHU	185	
	Repair refractory lining-incinerator	7	Repair steam traps BP 134	3	
	Repair & modify stm.piping BP 350	6	Repair arch & front wall of #3 boiler	19	
			Repair motor controls BP 134	27	
<u>FY78</u>	Install cont.blow-down sys.	2	Repair int. htg. piping Bldgs 200,400&600	230	
	Repair heat exchangers-264,377&430	133	Repair combustion chamber of #4 boiler	19	
	Repair windows - 54 FHU-Bldg 900	138	Replace HHW distr. sys.-front gate area	201	
	Replace condensate tank BP 350	15	" " " " -back gate area	247	
	Repair windows Bldg. 1086	2	" " " " -control area	220	
	Repair smoke stack BP 1028	3	Replace radiators Bldg. 529	16	
	Repair feedwater sys. BP 350	9	Repair combustion chambers BP 134	8	
<u>FY79</u>	Replace hot water generators - 12 80Q's	225	Repair int.htg.piping of FHU-front gate area	310	
	Interconnect BP 771&350	15	" " " " " Central area	211	
	Repair boiler equip. BP 350	44	Repair weather meter assembly BP 134	8	
	Repair 5 FW motor valves	1	Install corrosion control sys. on DHW sys.	18	
<u>FY80</u>	Repair stm.& HHW distr.sys.	328	Replace elect. sys. - BP 134	54	
	Replace steam traps - Laundry/Dry Clnng Plt.	-	Repair comb. chamber BP 134	5	
	Install thermostatic radiator valves	-			
	Repair comb.chamber & boiler tubes BP 350	7			
	Repair boiler BP 1024	3			
	Replace DHW distr. sys. - SGM Hill area	22			
	Replace smoke stack BP 501	4			
<u>FY81</u>	Install new boiler BP 1028	80	Replace chemical feeders BP 134	10	
	Install warm-air furnace - 128 FHU	-			
	Replace chemical feeders BP 134&350	17			
	Repair stm.htg.sys. Bldg. 201	51			
	Chemical cleaning of pkg. boilers	16			
<u>FY82</u>	Replace windows - 91 FHU Chapel Hill	335	Replace HHW/DHW bldg. service valves	106	
	" " 24 FHU SGM Hill	50	Replace int.HHW/DHW piping (non-FH bldgs.)	50	
	Repl.insul.on Bldg.breeching & heat Xchgrs	27			
	Alter Bldg. 202	17			
	Alter/repair Bldg. 322	67			
	Replace fuel oil tank - Gen. Plt. 133	8			
	Repair HHW & DHW distr.sys.	350			
	Alter/repair Commissary Annex Bldg. 680	105			
	Alter/repair Bldg. 315	124			
<u>FY83</u>			Replace windows 40 FHU Area "F"	278	
			" " 56 " Area "G"	414	

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TABLE X

## PAST ENERGY RETROFIT PROJECTS

Fisc. Yr.	SAGAMI		YOKOHAMA N.D.	
	Description	Cost (\$000)	Description	Cost (\$000)
88			Interconn. BP 308 & 324	5
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## 6.0 ENERGY MANAGEMENT PLAN

The FY 85 energy goal for USAGH is established for all installations under this command of which these four study installations are part thereof. Consequently, there are no official separate energy goals established for individual installations. However, with the 4 study installations representing over 90% of the total energy consumption for USAGH, its FY 85 goal should be readily attainable by implementing the energy conservation measures identified under this study. Sufficient projects have been developed to permit each installation to exceed its 20% reduction from FY 85 to FY 85 (FY 86 for Camp Zama). However, it should be emphasized that the official goal is established for all USAGH installations collectively and that cost-effectiveness should be the primary criterion in establishing priorities.

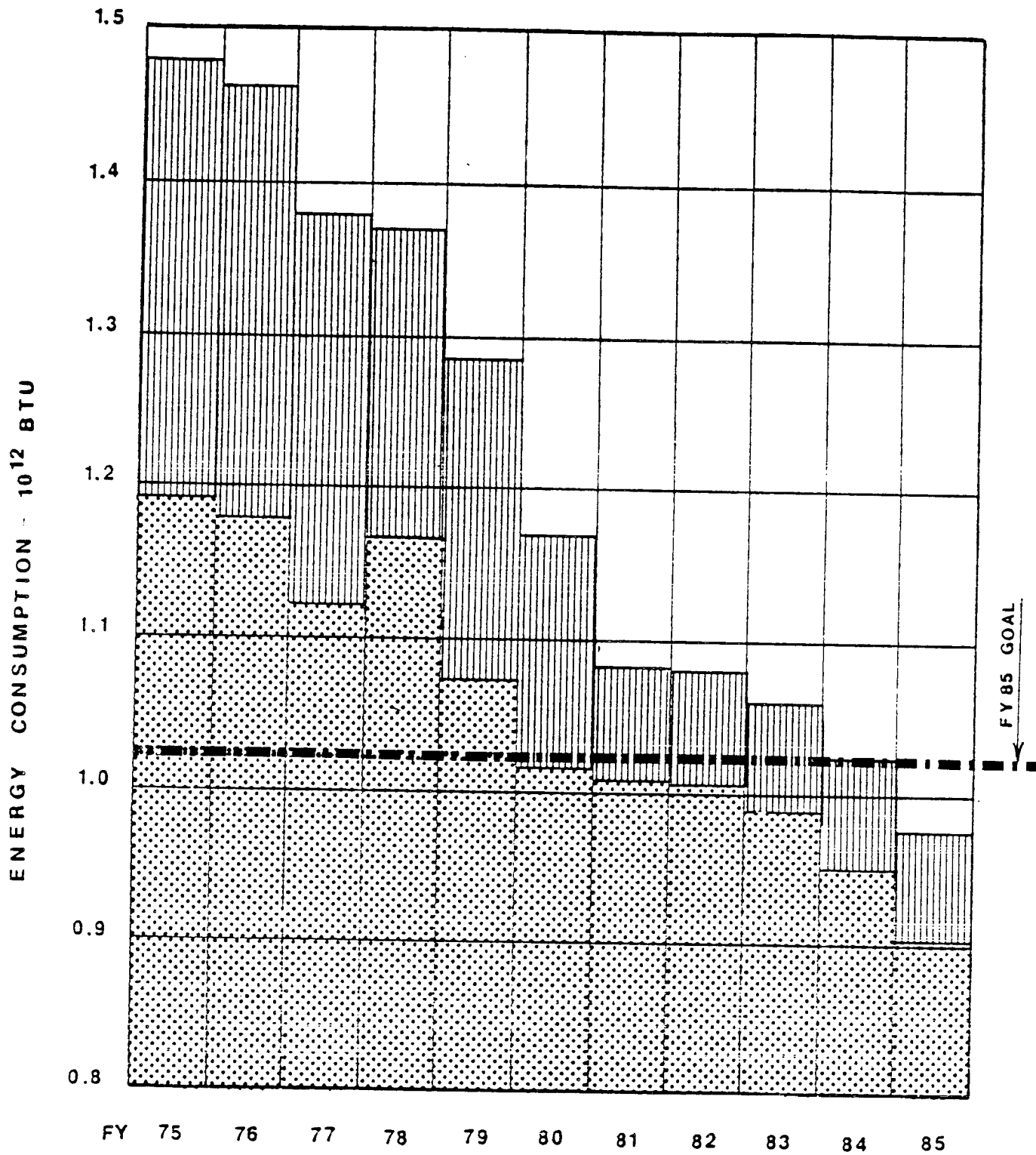
A year-by-year results of implementing current and proposed projects for each installation are shown in Table VII with the resulting projected energy consumption for each fiscal year up to and including FY 86. For Camp Zama, since the ECIP projects can be implemented in FY 85 at the earliest, the resulting impact on energy consumption is necessarily reflected in FY 86.

To reach the 20% reduction for these four installations collectively, a reduction of some 55,000 MBtu from FY 81 is required. The programmed projects, including existing funded projects as well as planned unfunded projects, are projected to reduce energy consumption by over 100,000 MBtu for FY 85 and by some 125,000 MBtu for FY 86 when the ECIP projects are completed at Camp Zama.



As previously stated, the current USAGH goal for FY 85 is  $1.02 \times 10^{12}$  Btu. Assuming that the rest of the installations, other than the 4 study bases, have a constant annual energy consumption of  $0.73 \times 10^{12}$  Btu through FY 85, then the FY 85 goal for USAGH can be met with the implementation of the proposed retrofit projects as shown in Figure E.

The projected USAGH consumption for FY 85 is  $.98 \times 10^{12}$  Btu which is  $.04 \times 10^{12}$  below the goal of  $1.02 \times 10^{12}$  Btu. This difference represents approximately 4% of the total consumption which is not a significant amount given the variations in annual climatic conditions and other factors influencing energy consumption. Therefore, concurrent with these proposed retrofit projects, current management actions need to be vigorously pursued in the future as well as the continued implementation of no cost/low cost actions by base personnel. Central to successfully reducing future energy consumption would be the continued cooperation of resident and non-resident population in energy conservation, all as described in the Energy Management Plan report.

Various forms of energy conservation opportunities (ECO) were identified and analyzed for cost-effectiveness including both small and large retrofit projects as shown in Table VI. Small projects that are low in cost with relatively high energy savings and can be implemented immediately should be given top priority. Examples of this type of project is the installation of flow restrictors on shower heads and electric water heaters to replace certain heat exchangers served by a relatively long steam line.



LEGEND

-  Other USAGH Bases
-  4 Study Bases

PAST & PROJECTED  
ENERGY CONSUMPTION

FIGURE E

However, to realize energy reductions that will make a measurable impact on overall energy consumption, those projects with potential for significant savings should also be given high priority. This type of project would include the improvement of building envelope with ceiling insulation and the control of indoor temperatures in buildings during unoccupied hours.

Buildings with suspended ceilings that are easy to install insulation should be given top priority. Although these projects may or may not have an E/C ratio of 13, they can be quickly done once funding is authorized with benefits accruing immediately.

Most non-residential buildings are occupied during normal working hours for 5 days a week which represents only one-third of the total time. The remaining two-thirds of the time which is unoccupied does not require the normal heating. However, with no means of controlling the heating system, heating continues for 24 hours every day which results in a tremendous amount of wasted energy.

Generally, daytime heating with internal heat gain from lighting, people and solar loads plus the warmer daytime temperature consumes only 25% of the all-day heating load. By setting back the indoor temperature during unoccupied periods, heating loads can be reduced by 40%

The projects have been prioritized in Table VI based generally on the E/C ratio and time required to implement projects. However, each project should be evaluated by taking into consideration various other

factors. Some of these factors would include, but not be limited to, the following:

- Availability of funding
- Need of competing non-energy projects
- Future use of facility
- Planned or future repair/rehabilitation of facility
- Level of energy reduction required to meet Army goal

After completion of each year's programming of projects, the remaining list of retrofit projects should be reviewed and re-prioritized as required.

The past energy conservation program of USAGH has resulted in outstanding results as evidenced by the year-to-year reduction in energy consumption. The proposed retrofit projects identified from this study should provide sufficient energy reduction to meet the FY 85 goal. However, a continuing effort will be required in all areas of energy conservation to ensure that the FY 85 goal can be met even if some of the retrofit projects should be deferred.

The Energy Management Plan is developed to provide a comprehensive program to guide future energy conservation efforts. In addition to the proposed retrofit projects shown in Table VI, various types of management and operations and maintenance initiatives are contained in the Master Energy Management Plan shown in Table XI.

	FY 83	
Management	<ul style="list-style-type: none"> <li>o Continue public informational program.</li> <li>o Continue Honshu Conservation Committee activities including Engineer Energy Think Tank.</li> <li>o Review and update USAGH Reg. 420-44 and USAGH Pam. 420-44-1 and 420-44-2.</li> <li>o Continue monitoring space utilization in facilities and determine if activities can be moved.</li> </ul>	<ul style="list-style-type: none"> <li>o Continue for FY 83</li> </ul>
No Cost/Low Cost	<ul style="list-style-type: none"> <li>o Calibrate thermostats and check setting.</li> <li>o Check temp. setting of hot water heating systems.</li> <li>o Review preventive maint. plan and upgrade as required.</li> <li>o Review boiler plant operations to reduce number of boilers on-line and maximize use of efficient boilers.</li> <li>o Monitor electric energy consumption during winter months for non-conforming use of electric heaters.</li> <li>o Monitor DHW consumption served from major heat exchangers to identify possible leaks and wastage.</li> <li>o Install permanent meters in FH areas and monitor energy consumption.</li> <li>o Install permanent electric meters in high energy consumption buildings and monitor.</li> <li>o Caulk openable windows that are never opened.</li> <li>o Install floor vent covers.</li> </ul>	<ul style="list-style-type: none"> <li>o Conduct oversized replacement</li> <li>o Conduct central B/HW heaters</li> <li>o Investigate achieve to Camp Zama.</li> <li>o Install according to results of</li> <li>o Initiate reduction in consumption</li> </ul>
Retrofit Projects	<ul style="list-style-type: none"> <li>o Undertake FY 83 retrofit projects</li> </ul>	<ul style="list-style-type: none"> <li>o Undertake</li> </ul>

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TABLE XI

MASTER ENERGY MANAGEMENT PLAN

FY 84	FY 85
<p>Continue with management activities outlined FY 83</p>	<ul style="list-style-type: none"> <li>o Continue with management activities outlined FY 83.</li> </ul>
<p>Conduct survey of electric motors to identify oversized motors and inefficient motors requiring replacement.</p> <p>Conduct survey of non-resid. DHW service from central BPs for replacement with individual heaters.</p> <p>Investigate and implement temporary means to save temp. set-back in Bldg. 101 and 102 in Zama.</p> <p>Install addit. meters in FH areas based on needs of installed meters.</p> <p>Initiate remedial measures to reduce electric consumption by high energy consumption bldgs.</p>	<ul style="list-style-type: none"> <li>o Initiate projects to replace electric motors and modify electric driven equip. to improve efficiency.</li> <li>o Initiate projects to install individual hot water heaters.</li> <li>o Conduct study to find alternate means of producing steam for industrial uses in Sagami during winter months.</li> </ul>
<p>Undertake FY 84 retrofit projects</p>	<ul style="list-style-type: none"> <li>o Undertake FY 85 retrofit projects</li> </ul>

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TABLE XI

MASTER ENERGY MANAGEMENT PLAN

FY 85

Continue with management activities outlined for FY 83.

Initiate projects to replace electric motors or retrofit electric driven equip. to improve efficiency.

Initiate projects to install individual hot water heaters.

Conduct study to find alternate means of providing steam for industrial uses in Sagami during summer months.

Retake FY 85 retrofit projects

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