

VOLUME ONE

EXECUTIVE SUMMARY

OF

ENERGY ENGINEERING ANALYSIS PROGRAM (EEAP)

PRESIDIO OF SAN FRANCISCO, CALIFORNIA

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SEPTEMBER 1986

19971017 270



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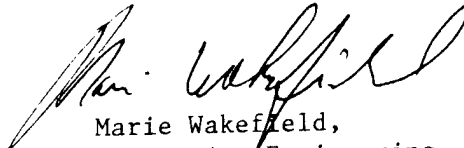

Marie Wakefield,
Librarian Engineering

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ECIP-FHA-1	Weatherstrip Windows - Family Housing
OSD PIF-1	Vent Dampers for Heating Boilers - Family Housing
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OSD PIF-3	Insulate Ductwork - Family Housing
ECIP-FHA-3	Insulate Walls - Family Housing
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LC-1	Secure Steam Line to Building 1818
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LC-10	Waste-Oil-Fired Boiler-Building 135

PURPOSE

This Energy Savings Opportunity Survey (ESOS) study was initiated to supplement prior energy conservation efforts at the Presidio of San Francisco. While previous recommendations concentrated on projects requiring substantial funds for implementation, the thrust of the ESOS is to generate energy projects for all types of funding.

SCOPE OF WORK OUTLINE

- o Review for general information the previously completed Energy Engineering Analysis Program (EEAP) study and any other energy studies which were performed at this installation.
- o Reevaluate selected projects and Energy Conservation Opportunities (ECOs) from the previous studies to determine their economic feasibility based on revised criteria, current site conditions and technical applicability.
- o Evaluate selected ECOs to determine their energy savings potential and economic feasibility.
- o Perform a limited site survey of selected buildings or areas to insure that any new methods of energy conservation which are practical and have not been evaluated in any previous energy study have been considered and the results documented.
- o Summarize and prioritize all energy conservation opportunities and projects from this study and all previous studies for use by the Installation Commander and Director of Engineering and Housing in developing their energy management plans.
- o Provide complete new programming or implementation documentation for all recommended ECOs.
- o Provide recommendations for training of Directorate of Engineering and Housing (DEH) personnel and for replacement of expendable equipment.
- o Prepare a comprehensive report to document the work performed, the results and the recommendations.

REEVALUATION OF PREVIOUSLY IDENTIFIED PROJECTS

A group of nine projects, which were identified as potential energy saving measures but were never implemented, were evaluated in this study. Five of these projects were previously evaluated in the 1979 EEAP.

Of the nine projects, six were found to be currently infeasible. Pertinent economic data for these projects is presented in Table A. The other three ECOs, Wall Insulation for Family Housing, Waste-Oil-Fired Boiler, and Replace Existing Heating Boilers, are feasible. Due to funding regulations, the ECO to Replace Existing Heating Boilers was divided into two projects. Economic data for these feasible projects is summarized in Tables B and C.

Table A

Reevaluation of Previously Identified Projects

Project Title	Energy Savings MBtu	\$	Non-Energy Savings (\$) (Cost)	Total Annual Savings (\$) (Cost)	Construction Cost (\$)	SIR	Simple Payback Period (Yrs)
High-Efficiency Motor Replacement	138	713	-	713	11,800	0.89	16.6
Storm Windows (Per Window)	0.5	3	-	3	225	0.26	75.3
Solar Domestic Hot Water	18.5	111	-	111	8,330	0.26	75.3
Wind Power Electrical Generation	3,005	15,536	(52,000)	(36,464)	1,100,000	(0.34)	-
Solar Space Heating	128.4	770	(350)	420	35,500	0.31	84.8
Replace Existing Water Heaters	7,069	42,414	(12,000)	30,414	1,200,000	0.57	39.6

RECOMMENDED PROJECTS

A site survey was conducted, in selected buildings (Annex B of the Scope of Work), to provide data on which to base our recommendations. Potential energy conservation opportunities (ECOs), found in Annex A of the Scope of Work, were evaluated for the buildings surveyed. While some strides have been made towards achieving the conservation goals of the base, we found further ECOs that are economically feasible. These include savings in such systems as heating, domestic hot water, lighting, electrical distribution, and operations and maintenance.

Following the directions of the scope of work, a few buildings in each group of "typical buildings" were surveyed, and the data thus gathered was extrapolated to include all buildings in that group. Although the ECOs presented in this report are feasible regardless of the magnitude of construction involved, if we underestimate the scope for a project, adequate funds may not be available to complete construction and, alternately, if we overestimate the scope we may be overestimating the potential energy savings. Every effort was made to be conservative with energy savings without underestimating costs. ECOs were then placed into various funding programs following the recommendations of personnel from the Presidio of San Francisco, FORSCOM, and the Sacramento District Corps of Engineers.

For the projects requiring \$3,556,950 in MILCON funds for implementation, yearly savings of 70,625 MBtu of natural gas and 16,342 MBtu of electricity, with annual cost savings amounting to \$506,072 may be realized. A summary of the savings from each of these ECOs is presented in Table B.

Low Cost/No Cost projects that are within the funding jurisdiction of the installation can produce annual savings of 3,275 MBtu of natural gas and 3,876 MBtu of electricity or annual cost savings of \$29,809. These projects are summarized in Table C.

EQUIPMENT REPLACEMENT

Guidelines for replacement of debilitated equipment with higher efficiency models has been included.

Pulse ignition fired water heating boilers and forced air furnaces can achieve energy savings by operating more efficiently than conventional heating equipment can. While these products have limited availability at the present time, we recommend their use when applicable.

Electric motors should be replaced with high efficiency models suited for the intended duty. High efficiency motors are readily available from a number of manufacturers.

Lighting is another area where the use of high efficiency replacement equipment is recommended. The application of fluorescent lamps which fit standard incandescent sockets is recommended as an energy saving measure.

Table B

Summary of Energy Conservation Opportunities Funded Projects

Project Number	Project Title	Annual Energy Savings		Total Savings (MBtu)	Annual Savings (\$)	Construction Cost (\$)	Savings Investment Ratio	Simple Pay-Back (Years)	Cost Breakdown	
		Natural Gas (MBtu)	Electricity (MBtu)						Material (\$)	Labor (Hours)
QRIP-1	Insulate Water Heaters - Family Housing	816	-	816	4,896	8,650	5.37	1.8	1,345	175
QRIP-2	Caulk Foundation Joints - Family Housing	663	-	663	3,978	7,800	4.84	2.0	1,680	145
ECIP-FHA-1	Weatherstrip Windows-Family Housing	14,655	-	14,655	87,930	484,500	3.52	5.5	72,310	9,790
OSD PIF-1	Vent Dampers for Heating Boilers-Family Housing	7,317	-	7,317	43,260	126,100	3.30	2.9	42,300	1,995
PECIP-1	Insulate Water Heaters	217	-	217	1,302	4,300	3.14	3.3	665	90
OSD PIF-2	Consolidate Loads - Marina Gate Substation, Fort Scott Substation, Building 70 Substation	-	16,342	16,342	84,488	306,000	2.62	3.6	162,375	3,420
ECIP-FHA-2	Vent Dampers for Water Heaters-Family Housing and Insulate Domestic Hot Water Pipes-Family Housing	6,315	-	6,315	36,366	282,600	2.54	7.8	80,315	4,355
ECIP-1	Replace Heating Boilers	6,527	-	6,527	39,162	310,000	2.45	7.9	206,560	2,470
OSD PIF-3	Insulate Ductwork-Family Housing	4,551	-	4,551	27,306	107,000	2.42	3.9	10,475	2,300
ECIP-FHA-3	Insulate Walls - Family Housing	21,608	-	21,608	129,648	1,110,000	2.27	8.6	214,480	21,350
ECIP-FHA-4	Replace Heating Boilers Family Housing	7,956	-	7,956	47,736	810,000	1.14	17.0	470,000	8,120
TOTALS		70,625	16,342	86,967	506,072	3,556,950			1,262,505	54,210

Handwritten notes: 259,500, 1,110,000, 2950

Table C

Summary of Energy Conservation Opportunities
 Low Cost - No Cost Projects

Project Number	Project Title	Annual Energy Savings		Total Savings (MBtu)	Annual Savings (\$)	Construction Cost (\$)	Savings Investment Ratio	Simple Pay-Back (Years)	Cost Breakdown	
		Natural Gas (MBtu)	Electricity (MBtu)						Material (\$)	Labor (Hours)
LC-1	Secure Steam Line to Building 1818	131	--	131	786	25	610.63	<1.0	--	1
LC-2	Secure Hot Water Tank - Building 1802	179	--	179	1,074	100	208.59	<1.0	50	2
LC-3	Secure Hot Water Tanks - Building 1801	177	--	177	1,062	270	76.39	<1.0	120	6
LC-4	Secure Hot Water Tank - Building 1807	33	--	33	198	60	64.09	<1.0	10	2
LC-5	Improve Power Factor - Marina Gate Substation	--	3,824	3,824	19,770	93,500	3.12	4.7	77,915	510
LC-6	Vent Dampers for Water Heaters	285	--	285	1,446	14,000	2.17	9.7	4,185	235
LC-7	Insulate Domestic Hot Water Piping	331	--	331	1,986	21,200	1.82	10.7	8,015	315
LC-8	Insulate Ductwork	205	--	205	1,230	14,600	1.63	11.9	1,430	320
LC-9	Replace Incandescent Lighting With High Pressure Sodium	--	52	52	393	3,600	1.50	9.2	2,405	25
LC-10	Waste Oil Boiler	1,934	--	1,934	1,864	96,000	1.18	51.7	73,640	530
TOTALS		3,275	3,876	7,151	29,809	243,355			167,770	1,946

Handwritten notes: 27,945 and 67,385

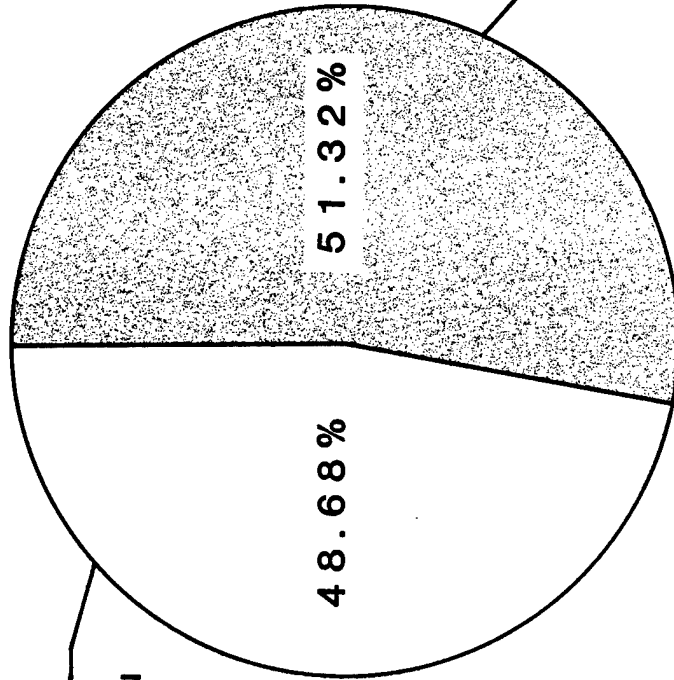
PERSONNEL TRAINING

Military and commercial training courses for maintenance personnel were researched for applicability. A number of courses were found that could provide the maintenance group with a basis for personnel training. Subjects covered by these courses include: refrigeration and air conditioning systems, energy conservation, preventive maintenance, control systems, water treatment, boiler maintenance, pump maintenance, and operation and maintenance of electric motors. Implementation of a training program is recommended.

IMPLEMENTATION

Implementation of all the recommended projects will save a significant amount of energy. The effect of these savings is illustrated graphically in Exhibits A and B which follow.

Natural Gas
687,450 MBtu
(\$4,124,700)



Electricity
724,711 MBtu
(\$3,746,756)

Exhibit A

Fiscal Year 1985 Energy Consumption



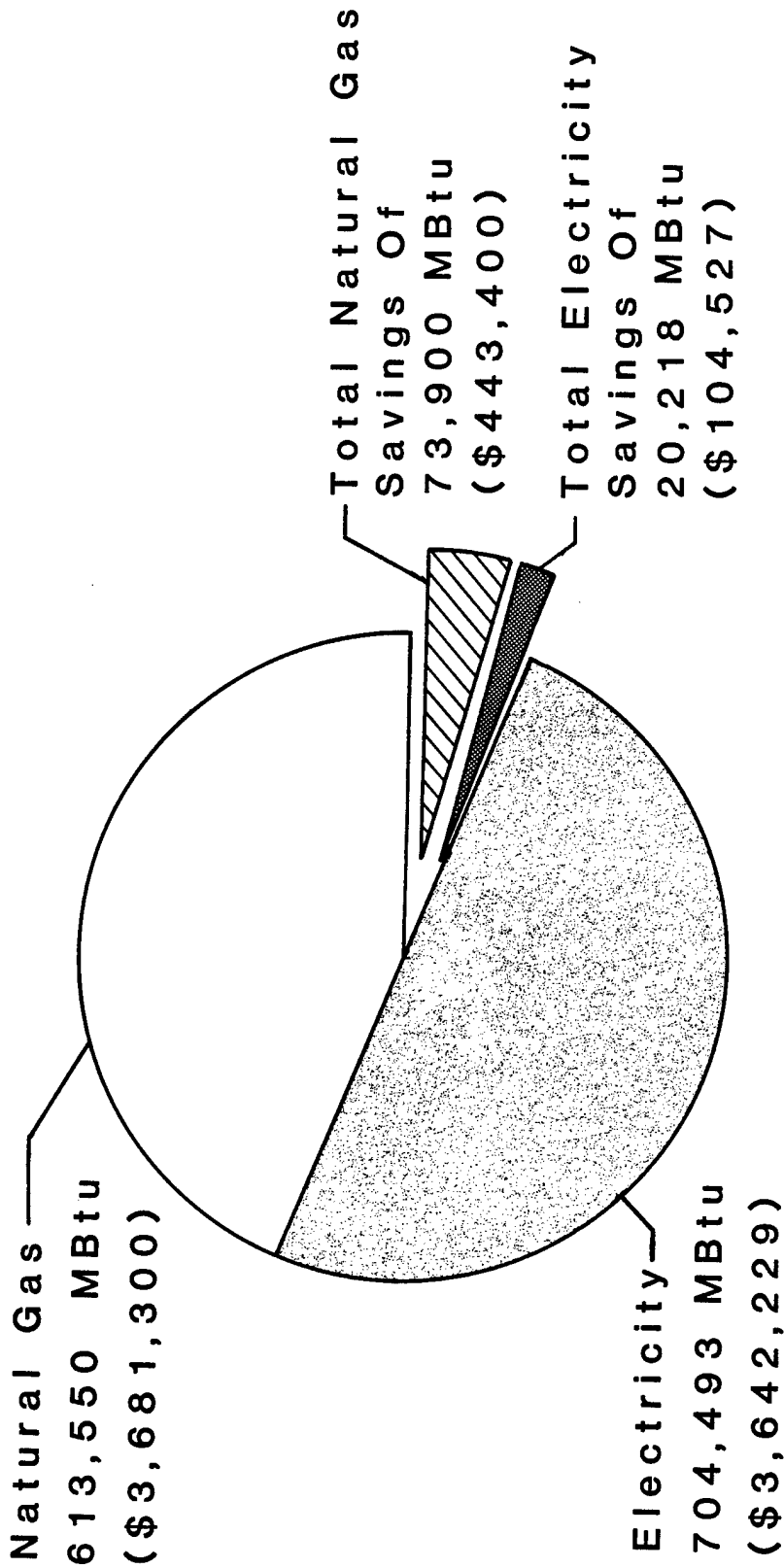


Exhibit B

**Projected Annual Energy Consumption
With Funded And Low Cost - No Cost Programs Completed**

