ENERGY MANAGEMENT DEMONSTRATION PROJECT REPORT

Navy Region Southwest

Navy Environmental Leadership Program

Prepared by
Tetra Tech EM Inc.
591 Camino De La Reina, Suite 640
San Diego, California 92108

Contract No. N62474-94-D-7609
Contract Task Order 0244, Subtask 13.12

Mr. Mike Magee, Program Manager

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ACKNOWLEDGEMENTS

This report was prepared in support of the Navy Environmental Leadership Program (NELP) under the direction of Mr. Magee, NELP Program Manager, Environmental Business and Technology Office, Navy Region Southwest, San Diego, California. The primary author of this report is Mr. Jon Duke, P.E., of Tetra Tech EM Inc (Tetra Tech). Mr. Duke is the former Director of the Navy Energy and Utilities Engineering Program and the former Staff Civil Engineer and Energy Officer for Naval Air Station (NAS) North Island. Mr. Duke was assisted in this project by Mr. Don King, P.E., of Tetra Tech. Mr. King is well-qualified in a number of engineering disciplines and lends considerable technical expertise to this project.

Tetra Tech acknowledges the outstanding cooperation and support provided to this project by the personnel of the Navy Public Works Center Utilities Department, the Naval Base Coronado Public Works Officers and the NAS North Island Maintenance shops. All persons contacted throughout the project were responsive and professional and their contributions to this project are gratefully appreciated.

EXECUTIVE SUMMARY

In October 1999, Tetra Tech EM Inc. (Tetra Tech) was tasked by the Navy Environmental Leadership Program (NELP) to provide certain energy management services to the Navy Region Southwest (NRSW) Energy Management Office. The purpose of this task was to demonstrate the energy cost savings and environmental benefits of selected energy management initiatives. A secondary purpose was to demonstrate that an aggressive energy management program could generate sufficient energy cost savings and utility incentives to be self-financing, with a return on investment of at least 200 percent.

This task was comprised of four elements:

1. Help Revise the Draft NRSW Energy Management Instruction
2. Help Develop a Process to Detect, Analyze, Investigate, and Correct Utilities Anomalies in NRSW Facilities
3. Recommend Effective Means to Implement an Electrical Demand Reduction (EDR) Program at Naval Base (NAVBASE) Coronado
4. Recommend Energy Controls Applications for NAVBASE Coronado Facilities

For Task Element 1, Tetra Tech reviewed the draft Commander Navy Region Southwest Instruction (COMVAVREGSOUTHWESTINST) 4101.1, reviewed the present energy management directives for San Diego and other activities, met with NRSW energy managers, and developed the revised draft COMVAVREGSOUTHWESTINST 4101.1 (Attachment A).

For Task Element 2, Tetra Tech investigated the Navy Public Works Center (PWC), San Diego energy and utility management systems, including the Supervisory Control and Data Acquisition (SCADA™), Computerized Utility Billing Integrated Control (CUBIC), and Enerscape™ systems. Tetra Tech selected Enerscape™ as being best suited for facility energy management purposes. Tetra Tech reviewed electrical demand curves on Enerscape™ for several NAVBASE Coronado buildings of interest and selected two simulator facilities, Buildings 1472 and 352, as having apparent electricity usage anomalies. Tetra Tech visited these buildings and met with their facility managers. Tetra Tech found significant building controls and heating and air conditioning problems at both buildings and recommended cost-effective ways to reduce costs. At both buildings, the facility managers were eager to use the

Enerscape™ data, which they had not seen before, to modify building operations. Tetra Tech estimates potential savings of approximately $85,000 in energy costs and rebates of $77,000 at these buildings. In both cases, Tetra Tech proved that facility energy anomalies can be readily identified and analyzed through the Enerscape™ system, and that significant energy cost savings are possible by working with facility managers and PWC Maintenance personnel to optimize building energy use. It is noted, however, that there appears to be a discrepancy between the Enerscape™ data and the data in the CUBIC billing system. Tetra Tech recommends that PWC Code 610 validate the data in both systems to ensure proper correlation.

In Task Element 3, Tetra Tech reviewed present EDR policies, interviewed NRSW energy managers, and developed recommended means to enhance the effectiveness of the EDR program. In addition to improvements in notifying facility energy managers of EDR events already underway, Tetra Tech recommends identifying "controllable loads," such as hangar and warehouse lighting, which activities authorize in advance to be partially or fully shed for EDR events. The EDR program can also be enhanced by re-vitalizing the facility energy manager network through monthly meetings, providing Enerscape™ data to facility managers and visiting managers at their facilities to suggest reasonable EDR measures. Tetra Tech further recommends applying innovative new technologies to drive down peak loads, such as light-emitting diode lights for fire alarm boxes, and enabling PWC Code 610 and other key managers to monitor important loads, such as Building 1472, in "real time" on Enerscape™.

Finally, in Task Element 4, Tetra Tech has identified potential applications of high-intensity discharge (HID) controls to allow HID lights to be set back to half power when operations permit. This proven technology is not yet in use in any NRSW facilities in San Diego. Tetra Tech has also identified potential applications of work station and space controls at Building 1472 which will drive down electrical demand and consumption costs. These control applications are applicable to a wide range of NRSW facilities and should be implemented wherever cost-effective to help facility managers optimize building energy costs.

The energy savings and project economics of the projects and measures recommended in this report are summarized in Table 1.

TABLE 1
SUMMARY OF RECOMMEND ENERGY MEASURES
Energy Management Demonstration ¾ NAVBASE Coronado

Projects	Life (Years)	Annual Energy Savings (kWh)	EDR Redux (kW)	Project Cost	SPC/ Rebate	SPB (Years)	ROI	Annual Energy/ Material Savings
Fix Controls	3	54,086	12.4	$2,800	—	—	—	$5,000
Fire Alarm LED's	10	179,492	20.5	$5,700	$ 9,000	—	—	$16,600
SCI Fire Alarm LED's	10	29,915	—	$1,000	—	—	—	$2,900
Bowling Alley LED's	10	11,700	0.1	$4,700	$600	—	—	$1,600
HID Lighting Controls	15	1,009,488	298.0	$469,000	$50,500	—	—	$94,900
1472 Mods	15	600,000	0	$61,000*	$43,400	—	—	$56,900
352 Mods	15	295,000	0	$34,000	$34,000	—	—	$27,900
	Totals	2,179,681	331	$ 578,200*	$137,500	2.1	47%	$ 205,800

Notes:

*	Some costs not available pending detailed engineering investigation
SPC	Standard performance contract
SPB	Simple Payback
ROI	Return on investment
kWh	Kilowatt-hour
kW	kilowatt
LED	Light-emitting diode
SCI	Naval Auxiliary Landing Station, San Clemente Island
HID	High-intensity discharge
1472 Mods	Building 1472 Modifications
352 Mods	Building 352 Modification
EDR	Electrical demand reduction
Redux	Reduction

1.0 INTRODUCTION

This project is a joint Navy Environmental Leadership Program (NELP) and Navy Region Southwest (NRSW) Energy Management Office (Navy Public Works Center [PWC] Code 610) initiative to demonstrate (1) the energy and water conservation and cost-saving opportunities and (2) the environmental benefits of a strong energy management program. This project is further intended to demonstrate that such a program can become self-sustaining through energy cost savings and utility incentives and that it offers returns far above program costs. Although the scope of this project was limited to Naval Base (NAVBASE) Coronado and was further limited to exclude utility systems and building energy audits being done by others, the findings and recommendations of this project apply to most NRSW activities.

This report represents the deliverable under Contract No. N62474-94-D-7609, Contract Task Order 244, Subtask 13.12.

2.0 BACKGROUND

In Fiscal Year (FY) 1999, Tetra Tech EM Inc. (Tetra Tech) conducted an energy baseline assessment of the "regionalized" NAVBASE Coronado energy management program. This assessment identified the difficulty of minimizing energy costs with no activity budget responsibility for utilities and without an on-site energy manager. The most recent energy progress report for Naval Air Station (NAS) North Island, Figure 1, indicates a 26 percent increase in energy use per square foot since FY98, when the energy manager was re-assigned, and a 39 percent increase since the end of FY97, when the utility budget was regionalized. Part of these increases is due to square footage going unreported, but part is likely due to the lack of energy management capability at the activity. NRSW restored the utility budget to the NAVBASE Coronado Public Works Officer (PWO) in FY99 and is pursuing other ways to reverse the growth in utility costs. The current Delivery Order is intended to support NRSW in this effort by demonstrating the potential energy cost savings and environmental benefits of certain energy management initiatives.

Navy Public Works Center (PWC) and the Southwest Division, Naval Facilities Engineering Command (SWDIV) have a number of energy and utilities conservation and cost reduction initiatives underway in San Diego, and this Delivery Order was designed not to duplicate or conflict with any of those programs.

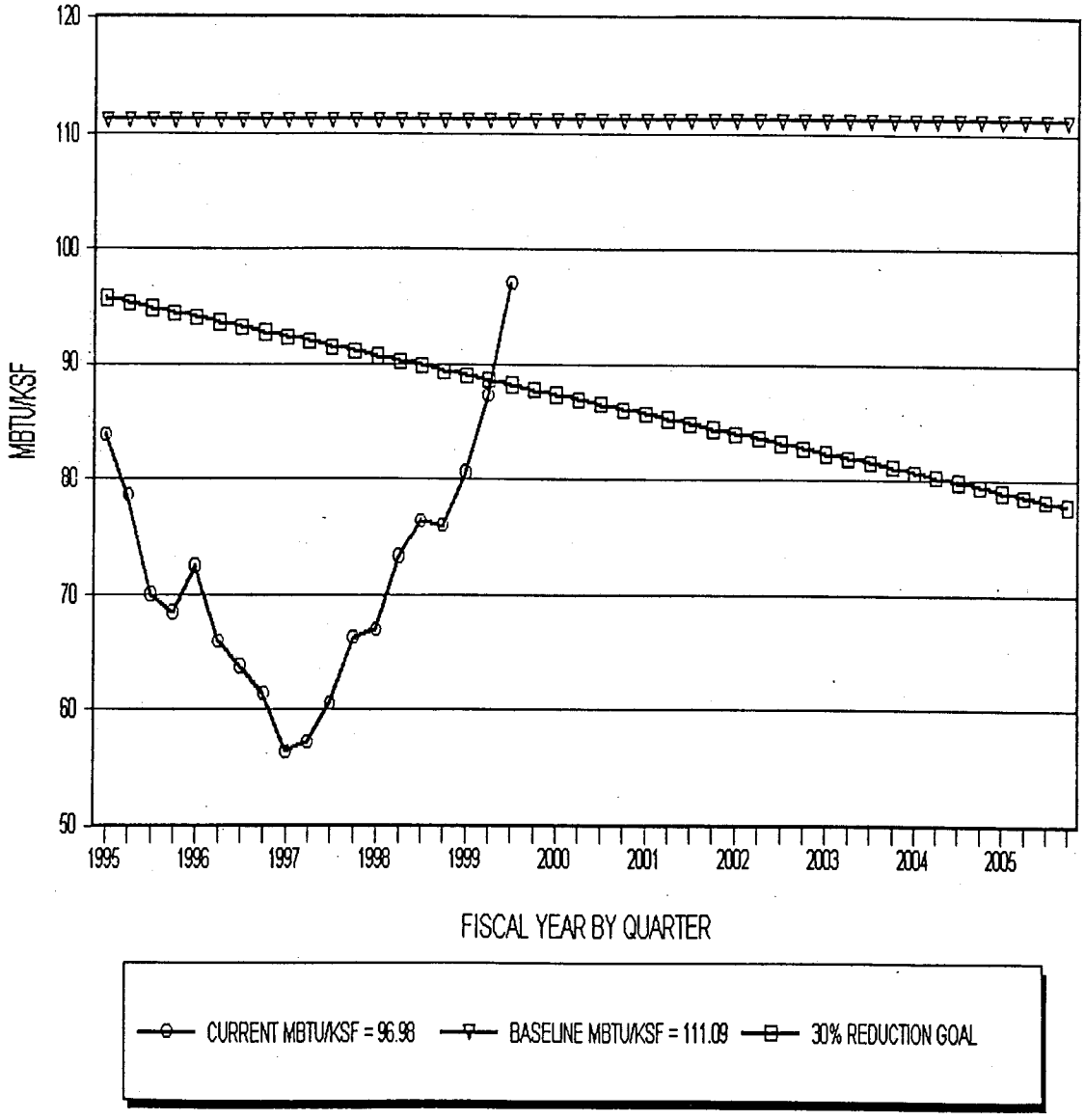
30% ENERGY REDUCTION PROGRESS

NAS NORTH IS SAN DIEGO CA (N00246)

THIRD QUARTER FY 99 (JUL 98 - JUN 99)

CURRENT PROGRESS = -12.70%

CURRENT QUARTER GOAL = -20.63%



Naval Base Coronado
FIGURE 1 Energy Progress Report Energy Management Demonstration
Tetra Tech EM Inc.

The NAS North Island utility plants and distribution systems are under study by others, for example, and SWDIV recently completed a heating, ventilating, and air conditioning (HVAC) and water conservation survey at NAS North Island through San Diego Gas and Electric (SDG&E). Accordingly, this task was designed to help NRSW enhance its energy management programs while being alert to potential controls and other cost reduction opportunities not identified by others.

In general, Tetra Tech was tasked to develop innovative energy management recommendations to help NRSW cut utility costs, conserve water and energy resources, and achieve the associated environmental benefits. This task fully supports NRSW's stated goal of "taking advantage of the latest innovations and adapting new technologies and business practices to get the job done."[1]

This energy management demonstration project is comprised of the following four task elements.

1. Help Revise the Draft NRSW Energy Management Instruction
2. Help Develop a Process to Detect, Analyze, Investigate, and Correct Utilities Anomalies in NRSW Facilities
3. Recommend Effective Means to Implement an EDR Program at NAVBASE Coronado
4. Recommend Cost-Effective Energy Controls Applications for NAVBASE Coronado Facilities

Findings and recommendations for these elements are discussed in Section 3.0.

3.0 ENERGY MANAGEMENT DEMONSTRATION PROJECT

This section presents the four task elements of this project. Objectives, approaches, findings and recommendations are discussed for each task element. Where projects or other energy cost reduction measures are identified, the expected costs and benefits of the measures are provided.

[1] Navy Region Southwest Mission, www.cnbsd.navy.mil/Mission/mission.htm

3.1 Help Revise the Draft NRSW Energy Management Instruction

3.1.1 Description

Tetra Tech was tasked to provide professional energy management advice and assistance to PWC Code 610 to help revise the draft NRSW Energy Management Instruction. The new instruction will set energy management policy for all NRSW shore installations, including installations in California, Nevada, and Arizona. The instruction will also incorporate proven energy management policies from previous PWC and other directives as well as new programs and initiatives developed to take advantage of new technologies and business practices.

3.1.2 Objective

The objective of this task element is to help NRSW establish an effective energy management program in California, Nevada, and Arizona.

3.1.3 Approach

Tetra Tech interviewed the head of PWC's Utility Management Branch, the NRSW energy managers, the NAVBASE Coronado PWO, and other key personnel. PWC provided the draft copy of the new instruction as well as other directives to be referenced. PWC also provided energy management directives from other Navy and Marine Corps activities. Tetra Tech (1) reviewed the documents provided by PWC, (2) selected a format which should best present the required information, and (3) prepared a revised draft of the NRSW energy management instruction for Navy review.

3.1.4 Discussion

The revised draft NRSW energy management instruction is based on the old NAS North Island energy instruction. The new instruction has been shortened and updated to reflect current energy policies and relevant references. Enclosures are attached to the instruction to provide specific direction on regional energy standards and requirements for each of the major types of energy and water use. An enclosure is also provided for the EDR program for San Diego activities. Tetra Tech recommends that a handbook

also be developed for facility energy monitors, separate from the basic directive. PWC has samples of handbooks from activities with successful energy programs that can be used as guides.

3.1.5 Deliverable

The revised draft NRSW Energy Management Instruction is provided as Attachment A.

3.2 Help Develop a Process to Detect, Analyze, Investigate, and Correct Utilities Anomalies in NRSW Facilities

3.2.1 Description

Tetra Tech was tasked to develop recommendations for cost-effective processes to detect, analyze, investigate, and correct significant utility anomalies in NRSW facilities. Anomalies are deviations in utility usage or cost for a facility or group of facilities as compared to past history and typical usage for similar facilities. Anomalies may indicate changes in facility operations, changes in control settings, problems with building systems or controls, or other facility problems.

3.2.2 Objective

The primary objective of this task element is to help NRSW establish a cost-effective process to detect, analyze, and correct significant utility anomalies at NAVBASE Coronado. The secondary objective is to demonstrate that such a system can cut utility costs, reduce energy and water wastes, and realize environmental benefits in a cost-effective, self-financing manner.

3.2.3 Approach

Tetra Tech worked closely with PWC Code 610 in performing this task. Tetra Tech reviewed PWC's available energy management systems, including Computerized Utility Billing Integrated Control (CUBIC) metered utility reports, Utility Control System/Supervisory Control and Data Acquisition (SCADA™) data profiles, SDG&E's web page, and the newly-installed Enerscape™ system. Tetra Tech also interviewed key personnel in Code 600 to see how the available systems can be used to identify and analyze

anomalies. Based on these activities, Tetra Tech agrees with PWC that Enerscape™ appears to be the most promising system for this purpose.

Tetra Tech used Enerscape™ to review electrical demand curves for several NAS North Island buildings of interest. Two buildings, 1472 and 352, both aviation simulator facilities, were identified as having unusually high peak and baseload demands, ranging from about 1,000 kW to 1,698 kW for Building 1472 in the first week of July 1999. Building 352 had similar peak demands but had a baseload demand of only about 500 kW, much less than the similar operation in Building 1472. Tetra Tech visited these buildings, met with their facility managers, presented the Enerscape™ print-outs, and looked at the building systems. A number of facility deficiencies were identified, some of which pose operational as well as energy problems. A series of operational, minor construction, repair, and alteration measures were developed to improve the operation of building systems while reducing energy costs.

As part of this task element, Tetra Tech met with the head of the PWC Maintenance shops at NAS North Island, spoke with HVAC mechanics, and toured the HVAC monitoring center in Building 343. The HVAC monitoring center and the HVAC shop should be considered key resources of any program to minimize NAS North Island energy costs and should be involved in the process to find and correct anomalies.

Based on the investigations at Building 1472 and Building 352, Tetra Tech found that the Enerscape™ system offers the easiest and most cost-effective way to routinely monitor facility energy use and to identify anomalies. However, Enerscape™ has not yet been fully implemented and is only available at three activities in San Diego, only one of which reports to NRSW.

The recommended process to identify, analyze, field-check, and correct facility energy anomalies is presented under findings and recommendations below.

3.2.4 Findings

Tetra Tech made the following findings as part of this task element:

a. PWC presently provides metered utility reports to facility energy managers to help them manage energy costs. These reports provide monthly utility consumption data and are useful for tracking

utility costs. PWC "flags" reports showing unusual changes in usage from past months and the previous year. Currently, this is the method used to identify and correct anomalies.

b. PWC uses the SCADA system to monitor buildings of concern on a case-by-case basis. SCADA can provide electrical demand curves for a transformer serving a particular building. This is a useful program but is not suitable for routinely monitoring a large number of facilities.

c. Enerscape™ provides displays of 15-minute electrical demand data for individual meters as well as several types of reports for kilowatt-hour (kWh) data. The 7-day demand curves for Building 1472 for the first weeks of the months of February through August 1999 are included as Attachment B and the curves for Building 352 as Attachment C; note that there are two meters for Building 352.

d. Enerscape™ will be available to Navy energy managers on the PWC Intranet and will provide the most detailed energy management data currently available. Enerscape™ has several shortcomings that must be overcome before it can be used as an everyday management tool, including:

- Enerscape™ draws historical data from the CUBIC data base. This data has not been updated since August 1999 for most buildings.

- Enerscape™ only covers electric meters at NAS North Island. It does not cover water or gas meters at NAS North Island or any meters at other NRSW activities in San Diego.

e. There is an apparent discrepancy between the demand and consumption data shown on Enerscape™ and the CUBIC metered utility reports and actual bills. This problem became evident in analyzing energy use at Buildings 1472 and 352. Actual electric demand, consumption, and billings for these buildings appear to be only about ¼ of the consumption indicated by Enerscape™.

f. The PWC HVAC monitoring center at NAS North Island is able to monitor the performance of several major HVAC systems at NAS North Island. However, since the Naval Aviation Depot withdrew funding for this service, PWC has been unable to staff the center for a full shift. It is understood that an additional ¼ man-year of budget is needed to man the center for a full shift.

g. The PWC Maintenance shops at NAS North Island are extremely interested in participating in an aggressive energy program at NAVBASE Coronado. The shops have expert knowledge of NAVBASE HVAC and other building systems and could be an important resource in identifying and fixing energy anomalies. Using the shops to carry out part of the energy program could generate cost savings that would help fund shop man-hours and help stabilize the work force.

h. There are significant problems in the HVAC system at Building 1472 as discussed in Mr. King's energy assessment (Attachment D). Among his findings are (1) the existing Johnson Controls HVAC control system has been disconnected; (2) the entire mechanical support system must be operated if any one of the five HVAC zones requires cooling; (3) the highbay ductwork for air handler units (AHU) 3, 4, and 5 is too high to provide cooling to the computers at floor level; (4) the AHU serving the classroom is greatly over-sized and has no thermostatic controls; and (5) the AHU-1 should be configured as a stand-alone system. There is no effective control of HVAC in

the building – the core of the building must be over-cooled to try to keep the simulator bays at a specified operating temperature. There is also an opportunity to reduce lighting costs by using motion sensors.

i. There are lesser opportunities to reduce HVAC costs in Building 352. AHU-1 and 2 operate continuously and should be set back when operations permit. The cooling tower may be partially secured on weekends when computer equipment is turned off. Similar to Building 1472, the supply ductwork for AHU-3 is too high to provide proper cooling.

j. Enerscape™ and CUBIC provide only historical data, although Enerscape™ is intended to provide real-time metering and control capability.

3.2.5 Recommendations

The following recommendations are provided:

a. Investigate and resolve any discrepancies between Enerscape™ and the CUBIC billing system.

b. Upload the missing CUBIC data to make Enerscape™ current, and upload monthly data thereafter on an on-going basis.

c. Expand Enerscape™ to include gas and water meters at NAS North Island.

d. Expand Enerscape™ to include, at least, Naval Amphibious Base (NAB) and Naval Auxiliary Landing Field (NALF) San Clemente Island. Expand to all NRSW activities in San Diego when practical.

e. Identify key meters at NAS North Island and elsewhere, e.g., Building 1472, key substations, etc., and use Enerscape™ to provide real-time metering. Use real-time metering to help manage EDR events and provide current data to key facility managers.

f. Establish the following process to identify, analyze, field-check, and correct energy anomalies:

(1) Review Enerscape™ demand curves and consumption data monthly for all significant [“significant” to be defined] meters on the system, meters which CUBIC has flagged as possible anomalies, and meters of interest to activities.

(2) Identify meters with excessive demand, unusual usage curves, too high a minimum demand, too high a minimum to peak demand ratio, too high a demand or consumption relative to similar facilities, or other anomalous use patterns.

(3) Use Enerscape™ and CUBIC metered utility reports as necessary to develop a better understanding of the anomaly.

(4) For buildings monitored by the HVAC monitoring center, check with maintenance for possible HVAC anomalies.

(5) For minor anomalies, alert the facility manager to a possible problem and ask them to check it out. Provide guidance and suggestions as needed.

(6) For significant anomalies or as requested by the facility manager, visit the building and look for the cause of the problem. Request maintenance assistance as appropriate.

(7) Identify corrective measures for verified problems and pass information and recommendations to the appropriate action code. Provide input for justification, including energy cost savings, payback, etc., as necessary to help secure funding. Track progress of work until complete.

g. As a result of the Building 1472 energy assessment, Tetra Tech recommends the following measures. A more detailed discussion of the measures is provided in Attachment D.

(1) Install motion sensors in the classroom, conference room, lobby, and other areas to control lighting.

(2) Reactivate or replace the inactive Johnson Controls control system for AHU-1, 2, 3, 4, and 5 to allow AHU's to operate independently.

(3) Turn off 50 percent of the cooling tower on weekends when the simulator equipment is secured.

(4) Extend the supply ductwork for AHU-3, 4, and 5 to within 8 feet of floor in high bays. This will improve the cooling supply to computers and may eliminate the need for supplementary cooling units on the floor.

(5) Convert AHU-2 to a stand-alone heat pump sized for the classroom; add thermostatic control. This will eliminate about 15 tons of excess capacity and provide control capability.

(6) Convert AHU-3, 4, and 5 to stand-alone systems with thermostatic controls.

(7) Convert AHU-1 to a stand-alone system and remove the existing mechanical plant.

h. As a result of the Building 352 energy assessment, Tetra Tech recommends the following measures. A more detailed discussion of the measures is provided in Attachment E.

(1) Install motion sensors in the classroom, conference room, locker rooms, and hallway areas to control lighting.

(2) "Fine tune" controls for AHU-1 and 2 and support systems; implement "use analysis" to allow setbacks when operations permit.

(3) Evaluate the potential to secure 50 percent of the cooling tower equipment on weekends.

(4) Extend the supply ductwork for AHU-3 to within 8 feet of floor in high bay.

The projected costs and energy savings of the above recommendations are summarized in Table 2. Note that these projections are preliminary, order-of-magnitude estimates only. The energy assessments of Buildings 1472 and 352 were performed solely to field-test the usefulness of the Enerscape™ system to identify energy anomalies.

TABLE 2
SUMMARY OF RECOMMENDED ENERGY MEASURES FOR BUILDINGS 1472 AND 352
Energy Management Demonstration ¾ NAVBASE Coronado

Projects	Life (Years)	Annual Energy Savings (kWh)	Demand Redux (kW)	Project Cost	SPC/ Rebate	SPB (Years)	Annual Energy Cost Savings
1472 Sensors	15	100,000	0	$7,000	$5,000	.2	$9,400
1472 Controls	15	250,000	0	$30,000	$0	1.25	$24,000
1472 Ductwork	15	100,000	0	$16,000	$16,000	1.7	$9,400
1472 Classroom	15	100,000	0	$8,000	$16,000	1.7	$9,400
1472 AHU-3,4,5	15	40,000	0	UNK	$6,400	UNK	$3,800
1472 C.T.	--	10,000	0	---	---	---	$900
352 Sensors	15	80,000	0	$8,500	$4,000	1.1	$7,500
352 “Tuning”	---	125,000	0	$20,000	---	1.7	$12,000
352 Ductwork	15	80,000	0	$5,500	$12,800	.7	$7,500
352 C.T.	---	10,000	0	---	---	---	$900
	Totals	895,000	0	$95,000	$60,200		$84,800

Notes:

SPC Standard performance contract
SPB Simple Payback
Redux Reduction
kWh Kilowatt-hour
kW kilowatt
UNK Unknown

3.3 Recommend Effective Means to Implement an EDR Program at NAVBASE Coronado

3.3.1 Description

Tetra Tech was tasked to develop recommendations for cost-effective means to re-implement the EDR program at NAVBASE Coronado.

3.3.2 Objective

The objective of this task element is to help NRSW enhance the effectiveness of the EDR program at NAVBASE Coronado. EDR offers the potential for significant cost savings through a modest investment of management resources.

3.3.3 Approach

Tetra Tech (1) interviewed NRSW energy managers and others to determine current EDR status, (2) reviewed available EDR and NAS North Island demand data, (3) developed potential EDR opportunities, and (4) prepared draft recommendations for NRSW review and comment and included these in the EDR enclosure to the draft energy management instruction.

In the process of developing EDR initiatives, Tetra Tech identified three potential applications of light-emitting diode technology and a project to install bi-level controls on high intensity discharge (HID) lighting in warehouses and hangars throughout the base. These projects would reduce peak demands and electrical consumption with no adverse effect on operations. The HID controls project would give PWC Code 610 about 298 kilowatts (kW) of "controllable load" to be shed during EDR events. Tetra Tech also noted a number of exterior lights with broken controls or other problems, some of which have gone uncorrected for years. Repairing these recurring problems will reduce peak demand another 12.4 kW with almost immediate payback.

3.3.4 Discussion

EDR is a sophisticated program designed to reduce peak electrical demand costs for PWC's customer activities. The premise of the program is that the San Diego activities pay peak demand charges based on when the overall SDG&E system sets its monthly peak, not when activities set their individual peaks. Because it is also possible to predict when SDG&E's peak will occur, it is possible for PWC to call an "EDR event" for a specific period, normally between 1300 and 1500 on a very hot, sunny day. The EDR program had its beginnings in the 1980's, when peak summer demand costs were over $20 per kW. For a command such as NAS North Island, with peak demand at that time of about 25,000 kW, peak demand charges could cost over $500,000 a month for the five "summer" billing months. The EDR program saved $50,000 to $100,000 a month for NAS North Island in avoided energy costs. Today, with a restructured

electricity market and much lower demand charges, there is less impetus behind the EDR program, but it remains an excellent way to reduce electrical costs.

The EDR program has many strong points. First, PWC has not only metered virtually all facilities in San Diego, but most of these meters are time-of-use type, able to meter electrical demand. Second, PWC has developed a five-tier electrical rate schedule to pass time-of-use consumption and demand charges straight through to its customers. PWC can now bill customers for on-peak, semi-peak, and off-peak electrical consumption (kWh) and for "coincident" and "non-coincident" demand, measured in kW. Activities which are able to reduce electrical load during EDR events receive the benefits of reduced demand charges on their electric bills. Activities which do not reduce their loads are directly billed the cost of those loads. The ability of CUBIC to bill electrical charges to the customers who incur them is of particular importance at NAS North Island, where aircraft carriers can tie up to shore power and increase the load by 10 megawatts or more in a few minutes. Thanks to CUBIC, the carriers pay their fair share of demand charges and NAS North Island is able to focus on its own EDR opportunities.

One EDR opportunity at NAS North Island and throughout San Diego is the application of bi-level controls to HID lighting in hangars, warehouses, and other industrial facilities. This technology allows these lights to be operated at half-power, with a barely discernible loss of lighting when operations permit. The lights can be dimmed or raised to full power on a schedule, by timer, by motion sensor, or by remote command, as the activity desires. This technology has been proven effective in a wide range of facilities and is certainly appropriate for NAS North Island. Table 3 lists the facilities recommended for such controls and their associated project economics. The cost and savings estimates are considered good budget numbers based on experience with similar projects elsewhere. It is envisioned that these systems will be installed on the buildings listed and that they will operate to save money 12 months a year. During EDR events in the summer, Code 610 should have the capability to remotely dim these HID lights to half power or turn them off, as previously agreed by the activity. This would give Code 610 a significant "controllable load" in addition to whatever loads can be shed by other means.

Another EDR opportunity is replacing of constant-burn or high use incandescent lamps with light-emitting diode (LED) lamps. One such application is for fire alarm boxes at NAS North Island, NAB Coronado, and Naval Outlying Landing Field (NOLF) Imperial Beach. There are about 300 such lights at these activities, each with a 69 Watt incandescent light bulb that can be replaced with an LED lamp burning 0.7 Watts.

TABLE 3
SUMMARY OF PROPOSED HID CONTROLS
Energy Management Demonstration - NAVBASE Coronado

	Baseline Conditions						Proposed Project											
Building	HID #	HID Type	Lamp Watts	Total kW	Annual Operation Hours	Annual kWh	Zones	Number Interior Lamps	Number Exterior Lamps	1/2 Power kW	Estimated Hours at 1/2 Power	EDR kW	Projected kWh Savings	Estimated Cost Savings	Estimated Project Cost	Estimated SPC Amount	Simple Payback Period (years)	ROI
Bldg 497 - DSU	52	MH	500	26	4380	113,880	3	52		0.3	3285	13	42,705	$ 4,014	$ 11,750	$ 2,135	2.4	42%
	10	MH	1000	10	4400	44,000			10	0.5	4107	0	20,534	$ 1,930	$ 2,000	$ 1,027	0.5	198%
Bldg 767 - AIMD	28	HPS	250	7	8760	61,320	2	28	0	0.1	4380	3.5	15,330	$ 1,441	$ 6,500	$ 767	4.0	25%
	112	MH	250	28	8760	245,280	6	112	0	0.1	4380	14	61,320	$ 5,764	$ 25,100	$ 3,066	3.8	26%
Cans 2 - 4	18	MH	250	4.5	8760	39,420	3	18	0	0.1	7884	2.25	17,739	$ 1,667	$ 4,950	$ 887	2.4	41%
Hangar 1456	240	HPS	400	96	8760	840,960	10	240	0	0.2	4380	48	210,240	$ 19,763	$ 52,500	$ 10,512	2.1	47%
Hangar 1474	120	HPS	400	48	8760	420,480	10	120	0	0.2	4380	24	105,120	$ 9,881	$ 28,500	$ 5,256	2.4	43%
Hangar 1477	70	HPS	400	28	8760	245,280	2	70	0	0.2	4380	14	61,320	$ 5,764	$ 14,900	$ 3,066	2.1	49%
Hangar 1481	50	HPS	250	12.5	8760	109,500	2	50	0	0.1	4380	6.25	27,375	$ 2,573	$ 10,900	$ 1,369	3.7	27%
Hangar 308	25	HPS	250	6.25	4380	27,375	1	25	0	0.1	2190	3.125	6,844	$ 643	$ 5,450	$ 342	7.9	13%
Hangar 340	84	HPS	250	21	8760	183,960	8	84	0	0.1	4380	10.5	45,990	$ 4,323	$ 20,400	$ 2,300	4.2	24%
Hangar 503	14	HPS	250	3.5	8760	30,660	1	14	0	0.1	4380	1.75	7,665	$ 721	$ 3,250	$ 383	4.0	25%
Hangar 525	60	HPS	250	15	8760	131,400	2	60	0	0.1	4380	7.5	32,850	$ 3,088	$ 12,900	$ 1,643	3.6	27%
Hangar 526	60	HPS	250	15	8760	131,400	2	60	0	0.1	4380	7.5	32,850	$ 3,088	$ 12,900	$ 1,643	3.6	27%
Warehouse 270	91	HPS	250	22.75	2350	53,463	4	91	0	0.1	2115	11.375	24,058	$ 2,261	$ 20,000	$ 1,203	8.3	12%
Warehouse 271	70	MH	250	17.5	2350	41,125	4	70	0	0.1	2115	8.75	18,506	$ 1,740	$ 15,800	$ 925	8.6	12%

TABLE 3
SUMMARY OF PROPOSED HID CONTROLS
Energy Management Demonstration - NAVBASE Coronado

	Baseline Conditions						Proposed Project											
Building	HID #	HID Type	Lamp Watts	Total kW	Annual Operation Hours	Annual kWh	Zones	Number Interior Lamps	Number Exterior Lamps	1/2 Power kW	Estimated Hours at 1/2 Power	EDR kW	Projected kWh Savings	Estimated Cost Savings	Estimated Project Cost	Estimated SPC Amount	Simple Payback Period (years)	ROI
Warehouse 651	94	HPS	250	23.5	2350	55,225	16	94	0	0.1	2115	11.75	24,851	$ 2,336	$ 26,000	$ 1,243	10.6	9%
	70	HPS	400	28	2350	65,800	4	70	0	0.2	2115	14	29,610	$ 2,783	$ 15,800	$ 1,481	5.1	19%
Warehouse 652	263	HPS	250	65.75	2350	154,513	24	263	0	0.1	2115	32.875	69,531	$ 6,536	$ 63,400	$ 3,477	9.2	11%
Warehouse 658	4	HPS	400	1.6	4400	7,040			4	0.2	3520	0.8	2,816	$ 265	$ 800	$ 141	2.5	40%
Warehouse 659	4	HPS	400	1.6	4400	7,040			4	0.2	3520	0.8	2,816	$ 265	$ 800	$ 141	2.5	40%
Warehouse 660	180	MH	250	45	2400	108,000	12	180	0	0.1	1920	22.5	43,200	$ 4,061	$ 41,400	$ 2,160	9.7	10%
	4	HPS	400	1.6	4400	7,040			4	0.2	3520	0.8	2,816	$ 265	$ 800	$ 141	2.5	40%
Warehouse 661	116	HPS	250	29	2400	69,600	6	116	0	0.1	1920	14.5	27,840	$ 2,617	$ 25,900	$ 1,392	9.4	11%
	60	MH	250	15	2400	36,000	6	60	0	0.1	1920	7.5	14,400	$ 1,354	$ 14,700	$ 720	10.3	10%
	4	HPS	400	1.6	4400	7,040			4	0.2	3520	0.8	2,816	$ 265	$ 800	$ 141	2.5	40%
Warehouse 662	4	HPS	400	1.6	4400	7,040			4	0.2	3520	0.8	2,816	$ 265	$ 800	$ 141	2.5	40%
Hangar 184 IB	60	MH	250	15	4380	65,700	4	60		0.1	3504	7.5	26,280	$ 2,470	$ 13,800	$ 1,314	5.1	20%
Hangar 193 IB	60	HPS	250	15	4380	65,700	4	60		0.1	3504	7.5	26,280	$ 2,470	$ 13,800	$ 1,314	5.1	20%
	12	HPS	125	1.5	4400	6,600			12	0.1	3960	0	2,970	$ 279	$ 2,400	$ 149	8.1	12%

Notes:

kW	Kilowatt
kWh	Kilowatt-hour
SPC	Standard Performance Contract
HID	High-intensity discharge
ROI	Return on investment
EDR	Electrical Demand Reduction

LED lights are also proposed to replace fire alarm and other constant-burn lights at NALF San Clemente Island (SCI). Tetra Tech did not visit SCI during this project, but it is estimated there are 50 suitable lights that could be replaced by LED's. This measure does not contribute to EDR, but it does save money.

LED lights are also proposed to replace approximately 140 compact fluorescent downlamps in the NAS North Island bowling alley. In this case, the compact fluorescents burn only about 15 Watts for about 16 hours a day, but the project is still economically feasible. The estimated costs and benefits of the above three LED projects are summarized in Table 4.

Finally, it is proposed that PWC Maintenance repair the broken sensors and other problems listed in Table 5 below, which represent 12.4 kW of unnecessary peak demand.

TABLE 4
SUMMARY OF PROPOSED LED PROJECTS
Energy Management Demonstration¾ NAVBASE Coronado

Projects	Life (Years)	Annual Energy Savings (kWh)	EDR Redux (kW)	Cost	SPC/ Rebate	SPB (Years)	ROI	Annual Energy/ Material Savings
1. Fire Alarm Indicators, NAS North Island, NAB Coronado, and NOLF Imperial Beach								
	10	179,492	20.5	$5,694	$8,975			$16,574
2. Fire Alarm Indicators, NALF SCI – Estimated 50 lights								
	10	29,915	0	$949	-			$2,942
3. Bowling Alley Lights, NAS North Island								
	10	11,700	0.1	$4,700	$600			$1,600
Totals		221,107	0.1	$11,343	$9,575	0.1	1194%	$21,116

Notes:

SPC	Standard performance contract	SCI	San Clemente Island
SPB	Simple Payback	NAS	Naval Air Station
ROI	Return on investment	NAB	Naval Amphibious Base
kWh	Kilowatt-hour	NOLF	Naval Outlying Landing Field
kW	kilowatt	NALF	Naval Auxiliary Landing Field

TABLE 5
SUMMRY OF PROPOSED LIGHTING REPAIRS
Energy Management Demonstration¾ NAVBASE Coronado

Projects	Life (Years)	Annual Energy Savings (kWh)	EDR Redux (kW)	Cost	SPC/ Rebate	SPB (Years)	ROI	Annual Energy/ Material Savings
Gate 4 Lights	3	502	0.1	$100	$ -	2.1	47%	$47
678 Light	3	821	0.2	$100	$ -	1.3	77%	$77
656 - 662 Lights	3	13,141	2.9	$500	$ -	0.4	247%	$1,235
I Bar light	3	123	0.0	$100	$ -	8.6	12%	$2
IB Firehouse Floods	3	414	0.3	$100	$ -	2.6	39%	$39
IB 52 Floods	3	166	0.1	$100	$ -	6.4	16%	$16
340 Butler HID's	3	2,053	0.2	$100	$ -	0.5	193%	$193
497 Floods	3	9,126	2.0	$100	$ -	0.1	858%	$858
497 Storage Lights	3	297	0.1	$100	$ -	3.6	28%	$28
404 Door Light	3	78	0.0	$ 50	$ -	6.9	15%	$7
335 HID	3	821	0.2	$100	$ -	1.3	77%	$77
1472 Pkg Lot Lts	3	3,285	1.4	$400	$ -	1.3	77%	$309
1456 Pkg Lot Lts	3	3,285	0.7	$200	$ -	0.6	154%	$309
650 HPS	3	821	0.2	$100	$ -	1.3	77%	$77
NAB Security, 2-T8's	3	263	0.1	$100	$ -	4.0	25%	$25
NAB NX Pkg Lot Lts	3	2,464	0.5	$100	$ -	0.4	232%	$232
NAB OWTP	3	1,643	0.4	$100	$ -	0.6	154%	$154
NAB 811-812-Tank HPS	3	4,107	0.9	$100	$ -	0.3	386%	$386
IB NX	3	821	0.2	$100	$ -	1.3	77%	$77
IB 184 HPS/LPS	3	9,035	2.0	$100	$ -	0.1	849%	$849
Fishing pier light	3	160	0.0	$100	$ -	6.7	15%	$15
308 light	1	660	-	$1	$ -	0.0	6204%	$62
		54,086	12.4	$2,750		0.5	182%	$5,007

Notes:

SPC Standard performance contract
SPB Simple Payback
ROI Return on investment
kWh Kilowatt-hour
kW kilowatt
HID High-intensity
SCI San Clemente Island
NAB Naval Amphibious Base
IB Naval Outlying Landing Field Imperial Beach

In addition to the projects identified above, there is a further opportunity to strengthen the EDR program through greater interaction, training, and communication with the network of facility energy monitors. A monthly monitor meeting is proposed to keep the network active and informed. PWC energy managers can use these meetings to arrange visits to key facilities. It is suggested that the energy managers and facility energy monitors agree on reasonable EDR measures to be implemented without sacrificing operations, safety, or morale. When monitors have a clearer understanding of what they can and should be doing for EDR's, EDR load sheds should be more successful.

Presently, PWC notifies the monitors of EDR events through a telephone calling tree and e-mail. PWC is in the process of making arrangements to notify monitors through Audix telephone messages and through announcements to pager holders. Tetra Tech concurs with these improvements. It is noted that on the day of one EDR event, demand dipped in the morning when notifications were apparently made, but creeped back up in the early afternoon. It is suggested that a reminder notification be made about mid-day on an EDR event day to ask monitors to re-check their areas and carry out agreed-upon EDR measures.

3.3.5 Recommendations

The following recommendations are provided:

a. Implement the three proposed LED projects.

b. Implement the proposed HID controls project, with both local and remote control of the system for EDR purposes. PWC should meet with activities to agree on measures to be taken to control the lights during EDR events.

c. Repair the lights noted in Table 5 and periodically identify and repair lights with new control problems.

d. Re-activate the facility energy monitor network with monthly meetings and, perhaps, quarterly luncheon meetings paid for by non-appropriated funds, such as rebates. Keep up a current roster of monitors, with e-mail addresses and phone and pager numbers. Provide good personnel training for monitors consistent with their responsibilities. Provide an evaluation or fitness report input for monitors, as requested; encourage them to submit suggestions, and evaluate those suggestions immediately; build a dialogue with as many monitors as possible; provide training opportunities to motivated monitors; support monitors in dealing with their commands; and visit as many facilities as possible with the monitors to continue to identify new project and operational opportunities.

e. Apply for Standard Performance Contract (SPC) incentive payments for the proposed projects and put the money into a special non-appropriated account to help finance future initiatives.

3.4 Recommend Cost-Effective Energy Controls Applications for NAVBASE Coronado Facilities

3.4.1 Description

Tetra Tech was tasked to develop recommendations for cost-effective applications of lighting, air conditioning and other building controls at NAVBASE Coronado.

3.4.2 Objective

The primary objective of this task element is to demonstrate the potential of building controls to conserve energy and cut utility costs.

3.4.3 Approach

Tetra Tech toured NAS North Island extensively on weekdays, weekends, and one holiday to see how the base operates and to judge the opportunities for control applications. Tetra Tech visited dozens of buildings and met with energy managers, maintenance mechanics, facility managers, and others to discuss how buildings are operated and controlled. Tetra Tech reviewed the recent NAS North Island HVAC and water conservation survey performed by SDG&E as well as the earlier lighting retrofit projects.

As noted above, Tetra Tech used the Enerscape™ system to find apparent energy anomalies in Buildings 1472 and 352. Tetra Tech identified significant HVAC control problems in one building and several opportunities to save energy with better controls in both buildings. A number of other apparent control problems were identified using Enerscape™, such as buildings with very high baseloads, buildings that operate at full power with few people working, and buildings that have unexplained high loads relative to their operations.

In general, Tetra Tech's approach to this task was to qualitatively assess the potential to save energy at NAVBASE Coronado through control applications. One major control application, for bi-level controls of HID lighting, was proposed in section 3.3. However, significant opportunities remain to (1) control administrative lighting through motion sensors; (2) restore inactive HVAC controls and setpoints, (3)

improve controls to allow building operators to properly manage building operations, and (4) improve zoning so that parts of a building may be heated or cooled to different standards.

As a rule, the past energy surveys and projects at NAVBASE Coronado did not provide for effective controls. NAVBASE Coronado enjoys energy-efficient lighting systems in every building, and can focus on the operation of those systems in a more efficient manner, through selected controls applications and by working closely with building operators.

3.4.4 Findings

a. NAVBASE Coronado has modern lighting systems but lacks effective lighting controls.

b. NAVBASE Coronado has significant HVAC control problems, as witnessed at Building 1472. HVAC control problems can be expected to worsen with the shops losing people, the HVAC monitoring center being unmanned, and the remaining resources working to keep systems running at all.

c. Past energy surveys and projects have largely ignored building controls, especially for lighting. The exception to this is the 1997 energy survey at SCI, which identified controls for each building.

d. Controls projects tend to save disproportionately large amounts of energy for a small investment. Since SPC cash incentives are based on kWh saved, not on project cost, it is possible to finance controls projects entirely through SPC payments. HVAC SPC payments were $.16 per kWh saved, versus $.05 for each lighting kWh. Therefore, HVAC control projects are particularly attractive.

e. Few workstation motion sensor controls were found at NAVBASE Coronado. These controls turn off monitors and printers when not in use. This is a new control opportunity with great application at NAVBASE Coronado and throughout the region.

3.4.5 Recommendations

a. Initiate a lighting and workstation controls project at NAVBASE Coronado. Identify control applications with simple paybacks in less than 1 year. Finance the project with activity funds, using shop or Seabee labor to install the controls. Apply for an SPC and use the SPC payments to finance more work, also qualifying for SPC payments, and so on.

b. Implement the controls and other fast payback recommendations in the SCI energy survey report.

c. Task the HVAC shop to identify HVAC controls deficiencies at NAVBASE Coronado and recommend corrective measures. Many of these problems and recommendations have likely been identified, but have not been carried out due to lack of funds or manpower. Estimate the energy

savings for each problem and implement corrective measures for all problems with paybacks less than 3 years. Submit projects to carry out all remaining work.

d. Provide additional ¼ man-year of budget to the HVAC shop to permit the HVAC monitoring center to be manned for one shift. Monitor HVAC systems to identify operating problems and develop further energy projects. Set proper operating parameters for each system and ensure they operate accordingly.

e. Ensure that future energy surveys properly consider controls as well as equipment.

ATTACHMENT A
REVISED DRAFT COMNAVREGSOUTHWESTINST 4101.1

COMNAVREGSWINST 4101.1
N44

COMNAVREGSW INSTRUCTION 4101.1

Subj: REGIONAL ENERGY MANAGEMENT PROGRAM

Ref: (a) Executive Order 13123, Greening the Government through Efficient Energy Management
(b) OPNAVINST 4100.5D
(c) http://www.energy.ca.gov/title24/index.html, Title 24, Part 6, California Code of Regulations, California's Energy Efficiency Standards
(d) COMNAVREGSWINST _____, Procurement of Energy Efficient Equipment, Environmentally Preferable Purchasing and Sustainable Design
(e) http://www.eren.doe.gov/femp/procurement, Federal Energy Management Program (FEMP), Product Energy Efficiency Recommendations
(f) http://www.epa.gov/appdstar/estar/products.html, DOE/EPA Energy Star® Product Purchasing
(g) COMNAVREGSWNOTE 11300.1 of 2 Nov 1999, Energy Management System/Direct Digital Controls (EMS/DDC) Design and Procurement Standardization Policy
(h) http://www.cnbsd.navy.mil, Navy Region Southwest Command Web Site
(i) COMNAVREGSWINST _____, Utility Demand Reduction Program Plan
(j) COMNAVBASESANDIEGOINST 4100.4A, Water Conservation
(k) COMNAVREGSWINST _____, Building Monitors
(l) http://pwlive.cbcph.navy.mil/energy_showcase, Naval Base Ventura County Energy Showcase Web Site

Encl: (1) Energy Management Program Responsibilities
(2) Energy Management Requirements and Guidelines

1. Purpose. To set energy management policy; provide goals, guidelines, and procedures; and assign action

responsibilities per references (a) through (l) in order to establish and maintain a coordinated, regional energy management program.

2. Cancellation. Existing energy management instructions for Navy Region, Southwest complexes in the Metro San Diego area, in their entirety.

3. Scope. Applies to all Navy Region, Southwest complexes and ships berthed at those complexes which receive shore utilities.

4. Background. Reference (a) sets the following energy and emissions goals for Federal agencies:

a. To reduce greenhouse gas emissions by 30 percent by 2010, relative to 1990 levels;
b. Reduce energy consumption per square foot by 30 percent by 2005 and 35 percent by 2010, relative to 1985;
c. Reduce industrial and laboratory energy use per square foot or other approved unit by 20 percent by 2005 and 25 percent by 2010, relative to 1990;
d. Strive to expand the use of renewable energy;
e. Strive to reduce the use of petroleum;
f. Strive to reduce source uses of energy; and
g. Reduce water consumption

Reference (b) sets Navy energy policy. Reference (c) provides energy efficiency standards for residential and non-residential buildings in California. Reference (d) sets Navy Region, Southwest policy for the procurement of energy-efficient equipment, environmentally preferable purchasing and sustainable design. Reference (e) provides FEMP product energy efficiency recommendations. Reference (f) provides guidance and tools for purchasing Energy Star® products. Reference (g) sets policy for the design and procurement of energy management systems (EMS) and direct digital controls (DDC) and associated equipment in the San Diego area. Reference (h) is the Navy Region, Southwest web site and provides energy management information for the Region’s energy managers. Reference (i) is the Utility Demand Reduction Program Plan, applicable to Metro San Diego activities and ships

receiving shore utilities from those activities. Reference (j) is the Water Conservation directive for Metro San Diego activities. Reference (k) establishes requirements for building monitors for Navy Region, Southwest activities. Reference (l) is the web site for the Navy energy showcase site at Naval Base Ventura County.

5. Discussion. Significant cost avoidances and reductions can be achieved through an effective energy management program. In addition, significant environmental benefits such as a reduction of greenhouse gas emissions and other pollutants associated with the production of electricity or the burning of fuels are attainable via such a program. An effective energy management program requires an all hands effort and an on-going commitment to sound energy management practices, life-cycle cost-effective projects, and efficiency in day-to-day operations. It does not sacrifice quality of life or productivity for artificial gains in energy efficiency. An effective energy management program can actually improve quality of life and productivity by tailoring energy use to actual needs and by freeing up energy dollars for more urgent mission and personnel support requirements.

6. Policy. Navy Region, Southwest is committed to achieve the energy and emissions reduction goals of reference (a). Specific energy management program requirements and organizational responsibilities are provided by enclosures (1) and (2). These requirements are applicable to all Navy Region, Southwest activities except where compliance with specific program requirements can be shown to be not life-cycle cost-effective.

7. Action. All complexes, tenant commands, activities, departments, and other organizations under the Navy Region, Southwest funding umbrella shall carry out the energy management policies and practices prescribed by enclosures (1) and (2). They shall use all management, technical, and contractual resources available to achieve the goals set by reference (a). Complexes may exceed the requirements of this Instruction as considered necessary,

consistent with mission requirements and health, safety and morale concerns.

Signed

Distribution: www.cnbsd.navy.mil/admin/menu.htm

ENERGY MANAGEMENT PROGRAM RESPONSIBILITIES

1. General. An effective energy management program must have command support, must be implemented base-wide through the chain of command and must enlist the support of all base personnel. Program managers must have authority commensurate with their responsibility and should have the ability to commit the necessary technical, management and financial resources to maximize cost and energy savings. The program should integrate the knowledge, skills and ideas of energy managers, utilities operators, facilities technicians, shop mechanics, building operators and others to achieve the greatest results. The Navy Region, Southwest energy management program is designed accordingly.

2. Organization. The regional energy management program is comprised of the following elements:

a. Regional Energy Management Board (REMB). The REMB is a command-level policy board comprised of the following members:

ACOS for Facilities (Chair)
ACOS for Logistics
ACOS for Infrastructure Planning
ACOS for Support Services
ACOS for Environmental & Safety
Program Manager (PM) for Energy & Utilities
All CNRSW PWO's

b. Regional Energy Officer (REO). The REO directs the regional energy management program and shall be the PM for Energy & Utilities (Code N446).

c. Regional Energy Steering Group (RESG). The RESG provides oversight and coordination of energy and utilities studies, audits, and projects within the region. The RESG shall have the following membership:

PM for Energy & Utilities (Chair)

Director, PWC Utilities Management Division
Manager, SOUTHWESTDIV Energy Business Line
SOUTHWESTDIV Energy Business Line Project Managers, as assigned,
SOUTHWESTDIV Energy Business Line Contracting Officer

d. Regional Energy Program Office (REPO). The REPO reports to the PM for Energy & Utilities. It provides energy management and technical support to the regional energy management program and to the three Metro complexes. The REPO is made up of the following positions:

Energy Administrator
Energy Manager, Naval Base, San Diego
Energy Manager, Naval Base, Coronado
Energy Manager, Naval Base, Point Loma

e. Complex Energy Officers (CEO's). CEO's direct the energy management programs at each complex within the region. The CEO shall be the complex PWO.

f. Complex Energy Managers (CEM's). Each complex shall have a CEM, whether as a primary or collateral duty. The CEM may be a military or civilian position, but in the interest of program continuity a civilian position is preferable. The CEM shall report to the CEO. The REPO serves as the CEM for the three Metro complexes.

g. Complex Energy Management Teams (EMT's). Each complex shall have an EMT, headed by the CEO and supported by the CEM or REPO. The EMT shall implement regional energy policies throughout the complexes.

h. Building Energy Monitors (BEM). Each Region building shall be assigned a collateral duty BEM and an alternate. The BEM may be the Building Monitor, as assigned in accordance with reference (k). BEM's are members of the EMT.

3. Responsibilities

a. Regional Energy Management Board (REMB). The REMB provides policy direction to the regional energy management program. It shall meet at least annually to review the progress of all complexes toward Navy energy goals, consider changes to energy policies and provide program direction.

b. Regional Energy Officer. The REO is responsible for carrying out the Region's energy management policies and programs. The REO shall serve as the Region's focal point for all energy matters. The REO shall direct the efforts of the RESG, the REPO and the CEO's throughout the Region. The REO shall recommend changes to the Region's energy management policies, direct regional energy management program activities and provide resources to carry out that program.

c. Regional Energy Steering Group. RESG responsibilities include the following:

(1) Provide technical support to the Regional energy management program.

(2) Plan energy audits, engineering studies, utility system assessments and other technical services to identify ways to make the Region's infrastructure more energy-efficient.

(3) Initiate competitive utility procurements, third party utility projects, energy service performance contracts and similar initiatives to reduce the Region's energy costs with a minimum of Navy investment.

(4) Initiate and coordinate demand-side management (DSM). DSM programs include energy audits, engineering studies, rate analyses, and other initiatives to reduce energy and water demands. DSM programs can include both utility-sponsored programs and Navy-funded projects and programs.

(5) Develop and manage Energy Conservation Investment Program (ECIP) and other projects to make the infrastructure more energy efficient.

d. Regional Energy Program Office. REPO is the center of Navy energy management expertise in the Metro area. REPO responsibilities include, but are not limited to:

(1) Serve as the primary point of contact for Metro area energy management matters on a daily basis.

(2) Assist Metro area CEO's in conducting EMT meetings and training workshops. Maintain current rosters of EMT members, make logistic arrangements for meetings, prepare training materials, develop agendas, arrange for speakers and otherwise help conduct professional, value-added meetings.

(3) In support of the Metro complexes, review utilities allocations and Compterized Utility Billing Integrated Control (CUBIC) reports, metered utility reports, Silicon Energy 1.4™ consumption trends, and investigate causes of apparent anomalies. Recommend and help implement measures to correct anomalies and reduce energy costs.

(4) Review energy-related work requests, Special Projects and Military Construction (MILCON) projects for the Metro complexes and provide applicable engineering review comments in the furtherance of energy efficiency, conservation and good energy and utility management practices.

(5) Organize and coordinate Energy Awareness Week committees at the Metro complexes and support other Region complexes in implementing their own successful programs. Help plan educational events, recognition ceremonies, publicity and other events to promote awareness in a meaningful fashion.

(6) Help Code N4461 execute utility demand reduction (UDR) alerts in the Metro area. Notify EMT members and non-Region commands, shed the Regional loads controlled by EMS/DDC, monitor effectiveness of demand reduction efforts and make follow-up notifications as necessary. Evaluate the effectiveness of UDR alerts and

implement measures to improve the effectiveness of future alerts.

(7) Support the Regional Energy Steering Group. Participate in meetings, report on Region programs and projects, work with SOUTHWESTDIV to plan upcoming projects and studies to best meet the Region's needs, identify emerging program needs, and otherwise help coordinate program activities with key support agencies.

(8) Host an annual regional energy management conference; support the meetings of the REMB and RESG; and coordinate energy workshops as needed.

(9) Initiate renewable energy, alternate fuel vehicle, and other emerging technology demonstration projects, frequently partnering and coordinating with the Navy Environmental Leadership Program (NELP).

(10) Review ECIP, DSM and ESPC projects.

(11) Support the complexes' efforts, such as energy audits, surveys and studies, metering programs, lighting optimization programs, and other actions.

(12) Review energy reports for all complexes, including the quarterly Energy Audit Report. Disseminate pertinent information throughout the program.

(13) Prepare Federal Energy Management Program (FEMP), SECNAV and other energy award nominations for the Metro complexes for submittal to Code N44. Provide nomination criteria and requirements to all complexes.

(14) Develop and maintain an effective regional energy awards program to recognize commands or individuals who excel in conservation efforts.

(15) Represent Navy Region, Southwest at workshops, seminars, and meetings on energy and utilities management.

(16) Recommend changes to energy and utilities management instructions as necessary.

d. Complex Energy Officers. CEO's shall be the point of contact for energy matters at their complexes. CEO's manage their complexes' utility and maintenance budgets, direct the activities of the Maintenance shops and have the authority and resources necessary to carry out an effective energy management program. Their responsibilities include the following:

(1) Establish and maintain an effective Energy Management Team (EMT) to implement regional energy policies throughout the complex.

(2) Ensure EMT members are aware of the Region's energy goals, the specific energy issues facing their complexes and their energy management responsibilities. Encourage EMT members to use their knowledge of building operations and mission requirements to suggest ways to reduce energy costs.

(3) Provide executive briefings to the Commanding Officer and department heads of the complex and to tenant activities under the Region's funding umbrella. Keep the command apprised of energy issues and progress toward energy and cost reduction goals. Enlist their support in making energy management an integral part of daily operations.

(4) Carry out walk-through's of key facilities to ensure that good energy management procedures are in place, building systems and controls are working properly and facility personnel understand what measures they are to take in case of UDR alerts. Also identify any fast-payback energy projects that might be implemented at each facility.

(5) Ensure the shops have the resources to properly maintain, repair and monitor building systems. Set up a system for energy-related problems to be promptly reported and resolved. Encourage shops personnel to use their expert knowledge of building systems to submit suggestions to reduce energy costs.

(6)Review energy deficiency reports generated by AIS inspections, the shops and EMT members. Ensure fast-payback opportunities are implemented immediately. Submit energy opportunities beyond local resources to implement to higher authority.

(7)Establish and maintain an active energy suggestion program. Refer adopted suggestions to REPO for wider implementation.

(8)Ensure designs for MILCON projects, special projects and significant other projects at the Complex are reviewed by the CEM/REPO for energy efficiency. Ensure that equipment purchases comply with this Instruction.

(9)Establish and maintain an energy awards program for the complex.

(10) Ensure that utility operations, building operations and maintenance programs are integrated to achieve the most life-cycle cost-effective operation.

e. Complex Energy Managers.

(1) Serve as the CEO's program manager for energy management. Provide the technical and staff support needed for the CEO to carry out the above energy management responsibilities.

(2) Assist the CEO in conducting EMT meetings and training workshops, as described for the REPO.

(3) Identify the complex's key facilities in terms of energy use and conduct energy walk-throughs as described above for the CEO's.

(4) Review utilities production reports and billings, identify apparent anomalies, and take appropriate measures to correct anomalies and reduce energy costs.

(5) Review energy-related work requests, Special Projects and Military Construction (MILCON) projects for the complex and provide energy review comments.

(6) Organize and coordinate Energy Awareness Week committees at the complex. Help plan educational events, recognition ceremonies, publicity and other events to promote awareness in a meaningful fashion.

(7) As applicable, execute UDR alerts for the complex as described above for the REPO.

(8) Initiate renewable energy, alternate fuel vehicle, fuel cell and other emerging technology demonstration projects, as feasible and cost-effective.

(9) Review ECIP, DSM and ESPC projects for the complex.

(10) Coordinate energy audits, surveys and studies, and other energy management actions at the complex

(11) Review the quarterly Energy Audit Report and other energy reports provided by others. Disseminate pertinent information to the CEO and EMT.

(12) Prepare FEMP, SECNAV and other energy award nominations for the complex for submittal to Code N44.

(13) Develop and maintain an effective complex energy awards program.

(14) Represent the complex at workshops, seminars, and meetings on energy and utilities management.

(15) Recommend changes to complex energy and utilities management instructions as necessary.

f. Energy Management Team. The EMT shall be comprised of the CEM/REPO, BEM’s, facility managers, department representatives, Maintenance shops

representatives and Utilities personnel, as appropriate. EMT members shall:

(1) Become familiar with applicable energy directives.

(2) Attend all EMT meetings and workshops, as required.

(3) As tasked by the CEO, walk through their facilities with the CEM/REPO and shops personnel to ensure building systems are working properly and that building operations are energy efficient.

(4) For members not tasked to do a walk-through, audit facilities independently for the same items as above. Request assistance through the CEO as required. Report any apparent building deficiencies to the CEM/REPO.

(5) Provide energy conservation briefings to personnel in their organization or building.

(6) Report water, steam, natural gas, and compressed air leaks to the Complex Work Reception Desk.

(7) Inform Building Monitors and other key personnel of the provisions of the Utility Demand Reduction (UDR) Program. Carry out demand reduction measures in assigned spaces when UDR alerts are called.

(8) Schedule and submit to the CEO a listing of events planned for Energy Awareness Week in order to coordinate them with other events. Submit listing no later than three weeks prior to start of Energy Awareness Week.

(9) Assist CEO with Regional Energy Awareness Week activities.

(10) Report to the EMT any energy discrepancies and violations noted, even though outside own area of responsibility.

(11) Initiate corrective action of energy discrepancies in area of responsibility.

ENERGY MANAGEMENT REQUIREMENTS AND GUIDELINES

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1. General Energy Management Requirements. The following general requirements and guidelines will be uniformly implemented and enforced:

a. The energy-efficient operation of buildings, which costs little, can save as much energy as an expensive energy project. Accordingly, all Navy Region, Southwest personnel shall carry out the following basic energy management measures:

(1) Metro San Diego complexes shall participate in the Utility Demand Reduction (UDR) Program when electrical load shed or gas curtailment events are called; reference (i) refers.

(2) Secure lighting, air conditioning, office equipment and other equipment to the greatest degree practical after working hours, on holidays and on weekends. Do not operate central air conditioning systems and large blocks of lights for the sake of the watch section or personnel working after hours. If the complex implements shortened work weeks, ensure buildings are

secured as fully as possible at the end of the last workday, to maximize energy cost savings.

(3) Turn off all lights in individual offices and spaces whenever the occupant leaves the area for any period longer than two minutes. Turn off exhaust fans and lights in unoccupied restrooms. Secure machinery and equipment when not in use.

(4) Activate the sleep mode on computer monitors, printers and copiers. Turn off monitors and printers when leaving your workstation for an hour or more. Turn off all work station equipment at the end of the day.

(5) Turn off lights in classrooms, conference rooms and other common use areas whenever unoccupied.

(6) Encourage others to take the initiative to turn off lights and equipment when not needed.

(7) Ensure outside security lights are never on during the day. Report problems to the Complex Work Reception Desk.

(8) Report broken or inaccurate controls to the Complex Work Reception Desk as potential energy problems. Do not accept malfunctioning heating, air conditioning and lighting controls as a fact of life.

(9) Secure interior lights whenever natural lighting provides adequate level of light. Level of overhead artificial lighting shall not exceed 50 foot-candles in any administrative space.

(10) Turn off all or part of the overhead industrial lighting in hangars, warehouses, shops, etc., as operations and lighting conditions permit. These lights are rarely all required during the day. Use task lighting for specific lighting requirements on the work floor.

(11) Secure exterior doors and windows when heating or cooling systems are in operation.

(12) Do not use portable heaters unless they are the only source of heat in a particular area which qualifies for comfort space heating and a work request has been submitted to install a permanent heating system or repair existing system. All applicable safety standards (as determined by the Federal Fire Department) and circuit loading conditions must be met. Procurement of additional electric heaters is prohibited. If portable heaters must be used, turn them off when leaving the area for any period.

(13) Close all water taps when not in use and use self-closing nozzles on hoses when used for automobile and aircraft washing. Maximum use of automatic or central washing systems is encouraged.

(14) Report all leaks, including steam, natural gas, water, and compressed air to the Complex Work Reception desk. Running toilets, broken faucets and similar minor problems cost hundreds of dollars a month and often these problems go unreported.

(15) Turn off the engine in government vehicles while waiting for personnel or material to be loaded or unloaded.

(16) Become familiar with and practice driving habits designed to conserve fuel and reduce maintenance costs.

(17) Consolidate trips involving government vehicles whenever possible. Rearrange schedules to reduce trips.

b. Activities shall provide training to their military and civilian personnel on the above general requirements and shall ensure compliance within their assigned spaces.

c. Activities shall further comply with the specific energy management requirements on the following pages.

2. ENERGY AWARENESS

a. Activities shall establish and sustain an active energy awareness program. This program shall include, at a minimum, the following elements:

(1) Command Involvement. Complex commanding officers and department heads must be aware of and be personally involved in the energy management program. They shall take a leadership role in the program and shall integrate energy efficiency into all aspects of base operations. The Energy Management Team shall provide energy briefings and program information to the commanding officer, department heads and other key personnel on a frequent basis.

(2) Training. Complexes shall maintain an active Energy Management Team (EMT), including an effective network of building energy monitors. The EMT shall meet at least quarterly for training, sharing ideas, and receiving feedback on progress toward meeting its energy goals. Monitors and other key members of the EMT shall be trained in the most effective ways to manage energy in their facilities, key things to check in building systems and new programs and ideas.

(3) Awareness Activities. Complexes shall conduct energy awareness activities during the annual Energy Awareness Week and throughout the year. Such activities shall include an active energy suggestion and awards program, articles in base publications, announcements on closed circuit TV systems, periodic e-mails and notices on subjects of concern, feedback to the command on energy goals and progress and similar activities.

(4) Awards. Complexes will participate in the FEMP and Secretary of the Navy energy awards programs. The FEMP award recognizes commands, groups and individuals for outstanding achievements in energy and water conservation. REPO will notify complexes of award submittal requirements and procedures at least 90 days before submittals are due. REPO will prepare nominations for the three Metro complexes for submittal through the

ACOS for Facilities. Complexes outside the Metro area shall prepare their own nominations for submittal to the ACOS for Facilities. Complexes shall also provide local recognition to groups and individuals who have contributed significantly to the energy program.

3. LIGHTING

a. Title 24 sets specific energy efficiency requirements for new buildings in California. Although Navy Region, Southwest buildings are not subject to state requirements, Title 24 energy standards are considered appropriate for Navy facilities and shall be complied with as noted herein. Accordingly, lighting systems in new facilities shall comply with the Title 24 energy efficiency standards prescribed by reference (c). Lighting in buildings undergoing major renovation shall be brought up to Title 24 standards except where shown to be not life-cycle cost-effective. Lighting in other buildings should be brought up to Title 24 standards through energy retrofit projects, wherever cost-effective.

b. Lighting systems in new facilities and facilities undergoing major renovations shall have control systems as specified in reference (c). Upgrades to lighting control systems should be included in any energy retrofit projects.

c. Existing lighting systems shall have occupancy sensors or other automatic controls to turn off lights in unoccupied spaces; this requirement is waived where such controls would have a payback longer than five years. Exterior lighting shall have photocell controls or other suitable controls so that the lighting operates in accordance with its intended purpose. For example, the carrier loading lights at the quaywall at NAS North Island are to be operated only when carriers are loading or unloading, not for general security purposes. Reference (c) provides guidance on suitable control systems that can be used to develop controls projects.

d. High intensity discharge (HID) interior lighting, e.g., metal halide and high pressure sodium type, shall

have bi-level controls installed to permit operation at half or full power, as operations permit. Typically, these lights can be operated at half power for more than 50 percent of the time and can go to full power instantaneously. Bi-level controls can be zoned to conform to work stations and can be controlled by timer, occupancy sensor, light sensor or other control schemes. These controls are appropriate for most Navy hangar, warehouse and industrial facilities.

e. Bi-level controls are also appropriate for exterior HID lighting but not for low pressure sodium lamps. These controls are typically cost-effective for lamps of 150 Watts or more but activities should perform their own life-cycle cost analysis based on local conditions.

f. HID lighting may be equipped with voltage regulator systems as an alternative to bi-level controls. Such systems reduce the power consumption of HID lights by about 25 percent, with little apparent difference in light levels.

g. Exterior building lighting, security, parking lot/area lighting, and street lighting shall be low pressure sodium (LPS). Fixtures and photometrics shall conform to local design, approved specifications. If applicable, historic zone compatible fixtures shall be specified. Exterior lighting shall be photocell controlled.

h. Sports areas such as ball fields, driving ranges, etc., may use metal halide lighting. Such lighting shall be photocell controlled to preclude being turned on during daylight hours and timer controlled to assure turn- off after use at night. Fixture and reflector design shall be such as to minimize glare, sky glow and light trespass.

i. Incandescent and mercury vapor lamps are not to be used in any Navy Region, Southwest facilities except for traditional holiday lighting and where there is no alternative product available. One substitution that is strongly recommended is the use of low-Wattage light-

emitting diode (L.E.D.) lamps in place of 24-hour incandescent lamps in fire alarm boxes. L.E.D. lamps typically use 95 percent less energy than incandescents and last for 100,000 hours.

j. Decorative lighting, such as exterior floodlights, downlights, etc., shall be minimized and the most efficient available products used. For example, low-Wattage compact fluorescent lamps are available to replace incandescent PAR lamps. L.E.D. lamps may be a good replacement for decorative incandescent lamps that can not be eliminated.

k. In administrative areas, overhead lighting during working hours shall be no more than:

50 foot-candles at work stations
30 foot-candles in work areas
10 foot-candles in non-work areas (passageways, rest rooms, etc.)

l. In general, the design lighting budget for administrative areas should not exceed 1.2 watts/square foot. In all other areas, minimum lighting levels appropriate to the task, shall be used.

m. Supplementary task lighting may be used if special requirements are judged to exist, such as in auto repair bays. Supplementary luminaires may be used in conjunction with general lighting to achieve the safe and appropriate task lighting authorized.

n. Natural light shall be used whenever possible, such as by opening hangar doors, blinds, and drapes, and removing paint from windows and skylights.

o. Skylights shall be installed whenever feasible and cost-effective. Reflector tubes, which pass sunlight into interior spaces, may be considered where cost-effective.

p. When painting office areas, non-glossy, light, reflective colors should be used to improve illumination of area. (Glossy paint can cause glare.)

q. Hangar bay decks should be painted white to provide reflected light under and around aircraft. Specialized glossy paint is available for this application.

r. Wherever practicable, partitions should be removed to create open spaces, which will permit freer movement of air and reduction in lighting requirements.

s. Lamps and light fixtures should be cleaned annually.

t. Do group relamping (by room, area or building) and keep records of what was relamped and when.

u. Fluorescent lighting systems shall be T8 type with approved solid state ballasts. Fluorescent systems using T12 tubes shall be upgraded to T8 as soon as practical. Lamp replacements for T8 systems shall only be with T8 products as re-installing T12 tubes in the upgraded systems will shorten the life of ballasts and lamps.

v. All new fixtures shall incorporate approved solid state ballasts, T8 lamps and polished aluminum reflectors where required. If additional light output is required, polished specular aluminum reflectors should be installed.

w. 4 lamp fixtures shall be delamped to two tubes and one ballast disconnected or removed. When unique situations require greater light intensity, such as 3 or 4 lamp fixtures, separate switching shall control the inner and outer lamps.

x. All exit signs shall be solid-state LED type with battery backup. Exit signs with incandescent or compact fluorescent lamps shall be upgraded to L.E.D. type. Self-illuminating radioluminous (radioactive) signs are prohibited except under unique circumstances and then written permission from the responsible Public Works Officer (PWO) is required.

y. Consider using janitorial forces during regular working hours, where practical, to eliminate continued use of utilities at night. Instruct cleaning crews to light only the immediate area in which they are working, turning lights off as they leave.

z. Eliminate the use of natural gas for outdoor or indoor decorative lighting such as torches, flares, etc.

aa. Soda and juice vending machines shall be delamped except where light is provided by L.E.D. lamps. Soda and juice vending machines with lighting and compressor cycling controls may be lighted.

4. OFFICE EQUIPMENT

a. All new or replacement office equipment shall comply with EPA's Energy Star® requirements. A good source of Energy Star® information is the Federal Energy Management Program (FEMP) web site, reference (e), http://www.eren.doe.gov/femp/procurement.

b. The sleep mode shall be activated on all monitors, printers and copiers to save energy when not in use. Computers, printers, monitors, desk lamps, and copy machines shall be turned off when leaving for the day or weekend. Fax machines may be left on to accept late faxes.

5. MOTORS AND GENERAL ELECTRICAL

a. New equipment motors and replacement motors shall be of the premium energy efficient type. Motors shall comply with efficiency requirements of NEMA Standard 12-6C.

b. When standard V-belts are replaced or installed, make sure belts are notched belts. Ganged web belts should replace individual multiple belts.

c. Proper belt tension and alignment shall be checked at installation and periodically thereafter.

Alignment between motor shaft, coupling and the driven shaft of pumps shall also be checked.

d. Assure proper lubrication of motor and/or shaft bearings.

e. Variable speed drives and/or soft start controls should be used with motors where applicable and cost-effective, particularly for large chiller and other pumps.

f. Power factor controllers shall be installed in electrical circuits where advantageous.

g. Inefficient 400 HZ motor-generators shall be replaced with approved solid state frequency converters meeting required MIL-STD specifications.

h. When testing standby generating equipment, the electrical load will be transferred to the emergency circuit where practical.

i. When purchasing new electrical equipment and appliances, specify the most energy efficient type as recommended by the FEMP and Energy Star® web sites, references (e) and (f). These sites provide the current product energy efficiencies available and list the most efficient products on the market. Reference (f) further provides tools to help activities analyze product life-cycle costs. Less energy efficient products may only be purchased when their life-cycle costs are more than 10 percent less than the most efficient products. These requirements apply to anyone buying equipment, including Government credit card holders.

j. For all motor and equipment purchases, the policy statements of reference (d) for the procurement of energy efficient equipment apply.

6. WATER

a. Reference (j) provides detailed water conservation requirements for all complexes and the Water Shortage Contingency Plan for the Metro San Diego area.

Elements of reference (j) are incorporated herein for completeness.

b. Complexes outside of the Metro San Diego area shall develop local water shortage contingency plans in support of their water supply district plans.

c. The following general water conservation measures are prescribed:

(1) Complexes will implement procedures to regularly inspect toilets, faucets, hose bibs, etc., for leaks and to arrange prompt repairs. A slow drip can waste 50 gallons or more a day, and a 1/8-inch stream can waste 2,800 gallons per day.

(2) All hoses shall be equipped with automatic shutoff nozzles.

(3) Fresh water will not be used for hosing down streets, piers, parking lots or buildings unless required for safety or health reasons.

(4) Complexes shall strive to meter 100 percent of water use. Water use records shall be reviewed at least monthly to detect any anomalies in water use. Apparent anomalies shall be field checked and any problems corrected. Anomalies are typically caused by unreported leaks, running toilets and over-watering of landscaping.

(5) Personnel shall report any apparent water leaks, broken sprinkler heads, wasteful watering practices and other wastes to the Complex Work Reception Desk.

(6) Contractors shall be metered for water use and shall be monitored for water waste. Such wastes shall be reported to the responsible Contracting Officer. This requirement may be waived for contracts involving only nominal use of water.

(7) If contractors are obtaining water from a fire hydrant, a hydrant meter shall be installed in order to track consumption.

(8) Complexes will publicize the water conservation program in base newspapers, family housing newsletters, cable TV, and other media.

(9) Personnel should wash full loads in washing machines and dishwashers.

(10) Organic and/or inorganic mulches will be used in all landscape planter beds, whether irrigated or not, to a maximum depth of 3 inches.

d. The following operations and maintenance water conservation measures are prescribed:

(1) Building water pressure regulators should be adjusted so as not to exceed 80 psig.

(2) Conduct periodic leak detection surveys of the water distribution system and repair all leaks. Such surveys have in the past identified undetected leaks of up to 40 percent of total base water use.

(3) Maintain water systems in accordance with NAVFAC MO-210, Maintenance and Operation of Water Supply, Treatment, and Distribution Systems. Ensure supply pressures are properly adjusted to the minimum pressures consistent with fire fighting and operational requirements.

(4) Maintain cathodic protection systems in accordance with NAVFAC MO-307, Cathodic Protection Systems Maintenance.

(5) Ensure the greatest practical return of condensate to the steam plant, to conserve water, energy and chemicals.

(6) Rate of water flow shall not exceed 2.5 gallons per minute (gpm) in showerheads and 2.2 gpm in

sink and lavatory faucets at 80 psig pressure. Faucets shall be equipped with aerators.

(7) Rate of water flow shall not exceed 1.6 gallons per flush in new and replacement toilets and 1.0 gallon per flush in new and replacement urinals. Consider waterless urinals where conditions and economics warrant, such as areas with difficult water supply.

(8) Existing toilets, urinals and flushometers shall be retrofitted to minimize water consumption.

(9) New and replacement sink and lavatory faucets shall be the automatic shut-off type. Lavatory faucets shall incorporate an aerator. In high usage areas such as theaters, gyms, and for handicap lavatories, infrared sensor controlled faucets shall be used.

(10) Where reclaimed water is available, evaluate the technical and economic feasibility of using it for irrigation, cooling towers and other industrial purposes.

(11) Eliminate all single pass cooling systems; convert to recirculating systems or use reclaimed water for this purpose.

(12) Maintain proper cooling tower water treatment programs and provide automatic bleed controls so as to operate cooling towers at 5-8 cycles of concentration before blowdown is required.

(13) Ensure cooling tower bleed valves work properly. One stuck valve can waste millions of gallons of water without being detected.

(14) When demolishing buildings, cut and plug abandoned water lines where they join the active system rather than just closing valves.

(15) Water softeners shall not be used, except it utility systems or for critical applications, because they are significant wasters of water and introduce salts

into the sewage system, reducing potential for production of reclaimed water.

(16) When purchasing new or replacement washing machines, specify energy and water efficient horizontal axis (front loading) type.

(17) Government vehicles shall be washed in recirculating washracks. Manual washing is limited to no more than once every two weeks unless further restricted by reference (j). These limitations may be waived for certain vehicles where health, safety and welfare are a concern, such as refuse trucks and vehicles transporting food and perishables.

(18) On-base washing of privately owned vehicles is authorized only at designated car wash stations, unless further restricted by reference (j).

(19) Manual washing, when allowed, shall be done with a hand held bucket or hose equipped with an automatic, positive shutoff nozzle for quick rinses.

(20) Aircraft washing shall be accomplished using low flow, high pressure washers, if available. Where not available, hoses shall use automatic shut off nozzles. Nozzles and hoses shall be replaced when damaged or leaking.

e. The following landscape irrigation water conservation measures are prescribed:

(1) Incorporate water conservation practices into grounds maintenance contracts.

(2) Irrigation pressure regulators shall be adjusted not to exceed 80 psig.

(3) Leaking irrigation piping and sprinkler heads shall be secured until repairs are made.

(4) Sprinkler heads shall be properly oriented to eliminate overspray onto sidewalks, parking lots, streets, etc.

(5) Do not overwater. Use the minimum amount required to maintain green areas and shrubbery and eliminate run off. For large landscaped areas, such as golf courses, request a turf audit from the local water supplier or the U.S. Soil Conservation Service. To arrange for an audit in San Diego County, contact CNRSW Code N4461 at (619) 556-8569 or -6855.

(6) Evaluate the use of reclaimed water to irrigate large landscaped areas. The PWC San Diego Utilities Department can help evaluate the feasibility of using reclaimed water in the Metro area. Outside the Metro San Diego area, local wastewater districts can assist activities in evaluating potential reclaimed water applications.

(7) Install automatic timers and moisture sensors on sprinkler systems where life-cycle cost-effective. Uncontrolled manual watering is a likely cause of water waste. Automatic sprinkling shall be completed by 0900.

(8) Assure sprinkler systems are not operated during or immediately after rain.

(9) Water green areas and shrubbery between 2100 and 0900 to minimize evaporation.

(10) Hand watering shall be done with an automatic hose nozzle and completed prior to 0900.

(11) Consider drip irrigation for shrubbery instead of sprinklers.

(12) Use native or indigenous species of plants, decorative stone and xeriscaping to minimize landscaping water use.

7. WATER HEATING

a. Hot water pipes shall be insulated, especially where recirculating pumps are in use. Install an insulating blanket on older hot water heaters.

b. Replacement water heaters shall be insulated to an R-15 level or greater and incorporate low NOx burners.

c. Install solar water heating systems when feasible and cost-effective.

d. Replace electric water heaters with gas, or propane heaters when appropriate and cost-effective. Steam heat exchangers should be replaced by natural gas water heaters in facilities where steam would normally be turned off to the building during non-heating season.

e. Consider heating or preheating water by recovering heat wasted from other sources such as air conditioners, compressors and large refrigeration units. This also lets them operate more efficiently.

f. If water must be heated electrically, install a timer in the circuit to shut down tank heaters when not required.

g. Set hot water heater temperatures to deliver tepid water to the faucet, unless otherwise required for sanitation purposes.

h. Consider small under-counter water heaters or instantaneous tankless water heaters to minimize or eliminate storage losses where heated water requirements are low. Verify electrical circuit capacity prior to installing instantaneous tankless water heaters.

i. In buildings where a hot water circulation pump is used, install a timer to deactivate pump during periods of no use.

j. New or replacement water heaters shall meet or exceed the most current energy efficiency requirements as recommended by Energy Star®. Consider heat pump water heaters as an alternative to electric units, particularly in locations where they can help remove heat from an area, such as an interior utility room.

8. SPACE HEATING

a. Space heating systems in new facilities and buildings undergoing major renovation shall comply with the Title 24 standards.

b. Except for unique circumstances, electric space heating is not authorized. Where authorized, these heaters must be inspected and approved by the Federal Fire Department. Trailers used in mild climates that have heat pumps and auxiliary heat strips should have the heat strips removed.

c. During working hours (only during the heating season) set thermostats to achieve a temperature no higher than 68 degrees Fahrenheit in spaces authorized heating and 55 degrees Fahrenheit or less at night during non-working periods. Install automatic set-back thermostats except where controls are connected to EMS/DDC systems. Warehouses and similar buildings will be maintained at a temperature no higher than 55 degrees Fahrenheit during the heating season. Exceptions will only be made for medical reasons or for operation of equipment requiring higher temperatures. Authorization will be given by the Complex Energy Officer on a case-by-case basis.

d. Insulate pipes or ducts supplying heat. Repair or replace damaged or missing insulation as required.

e. Check control valves for leaks.

f. Establish a program to check steam traps for proper operation, at least once a year. Defective traps shall be replaced or repaired as necessary.

g. Replace air filters on central air systems quarterly during heating season.

h. Install programmable thermostats on Heating, Ventilating and Air Conditioning (HVAC) systems, as recommended by Energy Star®, to properly control the system. For the Metro area, all control equipment must be compatible with the EMS/DDC system as prescribed by reference (g).

i. Install locking devices on room thermostats to prevent tampering.

j. Exterior steam distribution systems and steam systems in buildings shall be maintained to minimize losses. All steam leaks shall be repaired and bare steam piping, including valves shall be insulated. Ensure condensate pumps are working properly. Report steam leaks to the Complex Work Reception Desk.

k. Boilers used for Heating Hot Water (HHW) or steam heat shall incorporate low NOx burners. Boilers shall be high efficiency type and maintained and operated in an efficient, non-polluting manner.

l. New or replacement space heaters, boilers and furnaces shall meet or exceed the most current Energy Star® energy efficiency requirements.

9. COOLING and VENTILATING

a. Cooling and ventilating systems in new facilities and buildings undergoing major renovation shall comply with Title 24 energy efficiency standards.

b. Central air conditioning systems in administrative buildings shall be operated during working hours only and shall be set no lower than 76°F. Air conditioning systems supporting computer and other critical equipment, e.g., simulators, shall be set at a temperature in the highest third of the temperature range prescribed by the equipment manufacturer.

c. Natural cooling and ventilating (i.e., operable windows, vents) is the preferred method where conditioned air is not a requirement.

d. Window air conditioners are prohibited except for specifically authorized purposes, such as temperature and humidity control for critical equipment (personal computers are not considered critical equipment), where there is no other cost-effective way to provide the necessary cooling. Such exceptions shall be authorized in writing by the PWO and shall be posted in the space.

Building monitors shall validate any window air conditioner exemptions annually.

e. Central air conditioning systems shall be equipped with direct digital controls and interfaced to Energy Management System (EMS). Controls for such systems shall be in accordance with reference (g).

f. Remove unauthorized air conditioning units. Spaces in which comfort cooling is authorized shall be maintained at temperatures no lower than 76 degrees Fahrenheit (24.4 degrees Celsius). During unoccupied hours, cooling systems shall be secured, except if required for special temperature or humidity requirements.

g. Periodically check building use to confirm continued need for air conditioning equipment.Install automatic door closers on all doors leading to the exterior of an air conditioned space. Doors and windows are not to be propped open in conditioned spaces.

i. Provide blinds, shades, solar shields, tinted glass, heat reflection glass, or plastic film on windows and glass doors where solar heat gain is not desired. Replace louvered windows with double glazed windows in air conditioned spaces.

j. Consider installation of an economizer on air conditioners with 7 1/2 tons or more of cooling capacity. Where economizers are installed, check them periodically to ensure they are working, particularly in a salt air environment.

k. Repair leaking valves to prevent the loss of chilled water.

l. Ensure chilled water lines and air conditioner ducts are insulated.

m. Install wind driven mechanical air turbines in lieu of electrically powered ventilators, where feasible.

n. Replace filters on a quarterly or other optimum schedule and bags annually to allow free air circulation, prevent blower failure, and optimize system efficiency.

o. Inspect ductwork annually for dirt, moisture and/or mold growth. Clean as necessary to maintain satisfactory indoor air quality (IAQ).

p. Demising walls (interior barriers between conditioned and unconditioned spaces) shall be fully insulated. If a doorway must remain open between a conditioned and unconditioned space, such as for forklift operation, plastic strip curtains are required in the doorway.

q. Install programmable thermostats on Heating, Ventilating and Air Conditioning (HVAC) systems, as recommended by Energy Star®, to properly control the system. For the Metro area, all control equipment must be compatible with the EMS/DDC system as prescribed by reference (g).

r. Reduce size of ventilator motors and/or change sheaves to reduce the number of air changes per hour (ACH) to no more than is required by the most current American Society of Heating, Refrigeration and Air Conditioning Engineers (ASHRAE) standards.

s. Incorporate variable air volume (VAV) systems in new installations and retrofit where economically feasible.

t. Ensure proper preventative maintenance and timely corrective maintenance to enhance the efficient operation of HVAC systems.

u. Annually inspect outside air dampers to ensure proper operation, i.e., not rusted in one position, no leakage when fully closed, etc.

v. Use light colored roof coating in warehouses and air conditioned facilities to reflect sunlight and heat, when cost-effective.

w. Direct Digital Control (DDC) systems are more accurate and reliable than pneumatic control systems and require less maintenance and calibration. DDC is required when upgrading, retrofitting or replacing HVAC systems per reference (g)(Metro San Diego area only).

x. Consider variable speed drive (VSD) for large air handing systems.

y. New or replacement air conditioners shall meet or exceed the most current appliance energy efficiency requirements as per references (e) and (f).

z. The refrigerant of choice for new or replacement air conditioners shall be R-134a. This has an ozone depletion potential (ODP) of 0.0 thus meeting current and proposed future environmental regulations.

10. REFRIGERATION

a. Maintain temperatures per NAVMEDINST P-5010-1, where applicable.

b. Defrost manual refrigerators quarterly to avoid ice build-up, which retards the unit’s efficiency. Wipe dust build-up off of coils also.

c. Replace worn and/or improper sized door seals. If needed, tighten door latches and realign doors for a better fit.

d. Install thermo-strip door curtains in all walk-in freezers and refrigerators where doors must be open for extended periods.

e. Replace light switches with 15 minute delay timers on all walk-in refrigerators where cost-effective.

f. Install door buzzer with door switch on all walk-in refrigerators and freezers as reminder for all personnel to close doors.

g. New or replacement refrigerators and freezers shall meet or exceed the most current appliance energy

efficiency requirements as identified in the Title 24 standards.

h. Procurement of new and replacement refrigerators and water coolers shall specify R-134a refrigerant.

11. BUILDING ENVELOPE

a. Facilities having insufficient or no insulation shall be upgraded when cost-effective.

b. New facilities shall be insulated to meet standards of the climate zone they are located in.

c. Light colored roofing and walls are recommended to minimize solar heat gain.

d. Windows shall be dual glazed and have an overall u-value of 0.5 or lower for new construction or in retrofit applications. Inner glazing shall be low-E type and outer glazing may be tinted as required. Reinforced vinyl window frames are preferred as they require little maintenance, do not corrode, and do not transmit heat and cold like aluminum or steel frames.

e. New windows must have the temporary National Fenestration Rating Council (NFRC) label affixed which states the overall u-value.

f. Passive solar heating and daylighting shall be considered in the design and orientation of new facilities.

12. RENEWABLE ENERGY RESOURCES AND ALTERNATE FUEL VEHICLES. Navy Region, Southwest supports the goals of reference (a) to reduce greenhouse gas emissions through energy conservation, by reducing the burning of fossil fuels, and by reducing the source use of energy. Accordingly, the following actions are directed:

a. Activities shall consider cost-effective applications of photovoltaic, solar thermal, wind power and other forms of renewable energy to meet their energy needs while reducing greenhouse gas emissions. These

technologies are particularly cost-effective for remote locations and as an alternative to long cable runs. Questions regarding potential applications should be referred to the REPO.

b. Activities shall consider on-site fuel cell power generation applications as a cost-effective way to provide base power and thermal energy while reducing source uses of energy. This technology is rapidly becoming competitive with utility rates and is a very efficient way to generate electricity.

c. Activities shall take advantage of Federal, state and local grant and rebate programs to off-set the cost of renewable energy projects. For information on current rebate programs, contact the REPO.

d. Activities shall consider substituting electric, compressed natural gas, hybrid and other alternate fuel vehicles (AFV) for conventional gasoline and diesel-powered vehicles. For information on AFV programs and available rebate programs, contact the REPO.

e. Where natural gas pipelines are available, activities shall convert oil-fired boilers and furnaces to gas and remove the oil tanks. Where pipelines are not available, activities will convert such systems to propane where technically feasible and cost-effective. These actions will reduce greenhouse gas emissions, reduce the risk of oil spills and reduce environmental compliance costs.

13. OTHER PROCEDURES AND GUIDELINES

a. In general, all new facilities and buildings undergoing major renovations shall comply with or preferably exceed Title 24 energy efficiency standards. These standards are available on-line at reference (c).

b. Utility metering shall be incorporated in new facility design. Utilities, except for water to fire suppression systems, and sewer, shall be metered on all facilities.

c. Energy-related work requests shall be marked "ENERGY EFFICIENCY PROJECT" for purpose of expediting and shall be given a priority based on estimated payback.

d. Complexes shall sustain an active energy suggestion program as part of existing beneficial suggestion programs. They shall solicit energy suggestions from the shops, from building operators and tenants and from the general activity population. They shall evaluate energy-related suggestions as rapidly as possible, e.g., within five working days, and make cash payments promptly for approved suggestions. Approved suggestions shall be implemented wherever applicable and shall be forwarded to the Region for possible implementation at other activities. If suggestions are implemented beyond the original scope of the suggestion, additional cash payments shall be made to the suggestor. Awards shall be highly publicized to encourage further ideas.

e. Security Departments will ensure the minimum number of interior and exterior security lights are energized for safety and security in the areas patrolled by Security. Inoperative lights will be reported to the Complex Work Reception Desk. Not all exterior lights are intended to be operated routinely at night. For example, at NAS North Island, quay wall light switches marked "Aircraft Loading Lights" will be energized during loading or offloading of aircraft and supplies only.

f. Security Department will report excessive night-time lighting to the PWO.

g. All Region-Tenant agreements shall require the tenant to comply with current energy management directives.

h. New design or retrofit plans of facilities and utilities shall incorporate all applicable Department of Defense and Naval Facilities Engineering Command (NAVFAC) Sustainable Development Program requirements. Related guidelines to be incorporated shall be:

(1) NAVFAC: Planning and Design Policy Statement 98-01, Design of Sustainable Facilities and Infrastructure.

(2) NAVFAC: Planning and Design Policy Statement 98-02. Criteria Supporting the Design of Sustainable Facilities and Infrastructure.

(3) NAVFAC: Planning and Design Policy Statement 98-03. Procurement of Sustainable Facilities and Infrastructure through Architect-Engineer (A-E) and Related Contracts.

(4) NAVFAC: Planning and Design Policy Statement 98-04. NAVFAC Participation in the Affirmative Procurement of EPA Designated Products.

(5) NAVFAC: Interim design Criteria Technical Guidelines for Energy Conservation in Existing Buildings.

(6) Naval Facilities Engineering Service Center: Navy Water Conservation Guide for Shore Activities; User Guide UG-2017-E&U.

(7) California Code of Regulations, Title 24: Energy Efficiency Standards for Residential and Nonresidential Buildings, reference (c).

i. Complexes shall audit facilities and utility systems at least every five years. Audits may be performed by the serving utility companies, by Navy energy specialists or by contractors. Within the Region, audits will be coordinated by the Regional Energy Steering Group.

j. Within six months of receipt of this Instruction, complexes shall conduct walk-through’s of significant facilities by Energy Management Team personnel, facility managers, energy monitors and shop personnel, as appropriate. The purpose of these walk-through’s shall be to ensure that building systems and controls are operating properly and that buildings are being operated in an energy efficient manner. The walk-through’s will identify measures to be taken for electrical demand reduction, gas curtailment and water contingency events.

Finally, the walk-through's will identify potential energy conservation measures that can be taken within the activity's resources.

k. Complexes shall add a checklist of energy conservation items to Annual Inspection Surveys (AIS); this checklist will be provided by REPO by separate correspondence. AIS inspectors will look for energy-related deficiencies in building systems and controls, lighting, insulation and other areas in addition to the building itself. Energy deficiencies noted will be reported directly to the PWO.

l. Designs for Military Construction projects, special projects, and other alteration and minor construction projects over $25,000 shall be reviewed for energy efficiency. In the Metro San Diego area, designs shall be provided to the REPO at all design stages, including the conceptual design stage. The REPO shall review the designs or refer them to San Diego Gas & Electric Co. or other utilities for detailed review. Complexes outside the Metro area shall establish corresponding design review practices.

m. Purchases of ancillary building equipment and appliances shall comply with the environmentally preferable purchasing and sustainable design requirements of reference (d) and the energy efficiency standards and product recommendations of references (e) and (f). Questions regarding such purchases should be referred to the REPO.

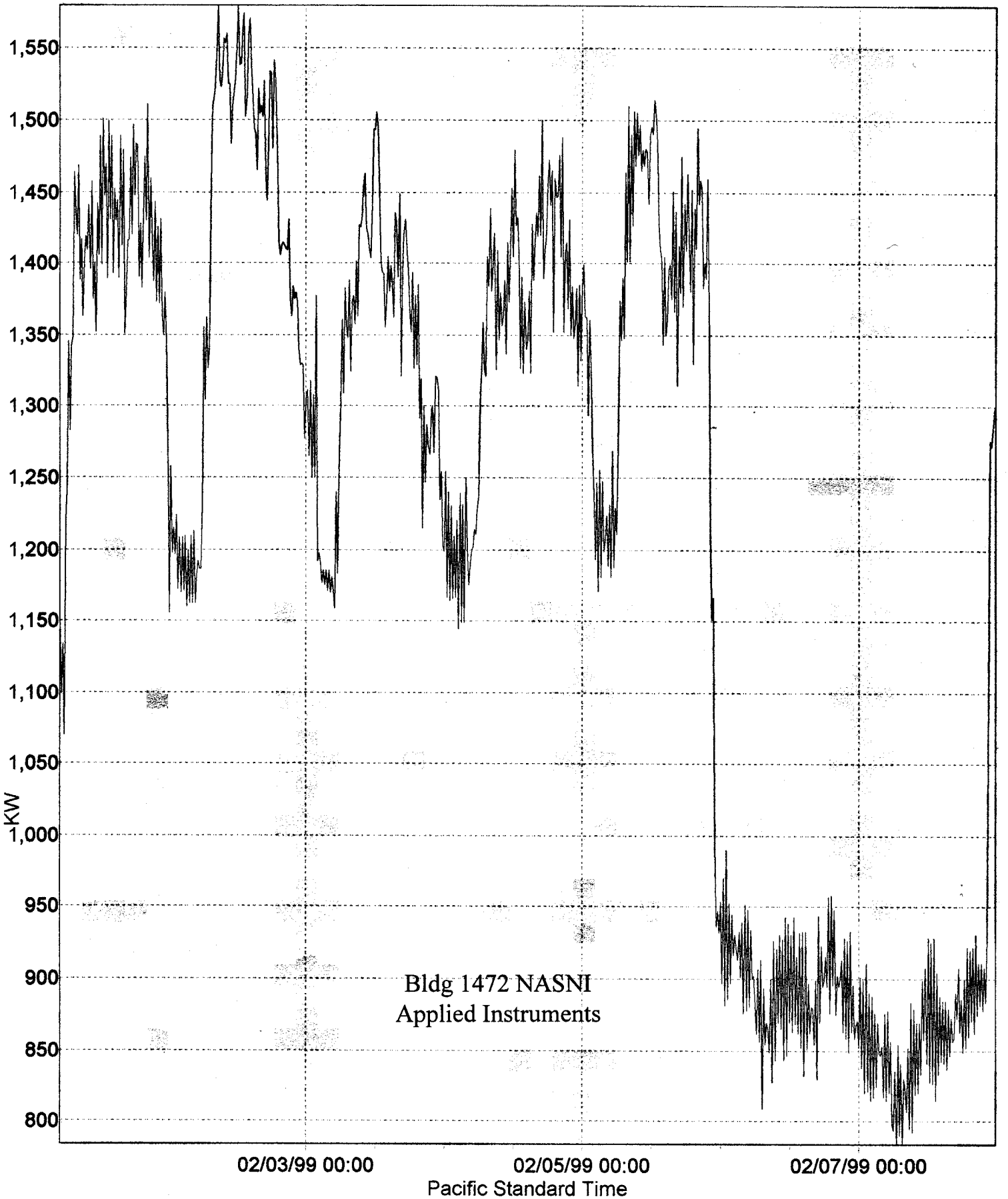
14. NAVY ENERGY SHOWCASE SITE. Naval Base, Ventura County is one of two Navy energy showcase sites. Building 850 at the Construction Battalion Center, Port Hueneme, is one of the showcase site's cornerstone projects. This building was built to demonstrate the state of the art in energy efficiency. The showcase web site, reference (l), helps demonstrate the Navy's aggressive leadership in energy conservation, efficient design practices, sustainable design and the benefits of effective partnering.

Navy Region, Southwest supports the Navy energy showcase program. All complexes are encouraged to take advantage of the showcase's knowledge and experience with energy technologies, sustainable design and efficient design practices and to implement these technologies and practices wherever feasible and cost-effective.

ATTACHEMENT B
ENERSCPAEÔ DEMAND CURVES, BUILDING 1472

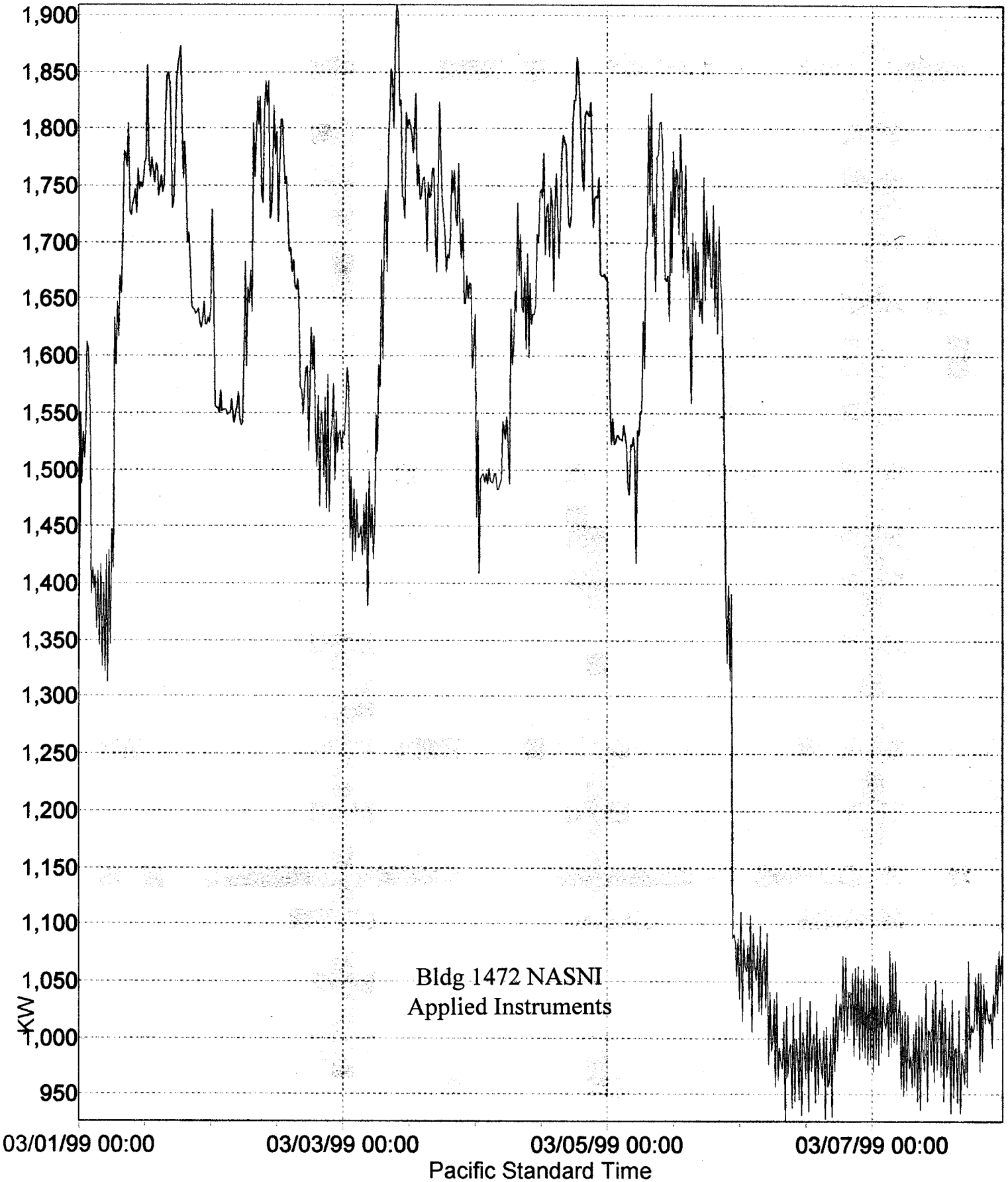
31055121 2/1/1999 - 2/7/1999

Total = 199314 KWH, Peak = 1580.08 at 2/2/1999 8:45:00 AM, Load Factor = 75.08%



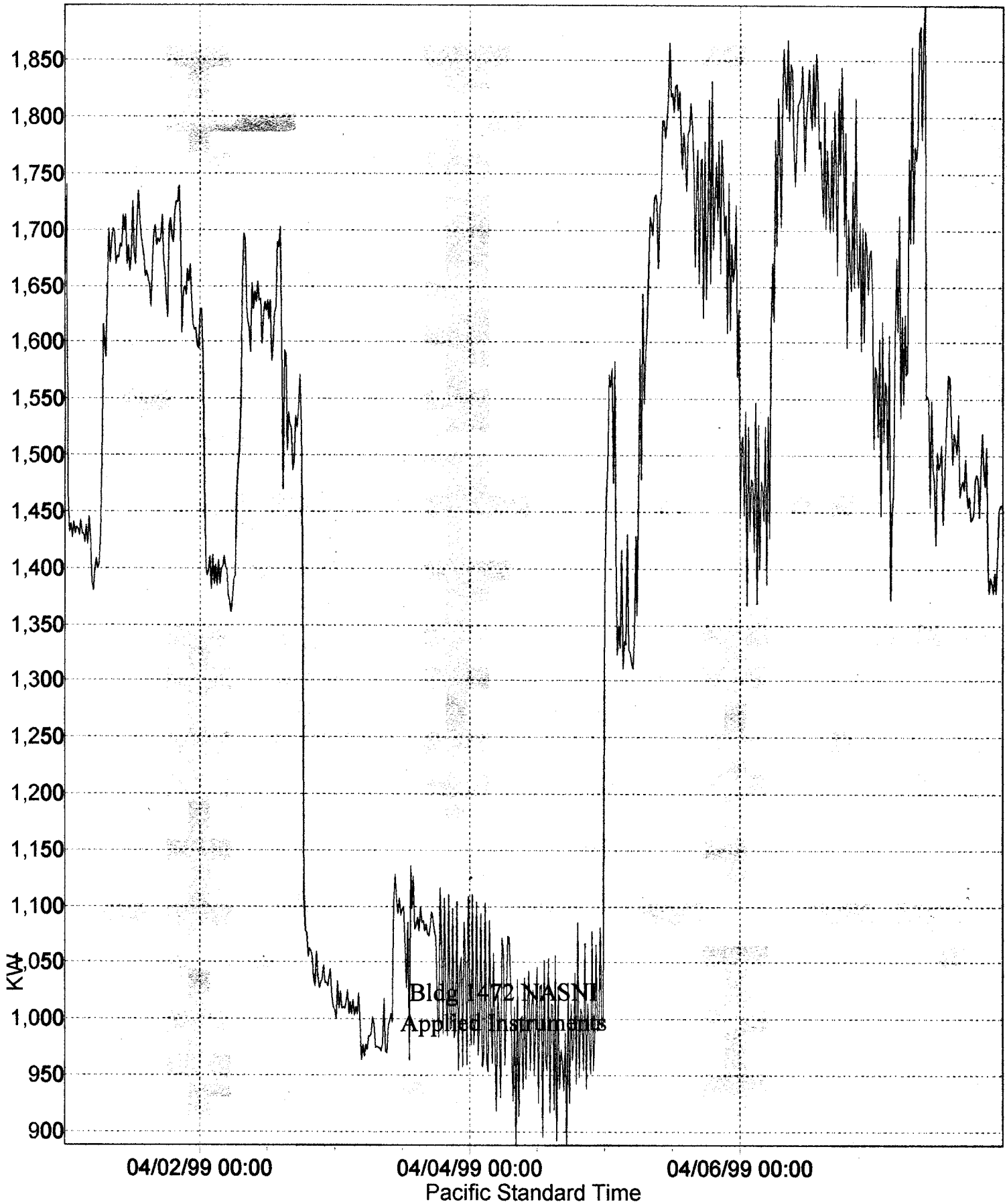
31055121 3/1/1999 - 3/7/1999

Total = 245678 KWH, Peak = 1909.09 at 3/3/1999 9:45:00 AM, Load Factor = 76.60%



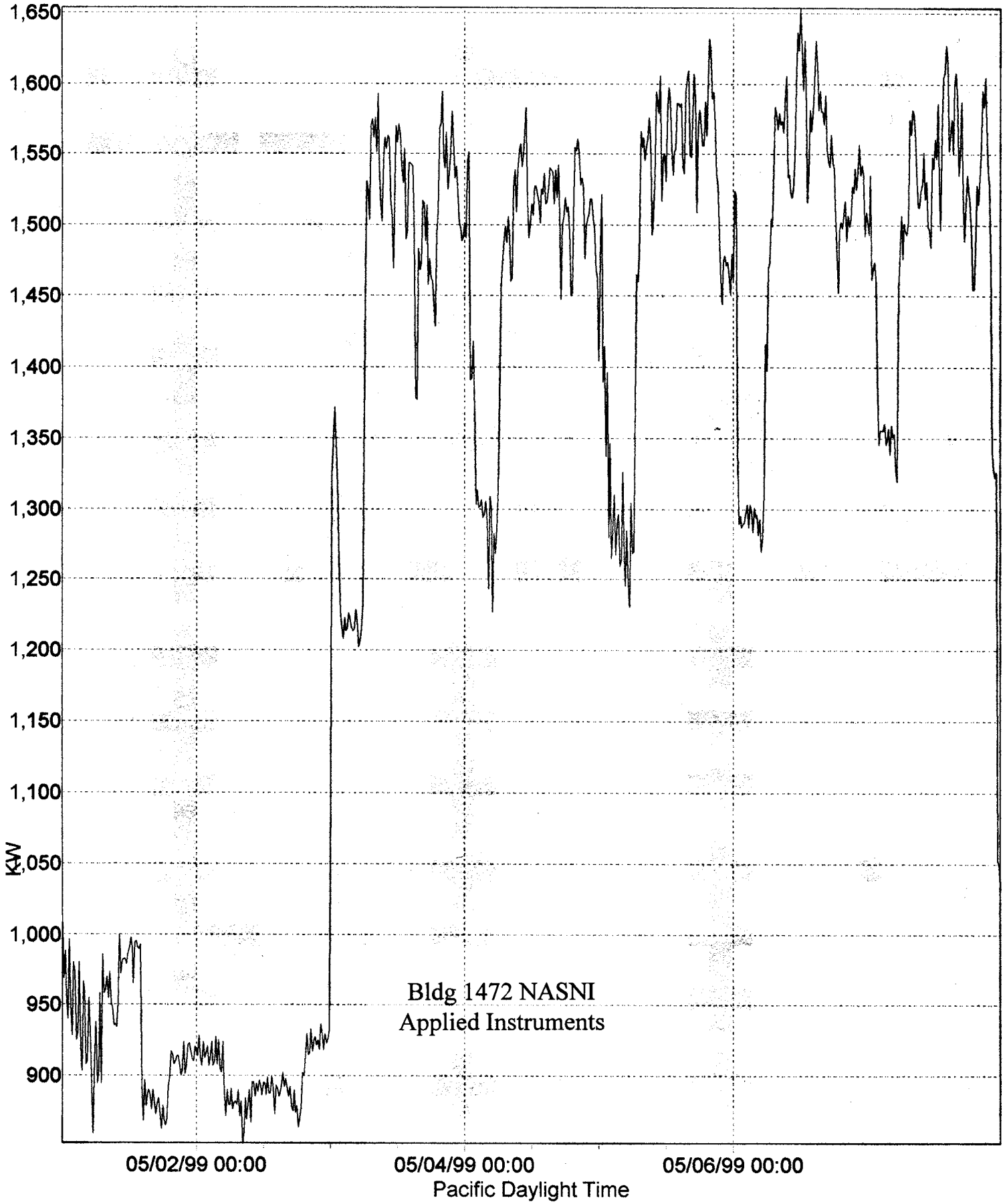
31055121 4/1/1999 - 4/7/1999

Total = 236610 KWH, Peak = 1899.42 at 4/7/1999 8:45:00 AM, Load Factor = 74.15%



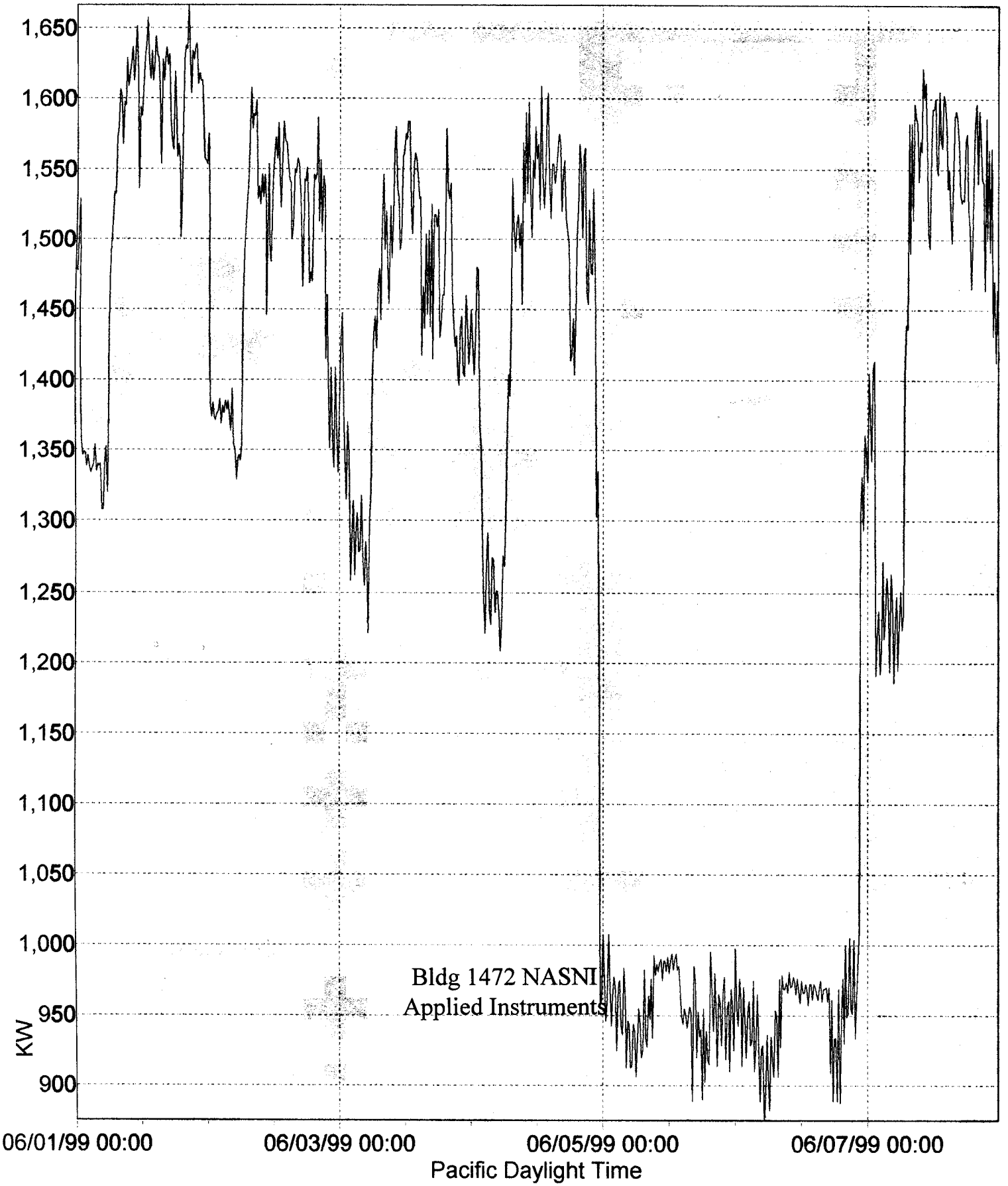
31055121 5/1/1999 - 5/7/1999

Total = 220895 KWH, Peak = 1653.12 at 5/6/1999 12:00:00 PM, Load Factor = 79.54%



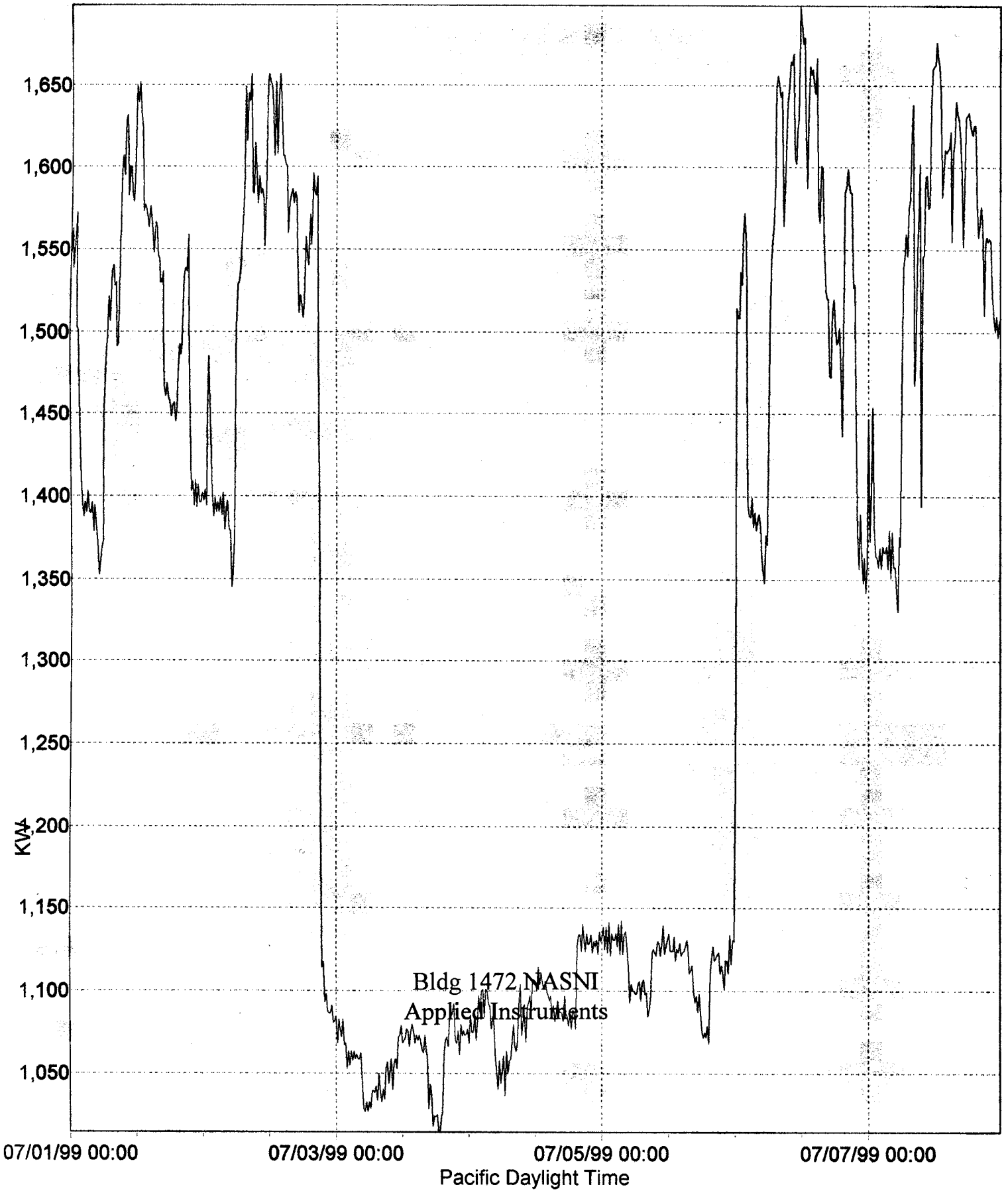
31055121 6/1/1999 - 6/7/1999

Total = 223095 KWH, Peak = 1665.79 at 6/1/1999 8:15:00 PM, Load Factor = 79.72%



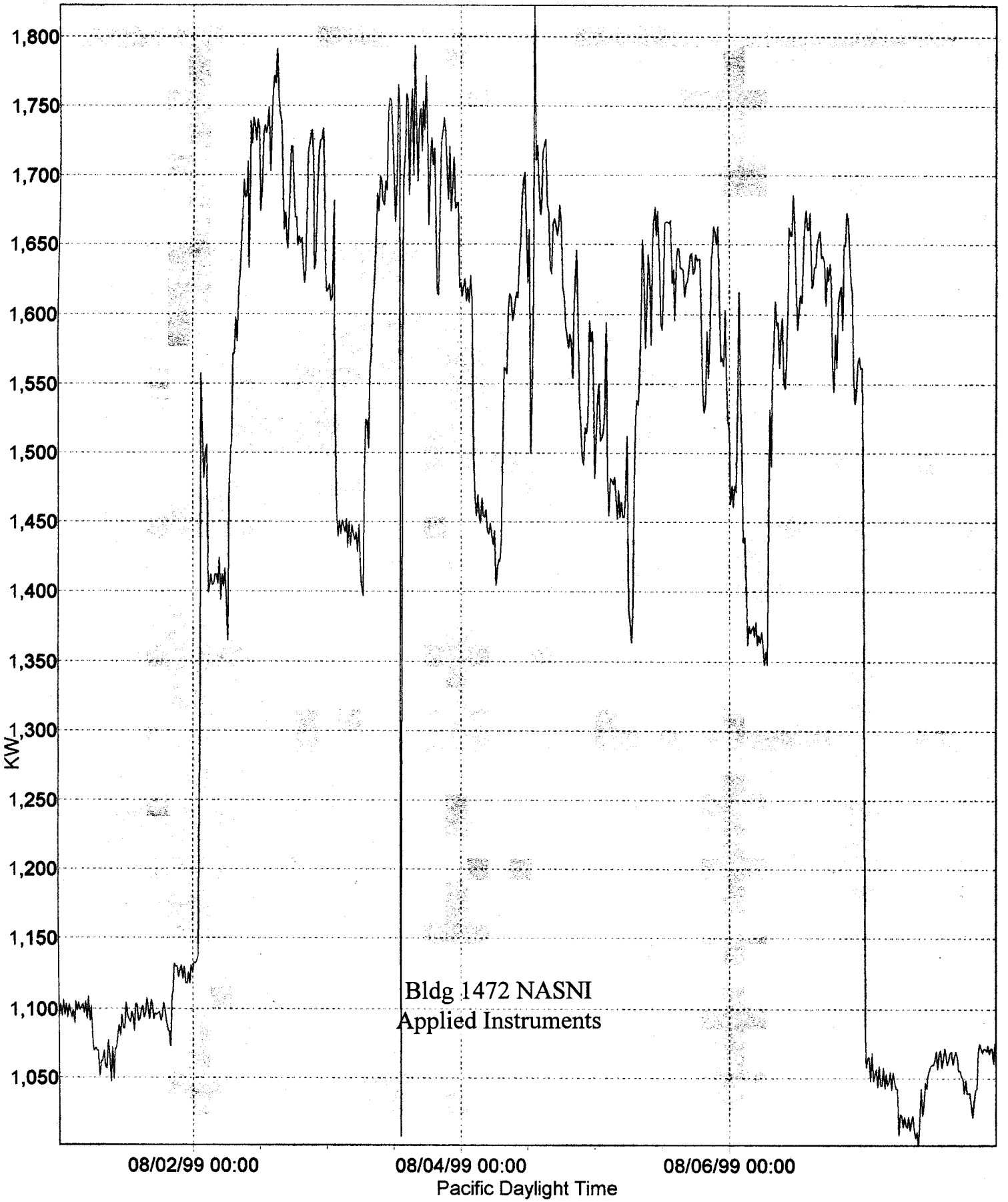
31055121 7/1/1999 - 7/7/1999

Total = 223169 KWH, Peak = 1698.05 at 7/6/1999 11:45:00 AM, Load Factor = 78.23%



31055121 8/1/1999 - 8/7/1999

Total = 241828 KWH, Peak = 1822.46 at 8/4/1999 1:15:00 PM, Load Factor = 78.98%



ATTACHEMENT C
ENERSCAPEÔ DEMAND CURVES, BUILDING 352

Appendix C not included in this electronic version

For a complete copy of the appendices, please contact:

Mr. Ken Decker
Navy Region Southwest Energy Manager
(619) 556-6855
DeckerKW@PWCSD.NAVY.MIL

ATTACHMENT D
ENERGY ASSESSMENT, BUILDING 1472

NORTH ISLAND ENERGY ASSESSMENT

BUILDING 1472-APPLIED INSTRUMENTS (HSL-41)

Contact: Francis P. Duriga
(619) 545-8298

RECOMMENDED IMPROVEMENT PLAN (ST= Short term. LT= Long Term):

Installation of motion sensors in classroom, conference, lobby and hallway areas to de-energize lighting. (Estimated savings 75-100 kW) [Estimated cost: Materials $ 2000, Labor $ 5,000] ST

At present, the entire mechanical support system is operated if any one of the five subsystems requires cooling. Reactivate and balance ancillary equipment to allow isolation of AHU's-1, 2,3,4, and 5. (Estimated savings 100 – 150 kW with better environment for personnel and equipment) [Estimated cost: Materials $ 10,000, Labor $ 20,000] ST

Turn off 50% of the cooling tower system on weekends as simulator computer support facilities are placed in standby mode. (Estimated savings 25-50 kW + cooling tower make-up water) [Estimated Cost: Material $000, Labor $000] ST

Extend supply air ductwork for AHU's 3, 4, and 5 to within 8 feet of floor. This improvement will provide a more efficient air flow pattern within the high bay area and improve area cooling. This may reduce the requirement of the supplemental Liebert systems. (Estimated savings 25-50 kW with better environment for equipment and personnel) [Estimated cost: Materials $ 4,500 three bays, Labor $ 11,500 three bays] ST

Convert AHU-2 to a stand alone Heat Pump sized for the classroom and add thermostatic control. At present, AHU-2 operates at 3,800 cfm @ 20 tons cooling without thermostatic controls. The existing space and mission requires <2,000 cfm and 4-6 tons. (Estimated savings 25 kW with better environment) [Estimated cost: Materials $ 3,500, Labor $ 4,500] ST

Convert AHU's- 3, 4, and5 to stand alone systems with thermostatic controls (Estimated Savings 50 kW each with better environment for personnel and equipment) [Requires detailed cost analysis] LT

Convert AHU-1 to a stand alone system and the remove existing mechanical plant. (Estimated savings unknown with improved environment for personnel and equipment) [Requires detailed cost analysis] LT

BACKGROUND:

Cooling Loads Identification:
Building Envelope
Learning Center (Classroom)
Simulator Room #1
Simulator Room #2
Computer Support
Simulator Rooms (New 2000)

Additional Process Loads:
Two 100 hp (Lincoln motor) hydraulic pump (operation 0600-2400)
Two 75 KVA 400 Hertz Generators

One 40 KVA 40 Hertz Generator
One Hydraulic Oil Cooler/Fan
Twelve Portable Heaters to compensate for excessively cold interior air temperature

HVAC System:
Building Envelope HVAC is provided by a roof top AHU-1 with a ventilation capacity of 24,000 cfm. Chilled water is provided via (2) 75 ton (64.4 kW) chillers located in Building 1473 (adjacent to 1472). The chiller cooling water is provided by a BAC cooling tower with a 15 hp fan. Two 5 hp circulation pumps are associated with the cooling tower circulation loop. The AHU is provided with a 24-hour clock that has been out of service for 8 years. The internal building temperature is monitored and maintained by the building supervisor via turning the main breaker on the MCC for the fan. The nine zone Johnson Control system is frozen in place and pneumatic support air (>20 psi) is lacking. The equipment and controls were equipped with data import and export features (blue box) which were not activated.

AHU-1 is equipped was VFD motor, inlet guide vanes and economizer. All are frozen in place. The VFD motor was replaced by PWC with a constant speed motor.

Learning Center HVAC is provided by a roof-top AHU-2 with a ventilation capacity of 3,600 cfm. Chilled water is provided via (2) 75 ton chillers located in Building 1473 (adjacent to 1472). The chiller cooling water is provided by a BAC cooling tower with a 15 hp fan. Two 5 hp circulation pumps are associated with the cooling tower circulation loop. AHU-2 is not controlled.

Simulator #1 (two low profile units with support computer equipment). The area is provided with a roof-top AHU-3 which provides cooling of the upper 15 feet of the bay. Several (4) Liebert units are located along the floor to provide area cooling and RH control. AHU-3 has a ventilation capacity of 8,400 cfm. The Liebert cooling systems are providing cooling water via two BAC cooling towers located adjacent to Building 1473. The room has a difficult time maintaining 68F and 50% RH.

Simulator #2 (one hydraulic operated unit with support computer equipment). The area is provided with a roof-top AHU-4 which provides cooling of the upper 15 feet of the bay. One (1) cooling unit is located adjacent to the cockpit area of the simulator. AHU-4 has a ventilation capacity of 8,400 cfm. Two(2) 100-hp Lincoln motors are used to provide hydraulic flow (6 gpm @ 1500psi). The simulators are powered from 0600-2400 each day. The systems are manually turned-off from 2400-0600.

Computer support area is provided with multiple water-cooled air handlers (1.5 hp each) to cool the electronic and computer support simulation equipment. Cooled water is provided via two BAC cooling tower and associated re-circulation pumps. All cooling tower and pumps are on 24-hours per day.

Simulator #3 (New training area). The area is provided with a roof-top AHU-5 which provides cooling of the upper 15 feet of the bay. AHU-5 will have a ventilation capacity of 8,400 cfm. The bay is currently under construction with occupancy scheduled for spring of 2000

CONTROLS:
24-hour day clock controls are installed but not in use
HVAC equipment operates continuously without thermostatic controls
Building facilities are manually operated

EXISTING ELECTRICAL LOADS AND PROFILES:
Using the historical trending charts available from the Navy's Enerscape™ Program and discussions with Mr. Frank Duriga Training Device Specialist, the Building has one electric meter feeding both Building 1472 and 1473. Meter ID # is 31055121. Several typical load profiles were reviewed including:

- normal weekday (M-F)
- normal weekend (S-S)
- holiday (long weekends F-M)

The results indicated that normal weekday operations vary from 1,300 kW at night to 1,700 kW peak day. Normal weekend with simulators off line was approximately 1,200 kW. Extended shut-down for a long weekend was 1,000-1,100 kW. As illustrated in the variation, the building has a high base load (load without process operations).

Each evening, 2400- 0600, the hydraulic pumps and associated systems are de-energized thus providing a 150-200 kW drop. This accounts for a large part of the difference between daytime and nighttime operations.

The remainder of the electrical load is estimated to be heating, ventilation, air conditioning, process equipment, and lighting. Approximately 600 kW of the 1000 kW load could be impacted by control enhancements and capital projects.

ATTACMENT E
ENERGY ASSESSMENT, BUILDING 352

NORTH ISLAND ENERGY ASSESSMENT
BUILDING 352- OPERATIONS TRAINING CENTER

Contact: Ernest Taylor
(619) 545-1901

RECOMMENDED IMPROVEMENT PLAN (ST= Short term. LT= Long Term):

Installation of motion sensors in classroom, conference, locker rooms lobby and hallway areas to de-energize lighting. (Estimated savings 100 -125 kW) [Estimated cost: Materials $ 2500, Labor $ 6,000] ST

At present, the AHU-1 and AHU-2 and support systems operate continuously. Fine tune controls and implement "use analysis" to allow setback conditions when areas within building are not in use. (Estimated savings 75 – 100kw with better environment for personnel and equipment) [Estimated cost: Materials $ 5,000, Labor $ 15,000] ST

Evaluate potential to turn off 50% of the cooling tower system on weekends as simulator computer support facilities are placed in standby mode. (Estimated savings 25-50 kW + cooling tower make-up water) [Estimated cost: Material $000, Labor $000] ST

Extend supply air ductwork for AHU #3 to within 8 feet of floor. Improvement will provide a more efficient air flow pattern within high bay area and improve area cooling (Estimated savings 25-50 kW with better environment for equipment and personnel). [Estimated cost Materials $ 1,500 three bays, Labor $ 4,000] ST

BACKGROUND:

Cooling Loads Identification:
Building East Envelop
Building Envelop West
Maintenance (Classroom)
Simulator Room #1
Computer Support

Additional Process Loads:
Four 75 hp (Lincoln motor) hydraulic pump (operation 0600-2400)
Two 35 hp hydraulic pumps (standby)
One 50 hp hydraulic pump – maintenance training operational during training
Two 75 KVA 400 Hertz Generators
One 40 KVA 40 Hertz Generator
Two Hydraulic Oil Cooler/Fan (15hp)
One Air compressor

HVAC System:
Building Envelop East and West HVAC are provided by unitary package roof top systems (located at ground level) AHU-1 and AHU-2. The internal cooling zones are controlled via zone valves. Thermostats are provided in each area and control the zone air flow valve. AHU-1 and AHU-2 are on 24-hours per day. Natural gas is manually activated during winter months by PWC.

Computer support has numerous self-contained cooling units. The units are cooled via cooling water from two BAC cooling towers and circulation pumps located adjacent to the building. All cooling tower and pumps are on 24-hours per day.

Simulator #1 (one hydraulic operated unit with support computer equipment). The area is provided with roof-top AHU-4, which provides cooling of the upper 15 feet of the bay. One (1) cooling unit is located adjacent to the cockpit area of the simulator. AHU-3 has a ventilation capacity of 8,400 cfm. Four (4) 75-hp pump/motors are used to provide hydraulic flow. The simulators are powered from 0600-2400 each day. The systems are manually turned-off from 2400-0600.

Maintenance Training Area is part of the east wing and has hydraulic and electrical support facilities.

CONTROLS:
24-hour day clock controls are installed but not in use
HVAC equipment operates continuously with zone mixing valve control
Building environmental conditions adjusted manually by PWC technician
Minimal (emergency level) lighting always on. Tied to emergency generator. If lights are turned-off, the emergency generator starts.

EXISTING ELECTRICAL LOADS AND PROFILES:
Using the historical trending charts available from the Navy's ENERSCAPE Program and discussions with Mr. Ernest Taylor Training Device Specialist, the Building has two electric meters feeding Building 352. Meter ID # 31040728 provides service to simulator electronics and Meter # 31041583 provides service to the remainder of the building loads including simulator mechanical, HVAC, and lighting. Several typical load profiles were reviewed including:

- normal weekday (M-F)
- normal weekend (S-S)
- holiday (long weekends F-M)

The results indicated that normal weekday operations vary from 1,200 kW(350 kW + 850kw) at night to 1,750 kW peak day(350kw+1400kw). Normal weekend with simulators off line was approximately 1,200 kW. Extended shut-down for a long weekend was 550 kW when all computer systems were shutdown (July 4th weekend 1999). As illustrated in the variation, the building has a high base load (load without process operations).

Each evening at 2400- 0600, the hydraulic pumps and associated systems are de-energized thus providing a 150-200 kW drop. This accounts for a large part of the difference between daytime and nighttime operations.

The remainder of the electrical load is estimated to be heating, ventilation, air conditioning, process equipment, and lighting. Approximately 500 kW of the 1000 kW load could be impacted by control enhancements and capital projects.