

UTILITIES AND ENERGY CONSERVATION MANUAL

TABLE OF CONTENTS

<u>IDENTIFICATION</u>	<u>TITLE</u>	<u>PAGE</u>
Chapter 1	Introduction Utilities and Energy Management....	1-1
1.	Scope.....	1-1
Chapter 2	Utilities.....	2-1
1.	Description Primary Utilities.....	2-1
2.	Description Extended Utilities.....	2-2
Chapter 3	UCAB (Utilities Conservation Appraisal Board)...	3-1
1.	UCAB Description.....	3-1
2.	UCAB Composition.....	3-2
3.	UCAB Purpose and duties.....	3-3
Chapter 4	Energy Conservation.....	4-1
1.	Introduction Scope.....	4-1
2.	Water.....	4-2
3.	Electricity.....	4-3
4.	Natural Gas.....	4-4
5.	EMCS(Energy management Control Systems).....	4-5
6.	Construction.....	4-6
7.	UEM (Unit Energy Monitor).....	4-7
8.	Additional Conservation Measures.....	4-8
Appendix A	Energy Conservation Definitions.....	A-1
Appendix B	Energy Conservation Requirements.....	B-1
Appendix C	Energy Conservation checklist summer.....	C-1
Appendix D	Energy Conservation checklist winter.....	D-1
Appendix E	Energy Conservation Violation Notice.....	E-1

UTILITIES AND ENERGY CONSERVATION MANUAL

CHAPTER 1

INTRODUCTION TO UTILITIES AND ENERGY MANAGEMENT

1. Scope.

a. As the largest consumer of energy in the U.S. economy, the Federal Government can and shall lead by example when it comes to creating innovative ways to reduce greenhouse gas emissions, increase energy efficiency, conserve water, reduce waste, and use environmentally-responsible products and technologies to reduce emissions and save money.

b. The Federal government occupies nearly 500,000 buildings, operates more than 600,000 vehicles, employs more than 1.8 million civilians, and purchases more than \$500 billion per year in goods and services. Development of sustainability plans will focus efforts on cost-effective projects and programs to save energy and reduce costs to tax payers.

c. This manual is a compilation of policies, instructions, guidance, procedures, definitions and requirements for the efficient operation, sustainment, restoration and modernization, procurement, and best energy management practices for the Combat Center. It establishes the energy management policies and requirements that Marine Corps Air Ground Combat Center (MCAGCC) and tenant organizations must implement to meet mandated legislative savings goals.

d. Purchasing of utilities to support base operations is a function of Public Works. Renewable energy production, energy resilience, and cost effecting purchasing have been identified as priorities to keep base operations and training uninterrupted. The base spends up to \$16M per year purchasing and producing utilities to support base functions.

UTILITIES AND ENERGY CONSERVATION MANUAL

CHAPTER 2

UTILITIES

1. Utilities General. One function of PWD is to provide adequate utility services to support the continuing training, growth, and sustainment of the Combat Center. The base owns and operates all utility systems on board MCAGCC. Every effort will be made to operate these systems as efficient as possible based on recommendations from Utilities and Energy Management (UEM). All utilities and energy usage are reportable and have a large effect on our annual budget.

a. Primary utilities systems

(1) Water. Water is a scarce and valuable commodity in the Mojave Desert. On board the Combat Center, we are fortunate to have our own water supply that requires minimal treatment. This water supply is very limited and natural replenishment is minimal to nonexistent. Based on current consumption, in 15 years, the current aquifer would require major changes to treatment and a new aquifer must be initiated. Current level of consumption is between 1.5 Million Gallons per Day (MGD), to 3MGD in the summer. The current storage capacity can supply up to three days if water supply is lost for any reason. The ever-growing population of the Combat Center puts an increased strain on MCAGCC's water supply. The base currently utilizes 11 water wells for potable water production. The prime contributors to excessive water consumption are lawn watering, evaporative cooling, and non-restrictive faucets and showers. Strict adherence to watering hours and other conservation measures are a must in this desert environment. There are legislative requirements to save domestic water.

(2) Non Potable Water. Non-potable water is grey water or non-drinkable water from sources that cannot be utilized without extensive treatment for drinking purposes. Different aquifers in the area are classified as non-potable and are used to water lawns or other plants. All non-potable water sources need to be marked as non-drinkable. At this time, there are currently three non-potable water wells on base.

(3) Sewage treatment. Water is a scare resource and shall be recycled. Recycling waste water allows the Combat Center to extend the life of the current aquifers. The waste water treatment plant is able to produce up to 1.5 million gallons of non-potable water per day. The plant uses a fermentation pit and wetlands area to treat the waste water. The treated waste water is used to irrigate the golf course.

(4) Electricity. The cost of procuring electrical power continues to rise. The Combat Center has spent an average of \$8M annually for electricity. Production of electricity is by Cogeneration plants, Photovoltaic panels, and fuel cells. Electricity costs increase about 5% annually with an increase of 2-5% in usage. The electrical infrastructure coming to the base has been upgraded from a 34.5KV line to a dual feed 115KV line.

UTILITIES AND ENERGY CONSERVATION MANUAL

This upgrade is needed in order to handle base growth. Care must be taken when operating all grid systems due to the complexity of the systems.

(5) Natural Gas. The base is fed with a single feed 400psi line off the Southern California Gas main line system. The gas feeds range from 25psi to 400psi for buildings and cogeneration plants. Natural gas supplies buildings with hot water and heating. The system is a mix of steel and polypropylene plastic lines. Base gas lines have been extended for the new Cogeneration plant and future build out to the Camp Wilson area.

b. Extended utilities. Extended utilities use primary utilities to generate other services required for building operations. The base has utilized a campus style or central plant strategy to supply heating and cooling needs to the base.

(1) Chilled water. Chilled water provides efficient cooling to 60% of base facilities. Large chilled water plants mechanically cool water using electricity and Cogeneration waste heat through absorption chillers to produce 44⁰F water and the chilled water is then distributed to the building terminal. By utilizing controls and heat exchanger, the building heat load can be transferred to the chilled water. Chilled water cooling is 20% more efficient than air cooled package A/C units. Chilled water will be utilized whenever possible vice mechanical A/C.

(2) High Temperature Hot Water (HTHW). The Central Heat Plant is a centrally located industrial facility that uses waste heat from the cogeneration plant, natural gas, or diesel fuel to provide hot water at up to 350⁰F. The water is pumped through 50 miles of piping out to the base and supplies 80% of facilities with domestic hot water, building heating, cooling, and steam needs. HTHW will be utilized wherever possible for efficiencies due to operations of Cogeneration plants providing free waste heat.

(3) Cogeneration plants. The Cogeneration plants produce electricity while collecting the waste heat to heat up HTHW. The plants produce 80% of the base requirement for electricity. The plants provide emergency power support in case of loss of commercial power to the core area of the base.

(4) Renewable solar. There are currently over 80 sunshades and roof locations which have solar panels mounted to them. These solar systems currently provide 4.8MW of power producing over 5 million Kilowatt hours of electricity. These systems feed back into the grid through building systems.

UTILITIES AND ENERGY CONSERVATION MANUAL

CHAPTER 3

UTILITIES CONSERVATION APPRAISAL BOARD (UCAB)

1. UCAB Description

a. The UCAB is established, in accordance with reference (p), to carry out the following functions:

(1) Planning and pursuing a progressive utilities and energy conservation plan.

(2) Ensure that targets are established and utilized in the conservation strategy and implementation.

(3) Prepare utility conservation instructions, notices, posters, bulletins, etc., as required by prevailing conditions, regulations, and law.

(4) Be the approving authority for all energy and water related issues as mentioned within the energy conservation guidelines.

2. UCAB Composition

a. The Combat Center UCAB shall consist of representatives from the following units/sections:

Public Works Officer	Chairperson
Public Works Maintenance Branch	Member
Public Works Engineering Branch	Member
Public Works Utilities Branch	Member
Family Housing Officer	Member
Southwest Region Fleet Transportation	Member
Comptroller Directorate	Member
Inspector Division	Member
Water Resources Manager	Member
Public Works Energy Manager	Advisor

b. Directors/Commanding Officers or designated representatives from the following units/sections shall be available as on-call task group members of the UCAB:

Operations and Training Directorate

UTILITIES AND ENERGY CONSERVATION MANUAL

Manpower Directorate

Communications and Data Directorate

Marine Corps Community Services

Business Management Directorate

Headquarters Battalion

Marine Corps Communication-Electronics School

Combat Service Support Group 1

Marine Wing Support Squadron 374

7th Marines

3. UCAB Purpose and Duties.

a. The UCAB is responsible for planning and pursuing a progressive utilities conservation program. The UCAB will recommend and direct the preparation of utility conservation instructions, notices, posters, bulletins, etc., as required by prevailing conditions, regulations, and law.

(1) Membership. Membership of the UCAB shall consist of the Director, G-4, or a representative, and all others as noted.

(2) Meetings. The UCAB will meet quarterly or as required. Minutes of the meetings and recommendations will be provided as requested to the Commanding General for review.

b. Assistant Chief of Staff, G-4.

(1) Issue warning letters to those tenant units, housing occupants, and tenant activities that have violated the warning provisions of Appendix E twice.

(2) Upon a third violation, review the occupant's eligibility to retain utilities to the facility quarters and possibly terminate the sponsor's assignment.

c. Utilities and Energy Management.

(1) The Energy Manager, Unit Energy Monitor, or representative, will conduct random energy conservation inspections using the forms contained in Appendix C and D and supply them to the Energy Manager to present summaries to the UCAB. Building/area supervisors, OIC's or SNCOIC's will receive copies of these inspections.

(2) Unit Commanders, Branch Heads, and/or Section Heads will be notified of repeat violations.

UTILITIES AND ENERGY CONSERVATION MANUAL

d. Family Housing Manager.

(1) Ensure that extracts of this Order are provided to each sponsor and/or family residing in government quarters.

(2) Ensure that watering of lawns and washing of privately owned vehicles (POVs) are in compliance with times set forth in Chapter 4.

(3) Ensure that tenants maximize water conservation by watering in such a manner as to prevent run-off on sidewalks and gutters.

(4) Issue family housing citations to those occupants who violate this Order.

(5) Notify the Assistant Chief of Staff, G-4, of occupants who violate this Order more than once.

e. Provost Marshal's Office. In the conduct of routine patrols, report violations of this order to the Combat Center Housing Manager or Facilities Maintenance Officer as appropriate.

f. Unit Commanders/OICs/Section Heads.

(1) Ensure the widest dissemination of the contents of this Order.

(2) Enforce the provisions contain in Chapter 4.

g. Unit Energy Monitor

(1) Ensure that all building/area occupants are instructed in the conservation of energy.

(2) Conduct inspections and continually monitor their assigned building/area to ensure compliance with the applicable portions of the Energy Conservation Inspection Checklists (Appendix C and D). Inspections will be conducted at least monthly. Inspection forms will be retained for 12 months. In addition, daily surveys of assigned buildings/area will be conducted to observe and correct any obvious energy conservation deficiencies.

(3) Notify individuals within their unit of energy conservation violations and ensure that corrective action is taken.

h. MAGTFTC, MCAGCC Inspector/UEM Auditor. During the course of Combat Center inspections, inspectors will ensure compliance with the Combat Center Orders and inform the respective unit commanders of all violations requiring corrective action.

UTILITIES AND ENERGY CONSERVATION MANUAL

CHAPTER 4

INTRODUCTION TO ENERGY CONSERVATION

1. Scope. In order to provide adequate future utility service and comply with legislative requirements, the establishment of an aggressive, effective utilities conservation program cannot be over emphasized. Our objective is to conserve energy while maintaining operational readiness.

2. Water Conservation. Water is a limited resource and every effort shall be made to conserve water and reuse water. Green areas will be limited to common areas and only authorized with approval. Watering schedule shall be submitted and approved by Energy Manger and Water Resources Manager.

CONSERVATION MEASURES

a. Lawn. Due to MCAGCC's desert environment, lawns are prohibited unless authorized by the UCAB. Common areas will be allowed to have grass. Xeriscape, rock scape, or a poly grass will be used for beatification of the area.

(1) Prior to planting grass, a request must be submitted to the Energy Manager and approved by the UCAB.

(2) The objective is to apply adequate amount of water to ensure healthy lawns and plants. Run-off, over watering, and excessive evaporation must be avoided. Watering will only be allowed in early morning and late evening. This will reduce the amount of evaporation. Only in special circumstances will watering during the day be allowed and a request shall be turned into the Energy Manager and Water Resources Manager for approval.

(3) In mixed planting, the best solution is a combination of several light watering of the lawn with less frequent heavy watering for deeper-rooted trees and shrubs, all properly timed. In no case is daily watering needed for established lawns.

(4) For additional information or specific questions contact the Public Works Division or Family Housing Office.

b. Tree. Only desert tolerant trees will be planted. Due to hot temperatures, non-climate tolerant trees will require more water and uproot due to sandy soil.

(1) All trees should be watered deep to prevent roots growing near the surface and ruining the lawn. The shallow roots make a tree susceptible to being blown over by high winds. Trees and shrubs that are improperly watered often become yellowish green, brown tipped, or partly defoliated. Frequent light irrigation can cause twig dieback of trees and shrubs growing in lawns.

UTILITIES AND ENERGY CONSERVATION MANUAL

(2) The base BEAP (Base Engineering and Architectural Plan) will be consulted as to which variety of tree should be planted. Only drought resistant and temperature tolerant trees will be authorized.

c. Watering.

(1) Watering During Heat of Day. Never water during the heat of the day as some of the water will evaporate and plants tend to wilt. It is understood that large areas require time for all zones to be watered and leeway will be given to those areas.

(2) Hand Watering and POV Washing. Use only a shut off spray head to limit the amount of water being used to wash POV. The use of potable water to wash driveways, sidewalks, and pave surfaces is not permitted unless approved by Energy Manager and Water Resources Manager.

(3) Tactical and Commercial Vehicles. The tactical vehicle wash racks (building 1944 & 1941), are available for washing tactical and commercial vehicles. These facilities recycle water. Contact ESD for liaison.

(4) Golf Course and large ball fields. A plan for seeding schedules, planned watering times, and amount of water planned to be used will be submitted to the base Energy Manager and Water Resources Manager quarterly for approval.

SIMPLE CONSERVATION MEASURES

- (1) Close water tap when not in use.
- (2) Do not run water at a rate exceeding immediate requirements.
- (3) Do not hold down the handle of automatic flushing valves on plumbing fixtures.
- (4) Operate fountains only when actually drinking.
- (5) Shut off leaking fixtures and submit work order for repair.
- (6) Take short showers instead of baths. Normally a bath will use 10 gallons more than a short shower.
- (7) Turn off the faucet while shaving or brushing teeth.
- (8) Accumulate a full load of clothes or dishes before washing them.
- (9) When replacing fixtures, only low flow approved fixtures will be used. Modifications to these low flow systems are not authorized. Every effort will be made to replace high flow fixtures with low flow and flow control valve fixtures. Low and no flow urinals are authorized and encouraged.

UTILITIES AND ENERGY CONSERVATION MANUAL

- (10) A water audit by UEM of all piping and fixtures will be completed every 5 years with work requests turned in to fix all leaks or issues identified.
- (11) Every effort will be made to not use domestic water for green areas. Green areas will be limited to the greatest extent possible.
- (12) The use of a hose that dispenses potable water must be fitted with a shut-off nozzle or device attached to it that causes it to cease dispensing water immediately when not in use.

3. Electricity. Electricity usage spans many different facets. Lighting, heating, cooling, and room or office equipment make up the majority of usage onboard MCAGCC. By using the electricity smartly, the overall effect of lowering the energy usage can be drastic.

CONSERVATION MEASURES

a. Lighting. Energy consumed for lighting shall be reduced by removing non-essential lamps and by applying non-uniform lighting levels to existing lighting systems. The use of internal and external motion sensors in spaces is required. Change to a lower wattage lamp whenever possible. Design on new buildings should be at the T832 watt level. All replacement fixture shall be low wattage T8 25watt light and ballast or better fixtures. LED lamps are authorized for internal applications only. Induction lamps will be used for external application over 10 feet or lamps that remain on during night time periods. Replace all incandescent lamps with compact fluorescent lamps with similar lumens. Remove unnecessary lamps in rooms where all lights operate on one switch. The simplest and most efficient way to reduce the amount of lighting is to remove some of the lamps and disconnect the ballast. Ballasts consume a constant 3-4 watt load if left connected. This could add up if de-lamping large amount of fixtures. Lights will have motion sensors installed and be turned off if room is vacated. All inefficient High Intensity Discharge (HID) exterior lighting, such as Mercury Vapor should be eliminated or replaced. External fixtures over 10 feet in height should use Induction fixtures and lamps below 10 feet use compact fluorescent. All non-safety lamps will have motion sensors and be dark sky compliant. Contact Public Works Division G-4 for assistance in determining proper lighting application and levels.

Table 1
Light Source Efficiencies

	Approximate Lumens Per Watt
Incandescent	9-24
Fluorescent	65-90
Induction	85-105
Mercury Vapor	34-53
Metal Halide	67-117

UTILITIES AND ENERGY CONSERVATION MANUAL

High Pressure Sodium	55-126
Low Pressure Sodium	73-129
	(monochromatic light source)

b. Heating and Cooling. Energy consumed for heating and cooling shall be reduced. During the heating season, temperature control devices shall be set to maintain 68 degrees Fahrenheit. The allowed set point for heating is 70 degrees Fahrenheit. This allows for all spaces to be maintained above the 68 degree. Cooling season temperature control devices shall be set to maintain 78 degrees Fahrenheit. The allowed set point for cooling is 76 degrees Fahrenheit. This allows for all spaces to be maintained below the 78 degree. Doors and windows must remain closed while cooling or heating systems are in operation. Keeping window coverings closed will help reducing heat gain and cooling load to the building.

c. Additional Air Conditioning Units. Requests for additional air conditioning units must be submitted to the Energy Manager and approved by the UCAB prior to purchase and installation. A determination of problems will be conducted and if there are other issues work tickets need to be submitted to correct the problem.

d. Personal Heaters. Threshold Heaters, Portable Heaters, and Portable Cooling Devices are prohibited. If there is a problem with the HVAC system, a work order shall be submitted to address the problem.

e. Exceptions. There are exceptions to the temperature setpoint policies prescribed for the protection and operation of certain specialized equipment. A request needs to be submitted to the Energy Manager by email with the matter explained and proper documentation showing the specialized equipment and the recommendation from the manufacturer. A letter of approval will be issued if approved. All spaces will be maintained at the prescribed temperature unless an approved waiver is approved and letter issued as documentation.

f. Refrigerators. Use of refrigerators on MCAGCC is being abused. Personal small size refrigerators are authorized for barracks rooms, and command level personnel (ie. Commanding Officer, Executive Officer, and senior staff NCO). All other refrigerator will be community related with the sizing dictated by 24 sqft per 3000 sqft or every 15 personnel.

g. Microwave ovens, coffee makers, toaster ovens. Use of this equipment is also being abused on MCAGCC. Personal size equipment is authorized for barracks rooms, and command level personnel. For every 3000 sqft or 15 personnel within a work space, a common area for this equipment will be identified for use.

h. Ice Machines. Ice machines will only be installed at the battalion level. A Work Request must be submitted with letter of explanation as to why the ice machine is needed to the Energy Manager. The ice machine will be approved by the UCAB for installation.

UTILITIES AND ENERGY CONSERVATION MANUAL

i. Air Compressors. Air Compressors will be secured at the end of the day, on weekends, and when they won't be used for an extended period of time. All new installations will have a breaker tied into the EMCS system to shut down the compressors in off hours. A bypass timer will be installed for afterhours use if necessary.

j. Equipment Approvals. Always get approval before purchasing and installing a major piece of equipment that uses large amounts of energy. The unit will be responsible for reimbursing the cost of the installation once approved.

k. Barracks. Lighting, computers, televisions, and any other non-essential equipment will be secured when not occupied. Common area lighting, recreation lighting, and other energy using equipment will be monitored and shut down by the duty when not being utilized. Report all faulty equipment to the barracks manager.

l. Computers. All computers and ancillary equipment shall be turned off at night. Power must be retained to the CPU so that upgrades or patches can be pushed to the computers. Use of motion sensor activated power strips is mandatory for energy savings. These strips allow the CPU to be powered while all other ancillary equipment is shut down if no movement is sensed.

m. Motors. All motors that fail will be replaced with an ultra-high efficiency motor. The savings from an ultra-high efficiency motor will pay for itself. In instance where a standard start stop is being used, evaluate the possibility of using soft start or Variable Frequency Drives to reduce demand and energy reduction.

n. Server Rooms. Server rooms inside facilities may vary in temperature based on design. Manufacturer recommended temperatures or design documentation must be submitted with letter for approval to PWD UEM to request variance from the base set points. The base provides server facilities and all efforts must utilize these server farm except when a waiver is issued.

o. Lighting and security lights. Outdoor lightings that are not required for mission, safety or security purposes shall be discontinued. This is being reviewed on a continuing basis, and any unnecessary lighting will be turned off or disconnected. Motion sensor will be used to the maximum extent possible. New technologies will be looked at for installation and energy savings and must be dark sky compliant for external lights.

p. Converters. Electrical converters (400 hertz) will not be operated when output is not being used.

q. Electrical consuming devices. Computers, fans, coffee makers, and all other appliances and electricity-consuming devices will be energy star compliant and will be turned off at the end of the workday or during the day when no longer needed for use. All new copiers must have a power saver switch on them that will automatically put them in the power saver mode.

UTILITIES AND ENERGY CONSERVATION MANUAL

r. Small HVAC units. The temperatures (degrees Fahrenheit) set at locally controlled units shall be temperatures allowed during the heating and cooling season. All units will be shut down when the area or building is not in use, after hours, or weekends and holidays.

s. Television. Television units are becoming more popular for waiting areas, gyms, and other facilities where time is spent waiting on further operations. Prior to purchase and installation, a work request with letter of explanation of why the unit is needed will be submitted to Public Works UEM for approval by the UCAB. All Televisions will be LED type units to save energy.

t. Vending machines. A list of installed vending machines will be submitted to Public Works UEM yearly. A work request with letter of explanation and location of nearest machines will be submitted to Public Works UEM for approval prior to installation. All vending machines will be high efficiency units using a vending miser technology or similar to save energy. The UCAB will approve all vending machine locations. After approval, a check for proper power requirements shall be accomplished. The contract holder or company providing the machine will be responsible to ensure adequate power is present or install additional circuits if required.

4. Natural Gas. Domestic natural gas usage is nominal compared with electricity and water usage but still spans many different facets. By using the natural gas smarter the overall effect of lowering the energy usage can be significant.

CONSERVATION MEASURES

a. Heat will not be provided when the outdoor temperature exceeds 60 degrees Fahrenheit. For buildings not on the high temperature hot water distribution system, heaters will not be placed into winter operation until the outdoor temperature falls below 60 degrees Fahrenheit between 0600 and 2200 for three consecutive days.

b. Unused spaces will not be heated; close off registers or air ducts to spaces not being used. Contact the Public Works Division if a building is to be unoccupied for one week or longer (deployments, field exercises, etc.).

c. Large doors in warehouses and shops will not be left open while areas are being heated.

d. The use of gas instant on water heaters in place of standard water tanks is required. Saving of 30% or more can be realized.

e. The largest user of natural gas is the Cogeneration plant and Central Heat Plant. The plants will be run in the most efficient manner possible utilizing the waste heat from the Cogeneration plant as the primary heat source. Supplement with boiler only when waste heat is not meeting the demand.

UTILITIES AND ENERGY CONSERVATION MANUAL

f. Ensure all water heaters are set to federal regulations. Setpoint will not excess 130F and water at the faucet at over 110F.

g. Inspections, surveys and leak detection will be performed every 5 years with follow up on repairs on all leaks within 2 years.

5. Energy Monitoring and Control System (EMCS).

a. The Combat Center spends approximately \$16 million annually for the purchase of electricity and natural gas. Energy conservation is the single most important function that can reduce this consumption. An EMCS and Public Works Network has been installed in over 240 buildings and facilities aboard the Combat Center. The proper operation of the system is critical to achieve energy savings.

b. Overall operation of the system is the responsibility of PWD Utilities Branch and PWD UEM has oversight and security control for access of the EMCS and Public Works Network (PWN). The PWD network also has numerous servers and data collection points that are critical to reporting and operations of the systems. UEM as lead will work with engineering and FMB to ensure these systems are integrated, function, report, and operate properly within the PWD network. UEM is responsible for setting up the network protocols, naming conventions, integration, and server date descriptors to ensure these systems function.

c. The EMCS is a computer system that uses electronic controllers in each building that are tied into a central computer system, via fiber optics, radio frequency, and phone lines. This system is operated by PWD, Utilities Branch. Electrical circuits are turned off after the end of the workday and turned on before the start of the next workday in order to cool or heat the building as required without having to leave the heating, ventilating, and air conditioning (HVAC) units on all night. In some instances the EMCS will also control lighting circuits but general wall outlets will not be affected. Therefore, any computers, (that must be left on), facsimile machines, refrigerators, etc., will not be affected when the "lights go out".

d. Participation in EMCS is mandatory. Operating hours for each building will be set in accordance with each unit's requirements. The EMCS allows for programming changes on an as needed basis. If there are plans to work extended hours for one or more days, units should submit a work request to PWD a minimum of five working days in advance, indicating the new times requested, the duration for which the change will be effective, the building number, and the point of contact for the particular facilities.

e. Unit Commanders, and UEM auditors are responsible for ensuring that program times are established for the maximum conservation. Schedules will be set to start no earlier than 1 hour prior to a buildings first occupant and go off 30 minutes after the last scheduled occupant. A bypass timer will be used in most cases to allow building systems to operate after hours. A maximum of two hours per activation will be allowed.

UTILITIES AND ENERGY CONSERVATION MANUAL

f. EMCS calibration is critical to maintain proper operation. An annual check of the building controls and calibration of equipment is required.

g. Any repairs to the EMCS will require submission of a work request to PWD via MAXIMO or the PWD trouble desk.

h. All utilities must be metered, all meters must communicate with the EMCS MCAGCC PWN and report back to the Meter Data Server.

6. Construction.

Construction plays a crucial role in energy savings. Control systems, commissioning, mechanical systems, and insulation have major contributions to energy savings. Leadership in Energy and Environmental Design (LEED) points will be targeted toward energy conservation. All drawings will be reviewed and approved for energy usage by UEM.

a. Controls. Controls are an integral part of a building automation system. If the controls are installed, programmed, or designed improperly, they will cause major problems. Currently, the base uses a majority of Johnson Controls products. These systems provide a front end application software for access to information. All systems installed shall be fully compatible and integrated with JCI front end system due to Risk Management Framework (RMF) network security protocols. An emphasis on commissioning will be required to ensure all buildings are properly turned over after construction. Multiple EMCS systems will not be used in a building. Controls can integrate room switches and alarms to shut off HVAC systems when doors or windows are left open. Controls and metering: All controls and metering must be approved by PWD UEM for manufacturer, communication protocols, and configuration into the PWD network and data collection system. RMF requirements will be adhered to.

b. Insulation. Due to the extreme temperatures in the desert region, an additional emphasis needs to place on insulation. Heat loss to external walls, door, and windows contribute to 15-20% of a buildings energy use.

(1) Walls will be at least R-19 value and ceiling R-30 to prevent heat and cooling losses.

(2) Doors require good seals and increased R value for external applications.

(3) Windows require double pane glass and E coat thin film coatings.

c. Barracks. Barracks will be internal door configuration only. Insulation is key to keeping energy efficiency for large spaces with multiple floors. A minimum of R-19 in walls and R-30 in ceiling will be used. Dual or triple pane windows are required with a window glazing. Window switches will be utilized to shut off room controls if windows are left open more than 15 minutes. Either fan coil unit control or series air handler operation is authorized depending on building configuration. Limiting use of outside air is priority.

UTILITIES AND ENERGY CONSERVATION MANUAL

d. Generation. All generation must be tied back into the PWD network. Rule 21 compliant equipment must be used. The base cannot over generate and push power back onto the grid. Renewable systems over 200 kW must have breaker controls and tie back to the PWD network for generation controls. Smart Grid technology is used aboard MCAGCC and compliance with current interconnect, state law, and regulations must apply. All electrical generation must have an interconnect agreement completed and submitted back to PWD UEM for submission to the utilities for contract mod.

e. RMF. Security of the PWD network and RMF IT requirements for the EMCS and overall PWD network must be coordinated with UEM. No unapproved controls equipment, programs, data servers, meters, or other equipment can be installed without proper documentation

7. Unit Energy Manager.

a. Unit Energy Managers will be assigned in writing. This is a new program being developed by HQMC per the United States Marine Corps Expeditionary Energy Strategy and Implementation Plan. Each unit at battalion or squadron level will have an assigned Unit Energy Manager and adhere to further guidance.

8. Additional General Conservation Measures.

a. Keep windows and doors shut and close drapes and blinds at the end of the workday.

b. Check weather stripping around windows, doors, and window air coolers. Request to have it installed or replaced if necessary.

c. Do not put furniture or equipment in front of return air intake that will obstruct airflow to furnaces and air conditioning units in the building.

d. Request that exterior door closers be adjusted to ensure doors close tightly.

e. Request through Public Works that air filters be cleaned or replaced if there is reduced airflow.

f. Do not use hot water if warm or cool water will do. Besides heating and cooling equipment, the water heater is the most expensive appliance to operate.

g. Turn off lights in all facilities when not in use.

h. Deactivate light fixtures in place to achieve mandatory reduced lighting levels. Fixtures need not be removed, but must be tagged to prevent maintenance crews from reconnecting. Install phantom tubes on rapid-start fluorescent fixtures to reduce light densities. If F32T8 (4-foot bi-pin lamps) are removed as a permanent light reduction on then the ballast should also be disconnected by a qualified electrician.

UTILITIES AND ENERGY CONSERVATION MANUAL

i. Turn off/disconnect energy consuming appliances when not in use (ie. Coffee maker).

j. Use minimum wattage light bulbs consistent with safety and work requirements. When possible, replace standard medium base incandescent lamps with fluorescent light with equivalent lumen.

k. Light is energy; use or reject solar heating as required. Open blinds and curtains during the heating months to allow the sun to assist in heating requirements. Similarly, close blinds and curtains during the summer months to prevent solar heat gain to air-conditioned space.

l. Use the energy saver switch on refrigerators. This switches off a device for a small heating element that reduces condensation around refrigerator and freezer doors and is typically not required in the desert environment. Similarly, the drying heat element on automatic dishwashers is typically not required in a low humidity environment. The use of individual refrigerators is restricted to barracks, command level officers, battalion level staff, and special requirements with approval from the Energy Manager and UCAB board. All other areas are to use a common refrigerator. It is recommended to have one refrigerator for every 10-15 personnel or 300 sqft in a building or space. Even small refrigerators use a large amount of energy.

m. After-hours classes held in Base sponsored buildings for private colleges in support of Marines will submit a list of buildings and rooms being used to the Energy Manager. Every effort will be made to use as few buildings as possible to limit energy usage. Controls systems schedules for these buildings need to be modified both before and after the class is complete. The schedule request by email will be submitted by WR# or email to Public Works 48 hours in advance of the class and 48 hours after the class is complete to return the schedule to normal.

n. Duty positions in buildings will utilize existing facilities that are occupied 24/7. There must be at least 10 personnel in the facility at all time to be considered occupied 24/7. This will allow excess buildings with only one or two personnel standing duty to be shut down for heating, cooling, and electrical lighting loads. Barracks spaces should be utilized for duty billets since they are occupied 24/7.

o. When individual gas or electric water heaters fail, they should be evaluated for replacement to an instant on type of heater. In some cases, an electric instant-on heater as a replacement to a standard electric heater may be uneconomical to install due to the increased amp draw of the instant-on heater. In locations where solar thermal is in use, solar will remain the primary source for producing hot water and instant on as a secondary.

p. Chilled water system maintenance is critical to energy savings. Annual teardown of chillers, pumps, and checks of controls is required for proper operations. Required setpoints and chiller operations are the responsibility of FMB but will be monitored by UEM. UEM will set operational requirements and setpoints to ensure efficient operations. Absorption chillers will be used as the primary source utilizing the waste heat from Cogeneration plants.

UTILITIES AND ENERGY CONSERVATION MANUAL

When changing out motors, compressors, or other equipment, energy efficiency will be required as a replacement strategy. New electric bearing motor drives are effective means of energy savings.

q. Up to 80% of the domestic hot water, building heating, cooling, and steam needs are supplied by the HTHW system. It is imperative that the systems are maintained and chemically treated properly. The HTHW system will be run in the most efficient energy savings way possible. The operation of the plant requires a standard operating procedure with input from UEM for efficient operations. It is required that a valve exercise program be implemented to maintain the system. Every 5 years an audit of all piping will be completed by UEM with work requests turned in to fix any problems with insulation or piping.

r. Every effort should be given to use recycled water. The waste water treatment plant treats and produces usable irrigation water. This combined with the Non Potable wells can supply all green areas with water. An energy efficient treatment of the water is required. Any change within the treatment plant which will increase energy usage has to be approved by UEM. Special effort needs to be made when operating large pumps and equipment. Summer peak times carry additional charges. Avoidance of these times is imperative. Peak times are the first week in June to the first week in October from 1200-1800.

UTILITIES AND ENERGY CONSERVATION MANUAL

APPENDIX A

Definitions

- (a) Renewable energy- Energy produced by solar, wind, biomass, landfill gas, ocean (including tidal, wave, current, and thermal), geothermal, municipal solid waste, or new hydroelectric generation capacity achieved from increased efficiency or additions of new capacity at an existing hydroelectric project.
- (b) Water consumption intensity- Water consumption per square foot of building space.
- (c) Aquifer- Underground substructure which stores large quantities of water.
- (d) Zero-net-energy building- A building that is designed, constructed, and operated to require a greatly reduced quantity of energy to operate, meet the balance of energy needs from sources of energy that do not produce greenhouse gases, and therefore result in no net emissions of greenhouse gases and be economically viable.
- (e) Energy intensity- Energy consumption per square foot of building space, including industrial or laboratory facilities.
- (f) Sustainability- "Sustainable" To create and maintain conditions, under which humans and nature can exist in productive harmony, that permit fulfilling the social, economic, and other requirements of present and future generations.
- (g) UESC- Utilities Energy Services Contract. Financed contract with utilities to perform energy savings projects using utilities budget.
- (h) ESPC- Energy Savings Performance Contract. Finance contract with private companies preselected under special legislation to provide energy savings projects using the utilities budget.
- (i) ECIP- Energy Conservation Incentive Program. MILCON level projects over \$750K directly submitted to HQMC for DOD funding.
- (j) EIP- Energy Incentive Program. HQMC funded FSRM funded projects under \$750K with a payback of 10 years.
- (k) DUERS- Defense Utility Reporting System. Energy usage reporting system through Naval Facilities Engineering Command Port Hueneme.
- (l) DD1391- Planning document to cost and describe program elements generally used for new construction projects.
- (m) Life Cycle Cost Analysis (LCCA)- A program which calculates the cost of equipment added to cost of maintenance over the life of the equipment to determine best value.
- (n) UCAB- Utilities Conservation Appraisal Board. Used to analyze costs associated with utilities and report energy progress.

UTILITIES AND ENERGY CONSERVATION MANUAL

APPENDIX B

1. Requirements.

- a. Energy conservation goal is to reduce energy intensity from a 2003 baseline by 3%/year from 2005 to 2015 for a total of 30% reduction.
- b. Water conservation goal is to reduce water usage from a 2007 baseline by 2%/year from 2008 to 2020 for a total of 26% reduction. This includes domestic water, non-potable water, and irrigation water.
- c. A Department of Energy requirement for renewable energy is 7.5% by 2013, DOD policy of renewable generation, 25% by 2025 recently increased goal of 50% by Secretary of the Navy.
- d. The policy of "no growth" above FY 1988 energy consumption levels has been established as the Marine Corps energy conservation goal.
- e. Energy consumption in new buildings, and buildings undergoing major renovation shall be net zero by 2030.
- f. Required that 25% of building that contain the top 75% of energy users have a grade three audit performed each year. 100% of facilities to be audited every 4 years.
- g. Meter the top 75% of facility energy users by 2012 and report back to a Department of Energy Website on all usage to include electricity, water, gas, MBTU values for chilled water and high temperature hot water. Meters will be smart meters where cost effective. Metering is required on major building renovations over \$200K. Smart meters will be installed to record interval data and be reportable back to a central location.
- h. All new facilities and major renovations will perform 30% better than American Society of Heating, Refrigeration and Air Conditioning Engineers current Standard 90.1.
- i. All new construction and major renovations shall incorporate all five guiding principles from the 2006 Federal Leadership in High Performance and Sustainable buildings Memorandum of Understanding. Use energy analysis to show compliance with part 434 of title 10 code of Federal regulations.
- j. All building and major renovation will incorporate the U.S. Green Building Council's Leadership in Energy and Environmental Design (LEEDS rating system) building Silver or better rating and be registered.
- k. Required purchase of Energy Star related equipment. All construction, procurement agents, including Government credit cards shall procure Energy Star products and other products in the top 25% of energy efficiency.
- l. Required reporting energy, renewable, water usage through the DUERS (Defense Utility Energy Reporting System).
- m. Utilize alternately finance vehicles (UESC, ESPC) to the maximum extent possible to fund energy and water savings projects. No more than 35% of utilities budget will be utilized.
- n. Use Life Cycle cost Analysis to determine cost affective installation of technologies for construction.
- o. Utilize energy program vehicles such as ECIP for major construction over \$750K for submission to HQMC. ECIP is a MILCON energy project submission directly to HQMC.
- p. Utilize energy program vehicles such as EIP for FSRM under \$750K when funding is available.

UTILITIES AND ENERGY CONSERVATION MANUAL

- q. Document sustainable development costs on the DD1391 for sustainable Construction.
- r. Awareness programs will be run to provide materials, training, and publicize the need for energy, and water savings.
- s. Submit annual report to HQMC for energy and water savings.
- t. Ensure operations and maintenance incorporates best practices to maintain and stay within operational limits to save energy and water.
- u. Encourage participation in the Energy Star building program. This program is based on a five-stage strategy to include lighting, building tune up, load reductions, fan system upgrades, and heating and cooling upgrades.
- v. Solar water heating is required within 30% of new construction or major renovations where life cycle cost effective.
- w. Where cost effective purchase renewable energy, or contract for EUL (Enhanced Use Lease) or PPA (Power Purchase Agreement) for installation and purchase of renewable energy.
- x. Aggregate purchases of utilities regionally except where not cost effective.
- y. Roofing design and major renovation to ensure renewable solar PV or solar thermal is incorporated in the roof design.
- z. Hold a quarterly UCAB (Utilities Conservation Appraisal Board) for utilities cost information and energy conservation.

UTILITIES AND ENERGY CONSERVATION MANUAL

APPENDIX C

Inspection Report

Cooling Season

Inspection Checklist - Building/Area Monitor Inspection Date: _____

Building/Area No: _____ Organization: _____

Name of Building/Area Monitor: _____ Telephone: _____

- 1. Are weekly inspections being completed, including the corrective action taken and the checklist on file for one year?.....YES / NO
- 2. Are authorized temperature limits for both day and night posted in buildings? YES / NO
- 3. Are air conditioning systems operated off an outdoor air thermostat?.....YES / NO
- 4. Are heating/cooling registers closed off in rooms not being used?.....YES / NO
- 5. Are portable electric heaters or cooling fans being used without permission from the Utilities Conservation and Appraisal Board?.....YES / NO
- 6. Are lights off in unoccupied areas?.....YES / NO
- 7. Have requests for repairs been made for energy conservation purposes? YES / NO
- 8. Are exhaust fans operating simultaneously with refrigerated air units? ... YES / NO
- 9. Are all doors closed during heating/cooling, except for times of entry and exit? YES / NO
- 10. Are air coolers shut off one-half hour before the close of business during cooling months?.....YES / NO
- 11. Are thermostats set at 55 degrees during non-working hours during heating months?.....YES / NO
- 12. Are water faucets shut off when not in use?.....YES / NO
- 13. Do all washbasins, sinks, and wash trays have stoppers?.....YES / NO
- 14. Are there leaking faucets or fixtures? Have work requests been submitted?YES / NO
- 15. Is there excess spillage of water from lawn irrigation?.....YES / NO

REMARKS:

Building/Area Monitor: _____ Date: _____
Signature

Inspector: _____ Date: _____
Signature

UTILITIES AND ENERGY CONSERVATION MANUAL

APPENDIX D

Inspection Report

Heating Season

- 1. Are authorized temperature limits for both day and night posted in building?.....YES / NO
- 2. Are thermostats set at 68 degrees?.....YES / NO
- 3. Are heating units for clubs, theaters, exchanges, and similar community-type activities used only during occupied hours? Are temperatures set back during non-occupied hours?.....YES / NO
- 4. Are all large doors closed during the heating season?.....YES / NO
- 5. Are windows closed during the heating season?.....YES / NO
- 6. Are heating registers closed off in rooms not being used?.....YES / NO
- 7. Is outdoor lighting turned off during daylight hours and non-use nighttime?YES / NO
- 8. Are lights kept off in unoccupied areas?.....YES / NO
- 9. Are electrical converters operating when output is not being used? YES/NO
- 10. Are portable heaters in use without authorization?.....YES / NO
- 11. Are all unnecessary exterior lights off?.....YES / NO
- 12. Have requests for repairs that are beyond the capability of self-help been made?.....YES / NO

REMARKS:

Building/Area Monitor: _____ Date: _____
Signature

Inspector: _____ Date: _____
Signature

UTILITIES AND ENERGY CONSERVATION MANUAL

APPENDIX E

Energy Conservation Violation Notice

Building Number: . _____

Person Responsible: _____

Organization (If applicable): _____

1. Reference MAGTFTC, MCAGCC ORDER 4100.4, Utilities Conservation.
2. The following energy conservation violation(s) was (were) noted at _____ (time), on _____ (date):

VIOLATIONS: _____

3. A copy of this notice will be routed through command channels if this is the third notice.

Energy Conservation Inspector