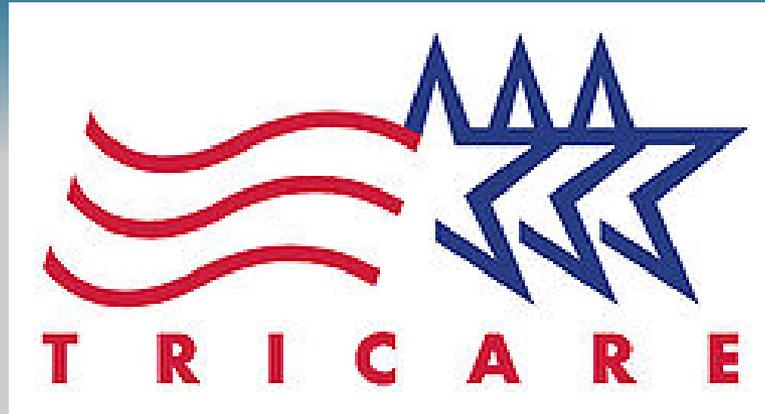


Charting a Course to Energy Independence

Providence, RI
August 9-12, 2009





ENERGY LEGISLATION

IMPACTS ON SPECIALTY BUILDINGS

HOSPITALS

A. Kent Bein, RA

August, 2009



About TRICARE Management Activity (TMA)



Office of the Assistant Secretary
of Defense/Health Affairs



Mission:
Manage the Defense Health Program

- Serves 9.4 million beneficiaries
 - Active duty service members and dependants.
- “Sister service” to the Veteran’s Administration.
- Integrate delivery of health benefits across the Military Health System.
- Facility responsibility includes hospitals, AHCC, clinics, dental clinics, veterinary hospitals, R&D centers.



Hospitals have unique energy requirements

	Typical Commercial Building	Hospital (DoD)
Operations	<ul style="list-style-type: none">Operates work day and work week	<ul style="list-style-type: none">Operate 24 hours/day, 7 days/ week
System reliability	<ul style="list-style-type: none">Cost of downtime reflected in lost revenue	<ul style="list-style-type: none">No Downtime; life safety /national defense issue. Mandatory open.
Criteria	<ul style="list-style-type: none">Industry Standards	<ul style="list-style-type: none">Military readiness; Military Medical Criteria
Infection control	<ul style="list-style-type: none">Minor requirement	<ul style="list-style-type: none">Mission Critical; affects filtering, ventilation, temperature, etc.
HVAC	<ul style="list-style-type: none">Inside air re-circulated to minimize heating/cooling	<ul style="list-style-type: none">Single-pass air, specially filteredSpecialty exhaust systems
Lighting	<ul style="list-style-type: none">Must support task execution, operations, but not mission critical	<ul style="list-style-type: none">Mission critical; OR's, exam, diagnostic and treatment rooms



Hospitals have unique energy requirements

	Typical Commercial Building	Hospital
Hot Water	<ul style="list-style-type: none">• Domestic hot water only	<ul style="list-style-type: none">• Very hot water for sterilization & laundry
Refrigeration	<ul style="list-style-type: none">• Food service	<ul style="list-style-type: none">• OR, food service, labs, morgue, specimens, medicines, etc.
Med gas, vacuum systems	<ul style="list-style-type: none">• Not required	<ul style="list-style-type: none">• Mandatory
Evidence Based Design	<ul style="list-style-type: none">• Not required	<ul style="list-style-type: none">• EBD features required, impact energy consumption. (Natural lighting, HEPA filtration...)



ENERGY CONSUMPTION CBECS COMPARISON

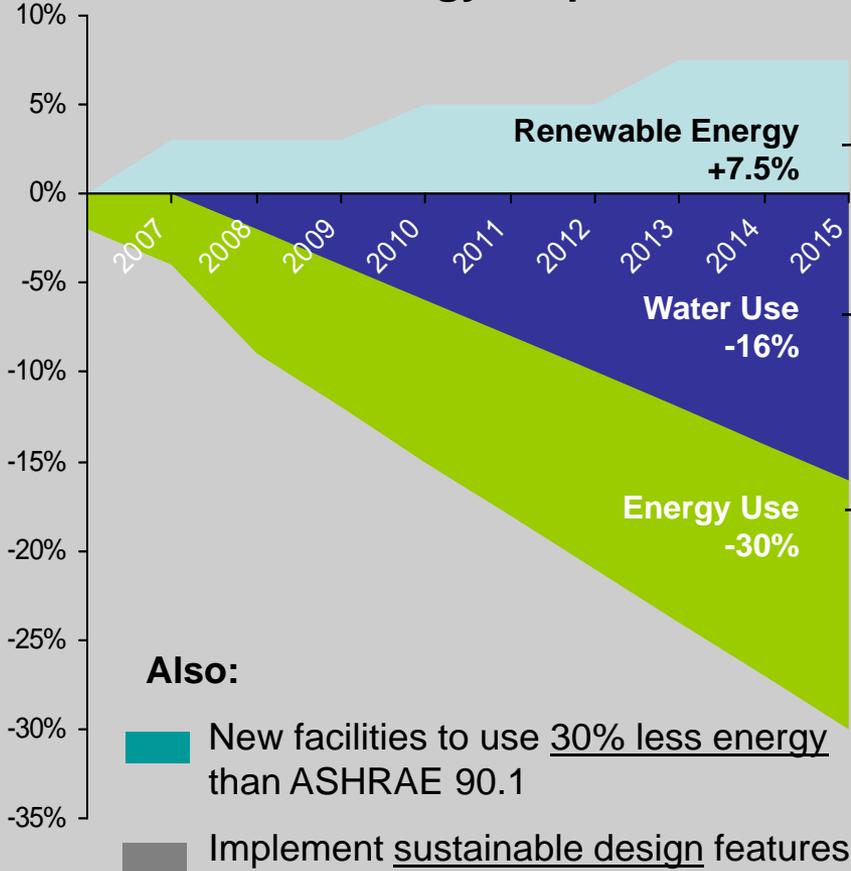
Energy Information Administration, Commercial Buildings Energy Consumption Survey (CBECS) data	Major Fuel Energy Intensity (thousand Btu/square foot)										
	Total	Space Heating	Cooling	Ventilation	Water Heating	Lighting	Cooking	Refrigeration	Office Equipment	Computers	Other
All Buildings*	89.8	34.0	6.7	5.9	6.9	17.6	2.6	5.5	1.0	2.3	7.4
Building Floorspace (Square Feet)											
1,001 to 5,000	98.9	30.5	6.7	2.7	7.1	13.7	7.1	20.2	1.2	1.7	8.1
5,001 to 10,000	78.3	30.0	5.4	2.6	6.1	12.5	5.2	8.4	0.8	1.4	5.9
10,001 to 25,000	67.3	28.1	4.1	3.9	3.7	13.1	2.1	4.6	0.8	1.6	5.3
25,001 to 50,000	77.6	30.2	6.6	5.8	6.3	13.9	1.6	3.9	0.8	1.9	6.7
50,001 to 100,000	83.8	32.4	6.5	7.2	6.0	17.4	1.2	3.3	0.7	2.0	7.1
100,001 to 200,000	103.0	41.3	7.1	8.8	7.9	21.5	0.9	2.7	Q	3.4	8.0
200,001 to 500,000	101.0	39.0	7.6	7.5	9.4	22.6	1.9	1.2	1.1	2.7	8.1
Over 500,000	129.7	44.9	11.5	9.5	11.7	30.6	2.2	2.1	Q	3.9	11.9
Principal Building Activity											
Education	83.1	39.4	8.0	8.4	5.8	11.5	0.8	1.6	0.4	3.3	4.0
Food Sales	199.7	28.9	9.8	5.9	2.9	36.7	8.6	94.8	1.6	1.5	9.1
Food Service	258.3	43.1	17.4	14.8	40.4	25.4	63.5	42.1	1.0	1.0	9.5
Health Care	187.7	70.4	14.1	13.3	30.2	33.1	3.5	2.6	1.2	3.2	16.1
Inpatient	249.2	91.8	18.6	20.0	48.4	40.1	5.6	2.0	1.1	3.6	18.1
Outpatient	94.6	38.1	7.2	3.3	2.5	22.6	Q	3.5	1.3	2.6	13.2
Lodging	100.0	22.2	4.9	2.7	31.4	24.3	3.2	2.3	Q	1.2	7.0
Retail (Other Than Mall).....	73.9	24.8	5.9	3.7	1.1	25.7	0.6	5.0	0.6	0.9	5.6
Office	92.9	32.8	8.9	5.2	2.0	23.1	0.3	2.9	2.6	6.1	9.0
Public Assembly	93.9	49.7	9.6	15.9	1.0	7.0	0.8	2.2	Q	Q	6.5
Public Order and Safety	115.8	49.9	8.9	9.5	14.0	16.5	1.3	2.9	0.6	1.5	10.6
Religious Worship	43.5	26.2	2.9	1.4	0.8	4.4	0.8	1.7	0.1	0.2	4.9
Service	77.0	35.9	3.8	6.0	1.0	15.6	Q	2.1	0.3	0.8	11.4
Warehouse and Storage	45.2	19.3	1.3	2.0	0.6	13.1	Q	3.5	0.2	0.5	4.8
Other	164.4	79.4	10.5	6.1	2.1	34.1	Q	6.0	Q	2.9	18.9
Vacant	20.9	14.4	0.6	0.4	0.1	1.7	Q	Q	Q	0.0	3.1



Meeting energy requirements will be a challenge

Federal Energy Requirements

Compliance Challenges



- MTF's rely on base for energy supply. Renewable Tech limitation. (Ex. Geothermal. Hospital Rqt 2000 tons; current tech only 60 ton).
 - Currently limited metered data;
 - Current plan is for 100% covered facilities to be metered by 2012;
 - Energy intensive. Not life cycle cost effective. Hard to better 30% ASHRAE 90.1
- | | |
|---------------------|---------------|
| Ft Belvoir Hospital | 15% Projected |
| Bethesda Med Ctr | 30% Projected |
| Ft Riley Hospital | 17% Projected |
- Achieving: TMA LEED Silver minimum requirement



EPACT 2005

☰ Sec 109; Efficiency Standards

- *If life-cycle cost-effective* new and replacement buildings will be designed to achieve energy consumption levels that are at least **30 percent below ASHRAE 90.1** standard commercial model (appendix, with recommended commercial modeling software).
 - ⊕ **Standard applicable to commercial facilities. No prescriptive requirement to date for health care facilities.**
 - ⊕ **Energy Intensive facilities can not cost effectively beat ASHRAE 90.1 .**
 - ⊕ **Dell Children Hospital Austin is only other known facility achieving goal.**
 - ⊕ **Ft Belvoir design projected 15% better than ASHRAE.**
 - ⊕ **Ft. Riley design projected 17% better than ASHRAE.**
 - ⊕ **Bethesda claiming 30%, but unlikely. Need NAVFAC explanation.**



EPACT 2005

☐ EPACT Sec. 103; EISA Sec. 434

- Install meters on Federal buildings to the maximum extent practicable by 10/1/12.
 - ⊗ **Covered med facilities; more than 10 percent metered to date.**
 - ⊗ **Requirement at Line level to implement.**
 - » **AF 60 facilities metered.**
 - » **Army funded metering first year. Commands may implement themselves, but no finalized plan.**
 - » **BUMED installations being shifted to Line. Line using IDIQ contract to implement metering.**
- EISA amended to add gas and steam by 2016.

☐ Section 203(a); Renewable Energy “...to the extent economically feasible”–

- TMA dependant on Installation.
- Includes: green utility procurement, solar, photovoltaic, wind, geothermal, biomass
 - ⊗ Purchase 3% in 2007 -2009.
 - ⊗ 5% in 2010 – 2012.
 - ⊗ 7.5% in 2013 and beyond.

☐ **Renewable technology not yet economically feasible on TMA projects.**

☐ **No TMA funded renewable energy building to date.**



EISA 2007

- Sec 431
 - ☐ Requires Federal agencies to reduce **total facility energy consumption per gross square foot 30% by 2015.**
 - **TMA facilities have reduced energy intensity (Btu/GSF) in goal subject facilities compared to 2003 baseline and is on track for 30 % by 2015.**
 - **As per Annual Energy Report, 9 % by 2008 achieved.**
 - NOTE: An agency may exclude from the requirements any building... in which energy intensive activities are carried out. (i.e. Hospitals)
 - ⊙ **TMA has not excluded our facilities. Facilities are being reported.**
- Sec. 432
 - ☐ Comprehensive energy and water evaluations (audits) for approximately 25 % covered facilities in a manner that ensures that an evaluation of each facility is completed at least once every four years. Energy managers must implement energy conservation measures within two years after the completion of each evaluation.
 - **Four TMA installations audited under TMA IIP program. Data call sent to Med services requesting remaining facilities' schedule by Sept 3, 2009.**



EISA 2007

- Sec. 433, New construction and major renovation;
 - ☐ fossil fuel-generated energy consumption of the buildings is reduced, as compared with such energy consumption by a similar building in fiscal year 2003 CBECS
 - **NO DOE guidance yet provided.**
- Sec. 433, Sustainable design principles;
 - ☐ shall be assigned to the site layout, design and construction of new construction and major renovation projects
 - **UFC REQUIREMENT. STANDARD DESIGN PRINCIPLES.**
-



EISA 2007

- Sec. 434:
 - ☐ Major replacements of installed equipment (such as heating and cooling systems), or renovation or expansion of existing space, must employ the most energy efficient designs, systems, equipment and controls that are life-cycle cost effective
 - **COMPLIANCE VIA UFC CRITERIA.**
 - ☐ Beginning in FY 2008, reduce water consumption intensity through life-cycle cost-effectiveness measures and sustainable facility design practices by 2 percent annually or 16 percent by the end of FY 2015 using FY 2007 as the baseline year.
 - **TMA on track for compliance. Energy Star baseline inputs to help get handle on accuracy and full compliance, using 2007 baseline vs 2008 inputs. Will start 2009 with its annual report in few months.**
- Sec 523: Solar Energy: 30% of hot water in new and renovated federal buildings from solar. Federal agencies are required to use solar hot water heaters for not less than 30 percent of demand where life-cycle cost effective.
 - ☐ Where life cycle cost effective.
 - ☐ Not yet used at TMA facilities.



Fort Belvoir, Virginia Community Hospital

Courtyards between the outpatient facilities emphasize storm-water treatment and the collection of rainwater for later use. Rain barrels funnel and capture water running off the roof, providing a visible manner in which hospital employees and patients can understand the beginning of the hydrological cycle. Two rain barrels and two underground cisterns per courtyard hold a combined total volume of approximately 160,000 gallons. This system will provide the majority of water needed for irrigation throughout the year.





FT. BELVOIR CONSTRUCTION AERIAL PHOTO



06/27/09



Walter Reed National Military Medical Center (WRNMMC) Bethesda, Maryland





Program Tools and Resources

Policy Levers

- TMA Design Criteria (UFC)
- TMA Directives
- Capital investment decision-making
- Information management
- LEED Silver
- Energy Audits to help identify opportunities

Execution

- MILCON (DD Form 1391)
- O&M
- Sustainment, Restoration
- ECIP
- ESPC (not many; See BRAC))

Planning

- **TMA Energy Subcommittee**
 - TMA
 - Medical Services' Reps
 - USACOE,
 - NAVFAC
 - Consultants (Booz Allen Hamilton, ORNL)

Tools and Resources

- Facility energy audits
- Energy portfolio manager
- HFSC Energy Subcommittee
- DOE Hospital Energy Alliance Working Group and Steering Committee



Way Ahead

1

Identify

Key mission needs and requirements across DoD health complex.

2

Acquire

Reliable facility energy consumption data to support program areas.

3

Target

Those facilities with greatest improvement potential for immediate action.

4

Implement

Conservation commitment by all stakeholders and all disciplines. (Architects upfront use ASHRAE 90.1)



BACK UP SLIDES



TMA sees opportunity to improve hospital energy use

TMA Facilities Portfolio

- 58 hospitals
- Recapitalization projects upcoming
 - 72% inpatient facilities >20 yrs old
- Opportunity to integrate advanced design, LEED
- Technology innovation greatest at end of equipment life

Policy Drivers

- EO 13423, EISA 2007, and EPACT 2005 all require significant energy measures
- These drivers provide TMA an opportunity to lead public and private health care energy management

Hospital Energy Fundamentals

- Hospitals are energy intensive to operate
- Larger, more intensive loads tend to offer the greatest opportunities for improvement

Efficiency Opportunity

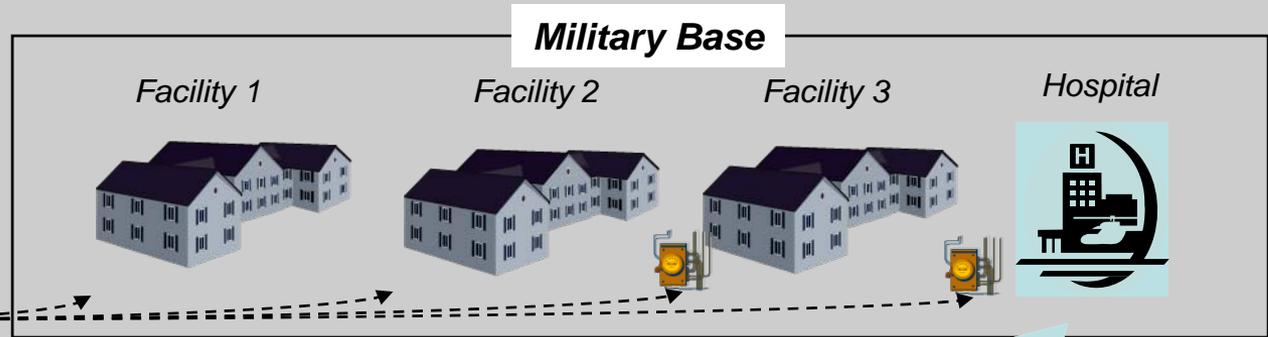
Energy Market Drivers

- Despite worst recession in decades, energy prices are still high
- Congressional action on climate will further escalate energy prices



A “plugs & processes” study will track hospital-specific energy use

Policy-driven advanced metering initiatives will place a meter on each covered facility



Study purpose: determine how the energy is used within the building – especially since hospital energy needs are uncharacteristic of other buildings

Hygiene



Ventilation



Temperature control



Water heating



Diagnostic equipment



Lighting



Refrigeration





Critical Care Area Examples

- **Operating rooms**
- **Labor and delivery rooms**
- **Cystoscope rooms**
- **Oral Surgery Maxillofacial surgery, Periodontics, and Endodontics**
- **Recovery (surgery and labor recovery beds)**
- **Coronary care units, Intensive care unit (patient bedrooms)**
- **Emergency care units (treatment/trauma/urgent care rooms and cubicles)**
- **Labor rooms (including stress test and preparation)**
- **Intensive care and isolation care nursery**
- **Cardiac catheterization**
- **Angiographic exposure room**
- **Hemodialysis (patient station)**
- **Surgery suite preparation and hold**
- **Hyperbaric chamber**
- **Radiation Therapy**
- **Nuclear medicine (camera room)**



Recent Success

☰ TMA has achieved near 30% savings on :

- USAMRICD, Aberdeen Maryland 30% (claimed).
- Ft Riley Hospital 15% (Projected)
- Ft Belvoir 14%. (Projected)
- Bethesda Med Center 30% (Projected)
 - ⊕ Expenditure to achieve 30% not offset by savings.
 - ⊕ Standard conservation practices.
 - » See HDR “Sustainable Return On Investment and Life Cycle Cost Analysis of” Energy and Water conservation Measures for Ft Belvoir Hospital” March 2009.



WHAT IS DIFFERENT ABOUT HOSPITALS

- Hospitals are open and function 24/7.
 - ☒ HVAC systems, including cooling and heating capacity for all critical care spaces, and heating of patient bedrooms run full time
 - ☒ Lighting on Full Time
 - ☒ Hot water and Steam on full time.
- Infection control, Specialty: filtering, ventilation, temperature, lighting requirements
 - ☒ surgery suite, delivery suite, nursery, coronary care unit, intensive care units, isolation rooms, X-ray rooms, emergency department, exam rooms ...
- Special exhaust systems:
 - laboratories, including radioisotope hoods, and isolation room exhaust fans.
- Imaging & labs
- Specialty diagnostic and treatment equipment
 - ☒ Temperature, ventilation and filtering issues
- Single pass air
- Refrigeration: Food service, morgue, specimens (blood, biological, pathology) and medicines.
- Food preparation
- Sterilization
- Specialty lighting requirements
 - ☒ Operating room, Diagnostic and treatment rooms, Helipad lighting and visual navigational aids
 - ☒ DoD UFC 4-510-01 Appdx A establishes lighting level requirements per each room.
- VERY hot water; not simply hand wash warm....
- medical gas and vacuum systems
- Life safety and critical care demand loads
- Multi-story facilities
- Elevators; Minimum One passenger and one hospital per hospital wing
- Emergency generator system

