

Thinking Out of the BOX

at the

Arizona Army National Guard



Jeff Seaton, CEM

Energy Manager

State of Arizona-DEMA

The Arizona Army National Guard

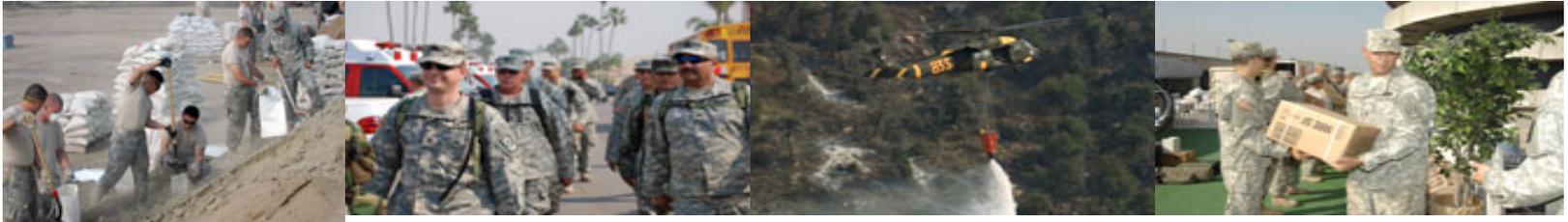
Federal Mission



Support the US Army



State Mission



Arizona Army National Guard Buildings

- 1,680,103 sq ft
- 147 buildings
- 24 cities
- 11 counties

\$29 million energy budget

- 40% office type bldgs
- 17% vehicle repair
- 16% aviation hangars
- 10% dormitory/ billets
- 9% training/ classrooms
- 6% storage facilities
- 1% dining facilities
- 1% medical facilities

The Energy Manager's MISSION

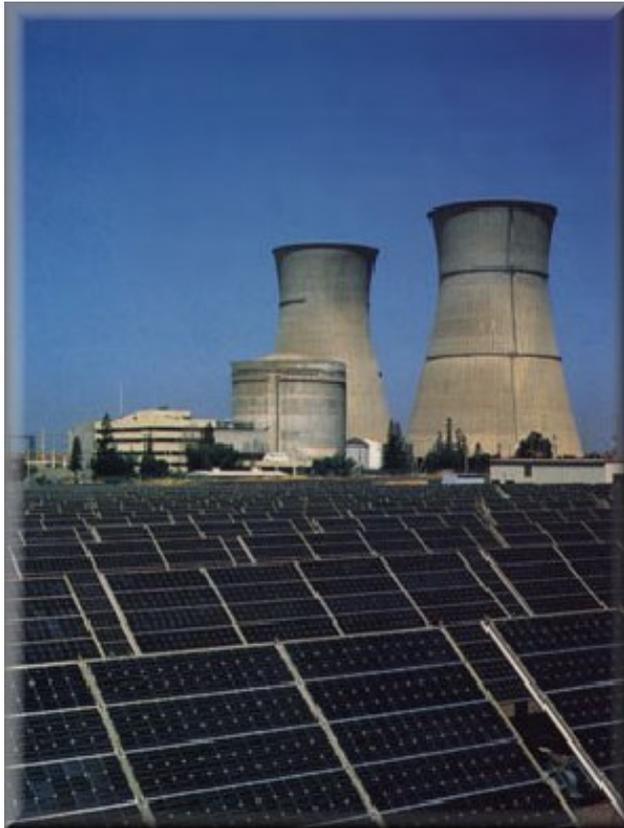
Develop projects to CONSERVE energy
and
lower operating expenses.....



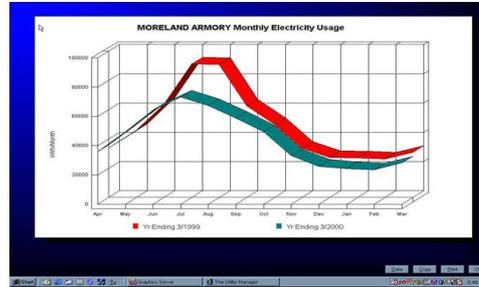
Can it be done ?.....

The Goal

Sustainability!



- ❖ Reduce energy usage
- ❖ Increase energy efficiency
- ❖ Reduce energy costs
- ❖ Be a visionary !
- ❖ Offer a visual statement
- ❖ Invest in the future



The Facts

ENERGY SAVED = DOLLARS SAVED

- Good business sense
- Increases efficiency
- Reduces pollution

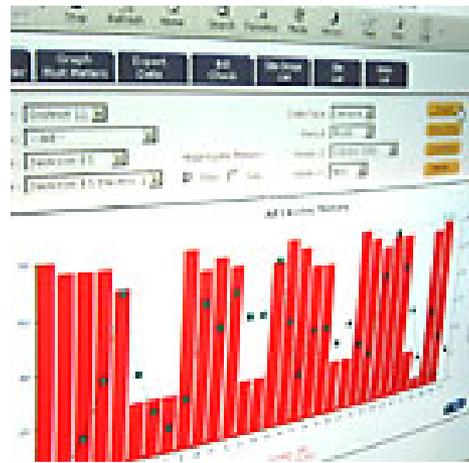


Tracking the bills



"You can't manage what you can't see!"

Site	Monthly E	% Chg	Monthly F	% Chg	Other Utilit % Chg	Monthly S	Monthly R	Monthly Total	Monthly Total YTD
MARANA	\$7,158	-51.70%	\$2,572	-38.20%	\$0	N/A	\$5,819	\$0	\$5,819
MARANA	\$20,090	-5.50%	\$1,124	-72.50%	\$0	N/A	\$5,649	\$0	\$5,649
PPMR DE N/A		-269.70%	\$0	N/A	\$0	N/A	\$0	\$0	\$0
SHOW LO	\$0	N/A	\$0	N/A	\$0	N/A	\$167	\$0	\$167
PPMR US N/A		-432.30%	\$178	-43.70%	\$0	N/A	\$280	\$0	\$280
MESA HC N/A		#####	\$0	N/A	\$0	N/A	\$670	\$51	\$621
MARANA	\$1,197	-34.50%	\$0	N/A	\$0	N/A	\$973	\$0	\$973
MORELAN N/A		-834.30%	\$681	5.20%	\$0	N/A	\$109	\$0	\$109
GLENDAL	\$798	N/A	\$0	N/A	\$0	N/A	\$0	\$0	\$0
52 ST ARB N/A		#####	\$269	-2.20%	\$0	N/A	\$56	\$0	\$56
ROOSEVENA		-617.30%	\$763	20.10%	\$0	N/A	\$254	\$0	\$254
SUNNY SL	\$133	-80.20%	\$0	N/A	\$0	N/A	\$707	\$0	\$707
ONTS ME	\$891	-42.30%	\$650	-25.00%	\$16	-20.60%	\$724	\$4	\$728
PPMR AII	\$582	-20.20%	\$0	N/A	\$0	N/A	\$122	\$0	\$122
PPMR US N/A		-925.10%	\$978	52.30%	\$0	N/A	\$93	\$0	\$93
PPMR CL	\$387	-26.70%	\$360	38.30%	\$0	N/A	\$138	\$0	\$138
ONTS EN	\$180	-72.90%	\$314	-52.70%	\$16	-54.20%	\$957	\$27	\$984
ONTS EN	\$145	-64.30%	\$250	-62.30%	\$15	N/A	\$633	\$8	\$641
PPMR FM	\$57	-39.30%	\$0	N/A	\$0	N/A	\$23	\$0	\$23
PPMR AA N/A		-883.20%	\$0	N/A	\$73	-72.10%	\$0	\$113	\$113
FLAGSTA	\$342	-16.40%	\$0	N/A	\$82	-57.10%	\$52	\$48	\$100
TEMPE AI	\$0	N/A	\$0	N/A	\$0	N/A	\$277	\$0	\$277
MESA BN	\$0	N/A	\$0	N/A	\$0	N/A	\$455	\$0	\$455
BELLEMC	\$637	7.70%	\$685	31.30%	\$36	30.10%	(\$134)	(\$4)	(\$138)
MESA OM	\$0	N/A	\$0	N/A	\$0	N/A	\$242	\$0	\$242
ONTS EN	\$179	-58.00%	\$274	-56.20%	\$181	1104.10%	\$544	(\$97)	\$447
PPMR FM N/A		#####	\$0	N/A	\$0	N/A	\$0	\$0	\$0
PPMR AT	\$809	-35.20%	\$0	N/A	\$0	N/A	\$211	\$0	\$211
YUMA AR	\$195	-27.10%	\$0	N/A	\$0	N/A	\$50	\$0	\$50
CHANDLE	\$596	18.60%	\$810	76.70%	\$0	N/A	(\$228)	\$0	(\$228)
PPMR VA	\$174	0.40%	\$0	N/A	\$18	-86.90%	(\$7)	\$131	\$124
PPMR GS N/A		-365.10%	\$2,316	-48.00%	\$13	-88.80%	\$1,946	\$51	\$1,997
SAFFRONIA		#####	\$0	N/A	\$0	N/A	\$0	\$0	\$0
PPMR ATI	\$90	-67.00%	\$0	N/A	\$14	N/A	\$83	\$0	\$83
PRESGOT	\$509	-39.20%	\$0	N/A	\$0	N/A	\$162	\$0	\$162
ONTS TEN	\$150	-28.40%	\$444	-17.60%	\$15	N/A	\$89	\$0	\$89
FLORENC	\$0	N/A	\$0	N/A	\$0	N/A	\$115	\$0	\$115
BELLEMC	\$422	-2.70%	\$1,122	44.80%	\$30	-55.10%	(\$142)	\$25	(\$118)
DOUGLAS N/A		#####	\$0	N/A	\$0	N/A	\$0	\$0	\$0
ONTS SR	\$404	-16.60%	\$458	-24.20%	\$24	346.10%	\$180	(\$9)	\$170
SAFFRONIA		#####	\$0	N/A	\$0	N/A	\$0	\$0	\$0
SHOW LO N/A		#####	\$0	N/A	\$0	N/A	\$33	\$0	\$33
FLORENC N/A		#####	\$0	N/A	\$0	N/A	\$0	\$0	\$0
ROOSEVENA		#####	\$747	15.90%	\$0	N/A	\$269	\$0	\$269
FLORENC N/A		#####	\$0	N/A	\$0	N/A	\$0	\$0	\$0
SILVERLANA		#####	\$1,451	209.30%	\$0	N/A	(\$552)	\$0	(\$552)
MARANA	\$1,558	-3.20%	\$0	N/A	\$0	N/A	\$47	\$0	\$47
MARANA	\$1,648	-10.60%	\$1,179	255.90%	\$0	N/A	(\$309)	\$0	(\$309)
PPMR GS N/A		#####	\$0	N/A	\$0	N/A	\$0	\$0	\$0
PPMR SJ	\$61	-51.00%	\$0	N/A	\$0	N/A	\$33	\$0	\$33
PPMR AV	\$18	-78.20%	\$0	N/A	\$0	N/A	\$29	\$0	\$29
PPMR M	\$387	19.70%	\$0	N/A	\$3	0.60%	(\$20)	\$0	(\$20)
VALENCIA N/A		#####	\$0	N/A	\$0	N/A	\$0	\$0	\$0
ONTS MA	\$96	-40.20%	\$69	-23.30%	\$15	N/A	\$79	\$0	\$79
PPMR AM N/A		#####	\$0	N/A	\$0	N/A	\$0	\$0	\$0
VALENCIA N/A		#####	\$0	N/A	\$0	N/A	\$0	\$0	\$0
PPMR AM	\$228	46.40%	\$0	N/A	\$0	N/A	(\$39)	\$0	(\$39)
ONTS CH	\$5	N/A	\$5	-96.80%	\$15	N/A	\$177	\$0	\$177
ONTS BN	\$119	-58.80%	\$151	N/A	\$15	N/A	\$52	\$8	\$60
PPMR TS	\$103	-38.70%	\$0	N/A	\$0	N/A	\$27	\$0	\$27



Sites - View

Site Search
Site ID/name: Auburn, WA...009

Site ID: 009
Site name: Auburn, WA

Date acquired: 01/01/1998 Date opened: 01/01/1998
Date disposed: / / Date closed: / /

Financial code:

Production units 1: Customers
Production units 2: (none)

Weather station: WA -- Seatac -- U001

Track floor area:
Last floor area: 5500 (SqF) Floor area varies

Memos [2] Add Edit Save Delete Close

Company

Company Description: Family Dining, Inc.
Organization type: Company
Floor area units: Square feet (SF)

Company Calendar
Start date: 01/1994
Number of periods: 12 Month
Financial period: 12

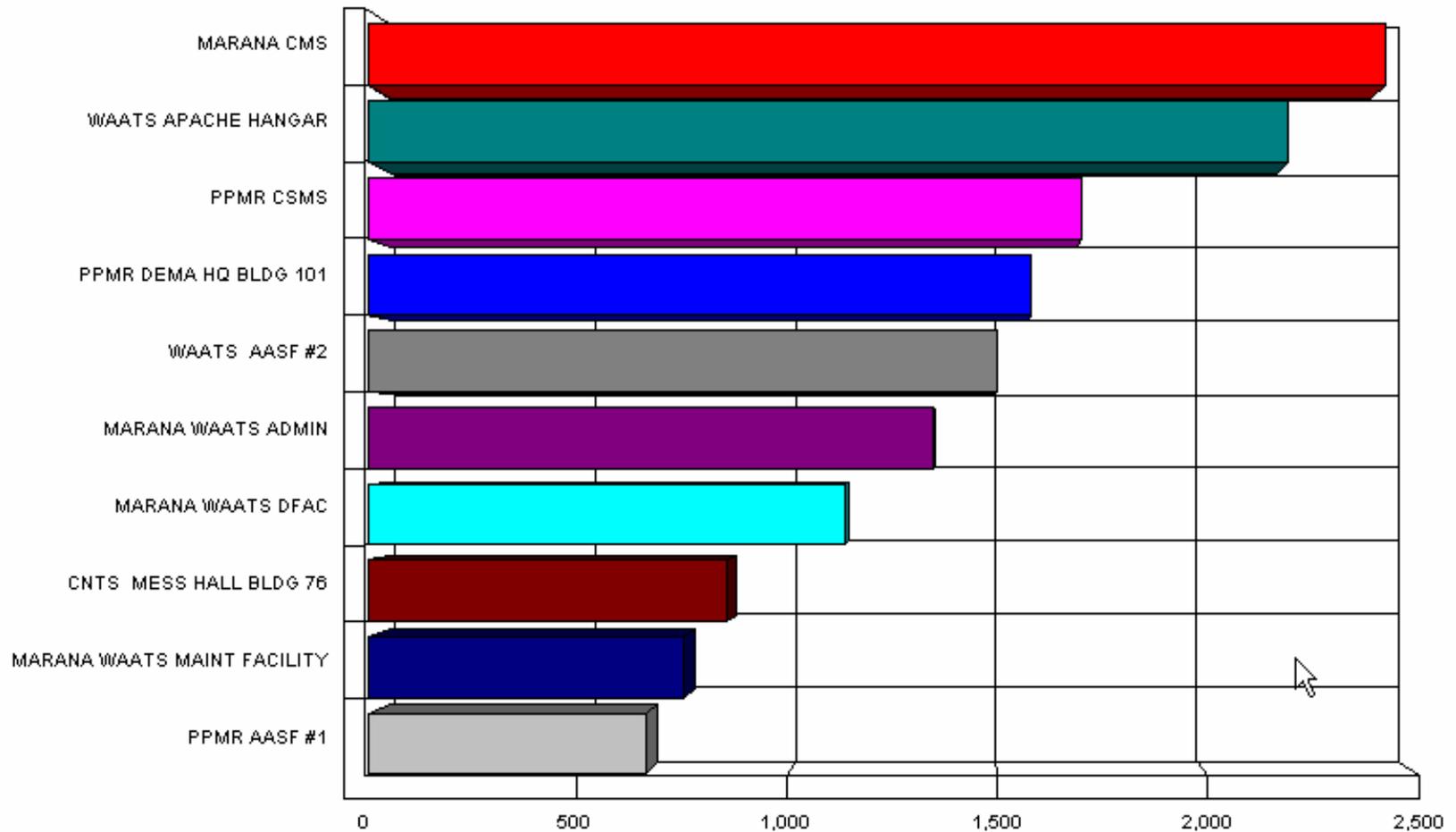
Utility Services

Energy Services	Reporting Units	Non-Energy Services	Reporting Units	Recycling Services	Reporting Units
<input checked="" type="checkbox"/> Electricity	kWh	<input checked="" type="checkbox"/> Water	CCF	<input checked="" type="checkbox"/> Paper Recycling	Lbs
<input checked="" type="checkbox"/> Natural Gas	Therms	<input checked="" type="checkbox"/> Irrigation	CCF	<input checked="" type="checkbox"/> Glass Recycling	Lbs
<input checked="" type="checkbox"/> Oil	Gallons	<input checked="" type="checkbox"/> Sewer	CCF	<input checked="" type="checkbox"/> Plastic Recycling	Lbs
<input checked="" type="checkbox"/> Diesel	Gallons	<input checked="" type="checkbox"/> Refuse	Cu Yd	<input checked="" type="checkbox"/> Metal Recycling	Lbs
<input checked="" type="checkbox"/> Coal		<input checked="" type="checkbox"/> Storm Water	CCF	<input checked="" type="checkbox"/> Other Recycling	Lbs
<input checked="" type="checkbox"/> Wood					
<input checked="" type="checkbox"/> Propane	Gallons				
<input checked="" type="checkbox"/> Steam					
<input checked="" type="checkbox"/> Chilled Water					

Calendar... G/L Accounts... Weather Stations Production Units Save Cancel

UM Pro software

Highest Total Energy Use State of Arizona - DEMA



Year to Date 01/2008

The Plan: Energy Conservation

Lighting
retrofits

Motion
sensors

HVAC
controls

Employee
awareness

Solar
projects



The Commitment

AZ DEMA



Diving into partnerships



ASU ARIZONA STATE UNIVERSITY



ALERTON[®]
TECHNOLOGIES INC

FEMP

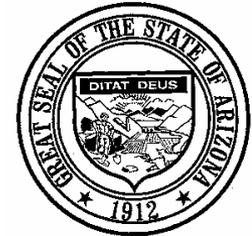


APS[®]



 **Touchstone Energy**[®]
The power of human connections

SRP
Delivering More Than Power.[®]



Tucson Electric Power
A UniSource Energy Company

TRICO
Electric Cooperative, Inc.
A Touchstone Energy  Cooperative

A Question of Labor

FMO Energy technicians being trained for:



- ❖ Installation
- ❖ Operating
- ❖ Troubleshooting
- ❖ Maintaining



Inspire and Motivate!

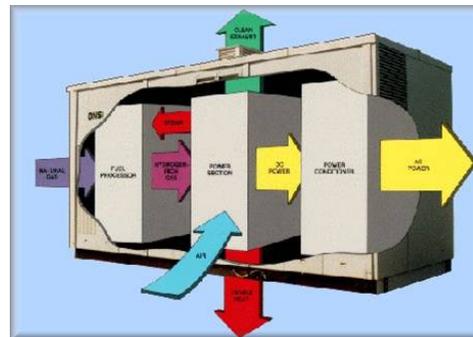
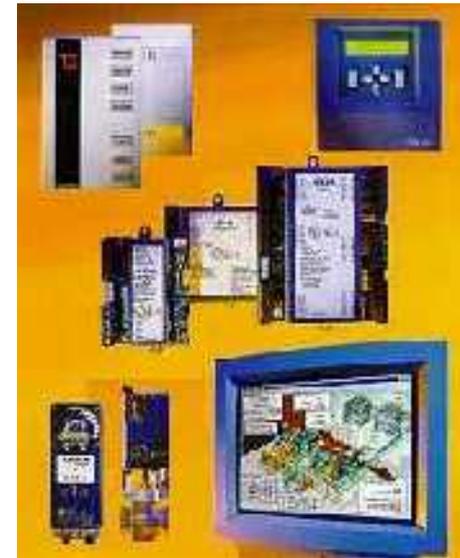
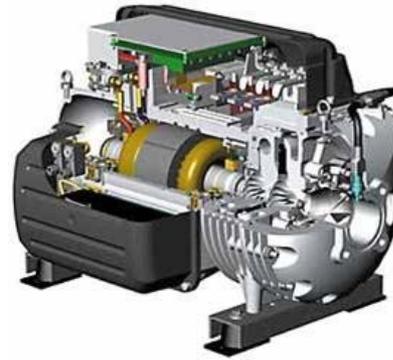
By offering our techs **TRAINING**
with exciting new technologies !



If you enjoy your job...

...you will believe in what you do!

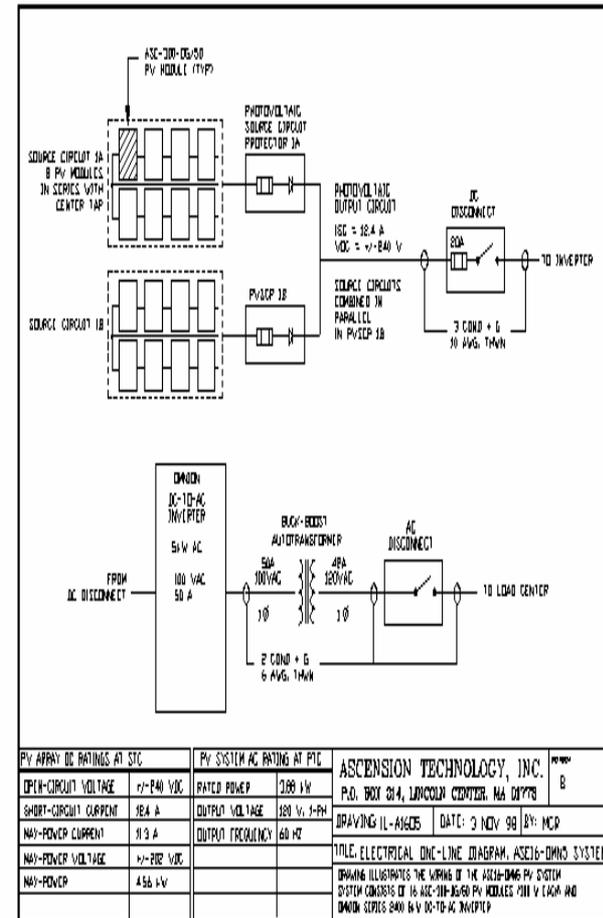
We Are Embracing Technology!





The Engineering

- ❖ Important to get it right!
- ❖ Use in-house expertise?
- ❖ Use utility partnerships?
- ❖ Choose PE's carefully!
- ❖ Ask lots of Questions!



The Projects

Lighting

- ❖ (Original) T12-T8 retrofits
- ❖ Super T8's @ relamping
- ❖ High-bay T5 (R&R)
- ❖ Pulse-start HID ballasts
- ❖ Motion sensors for AC
- ❖ LED/CFL security lighting



HVAC:

- ❖ BACnet EMCS
- ❖ Programmable Tstats
- ❖ Temperature settings
- ❖ AWARENESS !

Lighting Projects



0 Degree
High Bay Applications



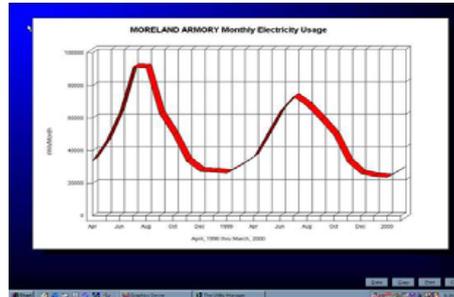
15 Degrees
High Bay / Aisle Application



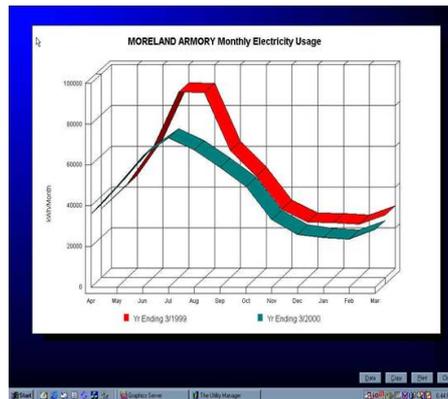
25 Degrees
High Bay / Long Aisle Application



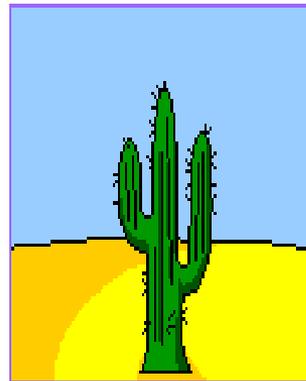
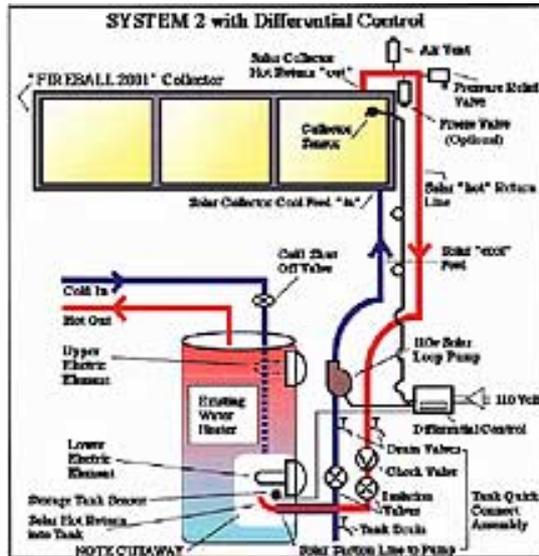
Shipping Mode
Assembly Free Installations



**34-35%
Of LOAD**



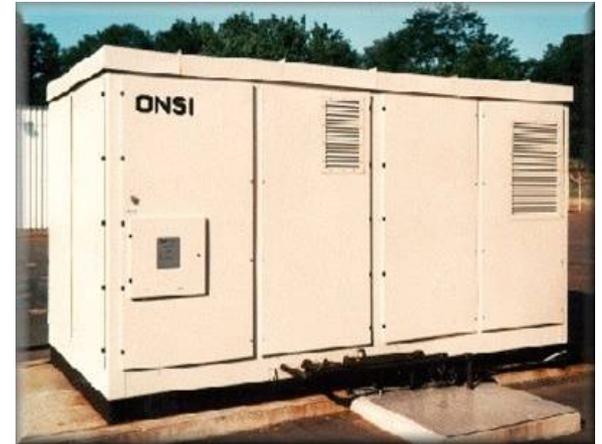
Renewable Projects



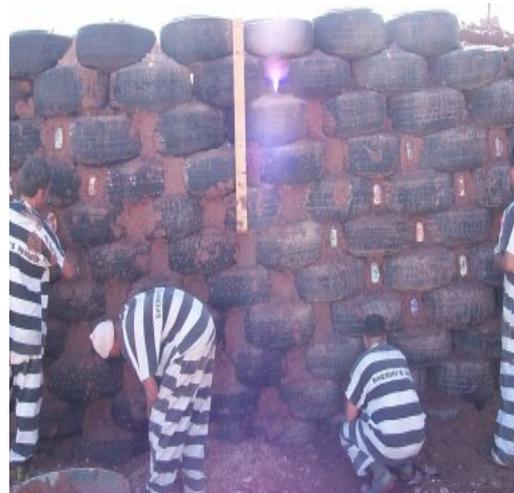
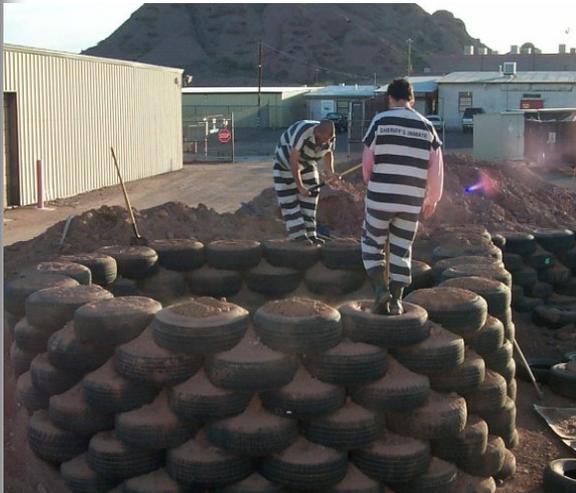
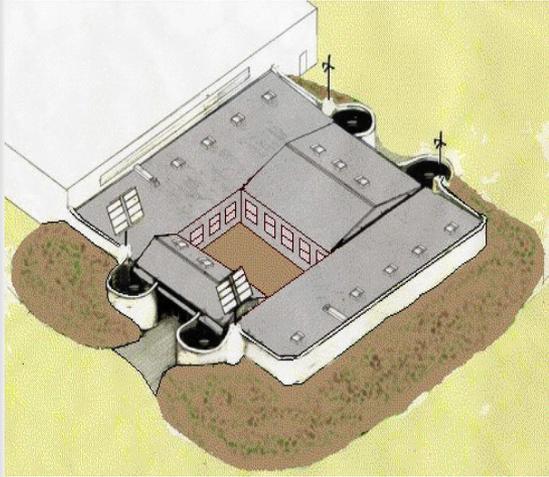
PV Arrays



Fuel Cells



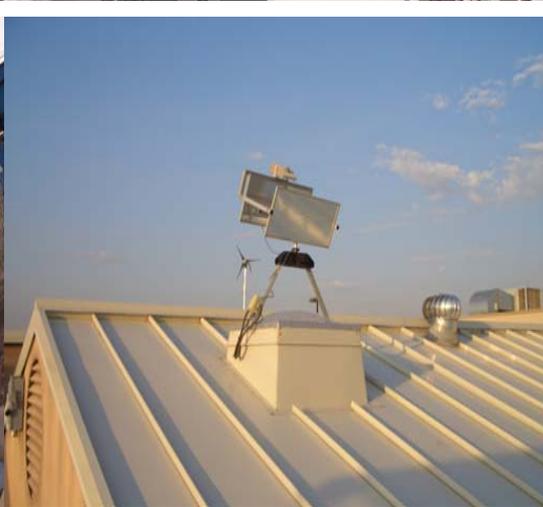
Our Crown Jewel : The "EcoBuilding"



Sustainability = the ECObuilding



The AZ ARNG ECObuilding



The AZ ARNG ECObuilding

- 7 KW Single crystal on 2-axis trackers
- 4 KW Thin film (laminated to roof)
- 1.5 KW Wind Turbines
(12.5 total KW, grid-connected)
- 10 Ton Solar Absorption Chiller
- 12 "Solar Tubes"
- 3 Skylights w/ PV powered 2-axis trackers
- 10 Operable "skywindows"
- Longwave UV and CO2 sensors in airhandler
- BACnet EMCS - monitors building conditions

The Arizona Army National Guard

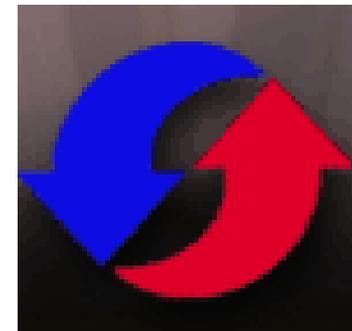
CAPTURING the SUN 365 days each year!



HVAC Projects



HVAC is 31-32%
Of BLDG LOAD

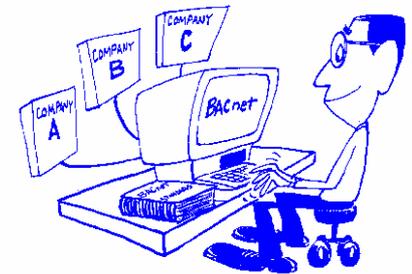


The DEMA BACnet



Why BACnet?

A collage of six screenshots from BACnet software interfaces. The top-left screenshot shows a 3D cutaway of a building with various rooms and systems labeled. The top-right screenshot is a control panel for 'WAATS Coastal Mission SIM' with various status indicators and tables. The middle-left screenshot shows a 3D model of a 'DEMA Headquarters Bldg' with 'CENTRAL PLANT' components. The middle-center screenshot is a 'National Guard Head Quarters Building, First Floor Plan' with 'BACnet EMCS' and 'State of Arizona - DEMA' labels. The middle-right screenshot shows a 3D model of a 'National Guard Roosevelt Army First Floor Plan' with 'System Pumps' and 'Hot Storage Tanks'. The bottom-right screenshot is a 'National Guard Roosevelt Army First Floor Plan' showing a detailed floor plan layout.



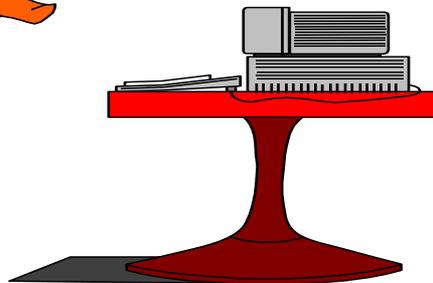
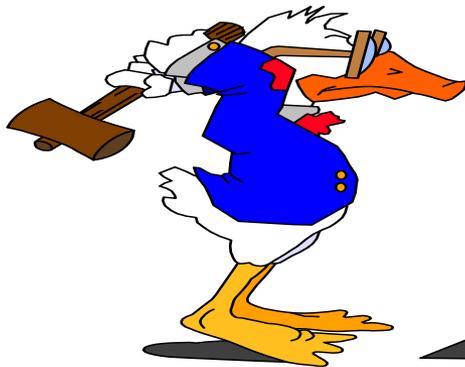
That's why!

BACnet "WEBtalk"

ACCESS FROM DEMA INTRANET

<http://159.87.121.101>

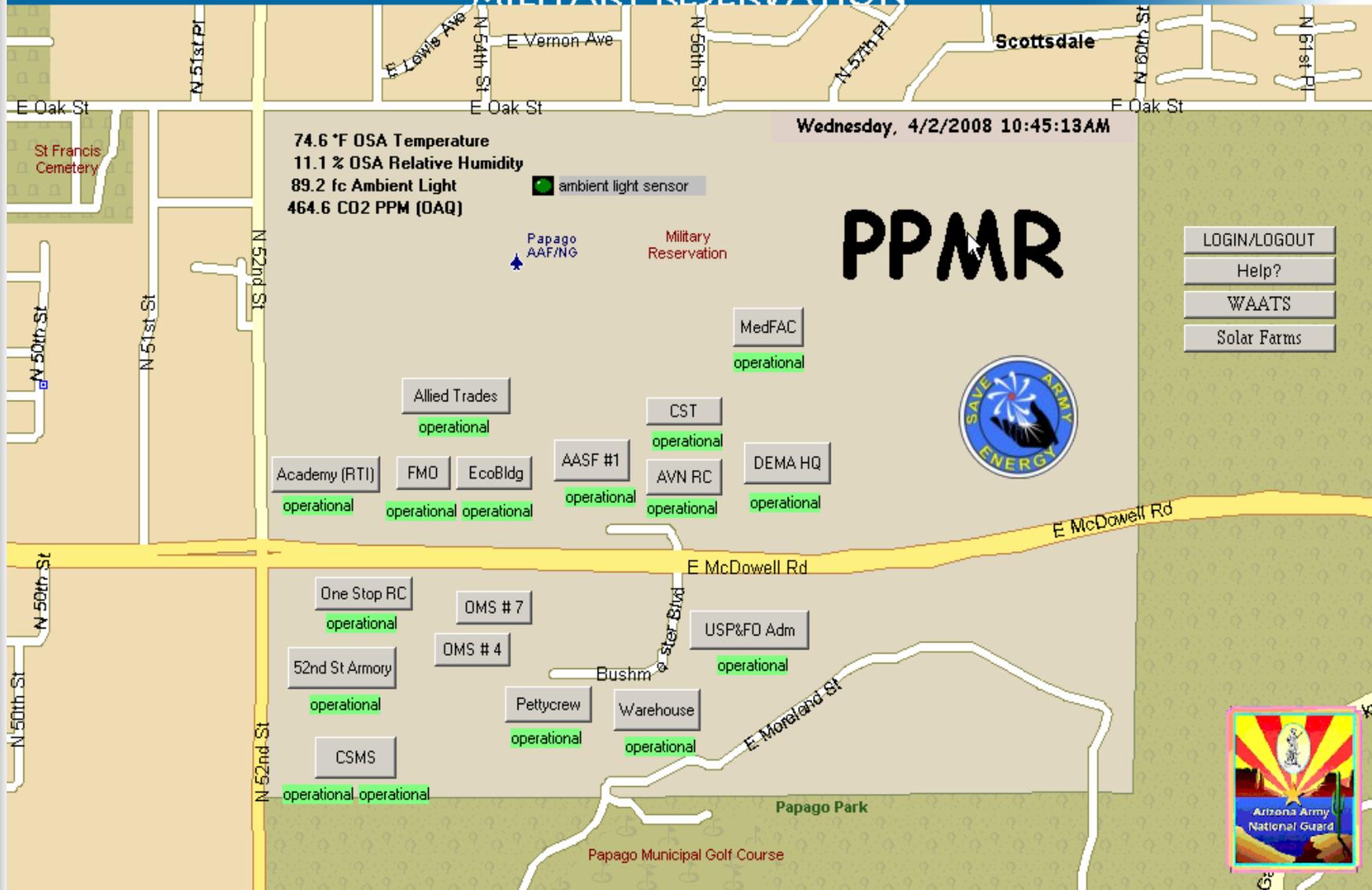
"view only"



ARIZONA ARMY NATIONAL GUARD

PAPAGO PARK MILITARY RESERVATION

Previous	Top Display
Ambient Light	Power Monitor
Phoenix Map	



- LOGIN/LOGOUT
- Help?
- WAATS
- Solar Farms

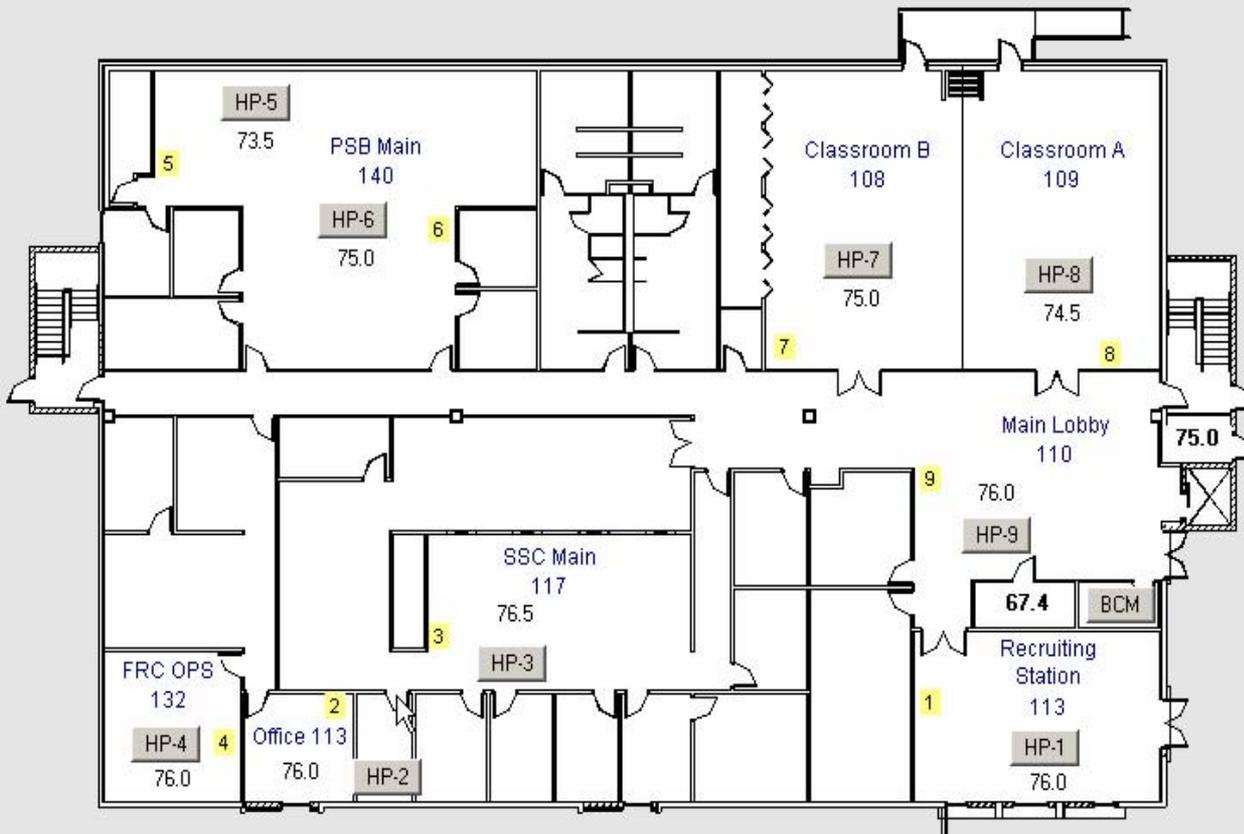




Arizona Army National Guard One Stop Readiness Center First Floor Plan

Wednesday, 4/2/2008 10:37:47AM

BUILDING M5710



Previous
Top Display
Phoenix Map
P.P.M.R
2nd Floor Plan
Equipment Overview
Time Schedules
Lighting Controls
Engineering
MISC.



**ENERGY
MANAGEMENT
SYSTEM**



<http://www.climatec.com>

Text Previous

OSA Temp. 67 °F

Occupied Schedule Status

0.0 Afterhours Timer

65 Htg Lockout Fan Mode

60 Clg Lockout 3

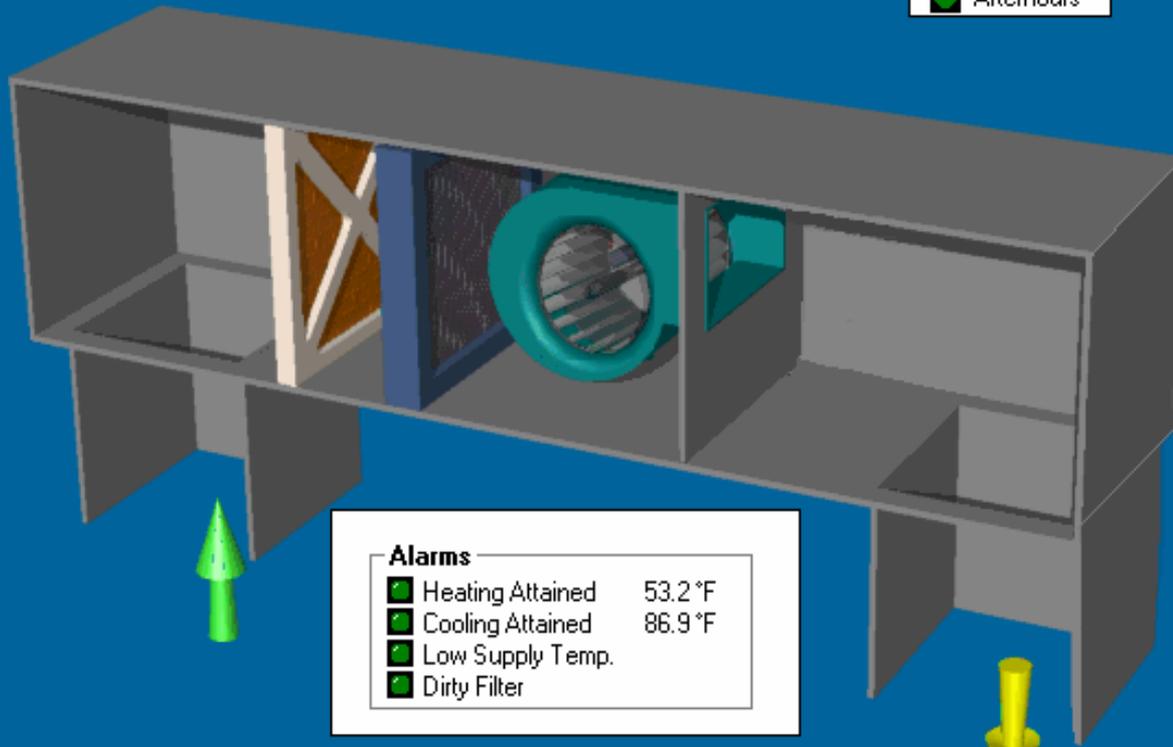
- 1 -- Continuous
- 2 -- Cycle Htg Only
- 3 -- Cycle Htg & Clg

- Occupied
- Warmup
- Cooldown
- Afterhours



Reversing Valve

Compressor Status



Alarms

- Heating Attained 53.2 °F
- Cooling Attained 86.9 °F
- Low Supply Temp.
- Dirty Filter

74.5 °F Space Temp.

73 Occupied Setpoint

0.0 °F Current Microtouch Bias

0.0 Microtouch Bias Limit

3.0 Heating Offset

3.0 Cooling Offset

58 Unocc. Htg. Stpt

85 Unocc. Clg. Stpt

0 % Heating Signal

0 % Cooling Signal

Supply Temp. 77 °F

Note: Reversing Valve On for Cooling

Zone Mode	Space	Equipment	Supply	Outside	Fan
<input checked="" type="radio"/> Occupied <input checked="" type="radio"/> Warmup <input checked="" type="radio"/> Cooldown <input checked="" type="radio"/> Afterhours	74.5 °F 	Heat Mode <input checked="" type="radio"/> Comp. 1	 77 °F	 67 °F	

	Heating SP	Cooling SP
Occupied	70.0 °F	76.0 °F
Unoccupied	58.0 °F	85.0 °F
Current	70.0 °F	76.0 °F

- Previous
- Graphic
- VLC Setup
- Runtimes

Zone Setpoint

Microtouch Zone Sensor Type

73.0 Occupied Setpoint

80.0 Occupied Stpt Hi Limit

70.0 Occupied Stpt Lo Limit

0.0 °F Current Microtouch Bias

0.0 Microtouch Bias Limit

Disabled Microset OFF Button

3.0 Heating Offset

3.0 Cooling Offset

58.0 Unoccupied Htg Stpt

85.0 Unoccupied Clg Stpt

Demand Control

0.0 °F Demand Offset

Cooling Lockout

Heating Lockout

Zone Status

Disable Unit

Test Mode

Occupied Command Mode

0.0 Afterhours Timer (hrs)

2.0 Afterhours Duration (hrs)

74.5 °F Space Temp

76.5 °F Supply Temp

67.0 °F Outside Air Temp

0 % Heating Signal

0 % Cooling Signal

Runtimes

3373 Fan Runtime (hours)

16 Filter Runtime (hours)

3000 Filter Runtime Alm Stpt

Filter Runtime Alarm

Miscellaneous

Fan Mode

3 Operating Mode

1 -- Continuous

2 -- Cycle Heating Only

3 -- Cycle Heating and Cooling

15.0 Comp. Cycle Time (min)

Enabled Field Service Mode

Alarms

80.0 Heating Attained Alm Stpt

53.2 °F Heating Attained Temp

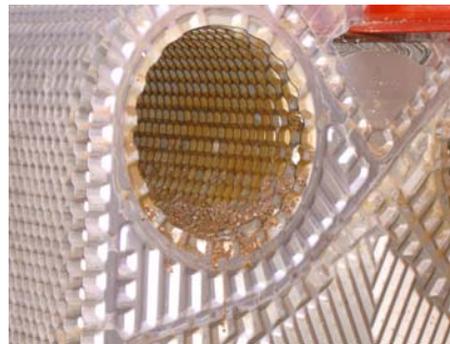
60.0 Cooling Attained Alm Stpt

86.9 °F Cooling Attained Temp

Engineering Projects



Existing Building Commissioning



DEMA Case Study

Existing Bldg Cx @WAATS

Western Army Aviation Training Site
Silver Bell Army Heliport, Marana, Arizona





WAATS

Combat Mission Simulator
Facility

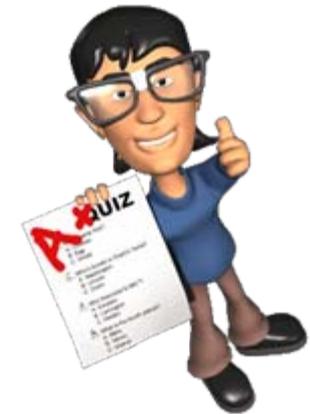
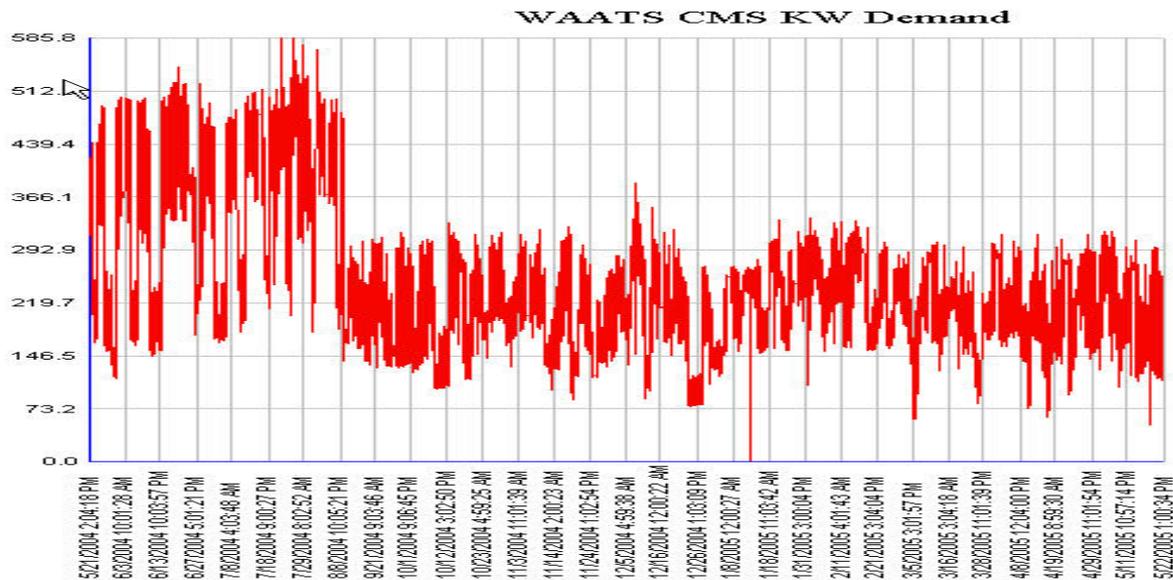


- Built in 1993
- 44,800 sq feet – TWO floors
- TWO separate computer rooms
- THREE Full-motion Flight Simulators
- FOUR A/V-Distance Learning Centers
- Six classrooms & 18 Office areas
- Just over 550 tons of cooling
- Training xxx students per year

The Saving\$

\$100K /yr in avoided energy costs
\$30K /yr in avoided maintenance
200KW /monthly demand reduction

1.3 year simple payback & SIR of 9.1*



The Costs of Projects

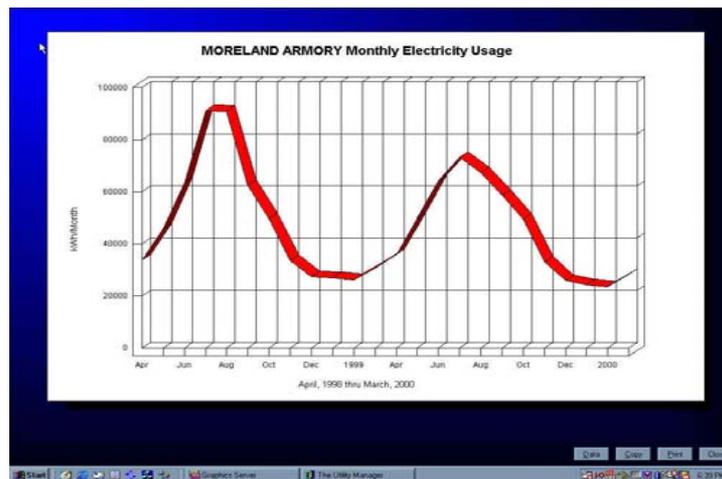
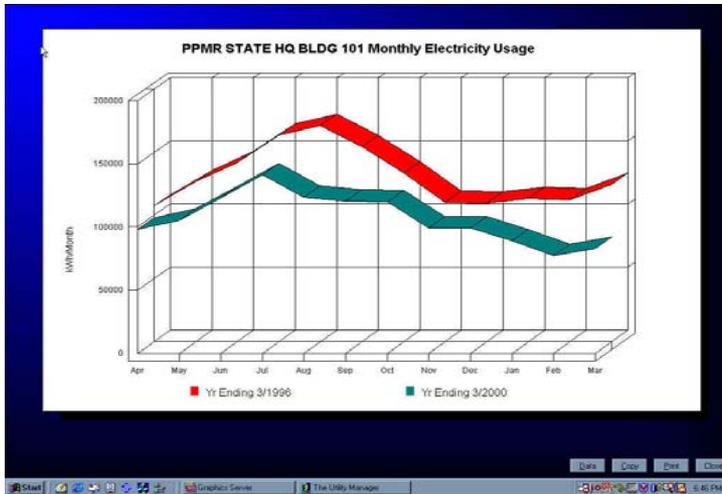
Keeping project costs down

- ❖ Life cycle costing – estimated savings
- ❖ We use best value for PRICING
- ❖ Shopping Around for Materials!
- ❖ Using Good Project Management
- ❖ WE apply (and sometimes get) GRANT\$
- ❖ In-house labor saves much of our cost



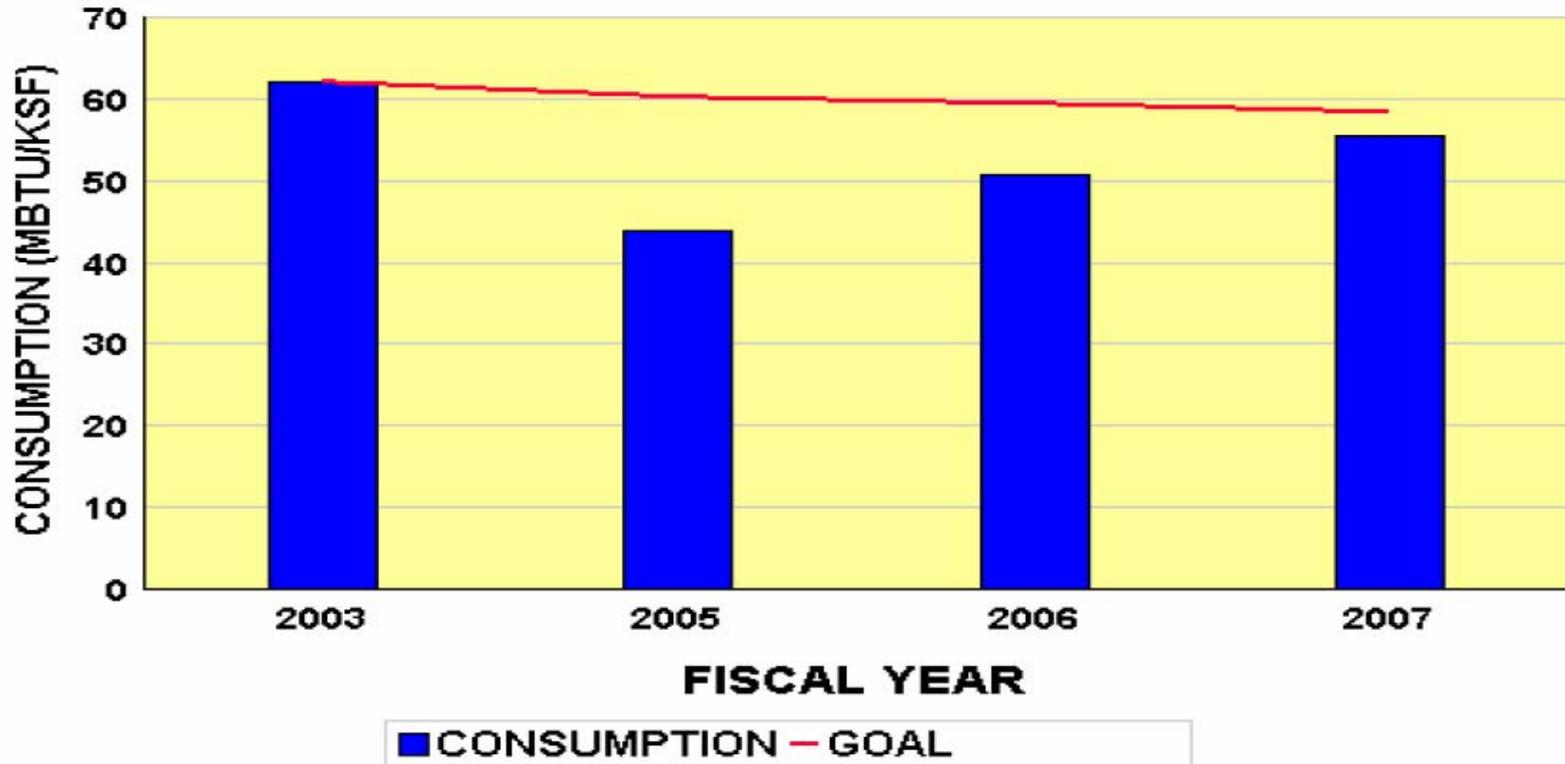
**OUR AVERAGE:
Simple Paybacks < 6 years**

Typical Project Benefits

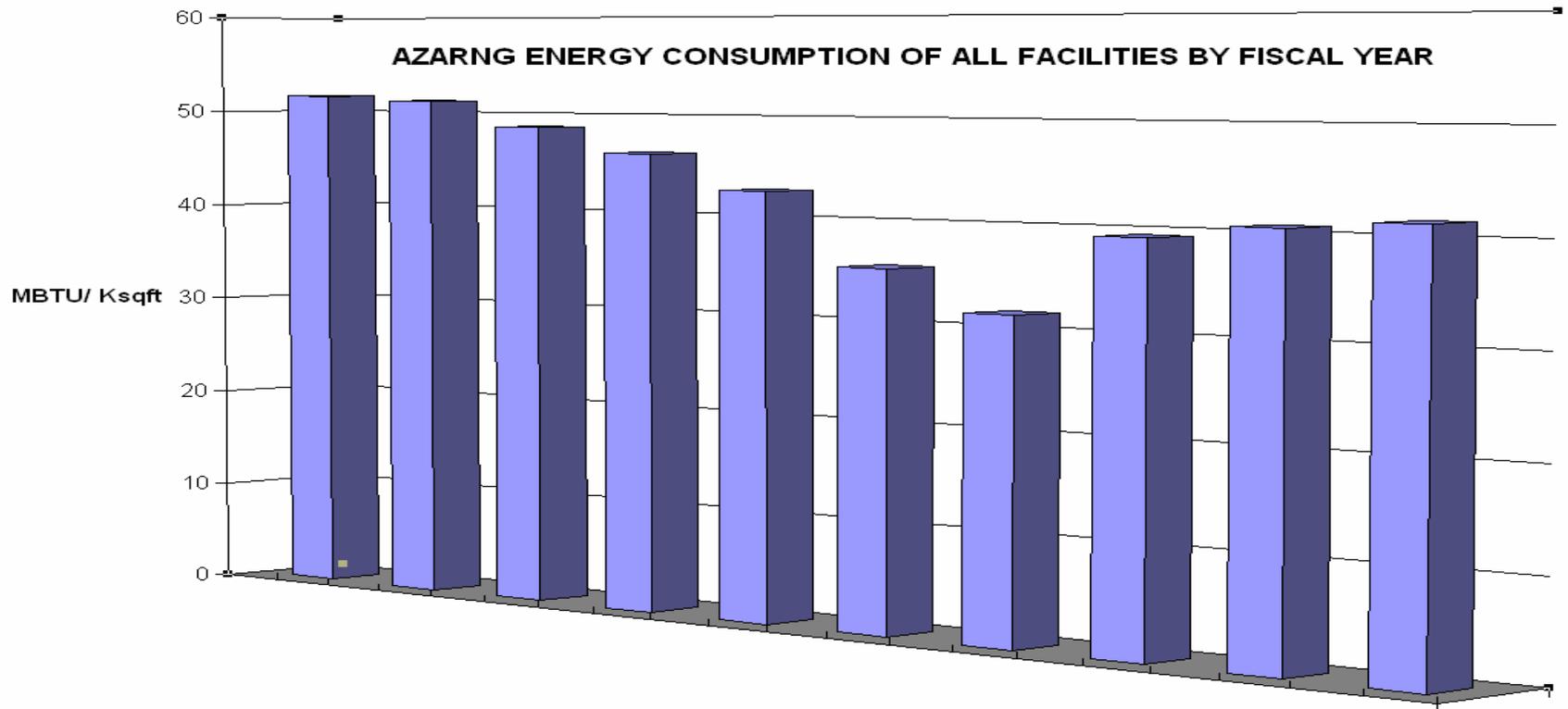


Where we are:

PROGRESS GRAPH
FOR ARIZONA ARNG



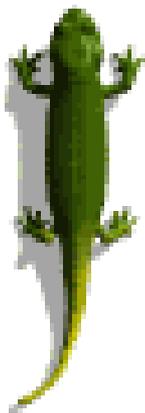
Where we WERE:



32% Below our 1999 Baseline in 2005

WHY aren't WE meeting our Objectives?

- ❖ People leave their lights ON
- ❖ Offices are not held to required summer/ winter temperature settings
- ❖ People don't follow occupancy schedules

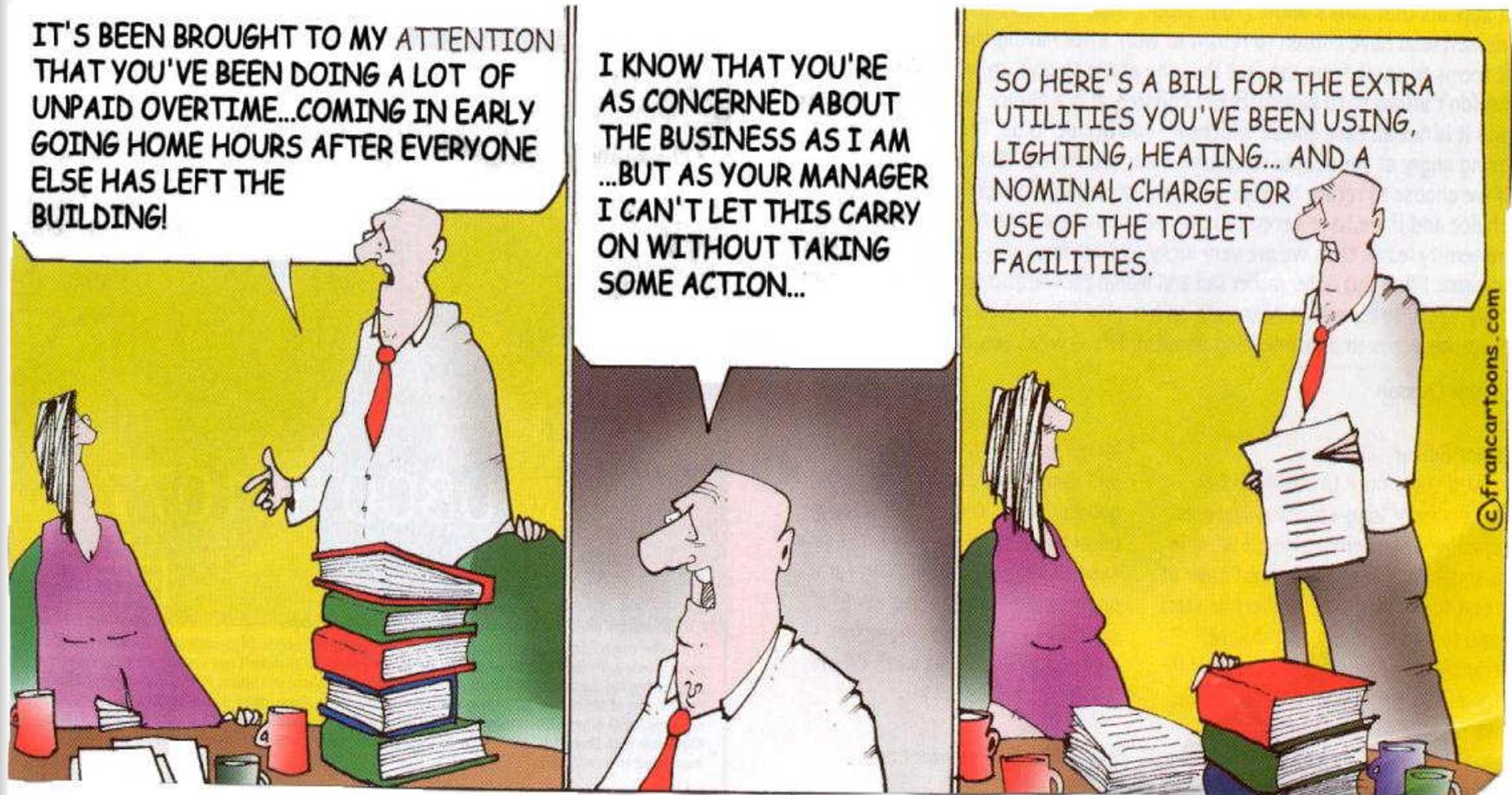


- ❖ Some buildings run 24/7
- ❖ More people in buildings

Do we need to be "energy cops"?



Scheduling our BACnet Buildings at the AzARNG....



How do you do your part in an energy conservation program?

We need to work together!



Use **AWARENESS** to
help reduce **ENERGY!**



Employee Awareness

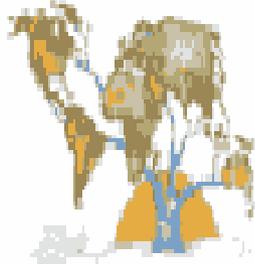


Earth Day Activities

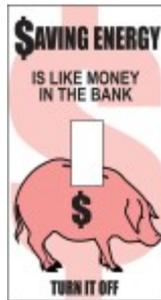


Using Awareness: Every Day!

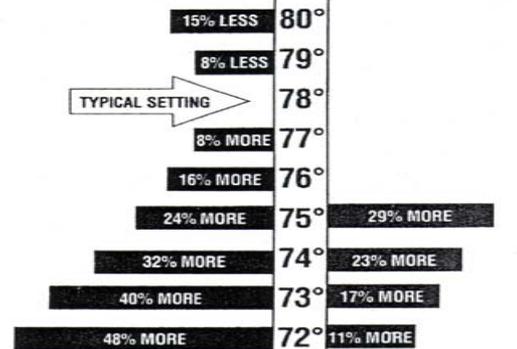
ONE EARTH - ONE PEOPLE



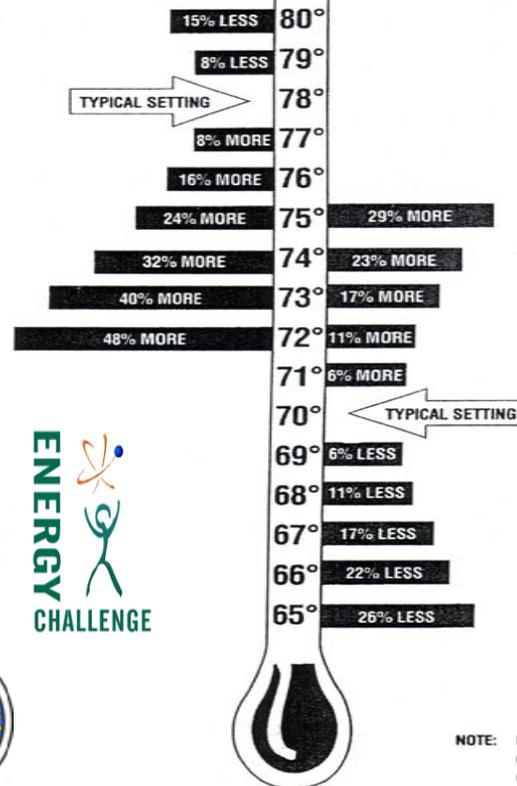
EARTH DAY 2004



COOLING
Cost of keeping room temperatures above and below 78°



HEATING
Cost of keeping room temperatures above and below 70° using any type fuel



TURN IT OFF WHEN NOT IN USE



Signs, posters and reminders

FEMP



ENERGY CHALLENGE



from partnerships

NOTE: Percentages of change are for air conditioning and heating costs only, not total energy bill.

In Summary

Saving ENERGY saves \$!

- ❖ Start by spreading the word to your peers and employees!

ENERGY CONSERVATION is a life style !

- ❖ Shut OFF lights, computers, office equipment DAILY.
- ❖ Adhere to the temperature setting REQUIREMENTS – !
- ❖ COMFORT is a mind-set: what you wear makes a difference.
- ❖ Continue with ECM projects -- USE new technology.
- ❖ People can be comfortable, while saving energy!

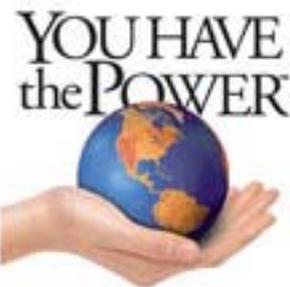
BUT – WE need EVERYONE's HELP!



Guarding Our
Energy



Arizona Army National Guard



Questions?



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