



Fort Knox Energy Initiatives



Fort Knox Energy Program *Army's first Energy Secure Installation*



Fort Knox, Kentucky

6th largest city in Kentucky

- 109,000 acres
- 20,000+ Soldiers & 8,600 civilians
- 17,264,000 ft² of building space
- Hospital
- 661KSF Classroom Space
- 67 barracks buildings
- New 900KSF Office Complex
- Airfield
- Post Office
- Shopping Venues
- 61 Training Ranges
- Numerous Recreation Facilities
- Schools





Energy Reduction Mandate

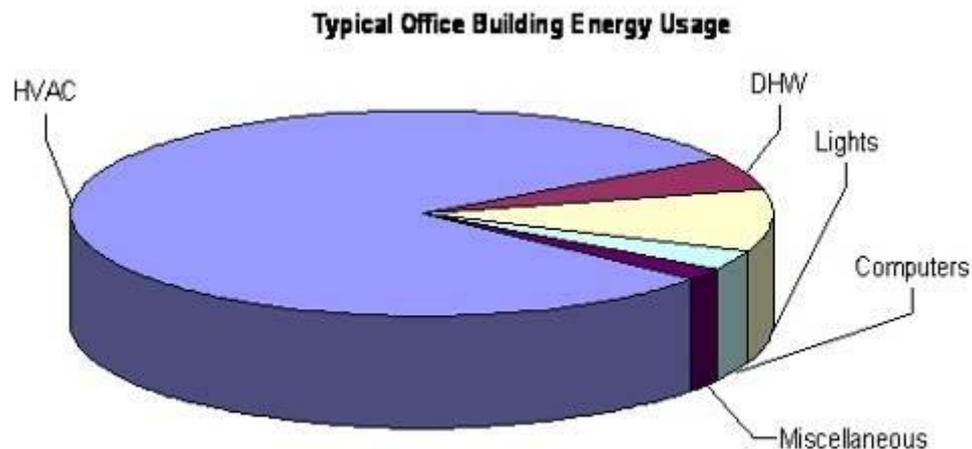
- Energy Policy Act (EPACT)
 - In 1992 the Clinton Administration passed the Energy Policy Act
 - Executive Order 13123, 3 June 1999, set a path that federal facilities must reduce energy consumption by 3% annually. E.O 13693 now goes from 2015 for 25% in the next 10 years
- Fort Knox energy conservation program started in the 1970s
 - Education, lighting, envelope improvements, and monitoring





Typical Office Facility

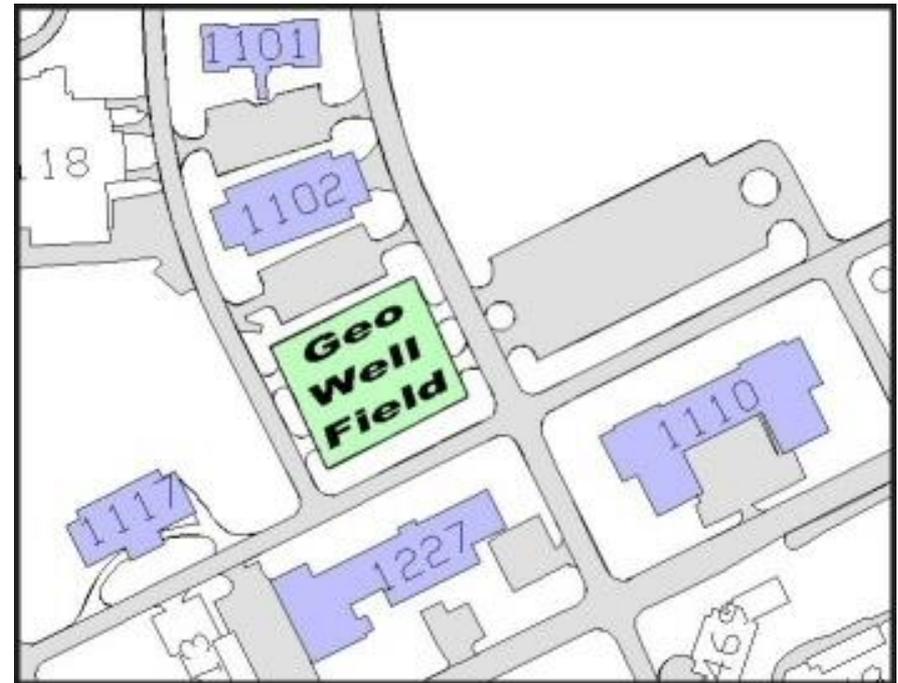
- Buildings must be evaluated to determine how energy is being consumed
- All buildings are unique but HVAC is commonly one of our highest energy consumers
- Historically energy consumption has not been managed and controlled





Geothermal (Ground Coupled) Well Field

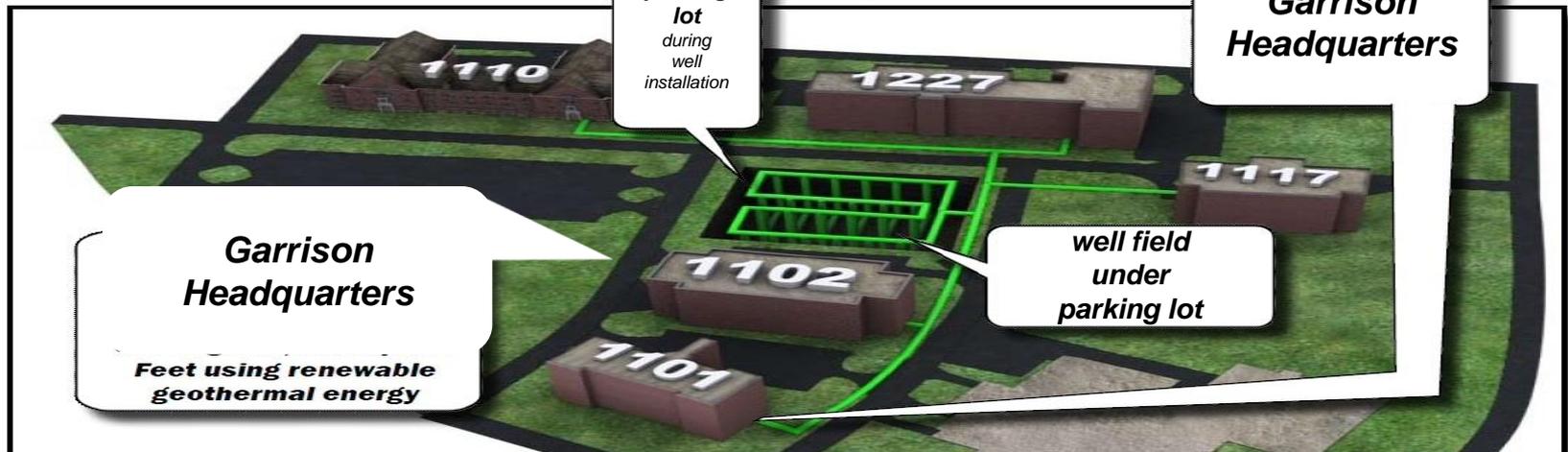
- Consolidated Well Fields
 - Provides heating, cooling, and domestic hot water
 - Maximizes building diversity
 - Minimizes construction expenses
- Project won Secretary of the Army Energy and Water Management Award in 2009
- Bldg #1110 won an Energy Star Rating for 2008





Ground Coupled Heat Pumps

A typical example of many large ground coupled heat pump projects constructed at Fort Knox. This 5-building complex (140K ft²) was disconnected from natural gas and connected to a geothermal ground coupled heat pump system (containing 130 500-ft deep wells)

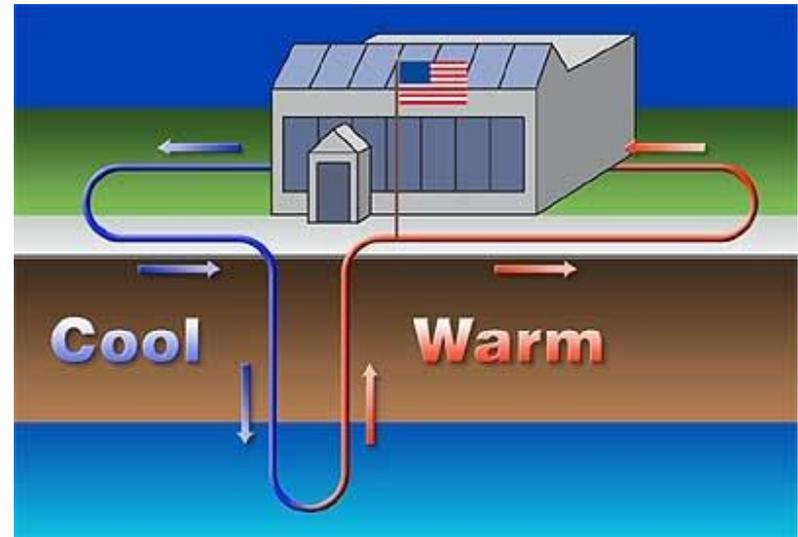




Ground Coupled Heat Pumps

Facts:

- ~6 million ft² of “eligible” 12 million ft² heated and cooled from constant earth temperature
- ~5100 wells (500 ft deep) to couple with the earth temp of 57°F
- ~900 miles of underground piping
- HVAC-automation team
Nolin/Harshaw-Trane





Infrared Heating

Infrared systems heat buildings in the same way the sun heats the earth

- Energy efficient (92%)
- Quick heat recovery
- Environmentally friendly
- Reduced heating costs
- Comfortable heat
- Focus heat on people and objects
- Eliminate inefficient boilers

** 110 buildings on post, typically high bay maintenance and storage



Infrared heat @
Godman Army Airfield





Lighting Improvements

- Improve low lighting conditions while saving energy
- Provide on-demand lighting through use of occupancy sensors
- Harvest natural light when applicable
- Eliminate High Intensity Discharge (HID) lighting indoors





Insulation Upgrades

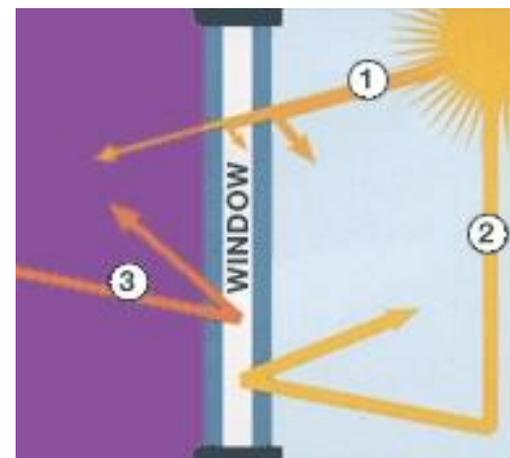
- Upgraded insulation in multiple types of buildings
 - Spray foam
- Encapsulated crawl spaces improving energy efficiency and indoor air quality
- Decreases infiltration and creates a tight building
- Used primarily on old leaky maintenance buildings





Energy Efficient Windows

- Replaced windows in many of our older facilities
- Established a minimum standard for historical and commercial type windows for both repair and new construction
- Windows used must be:
 - Thermopane insulated panel
 - Low E glass
 - Argon or Krypton filled
 - 30-year replacement warranty
 - Installed per manufacturer's guideline to provided tightness seal and vapor barrier





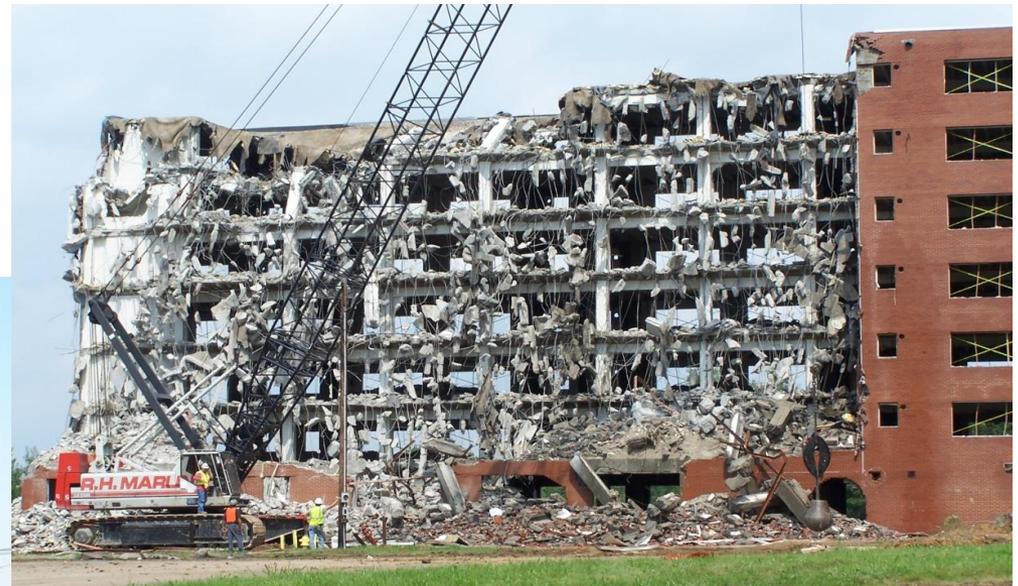
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ENERGY SAVING PROJECTS

Facility Reduction Program 1995 to Present

4.5M SF demolished





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Investing in Solar Power

**Grid Connected Solar Power
3.67MW on line.**

**Off Grid PV Lighting
17 Locations**

**Prismatic Daylighting
6 Locations**

**Solar Thermal Hot Water
3 Locations**

**Solar Walls
4 Buildings**





2.1 MegaWatt Solar Array

- Nolin RECC, our Electrical Privatization Contractor, is constructing a 2.1 MW Solar Array on post.
- Nolin is financing the project over 25 years. Fort Knox will pay for KWH produced at a rate comparable to our blended electric rate.
- This green renewable power will supplant electricity generated by LG&E coal-fired power plants. The rate we pay for this solar power is extremely cheap for green power.
- This will support EPACT 2005 mandate of >7.5% renewable energy by 2013
- The Solar Array will be located in a 10 acre field west of Bldg #6034.
- Fort Knox has an additional 1.56 MW of solar power installed at various locations on post.





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Maude Complex Geothermal Pond



HRCOE
PHOTO BY GERRY LYNN
18 JUNE 2010





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Building Envelope Improvements---Maintenance Buildings





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Water Conservation Strategies

- Installed 560 high efficiency low-flow toilets
- Waterless urinal test program
- Golf course water collection lakes for irrigation
- Retrofit program to convert faucets to low-flow fixtures
- Reduced cooling tower water usage due to implementation of geothermal systems
- Capture wastewater effluent for irrigation. Has potential for other uses.
- Fix Leaks!



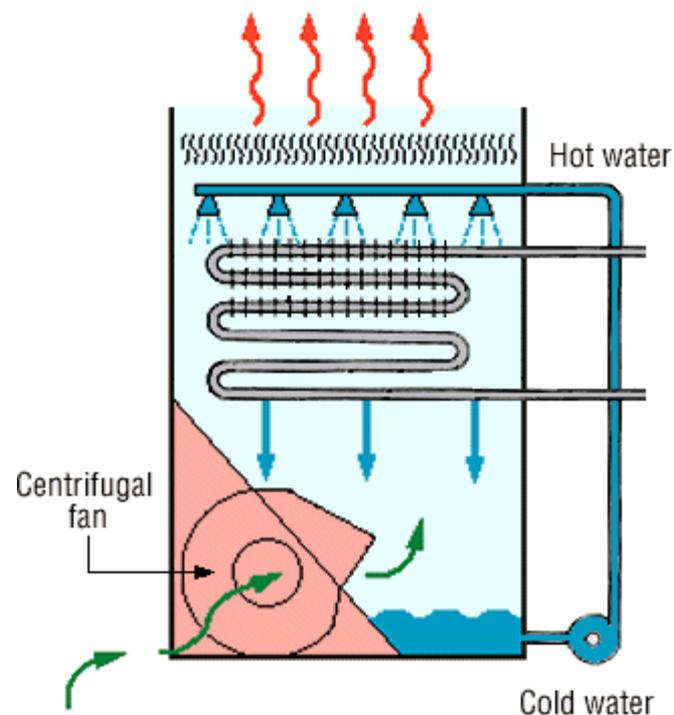


MAUDE COMPLEX DATA CENTER

Data Center Heat Recovery

- Interconnect the heat pump loop and data center
 - Recover the waste heat that is sent to the environment 24/7
 - Converts waste energy into beneficial energy to heat the building in the winter
 - Reduces runtimes on boiler
 - Extends usable life of boiler
 - Payback < 10 yrs

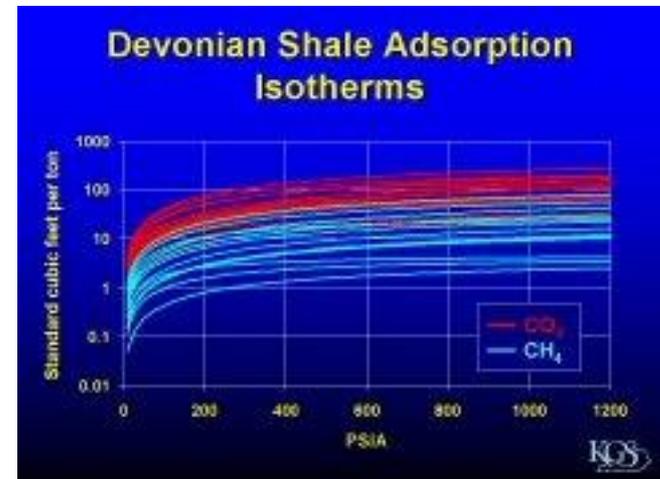
Waste Heat





Renewable Methane Gas

- Drill renewable energy from below Fort Knox that is trapped within the Devonian Shale
- Entire project conceived and accomplished at no cost to the government
- Gas production began in January 2009
- Gas price is indexed to 86% of the NYMEX spot price
 - Government saves transportation and marketing fees
- Provides enough gas for entire summertime load





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21ST CENTURY SCHOOLS: KINGSOLVER – PIERCE ELEMENTARY





FORT KNOX ENERGY INITIATIVES BRIEF



ENERGY DASHBOARD



- Fort Knox met smart metering requirements in 2009
- Metered data analysis supported by TRANE Intelligent Services software
- Allows instantaneous review of Bldg Energy Performance against baselines
- Minimizes energy waste by flagging poor performing bldgs for immediate action

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UNIT ENERGY REPORT CARDS

Maude Complex

Facility	Base Energy Cost	Actual Energy Cost	Savings	% Savings	Grade
6579	\$2,561.28	\$1,266.65	\$1,294.63	50.55%	GREEN
6434 Data Center	\$32,698.08	\$35,666.29	-\$2,968.21	-9.08%	RED
6434-1	\$13,530.24	\$10,572.18	\$2,958.06	21.86%	GREEN
6434-2	\$14,933.38	\$11,433.73	\$3,499.65	23.44%	GREEN
6434-3	\$15,033.60	\$10,131.43	\$4,902.17	32.61%	GREEN
6434-4	\$37,180.32	\$26,929.18	\$10,251.14	27.57%	GREEN
6434-5	\$11,191.68	\$10,200.70	\$990.98	8.85%	AMBER
6434-6	\$10,300.80	\$9,224.71	\$1,076.09	10.45%	AMBER



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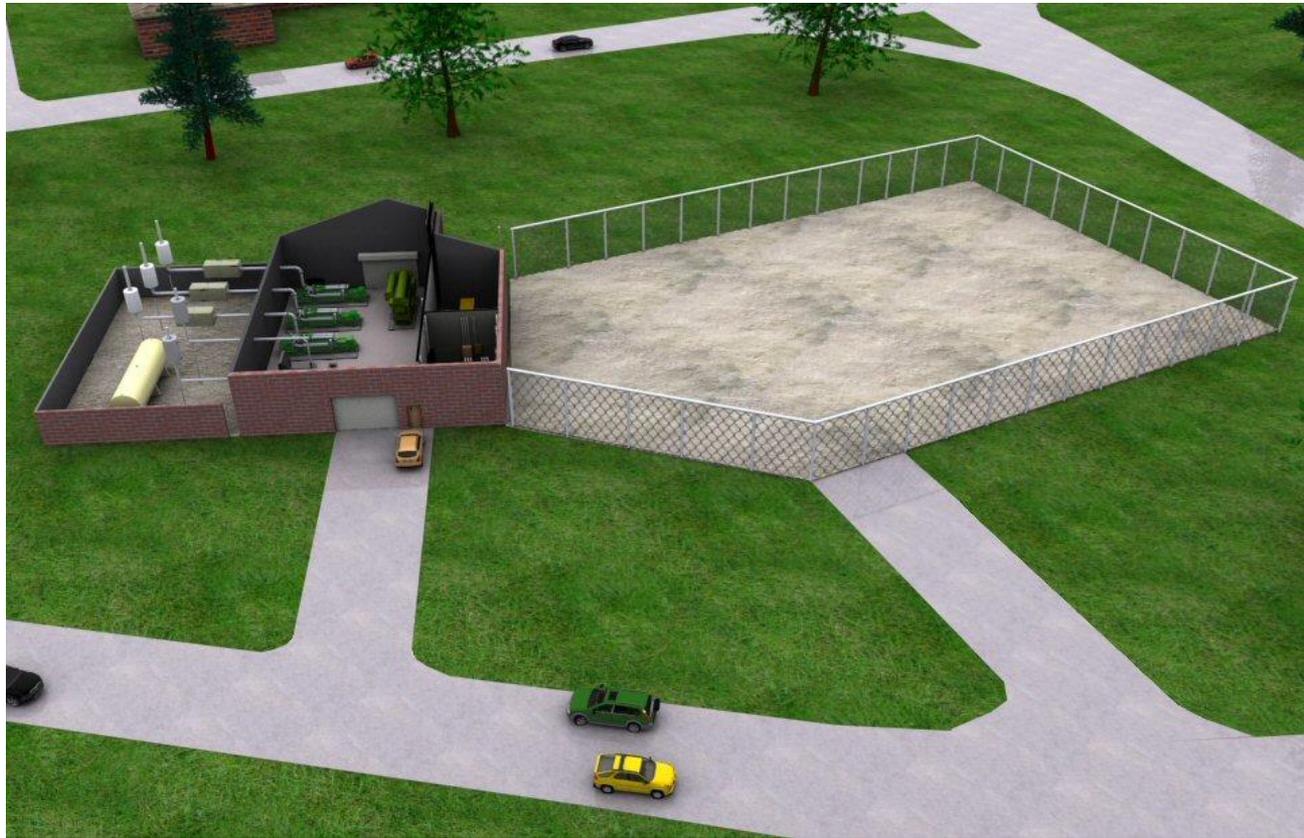
- Ice Storm January 2009 cripples Fort Knox
- Military Bases told to develop 90 day emergency plan
- Goal to achieve Net Zero Energy



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Energy Security Project Rendering of New Power Generation Facilities for Energy Security Project



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Customer Service: 1-800-331-7370 (M-F, 7 a.m. to 6 p.m. ET)
Online Customer Self-Service: www.lge-ku.com (24 hours a day)

DUE DATE	Pay This Amount
09/12/13	\$1,339,804.86

ELECTRIC CHARGES	
Contract 1093700	
Rate Type: Fort Knox - Special Contract	
\$ 689,282.00	Energy Charge (\$0.0374 x 18,430,000 kWh)
\$ 559,807.20	Base Demand Charge (\$14.67 x 38,160.0 kW)
\$ (35,827.66)	Power Factor Charge 96.07% (\$-0.0640 x 559,807.20)
\$ 22,966.72	ECR Surcharge (3.23% x (\$1,213,261.54 - \$502,217.50))
\$ 103,576.60	Electric Fuel Adjustment (\$0.00562 x 18,430,000 kWh)
\$ 1,339,804.86	Total Charges Contract 1093700

Account Number	Payment Due Date	Pay This Amount	Amount Due After Due Date	Winter Help Donation	Amount Enclosed
3000-0905-6122	09/12/13	\$1,339,804.86	\$1,339,804.86		\$

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Maple Ridge Housing

Housing partner installing ground coupled heat pumps in new construction.





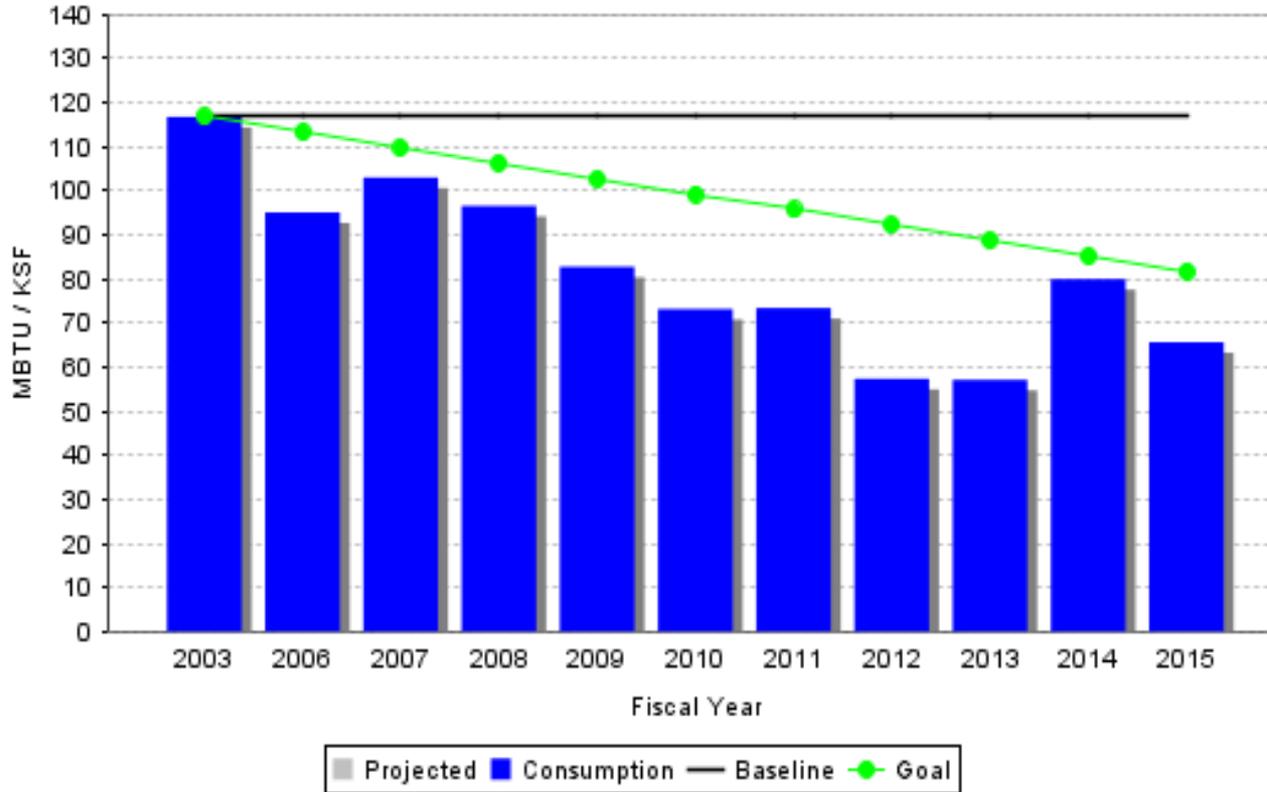
Program Results

- Decreased energy consumption
 - Total energy consumption decreased 51% from 2003 baseline
 - Over 50 buildings that are Energy Star certified.
- Annually saves Fort Knox over \$10 million due to energy initiatives
- Decreased pollutants
 - Geothermal systems have greatly reduced number of boilers
- Fort Knox has been recognized as a leader within the Army and local community for their energy efficiency practices
- Improved indoor air quality
 - Providing the correct amount of ventilation
 - More comfortable and productive working conditions
 - Significant component to mold elimination





FORT KNOX ENERGY INITIATIVES





FORT KNOX ENERGY INITIATIVES



- Awards List

- 1986, 1996, 1998, 2004-2013 Secretary of the Army Energy and Water Management Awards
- 2012 Runner Up in DoE Better Buildings Challenge
- 2005 – Dept of Energy "You Have The Power" Award
- 2005 - Presidential Energy Award
- 2006 - Energy Champion
- 2006 - Technology Specific Product Application of the Year (Nolin RECC)
- 2006 - Community Service Award (Nolin RECC & Fort Knox)

Leadership

The Fort Knox Disney Barracks Area, constructed in the 1960s, is comprised of 38 buildings that make up more than 800,000sf of conditioned space. After 40 years, old and inefficient systems consumed 39 percent more energy than they should, while poorly functioning ventilation equipment caused many indoor air quality problems. In FY 2005, Fort Knox used a Utility Energy Service Contract (UESC) to fund replacement of 70 percent of the existing heating and cooling systems with geothermal heat pumps and modernize the barracks with new ventilation systems to improve indoor air quality. The project now saves 102 million cubic feet of natural gas and more than \$800,000 annually.

Disney Barracks Area
Fort Knox, Kentucky

YOU HAVE the POWER

United States Department of the Army
Federal Energy Management Program

For more information on how you might benefit in the Fort Knox the Power campaign, visit the FEMP Web site at www.femp.gov.

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End of Brief

INSTALLATION MANAGEMENT COMMAND



“Sustain, Support and Defend”