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Energy Use and Cost in the Veteran's Health Administration

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Purpose

- Determine energy use and cost in VHA facilities.
- Compare by energy type, VISN and over time.
- Identify potential for savings.
- Begin to develop methods to identify inpatient hospital energy costs, including ventilation.
- Further develop methods to identify potential for energy savings by optimizing the use of ventilation air for infection control while maintaining acceptable levels of indoor quality.

Energy Goals for Federal Government

1. Federal Energy Policy Act 2005 (EPAAct 2005)
2. Energy Independence and Security Act 2007 (EISA 2007)

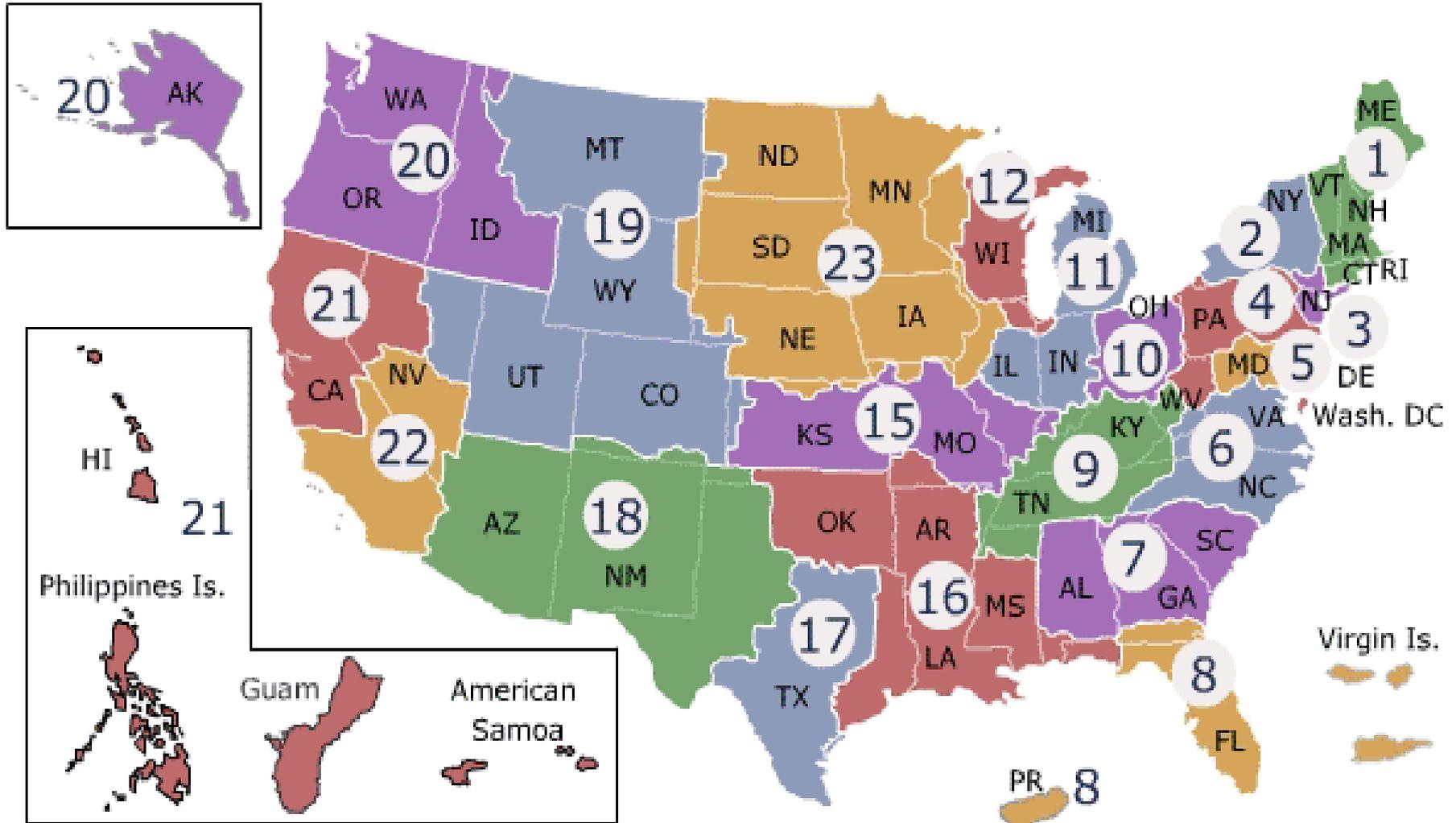
Reduce building energy intensity 3% annually through 2015, or 30% total reduction (using 2003 as baseline).

Description of VHA

- Largest integrated health care system in U.S.
- 153 hospitals, in 21 veterans integrated service networks (VISNs)
- 901 community based clinics
- 135 nursing homes
- 140 million gsf (2003) to 146 million (2010)
- Serving 5.4 million veterans out of 7.8 million enrolled veterans.

Source: 2010 VHA Quality and Safety Report and the VHA Facility Condition Assessment Report

Veteran Integrated Service Network (VISN)



Methods

1. Data Sources:

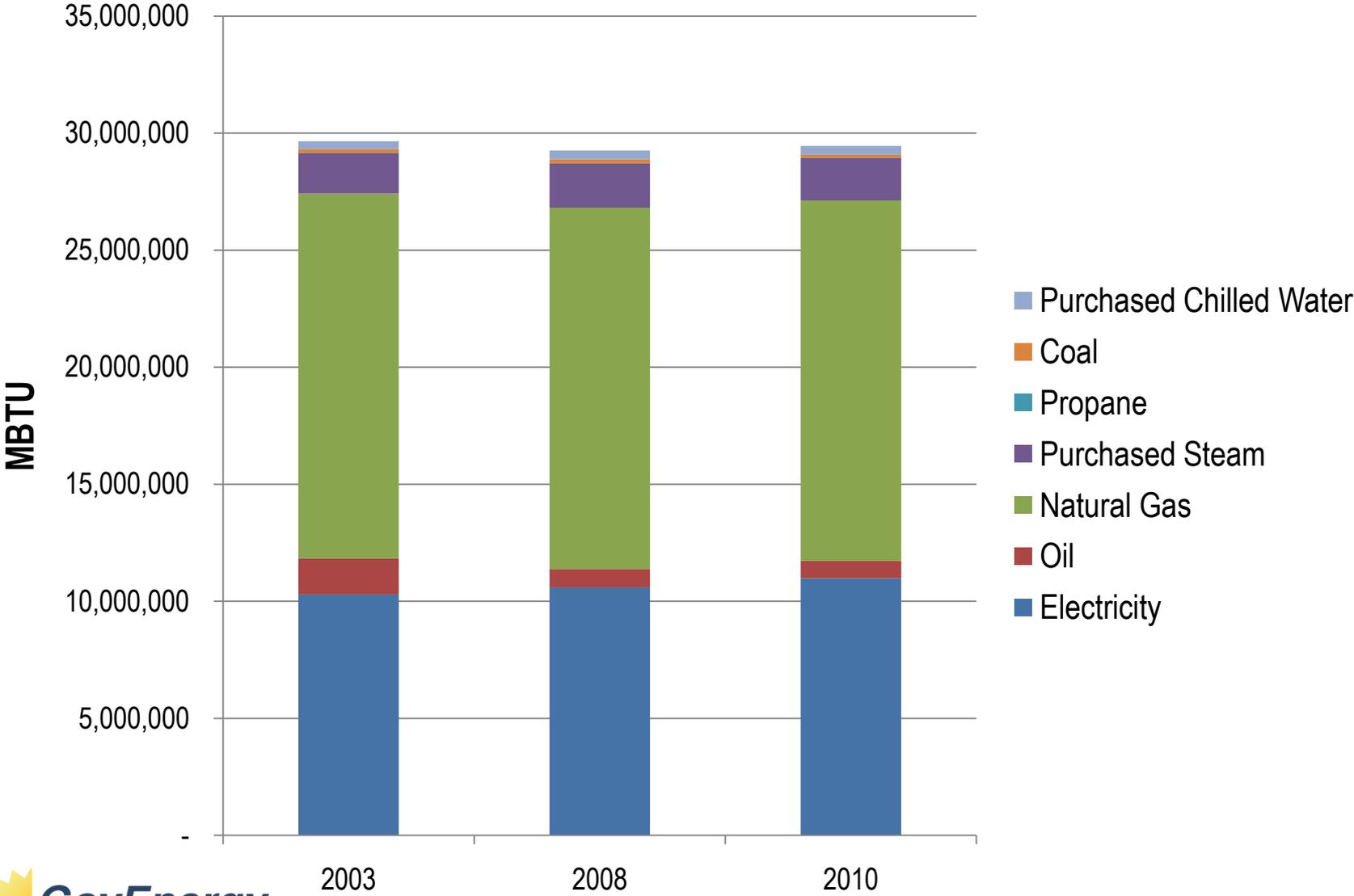
- 2003-2010 energy and cost data (quarterly) from the VHA Energy Cube.
- 2010 facility square footage from the VHA Facility Condition Assessment Report.

2. Energy use and costs related to diesel and biodiesel vehicles and equipment were excluded.

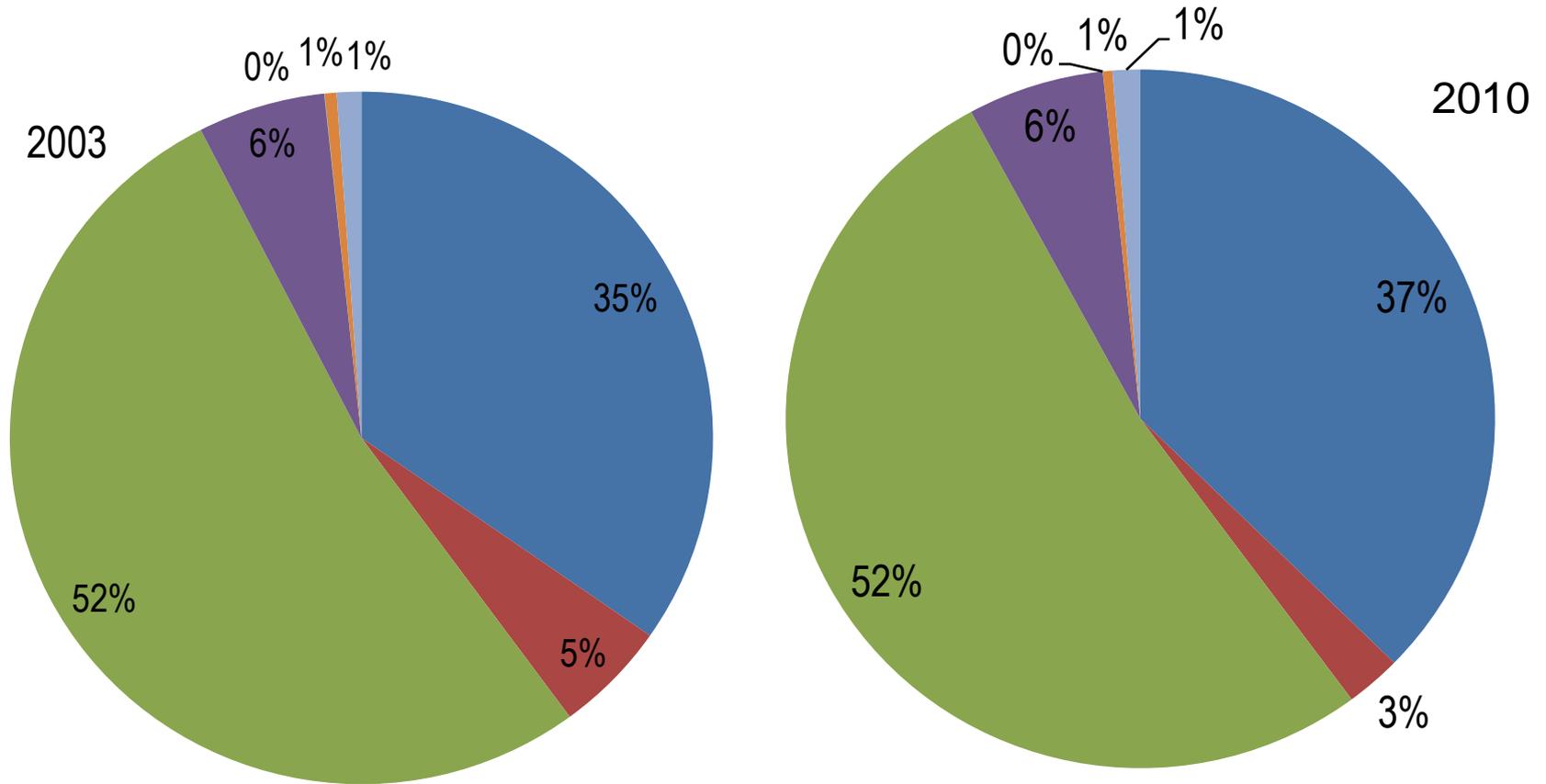
3. Costs related to water excluded.

Site Energy Use by Energy Type

Veteran's Health Administration



BTUs by Energy Type Veteran's Health Administration



- Electricity
- Natural Gas
- Propane
- Oil
- Purchased Steam
- Coal

Total Energy Costs

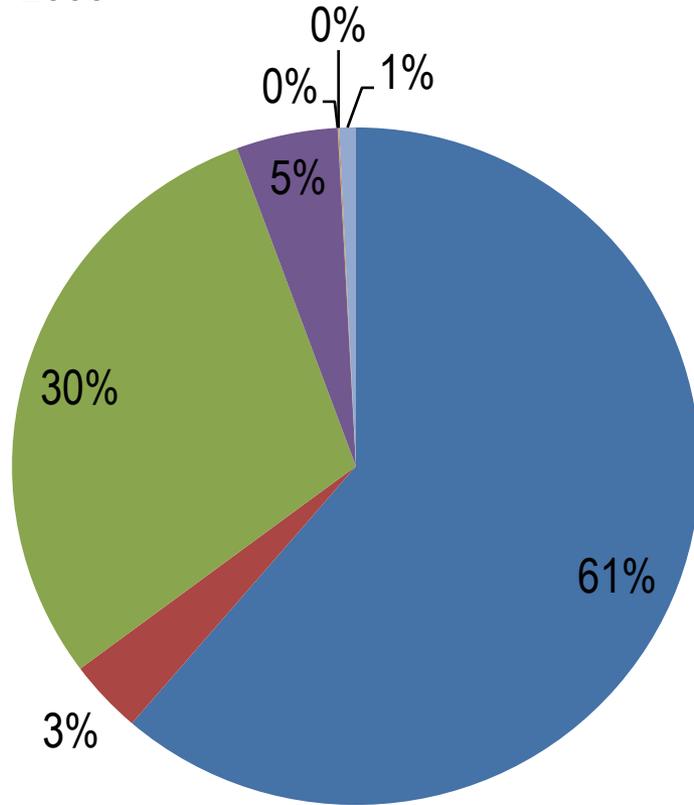
Veteran's Health Administration



Energy Costs

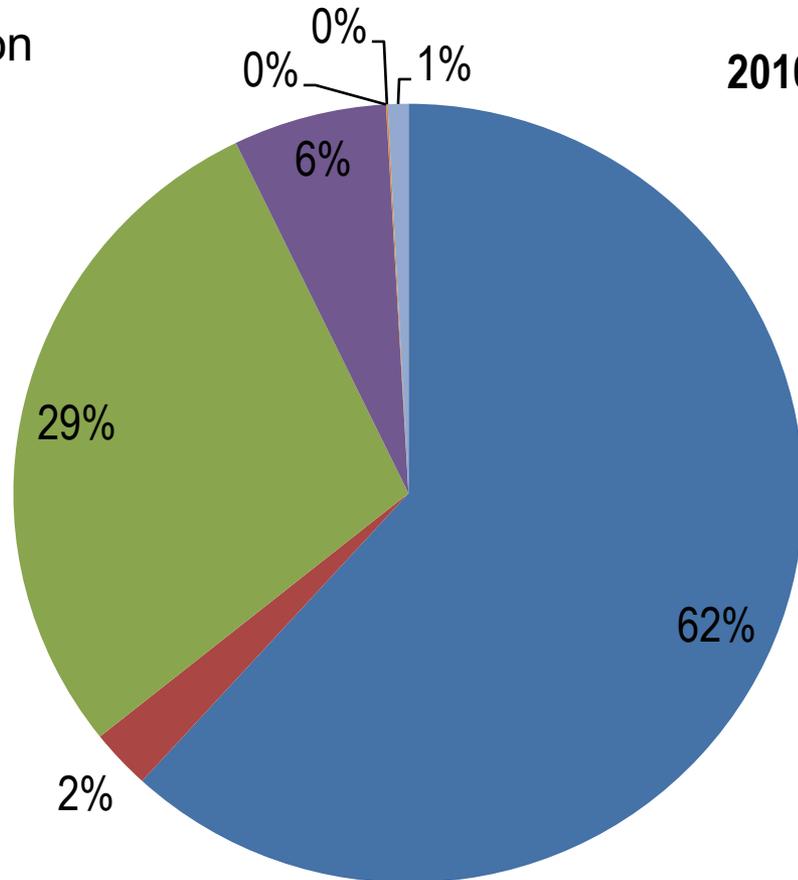
Veteran's Health Administration

2003



Total = \$323,468,008

2010



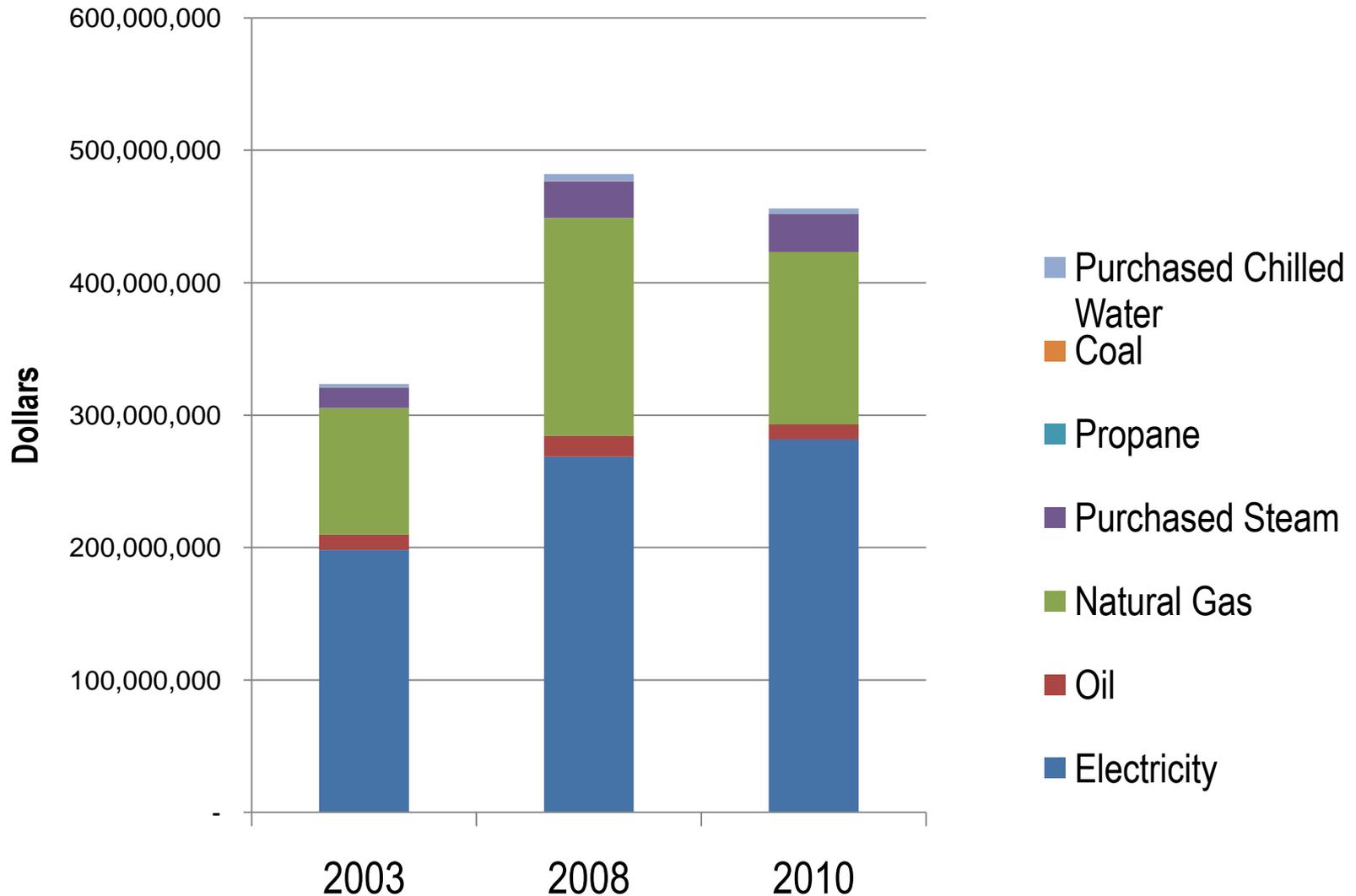
Total = \$456,072,264

■ Electricity
■ Natural Gas

■ Oil
■ Purchased Steam

Note: Does not include water (which ranged between \$19 and \$25 million) or vehicle and equipment energy use.

Total VHA Energy Costs by Type

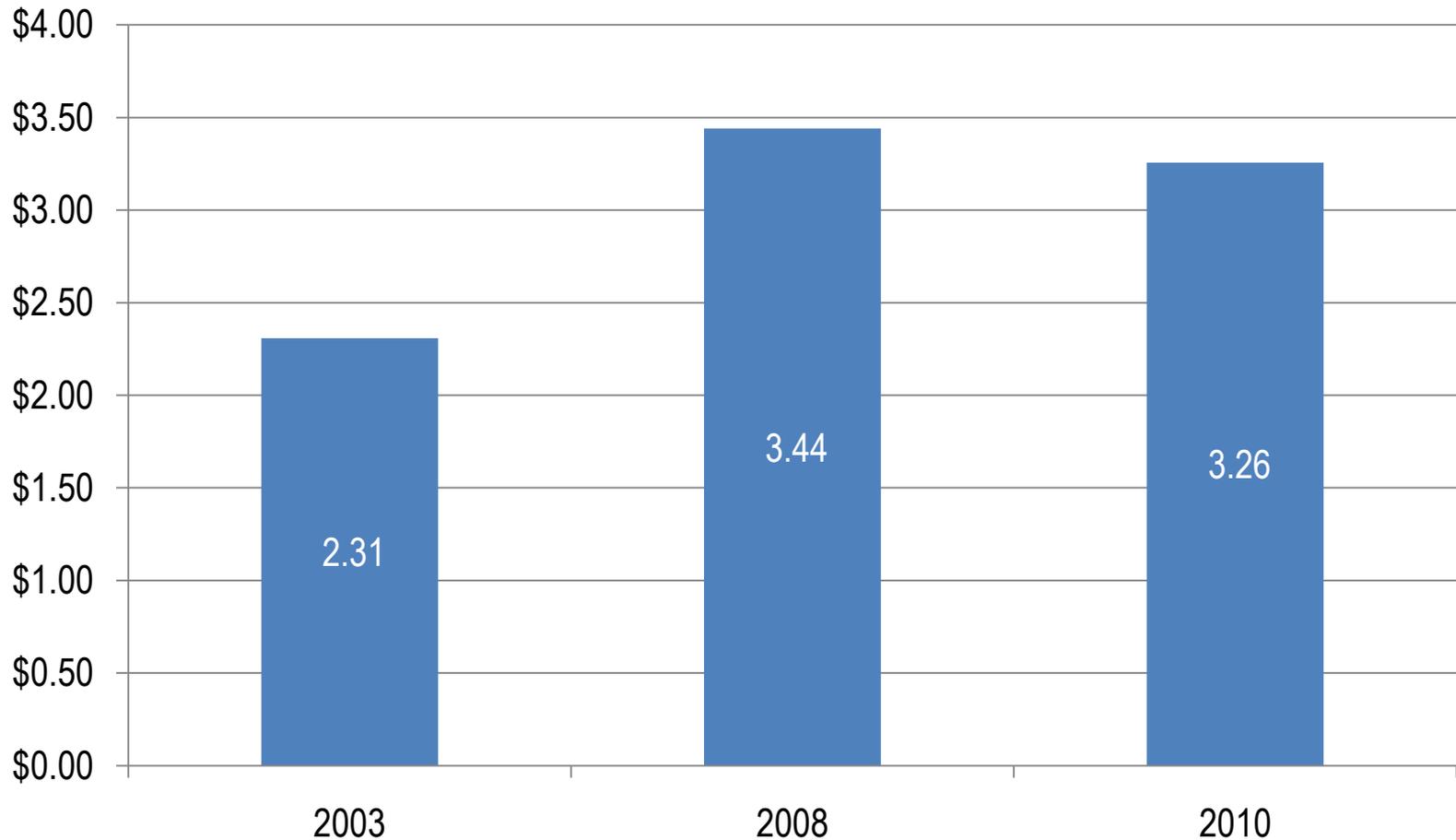


Cost Per Million BTUs

Veteran's Health Administration

	2003	2008	2010
Electricity	19.28	25.35	25.64
Oil	7.32	20.17	15.17
Natural Gas	6.14	10.65	8.46
Purchased Steam	8.87	14.58	15.63
Propane	12.26	24.69	28.54
Coal	1.04	2.03	2.31
Purchased Chilled Water	7.56	13.78	10.35
Average Total Cost	\$8.92	\$15.90	\$15.16

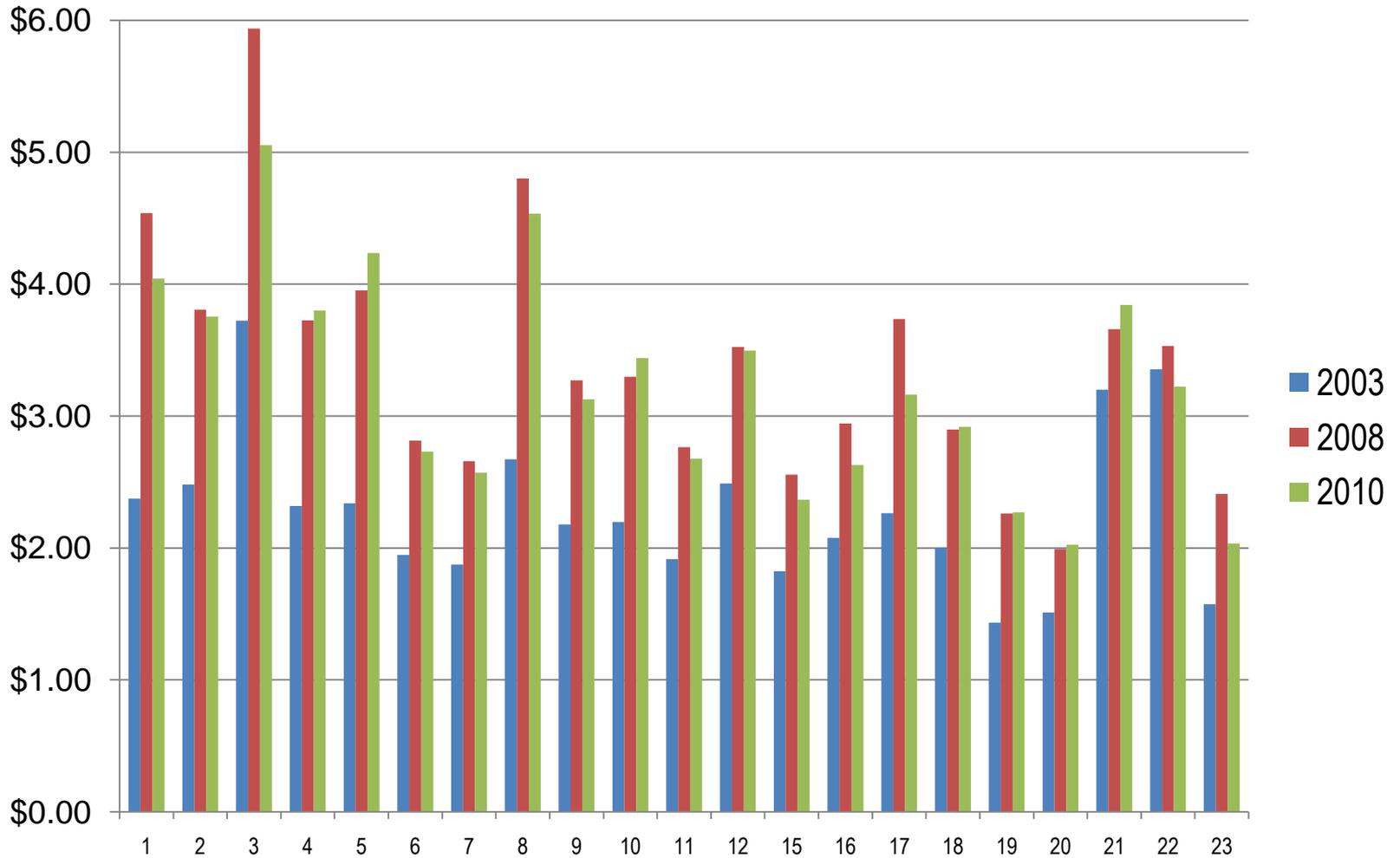
Total Energy Cost Intensity (Per Sq. Foot) Veteran's Health Administration

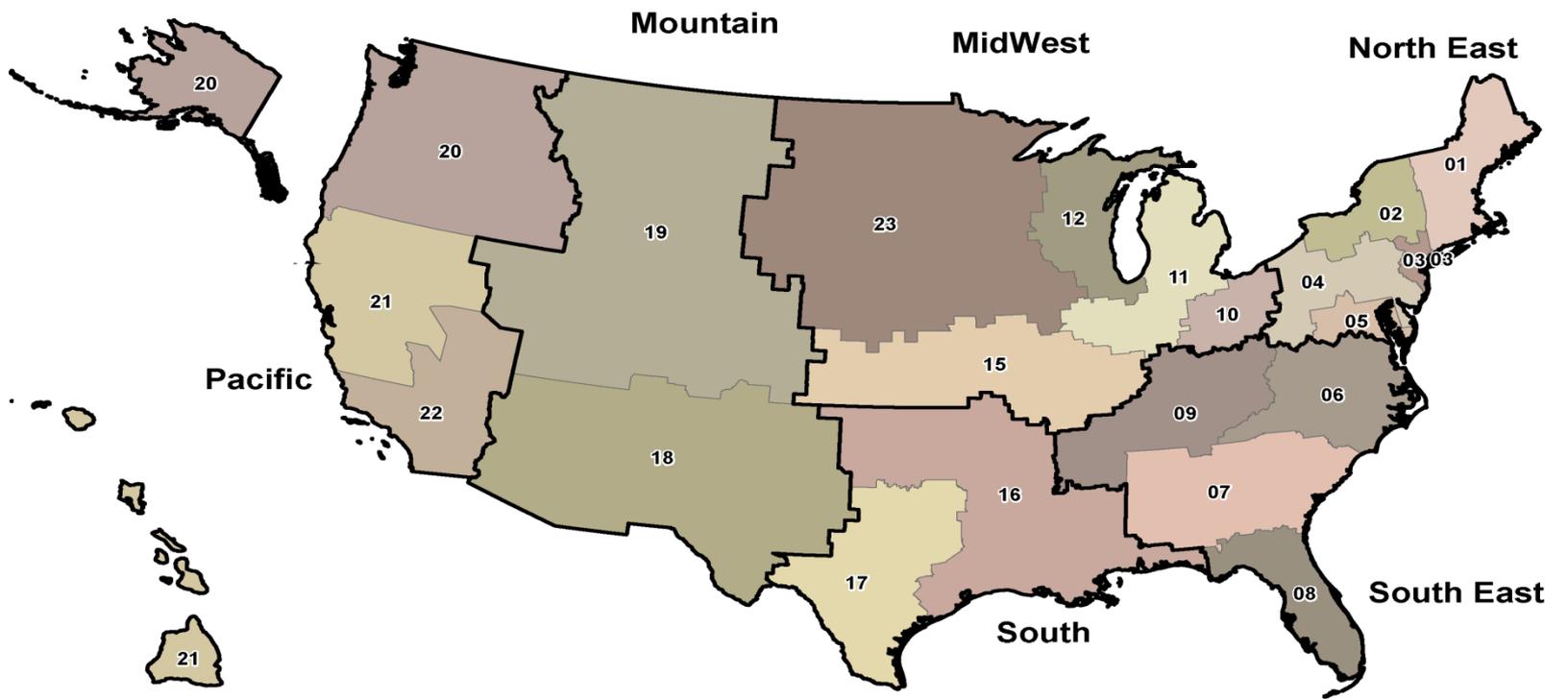


Note: Based on VHA Facility Condition Assessment Report listing 140,108,370 sq. ft. for VHA facilities. Sq. ft. assumed the same across all years.

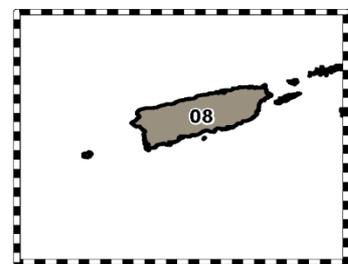
Energy Cost Intensity (per sq. ft.) by VISN

Veteran's Health Administration





Regions of the United States of America By VISN



Regional Energy Intensity

Veteran's Health Administration

	Cost Intensity			
	2003	2008	2010	
				% Chg
Northeast	2.89	4.71	4.43	53.3
Southeast	2.31	3.56	3.42	48.1
Midwest	2.11	3.04	2.93	38.9
South	2.26	3.35	2.96	31.0
Mountain	1.88	2.78	2.82	50.0
Pacific	2.89	3.35	3.27	13.1
Total	2.31	3.44	3.26	41.1

Energy Use and Cost Comparison

	Location	Energy Intensity (kBTU sq. ft)	Cost Intensity per sq ft
Lewis-Gale Medical Center/1	Salem, VA	362.4	\$4.94
MountainView Hospital/1	Las Vegas, NV	312.5	\$5.71
Trident Health System/1	Charleston, SC	229.3	\$3.82
University Hospital and Medical Center/1	Tamarac, FL	405.0	\$5.77
Shriner's Hospital for Children/2	Houston, TX	190.0	
Saint Francis Hospital and Medical Center/2	Hartford, CT	154.6	
The Christ Hospital/2	Cincinnati, OH	229.0	
VHA All Buildings	National	210.2	\$3.26

/1 Lighting Suppler Summit, Hospital Corporation of America, May 2009.

/2 American Society for Healthcare Engineering: <http://www.ashe.org/e2c/cs/>.

VHA Energy Cost Perspective

1. Total VHA Energy Cost (2010)= \$456 million
Total VHA Medical Research and Support (2010) =\$581 million
2. VISN 8 Energy Costs (2010)=\$36 million
Could provide care to:
 - 1,033 stroke patients for a year * OR
 - 1,452 nursing home patients (CPI adjusted)

*Hayes J., B. Vogel, and D. Reker. "Factors Associated with VHA Costs or Care for First 12 Months After First Stroke," 45(9):1375-1384, 2008.

Conclusions

1. VHA energy change from 2003 to 2010:
Energy intensity reduced by 12.7 percent.
Energy costs increased by 41.0 percent
Northeast had greatest increase in energy costs: 53.3 %
2. Results highly sensitive to square footage estimates.
3. To identify hospital energy use need to:
 - improve estimates of hospital square footage
 - meter hospital buildings only
 - identify types of HVAC systems in hospitals

Next Steps

- Identify inpatient hospital energy use and cost. Hospital structures account for 42.3 percent of total VHA square footage or 60,186,025 sq. ft
- Studies have stated that inpatient energy use can be up to 3 times more than other medical facility use.
- Determine ventilation energy use and cost through case studies at VHA hospitals that are currently metering hospital structures.

Hospital Ventilation and Infection Control

- Hospitals maintain high ventilation rates to reduce risk of contamination and infection.
- HVAC can account for nearly half of a hospital's total energy use.*
- Hospitals can achieve substantial energy savings and meet demands of infection control.

*High Performance Hospital Partnerships, 2009 ASHE Planning, Design and Construction Conference, College of Built Environments, University of Washington.

Demonstrated Energy Savings in Hospitals from Ventilation Modification

- Odense University Hospital in Denmark replaced 50 year old fans with Zerax fans-34% reduction in electricity consumption.
- Lewis County General Hospital (Lowville, NY) installed 4 new variable frequency drives on supply and return fans of the air handler-15% reduction in HVAC energy use.
- National Renewable Energy Laboratory estimates that large hospitals can achieve 50% energy savings through energy design improvements. (NREL/TP-550-47867)

Key References

- Veterans Health Administration, Budget for Fiscal Year 2011, Government Printing Office, p. 1070.
- Energy VHA Cube: <http://vssc.med.va.gov/EnergySQL/>.
- VHA Facility Condition Assessment Reports
<http://vaww.vhacowebapps.cio.med.va.gov/cis/>.
- VBA Utility Usage Database Guidebook, BTU Conversion Table, Appendix 1, p. 25, April 2006.
- 2010 Building Energy Data Book, U.S. Department of Energy, March 2011. <http://buildingsdatabook.eren.doe.gov/>