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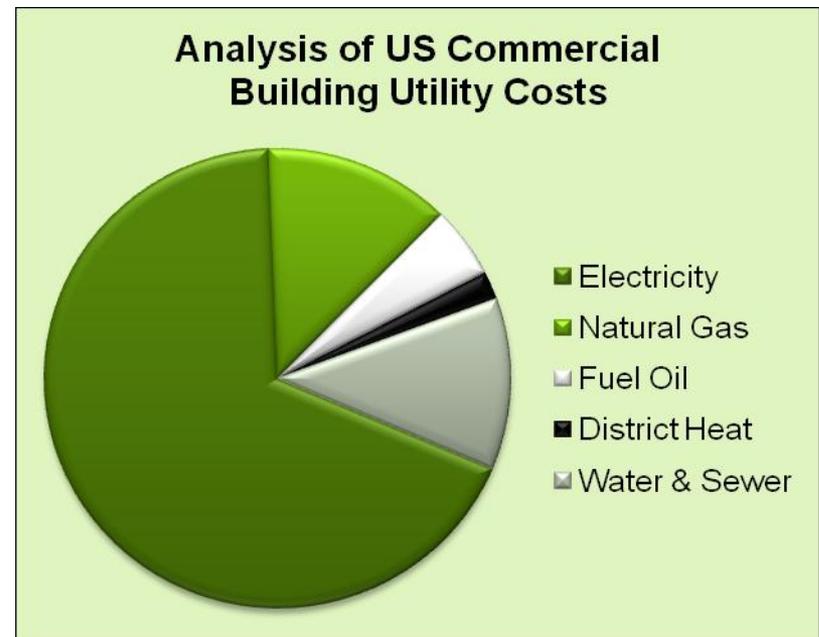
**A River of Energy Solutions**

# Comprehensive Water Conservation

Chris Wheeler, H2O Applied Technologies

# Why Water Conservation?

- Finite supply
- Something people care about
- Expensive, getting more expensive
- Typically short payback
- Helps build scope and/or profitability



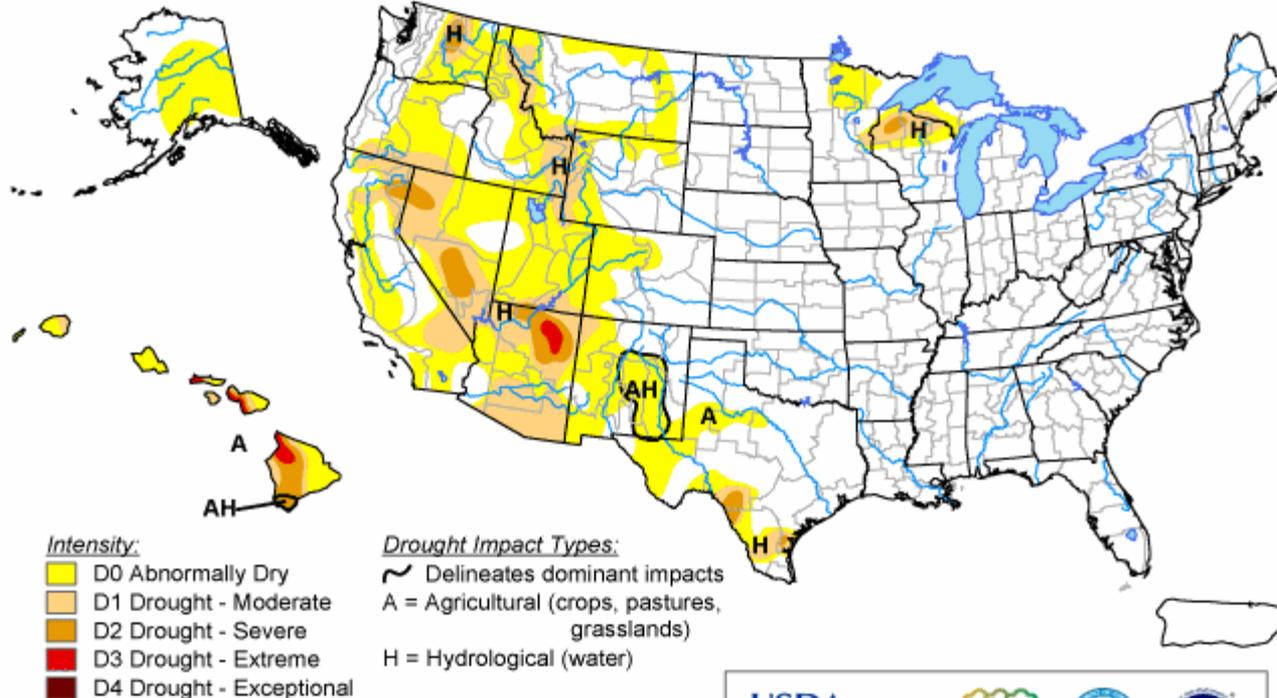
# Federal Mandates

- EXECUTIVE ORDER 13423
  - Reduce water use by 16%: Reduce water intensity (gallons/sf) by 2% each year through 2015 for a total reduction of 16%, relative to the agency's 2007 baseline.
- EXECUTIVE ORDER 13514:
  - Reduce water use by 26%: Extends the requirements of 13423 (reduce water intensity by 2% each year) by 5 years.
  - Reduce industrial, landscaping, and agricultural (ILA) water consumption by 2% annually or 20% by the end of FY 2020 (baseline FY 2010 ILA consumption).

# Local Restrictions

## U.S. Drought Monitor

January 26, 2010  
Valid 7 a.m. EST



The Drought Monitor focuses on broad-scale conditions. Local conditions may vary. See accompanying text summary for forecast statements.

<http://drought.unl.edu/dm>



Released Thursday, January 28, 2010  
Author: David Miskus, CPC/NCEP/NWS/NOAA

# Where do we Begin?



# Benchmarking

<b>Benchmarking Data - Water Usage Analysis- H<sub>2</sub>O Applied Technologies</b>						
<b>Actual Data - On-site Engineering Evaluations &amp; Installations</b>						
<b>Major Medical Teaching/Research Hospitals/Campus</b>						
Facility	NYU	Mt. Sinai	HUMC	Montefiore	WPH	
City / State	New York, NY	New York, NY	Hackensack,NJ	Bronx, NY	Pittsburgh,PA	AVERAGE
Number of Beds	734	950	572	490	420	633
Staff FTEs	4,622	8,609	4,844	3,405	4,780	5,252
Outpatient Visits	134,750	694,126	685,592	668,738	377,656	512,172
Medical Research	x	x	x	x		
Water Usage (Gals/yr)	300,000,000	450,000,000	107,000,000	85,000,000	75,000,000	203,400,000
Year-round cooling	x	x	x			
Seasonal Cooling				x	x	
Number of Sterilizers	45	90	18	8	22	37
Water - Cooled Vac/Air #skids	6	0	2	3	4	3
<b>Best Practice Achieved Savings Gals/yr</b>	<b>87,500,000</b>	<b>94,500,000</b>	<b>21,000,000</b>	<b>17,000,000</b>	<b>22,000,000</b>	
<b>Percent of Achieved Savings</b>	<b>29%</b>	<b>21%</b>	<b>19 %</b>	<b>20 %</b>	<b>29 %</b>	
<b>Water Usage - Gals. Per Bed/yr.</b>	<b>408,719</b>	<b>473,684</b>	<b>187,063</b>	<b>173,469</b>	<b>178,571</b>	<b>284,301</b>

ASHE 39th Annual Conference and Technology Exhibition (July 29-31, 2002)

# Baseline

- 2007 Baseline Year
- Gallons/Sq. ft.
- 2009 Benchmark for Hospitals = 51 gals/sq.ft.
- 441 gallons per staffed bed per day
- 353 gallons per adjusted patient day (APD).

# Understanding Water Bills

- Fixed Charges
  - Meters
  - Fire Service
  - Backflow Prevention
  - Capital Improvements
  - Road Frontage
  - Storm water
- Variable Charges
  - Consumption
  - Usually in hundred cubic feet (748 gallons)
  - Graduated Rates

Basic Water Data		
	ccf	kgal
<b>Annual Consumption</b>	24,260	18,146
<b>Annual Water Bill</b>	\$189,340	\$189,340
<b>Water/Sewer Rate</b>	\$7.80	\$10.43

Water Bill Data		
	ccf	kgal
<b>Annual Consumption</b>	24,260	18,146
<b>Meter Charges</b>	\$106,770	\$106,770
<b>Consumption Charges</b>	\$82,570	\$82,570
<b>Water/Sewer Rate</b>	\$3.40	\$4.55

# Water Balance

Customer Name  
Water Balance  
Date: 99/99/99

Category	Subcategory	Pre-Retrofit Conditions		Post-Retrofit Conditions		Savings	
		Amount (kgal/yr)	Percentage (%)	Amount (kgal/yr)	Percentage (%)	Amount (kgal/yr)	Percentage (%)
Domestic	Domestic	17,355	11.3%	11,849	15.0%	5,506	31.7%
Sterlizers - CTS	Condensate Tempering	16,354	10.7%	393	0.5%	15,961	97.6%
Sterlizers - VWS	Condensate Tempering	2,883	1.9%	721	0.9%	2,162	75.0%
Medical Vacuum Pumps	Process	5,657	3.7%	874	1.1%	4,783	84.6%
Medical Air Compressors	Process	3,224	2.1%	786	1.0%	2,437	75.6%
Condensate Coolers and Tempering	Condensate Tempering	41,199	26.9%	3,145	4.0%	38,054	92.4%
Chiller Cooling Tower Makeup (Uris, Main Lachman)	Cooling	5,271	3.4%	-	0.0%	5,271	100.0%
Chiller Cooling Tower Makeup (Other)	Cooling	11,000	7.2%	11,000	13.9%	-	0.0%
HVAC (water cooled AC and ice machines)	Refrigeration	5,000	3.3%	5,000	6.3%	-	0.0%
Cafeteria and Food Service	Food Service	25,000	16.3%	25,000	31.7%	-	0.0%
Pathology, Morgue AC, Sewage Ejector	Process	5,000	3.3%	5,000	6.3%	-	0.0%
Cleaning	Process	3,000	2.0%	3,000	3.8%	-	0.0%
Unaccounted For	Unaccounted	12,092	7.9%	12,092	15.3%	-	0.0%

<b>Total</b>	153,035	100%	78,860	100%	74,175	48.5%
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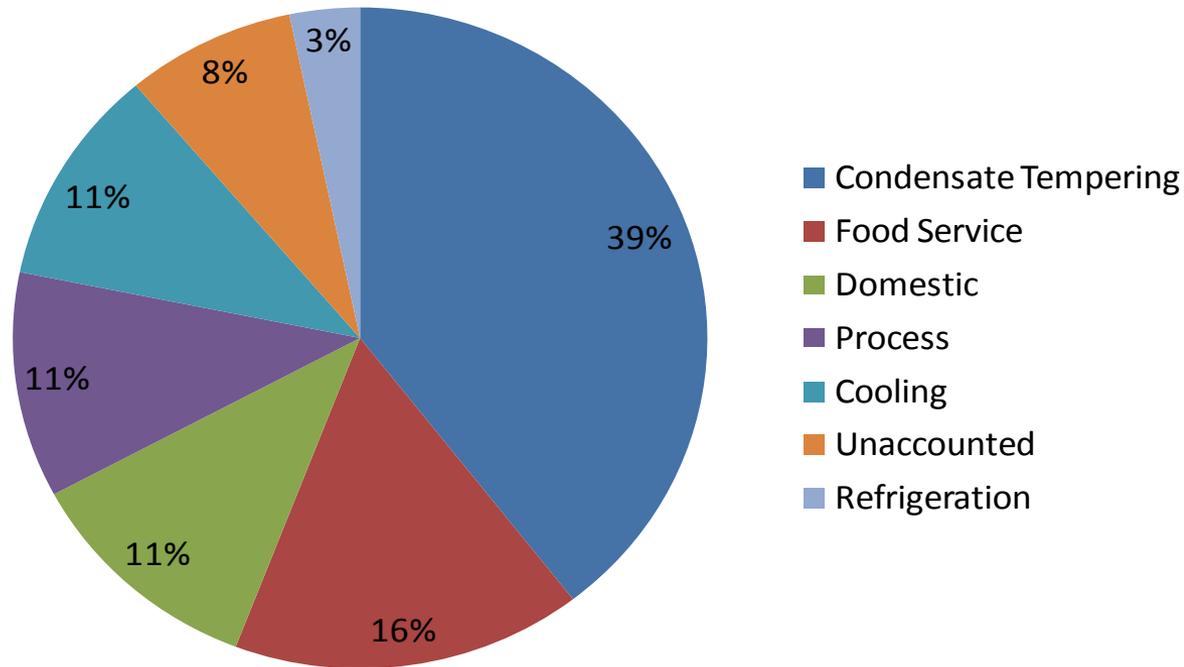
<b>Total Billed Usage</b>	153,035
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Billing History (August through July)

Account #	Service Address	CCF	Kgal
#90001-31817-001	Address #1	35,064	26,228
#60001-31818-001	Address #2	167,654	125,405
#30001-30783-001	Address #3	1,874	1,402
<b>Total:</b>		204,592	153,035

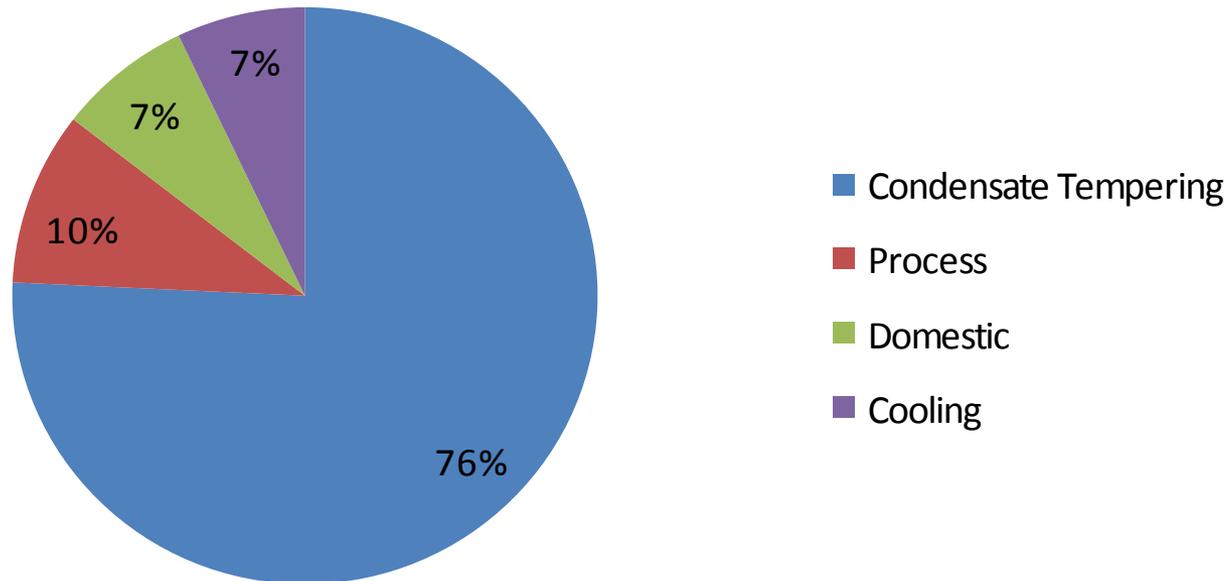
# Baseline Consumption Analysis

## Pre-Retrofit Water Balance



# Post-Retrofit Savings

## % of Total Savings by Use



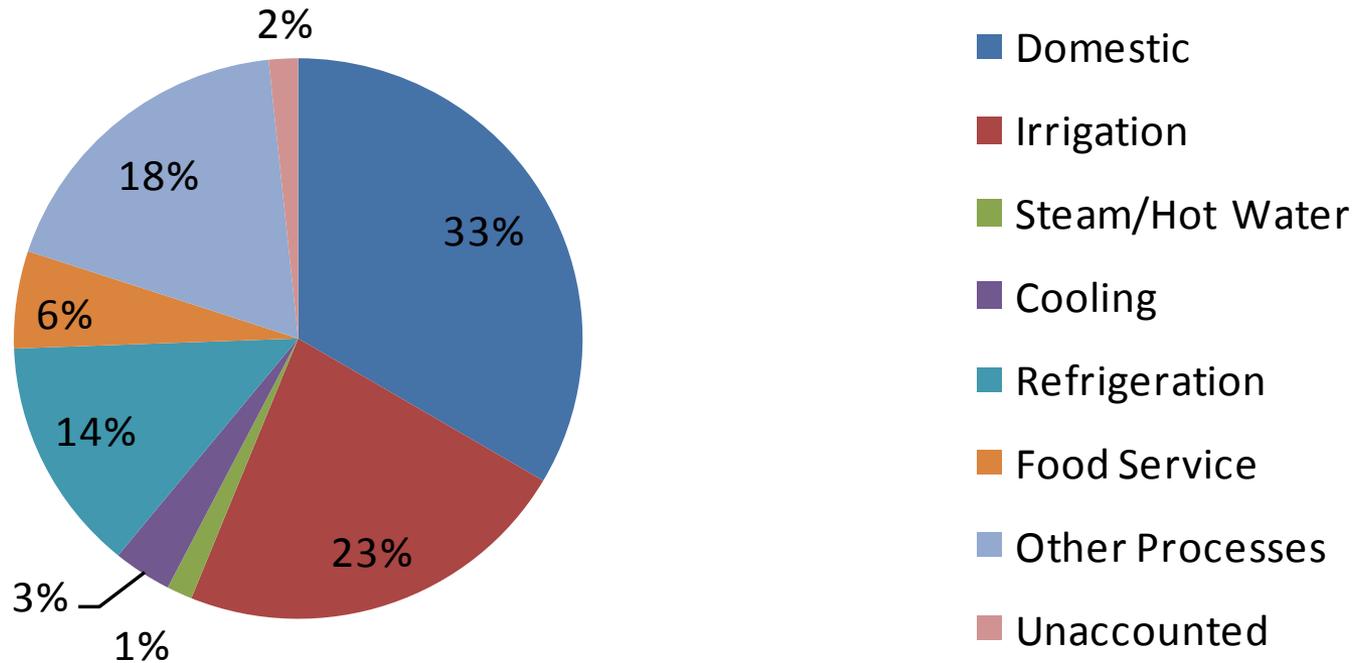
# Sample Measures

- Sterilizers
  - Install Condensate Tempering Systems
- Kitchen
  - Install final rinse controls
  - Replace pre-rinse nozzles
- Pure Water Systems
  - Replace steam stills with RO/DI
  - Recycle RO reject
- Cooling Towers
  - Install make up and blowdown meters
  - Green chemicals and pulse power
- Laundry
  - Install filtration for water reuse
- Irrigation
  - Weather based control systems
- Bathrooms
  - Install 1.28 gpf toilets and low flow (laminar) faucet restrictors
- Steam Distribution
  - Replace steam traps
  - Insulate bare pipe, valves, & fittings
  - Monitor condensate return volume & temp



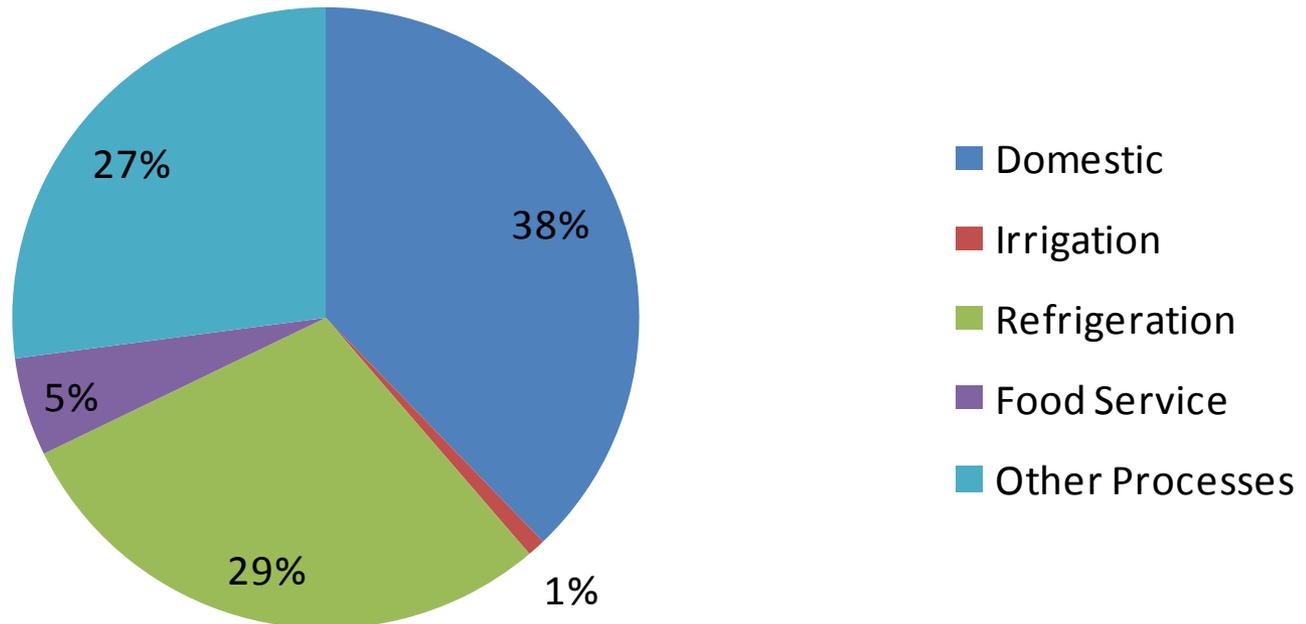
# VAMC San Francisco

## Baseline Water Balance

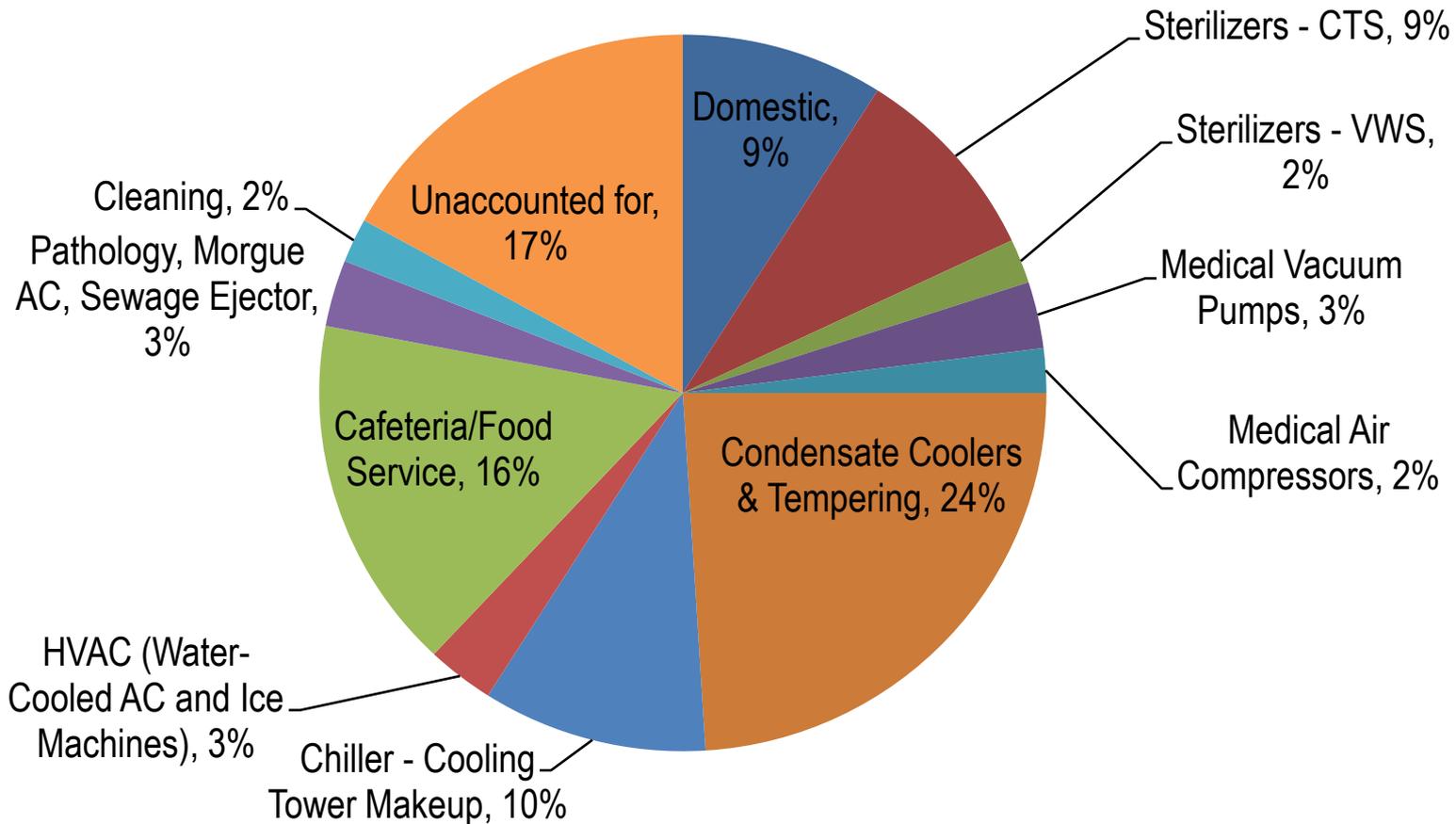


# San Francisco VAMC

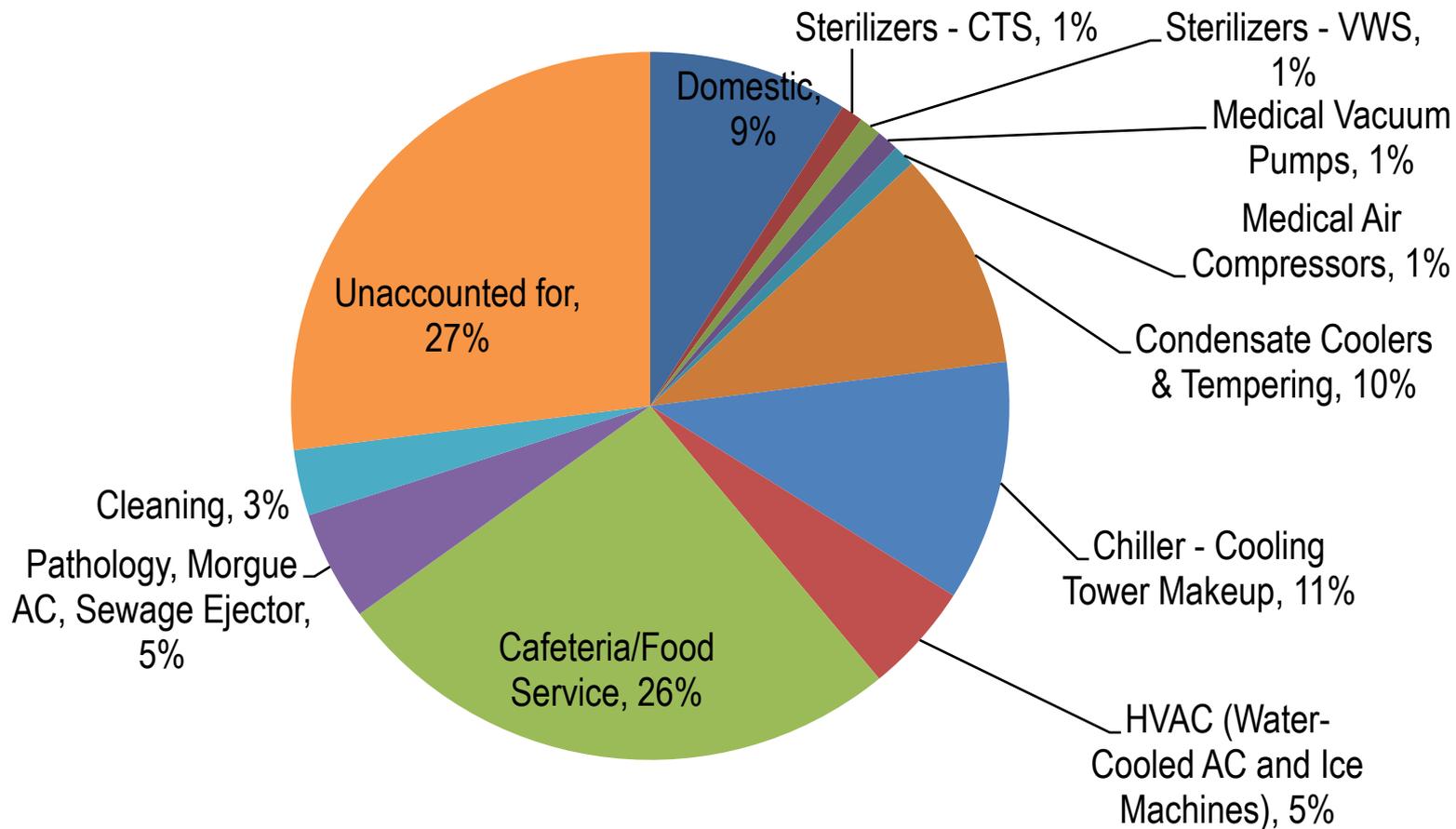
## % of Total Savings by Use



# Lenox Hill Hospital Mass Balance Water Conservation Before Conservation Program 153,035,000 gallons/year



# Lenox Hill Hospital Mass Balance Water Conservation After Conservation Program 55,942,000 gallons/year



# Comprehensive Water

## Process Water Reductions

- Irrigation Systems
- Steam Sterilizers, Vacuum & Gravity
- Vacuum Pumps/Air Compressors
- Food Service Area
- Refrigeration Equipment
- Pure Water Stills
- Analytical Equipment
- Animal Cage Washers
- Laundry
- Boiler Blow-down
- Swimming Pools
- Cooling Tower Makeup Water
- Tempering Systems

## Reuse, Re-circulate and Replace

- Reverse Osmosis Units
- Rainwater Harvesting
- AHU Condensate reuse
- New Wells
- Leak Reduction

## Domestic Water Reduction

- Toilets
- Sinks
- Showers

# Comprehensive Water

## Reuse, Re-circulate and Replace

- Reverse Osmosis Units
- Rainwater Harvesting
- AHU Condensate reuse
- New Wells
- Leak Reduction

## Steam

- Steam Distribution System Analysis
- Steam Trap Replacement
- Insulation of Steam Fittings
- Condensate Recovery

## Domestic Water Reduction

- Toilets
- Sinks
- Showers

# Do you have any Questions?



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A Beacon Company