



# Green Energy Waste Heat Recovery Solutions

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Hot Water Forum  
Portland, OR

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# The Problem

- ▶ 1. The energy needed to heat water in cold weather climates exceed the ability of water heating systems
  - Tank
  - Tankless
- ▶ 2. In warm weather climates electricity costs for heating water are rising exponentially

# Water Heating Systems

- ▶ Tank
  - ▶ Tankless
  - ▶ Solar
- 
- ▶ DWHR is a booster to any these

# What happens to hot water when it goes down the drain?

- ▶ Wasted Energy Source
- ▶ It is the 2<sup>nd</sup> highest utility cost for residential, commercial and industrial applications
- ▶ Heat Energy can be easily captured and reused with a simple gravity flow passive heat exchanger

# GreenFoX

## Drain Water Heat Recovery

A Variety of Simple Add-on's  
**FOR any**  
Water Heating or HVACR System

- \$ Save millions of BTU's
- \$ Extend equipment life
- \$ Raise system efficiency
- \$ Low or NO maintenance
- \$ Increase hot water supply
- \$ Reduce Carbon Emissions
- \$ Quick and painless lifetime ROI
- \$ Enhance tankless performance
- \$ Decrease equipment workload



Lower Refrigerant Temperature - Increase SEER

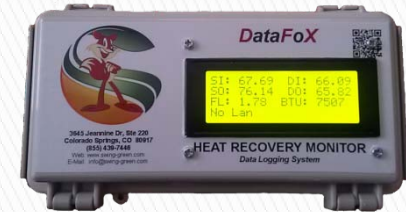


Water Heater  
Booster



# DataFoX

## Data Logger



- See IT Live!
- BTU Savings
- CO<sup>2</sup> Reduction
- Usage Efficiency
- Temperature Rise

# ArcticFox

## Pre-Chiller

Commercial Ice Machines



Applications start here...

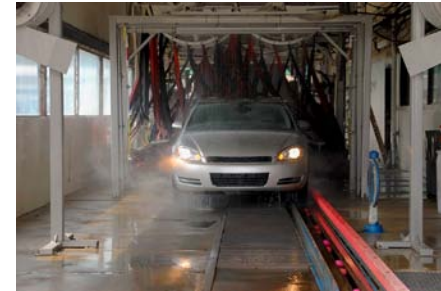
**Industrial**  
Dairy Farms  
Power Plants  
Cooling Towers  
Food Processing

**Government**  
Ships  
Barracks  
Hospitals  
IT Rooms

**Residential**  
Retrofits  
Multi-family  
Single Family  
New Construction

**Commercial**  
Hotels  
Laundries  
Restaurants  
Fitness Centers

# ANYWHERE hot water is in DEMAND





# GreenFoX Drain Water Heat Recovery

residential - commercial - industrial

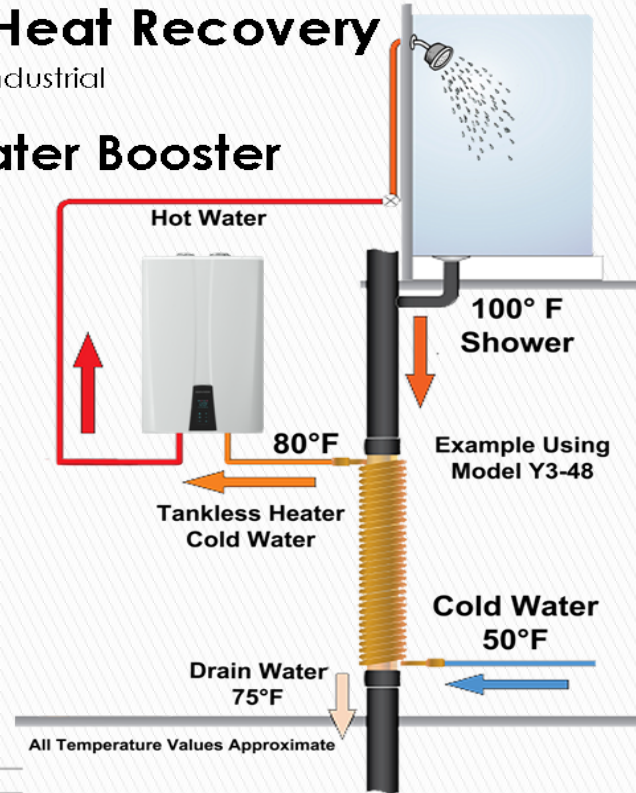
## Tankless Water Heater Booster

**STOP RUNNING OUT OF HOT WATER!**

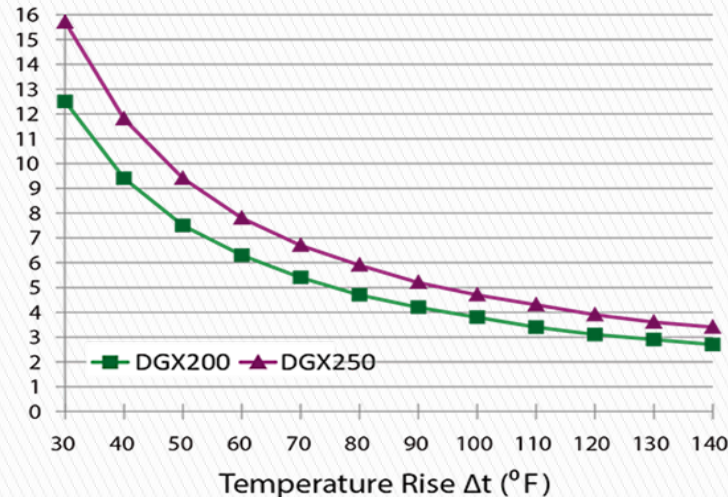
Heat incoming cold water from 50° to 80°  
 Boost heater output up to 9.5 GPM  
 Increase GPM rating 30% to 50%

**ZERO ENERGY PRODUCT**

Get more hot water with less energy  
 Recycle heat energy  
 Lower utility bills



GPM Flow Rates at Various Temperature Rises



- GREEN Benefits**
- Quick install
  - No maintenance
  - Year round operation
  - 30+ year plumbing life
  - Reduce heating time
  - Extend water heater life
  - Increase system efficiency
  - HERS Index
  - LEED points
  - Utility rebates
  - Tax incentives
  - 100% recyclable
  - USD OE recognized
  - Reduce CO<sub>2</sub> emissions
  - Reduce everyday energy use

# One Year Data Logging Results

- ▶ Installation Type: Residential
- ▶ Location: Colorado Springs, CO
- ▶ Occupancy: 4
- ▶ Fuel Type: Natural Gas
- ▶ Heating Type:  
Shared Hydronic/Hot Water
  
- ▶ Heat Recovery Type: DWHR
- ▶ Model: Y3-48
- ▶ Winter Ground Water  
Temperature: 43°F
- ▶ Summer Ground Water  
Temperature: 65°F



## Drain Water Heat Recovery Charts

- 1) The following graphs show live data for periods of hot water flow only.
- 2) Flow and Temperature readings are averaged over 1 minute polling periods.
- 3) Graph shows 36 hour time period.



# Residential Usage and Energy Recovery

	Year to date	Last 30 days
Gallons of Hot Water Used	14,429.51	912.64
BTU's Saved	2,279,104	162,768
<b>Natural Gas Energy Savings – Water Heat EF Rating 0.86</b>		
Therms Saved	26.50	1.89
Lbs CO2 Saved	292.12	20.86
<b>Electrical Energy Equivalents – Water Heat EF Rating 0.96</b>		
KWH Saved	695.60	49.68
Coal Fired Plant Lbs CO2 Saved	1,446.85	103.33
Natural Gas Fired Plant Lbs CO2 Saved	848.63	60.61

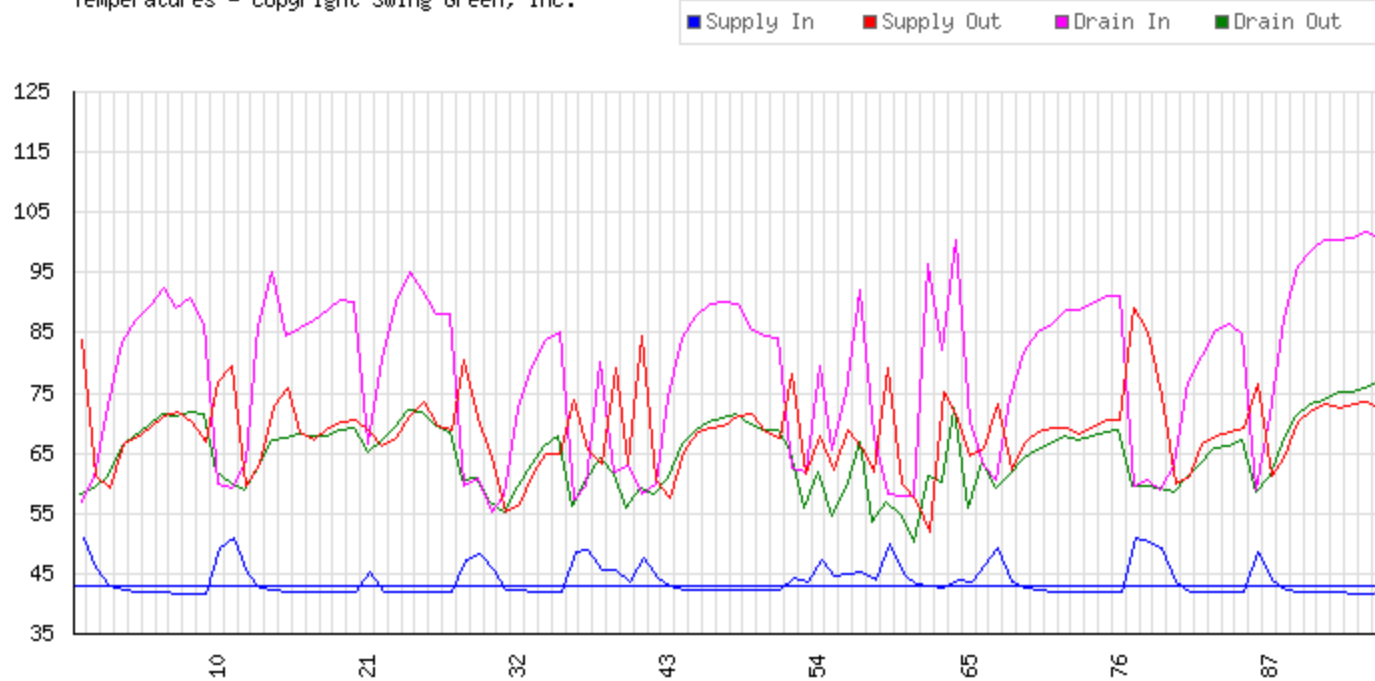
# Instantaneous BTU's per Hour recovered

Instantaneous BTU/Hr - Copyright Swing Green, Inc.



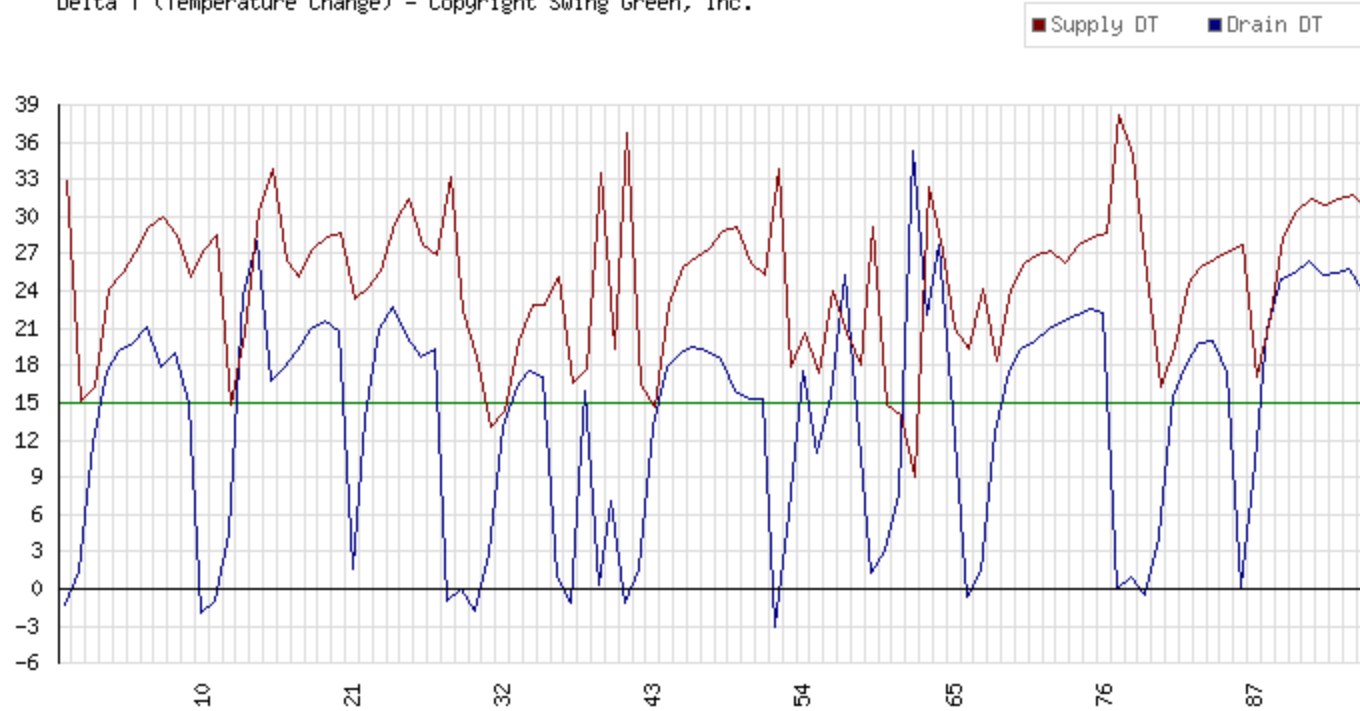
# Supply and Drain Temperatures

Temperatures - Copyright Swing Green, Inc.



# Supply and Drain Delta T

Delta T (Temperature Change) - Copyright Swing Green, Inc.



# Flow Rate (GPM)

Flow Rate (GPM) - Copyright Swing Green, Inc.



# Unit Heat Transfer Efficiency

DWHR Unit Efficiency (%) - Copyright Swing Green, Inc.



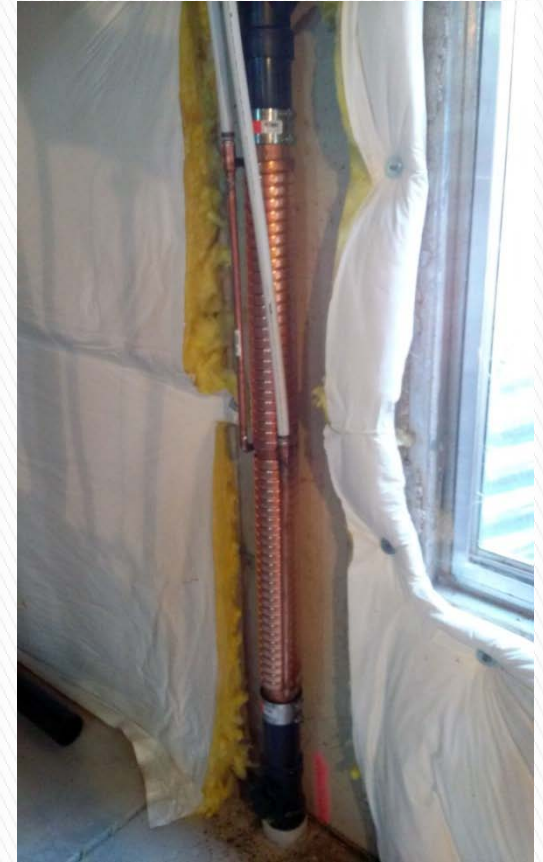
# Simple Installation



Replace section of drain



Connect water supply





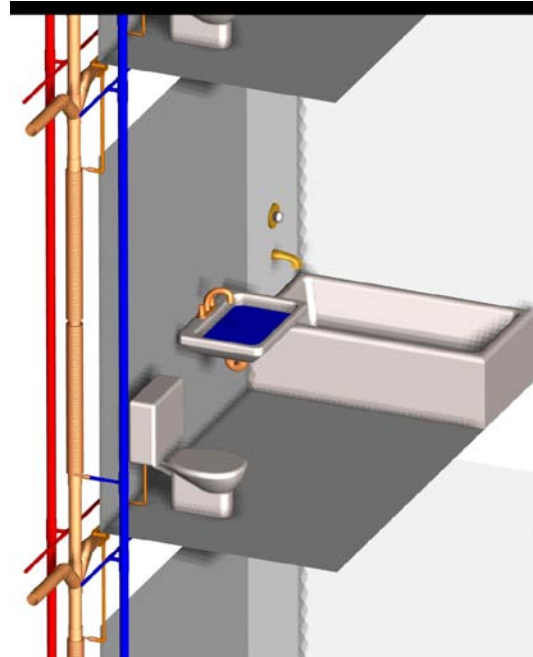
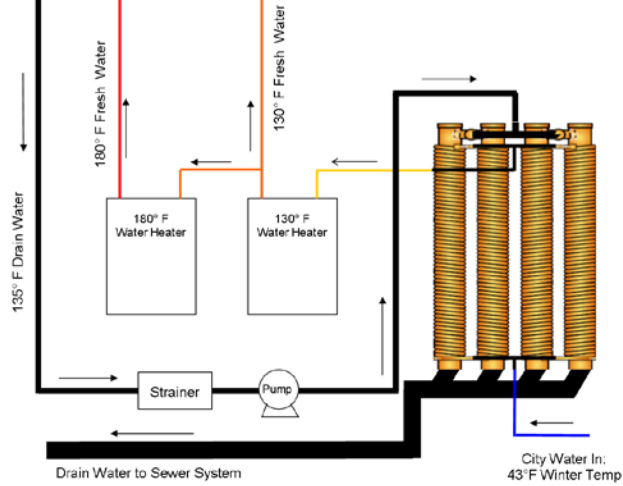




## GreenFoX DWHR System

M2P4-60  
High Capacity & Efficiency  
Manifold System

Efficiency Rating:  
79% @ 4.5 GPM  
72% @ 6.5 GPM

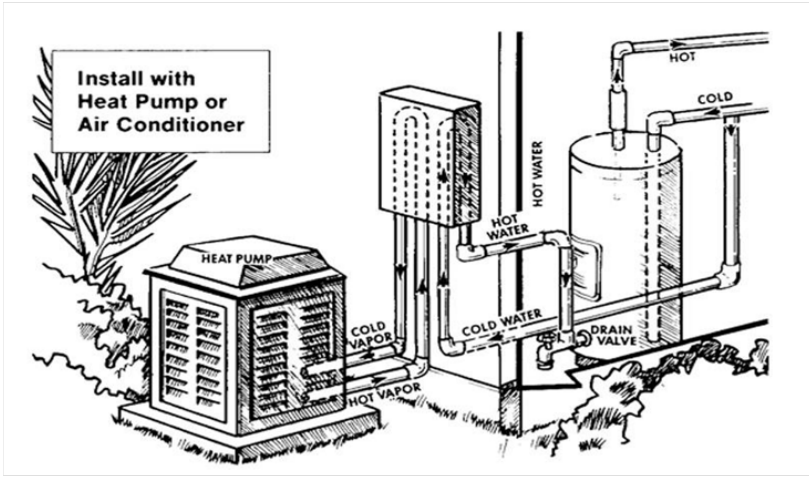


# Energy Recycling ~ Air Conditioner Superheat Recovery

**AirFoX**  
 Desuperheater  
 for use in residential and commercial applications

**Recover Air Conditioning Waste Energy**

**Heat water while you cool your house**



### Green Benefits

- ◆ Zero Energy
- ◆ LEED points
- ◆ HERS Index
- ◆ Utility rebates
- ◆ Reduce CO<sub>2</sub>
- ◆ 100% recyclable
- ◆ Year round action
- ◆ No maintenance
- ◆ Reduce energy use

*Installation does NOT void existing equipment manufacturers warranty*

*Circulation pump and controls are included.*

### TYPICAL SAVINGS ESTIMATES

	NATURAL GAS @ \$1.65/THERM	PROPANE @ \$3.90/GAL	ELECTRICITY @ \$.12/KWH
FULL SERVICE RESTAURANT 500 Meals/Day	\$377.00/mo.	\$960.00/mo.	\$565.00/mo
JR/SENIOR HIGH SCHOOL 1000 Students	\$405.00/mo.	\$1025.00/mo.	\$603.00/mo.
MOTELS/HOTELS 150 Rooms	\$456.00/mo	\$1153.00/mo	\$679.00/mo.

Actual savings may vary. Consult factory for detailed audit and sizing form.

# Benefits of AirFoX

- ▶ Safely produce up to 50 GPH of 140 degree F
- ▶ Cool refrigerant gas
- ▶ Extend compressor life of HVACR systems
- ▶ Reduce energy consumption
- ▶ Increase SEER and efficiency
- ▶ Quick ROI

# Variables used for Following Scenarios

Operating Costs	(DWHR) Drain Water Heat Recovery	(ACHR) Air Conditioning Heat Recovery
Electric \$0.13/kWh	Ground water temp 50 °F	A/C 5 Tons residential
Natural Gas 1.004/Therm	Drain water temp 100 °F	A/C ≥ 20 Tons commercial
Water Heater Energy Factor 0.92 Electric	Model Efficiency 0.57	Cooling Months 8
Water Heater Energy Factor 0.61 Natural Gas		

*The following tables and calculations show potential savings that are viewed here with a range of defined variables. For an accurate estimate of savings, consult your local dealer or Swing Green for an engineering analysis of your facility.*

The values contained in these estimating calculators are based on national averages from the Bureau of Labor Statistics, Environmental Protection Agency, U.S. Census Bureau and other sources.

## Hospital

Occupancy per day	500		
Gallons per person	35		
<b>Typical Monthly Expenditures</b>		<b>Monthly Savings</b>	
Gallons of hot water per month	532,292	<b>GreenFoX DWHR</b>	<b>AirFoX Desuperheater</b>
Electric Water Heater Cost	\$12,845	\$5,230	\$8,563
Gas Water Heater Cost	\$5,110	\$2,081	\$3,407
BTU's Used	310,491,052	BTU's recovered 126,414,214	BTU's recovered 206,994,035

## Health Club

Occupancy per day	300		
Gallons per person	25		
<b>Typical Monthly Expenditures</b>		<b>Monthly Savings</b>	
Gallons of hot water per month	228,125	<b>GreenFoX DWHR</b>	<b>AirFoX Desuperheater</b>
Electric Water Heater Cost	\$5,505	\$2,241	\$3,670
Gas Water Heater Cost	\$2,190	\$892	\$1,460
BTU's Used	133,067,594	BTU's recovered 54,177,520	BTU's recovered 88,711,729

## Dormitory/Barracks

Occupancy - 2 person per room	200	Average Occupancy 98%	
Gallons per person, per day	30		
<b>Typical Monthly Expenditures</b>		<b>Monthly Savings</b>	
Gallons of hot water per month	357,700	<b>GreenFoX DWHR</b>	<b>AirFoX Desuperheater</b>
Electric Water Heater Cost	\$8,632	\$3,514	\$5,755
Gas Water Heater Cost	\$3,420	\$1,393	\$2,280
BTU's Used	208,753,100	BTU's recovered 84,950,352	BTU's recovered 139,099,991

## Full Service Hotel

Number of Rooms	290	Average Occupancy 66%	
Gallons per person, per day	30	Occupancy - 2 person per room	
<b>Typical Monthly Expenditures</b>		<b>Monthly Savings</b>	
Gallons of hot water per month	349,305	<b>GreenFoX DWHR</b>	<b>AirFoX Desuperheater</b>
Electric Water Heater Cost	\$8,429	\$3,432	\$5,619
Gas Water Heater Cost	\$3,340	\$1,360	\$2,227
BTU's Used	203,753,100	BTU's recovered 82,956,619	BTU's recovered 135,835,400



## Full Service Restaurant

Meals per day	500		
Gallons per meal	5		
<b>Typical Monthly Expenditures</b>		<b>Monthly Savings</b>	
Gallons of hot water per month	76,042	<b>GreenFoX DWHR</b>	<b>AirFoX Desuperheater</b>
Electric Water Heater Cost	\$1,835	\$747	\$1,223
Gas Water Heater Cost	\$730	\$297	\$487
BTU's Used	44,355,865	BTU's recovered 18,059,173	BTU's recovered 29,570,576

## Residential

Occupancy - person	4		
Gallons per person, per day	35		
<b>Typical Monthly Expenditures</b>		<b>Monthly Savings</b>	
Gallons of hot water per month	4,258	<b>GreenFoX DWHR</b>	<b>AirFoX Desuperheater</b>
Electric Water Heater Cost	\$103	\$42	\$69
Gas Water Heater Cost	\$41	\$17	\$27
BTU's Used	2,483,928	BTU's recovered 1,011,314	BTU's recovered 1,655,952

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- 2) "Average Energy Prices in the Los Angeles Area."  
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<http://www.statisticbrain.com/hotel-revenue-statistics/>

# Thank you for your time



## GREEN ENERGY!

### STOP

WASTING ENERGY!

RUNNING OUT OF HOT WATER!

THROWING \$\$\$ DOWN THE DRAIN!

OVERWORKING YOUR WATER HEATER!

### ASK US HOW!