

Heat Pump Water Heaters

Flexible Energy Storage



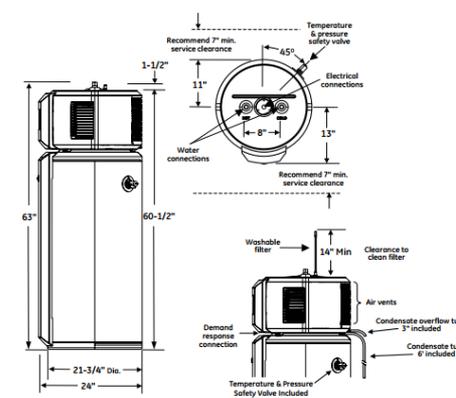
Michael Beyerle, P.E.
GE Appliances
Product Manager – Connected Products



Change happens...



Change happens...

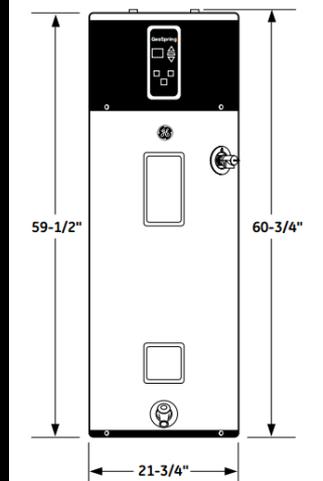


Above illustration intended for dimensional reference only. Refer to photograph for actual product appearance.

GEH50DNSRSA GeoSpring™ hybrid water heater

Features and Benefits

- ENERGY STAR® Qualified - Exceeds federal guidelines for energy efficiency and provides year-round energy and money savings
- Consumes up to 62% less energy than a standard electric water heater
- Save \$320 per year in water heater operating cost (Based on DOE test procedure and comparison of a 50-gallon standard electric tank water heater using 4879 kWh per year vs. the GeoSpring™ hybrid water heater using 1856 kWh per year.)
- Demand response capable
- Offers easy replacement of standard electric water heater
- Fits in similar footprint as a standard 50-gallon water heater
- Uses existing water and electrical connections
- Perfect for new construction or replacement upgrade
- GEH50DNSRSA - Silver Metallic

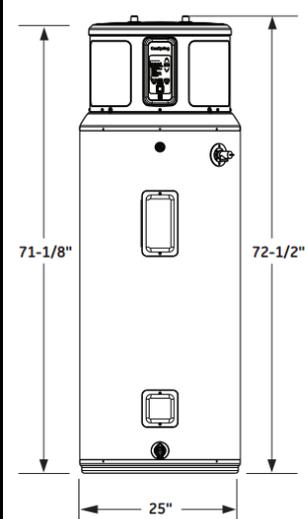


Above illustration intended for dimensional reference only.
Refer to photograph for actual product appearance.

GEH50DEEDSR GeoSpring™ hybrid electric water heater

Features and Benefits

- 62% more efficient than a standard electric 50-gallon water heater
- Saves the average household \$365 every year* in water heating expenses - that's \$3,650 savings over a 10-year period
- Provides the same amount of hot water as a traditional 50-gallon standard electric water heater with 65 gallons first-hour delivery
- Electronic controls with 4 operating modes plus a vacation setting make it simple to select the temperature and optimal energy savings performance
- Utilizes heat pump technology to absorb the heat in ambient air and transfers it into water, making GeoSpring an efficient and environmentally friendly water heater
- Qualifies for state and local utility rebates and tax credits
- Designed for common indoor installation in areas such as: basement, garage, closet, utility room, attic, etc.
- Limited 10 year warranty provides peace of mind and dependability
- Proudly Made in America
- GEH50DEEDSR - Red



Above illustration intended for dimensional reference only. Refer to photograph for actual product appearance.

GEH80DFEJSR GeoSpring™ hybrid electric water heater

Features and Benefits

- 2.9 Energy Factor
- Saves the average 5-6 person household \$410-\$500 every year* in water heating expenses (*http://www.energystar.gov/index.cfm?c=heat_pump.pr_savings_benefits, accessed January 21, 2015)
- 67% more efficient than a standard electric 50-gallon water heater
- Provides the same amount of hot water as a traditional 80-gallon standard electric water heater with 92 gallons first-hour delivery
- Qualifies for state and local utility rebates and tax credits
- Designed for common indoor installation in areas such as: basement, garage, closet, utility room, attic, etc.
- Limited 1-year labor warranty on entire appliance, 10 year parts warranty
- Proudly Made in America, product contains 70 to 90% U.S. content. Details at geappliances.com/USA
- Exceeds 2015 ENERGY STAR® requirements.
- GFH80DFEJSR - Red



GE imagination at work

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Made in America' makes a comeback



America at Work



GE is investing \$1 billion through 2014 to completely revitalize its U.S. appliances business and create more than 3,000 U.S. jobs, including an \$88 million investment in its Roper Corporate subsidiary in Lafayette, Ga.

Workers piece together dishwashers on the 'le line is 1,200 square feet, compared to a tradit



GE Opens First New Manufacturing Operation in Louisville, Ky. in Over 50 Years



- *The GeoSpring™ Hybrid Water Heater rolls off the assembly line for the first time in Louisville*
- *\$38 million investment turns vacant factory into vibrant, high-tech manufacturing operation*
- *GE chooses to invest in new U.S. manufacturing facility — the first milestone in its \$1 billion investment in the Appliances' business, creating 1,300 American jobs by 2014*
- *Success of GE's super-efficient hybrid water heaters expected to create demand and more jobs*

LOUISVILLE, Ky., – Feb. 10, 2012 – (NYSE:GE) – GE Appliances today announced the opening of its GeoSpring™ Hybrid Water Heater manufacturing facility at Appliance Park in Louisville, Ky. The first to open there since 1957. The \$38 million investment in the new facility is the first milestone in commitments GE has made since 2009 to invest \$800 million in Louisville and create more than 1,300 new jobs. The investment in the new product and other recent investments at Appliance Park has created **1,300 salaried jobs** in fields like engineering, industrial design and

“The journey we started in 2009 to get to this day has been a long one,” said Appliances President and CEO Charles “Chip” Blankenship. “It’s a testament to bringing new, industry-leading products and jobs back to the heart of America through the imagination, courage and plain hard work by a lot of people. We thank our employees, government and company officials for having an open heart to these jobs to Appliance Park and creating a bright future for our community.”

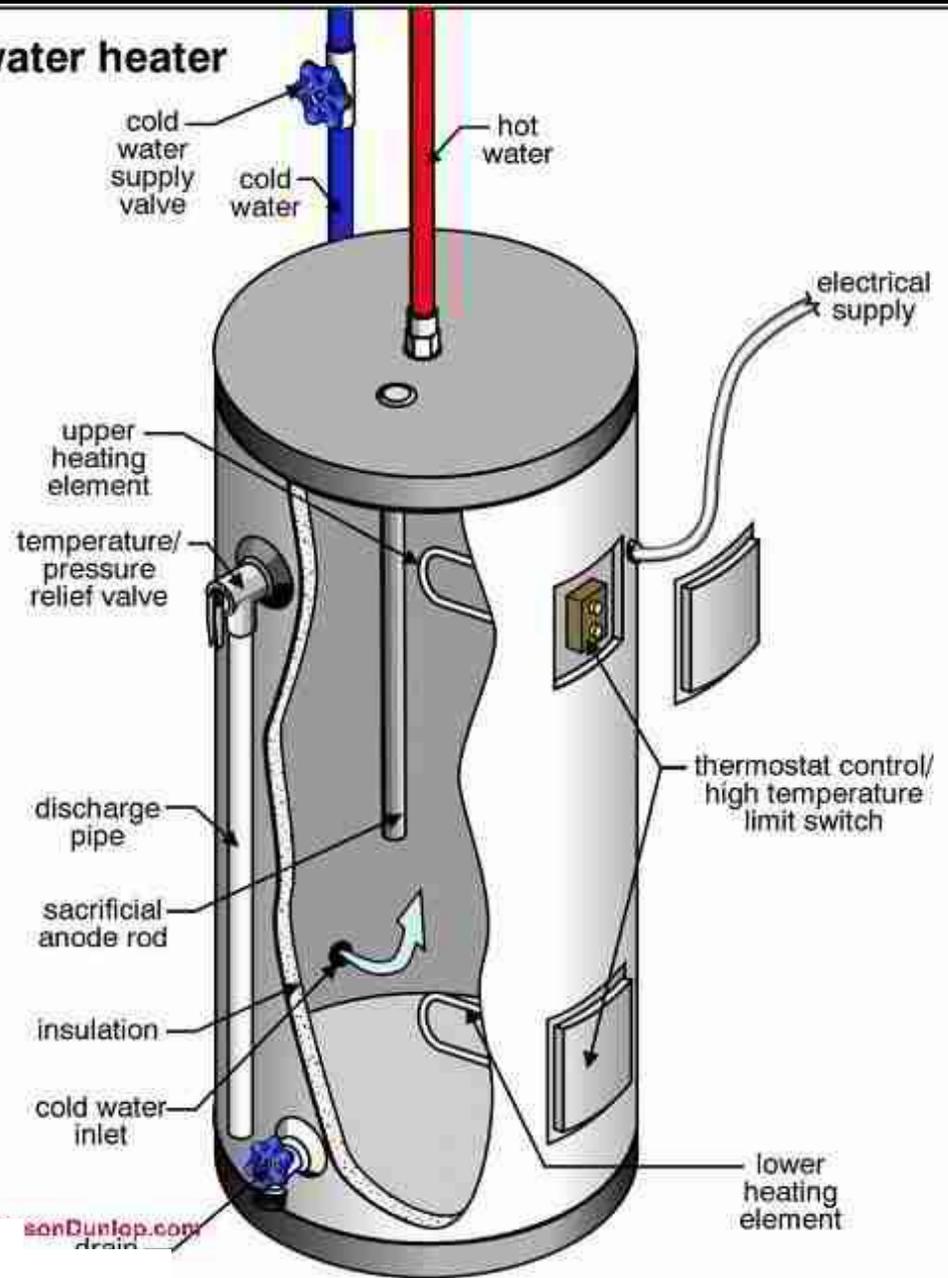
\$38 million dollar GE investment turns vacant U.S. factory into vibrant, high-tech manufacturing operation.



GE GeoSpring™ Hybrid Electric Water Heater at Appliance Park

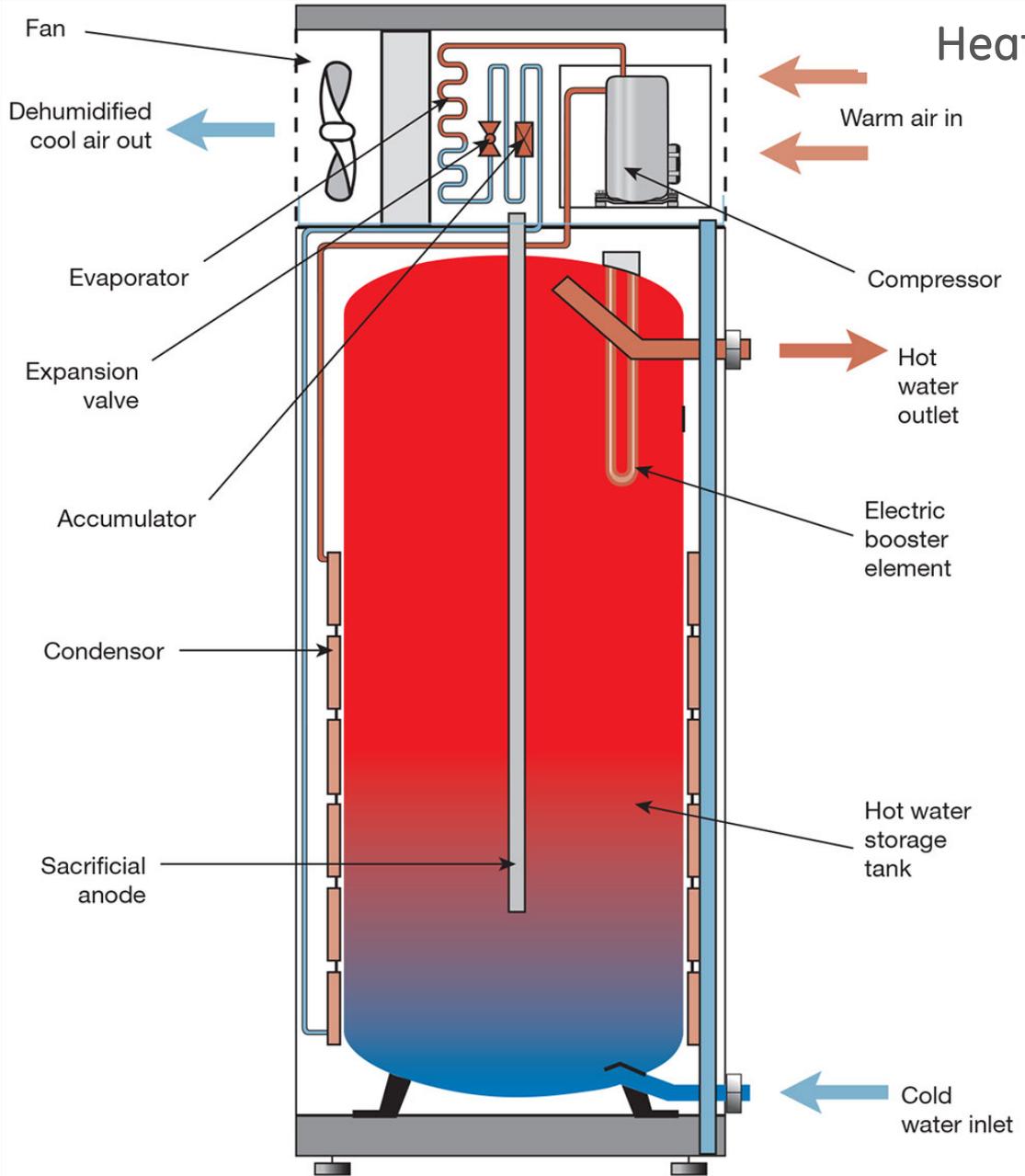
\$38 million dollar GE investment turns vacant U.S. factory into vibrant, high-tech manufacturing operation.

Electric water heater



sonDunlop.com
drain

Heat Pump Water Heater



Improving Heat Pump Water Heater Efficiency by Avoiding Electric Resistance Heater Use

September 30, 2014

Prepared by
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Jeffrey Munk
Roderick Jackson
Anthony Gehl
April Parkison
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Grid Smart Appliance Project: Final Report

Tennessee Valley Authority
Prepared by DNV GL (KEMA, Inc.)
August 2014

Energy Usage Patterns in Fielded Smart Appliances

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Abstract

The purpose of this paper is to discuss an in-depth demand side management (DSM) study being performed by General Electric (GE) in conjunction with the Tennessee Valley Authority (TVA), the Glasgow Electric Plant Board (GEPB) of Glasgow, Kentucky and the University of Louisville. The study was separated into multiple phases each of which was approximately three months in length. Different demand response (DR) strategies were tested during these phases and energy consumption was measured. These results include the energy performance of ENERGY STAR smart appliances, as well as the effects of two demand response schemes and their implications on residential appliance

through Programmable Communicating Thermostats (PCT) or direct load control (DLC) switches. As smart grid technology continues to grow, household appliances, e.g. refrigerators and washing machines, can be outfitted with controllers to either change appliance behavior or turn the appliance off during DR periods to reduce peak demand [1]. In 2011, these parties agreed to collaborate in the implementation of a highly controlled smart appliance pilot study. The partners in the pilot study are GE Appliances, Glasgow Electric Plant Board (GEPB), and Tennessee Valley Authority (TVA). GE has a long-standing commitment to energy efficiency and has been recognized several times as the ENERGY STAR Partner of the Year. In 2010, GE introduced the EcoLine™ line of "smart" appliances, which have integrated PCT features. The

PNNL-23526



Prepared for the U.S. Department of Energy
under Contract DE-AC05-79OR21400

Impact of Ducting on Heat Pump Water Heater Space Conditioning Energy Use and Comfort

SH Widder JM Petersen
GB Parker MC Baechler

July 2014



Proudly Operated by Battelle



September 29, 2014
REPORT #E14-296

Heat Pump Water Heaters for Demand Response and Energy Storage

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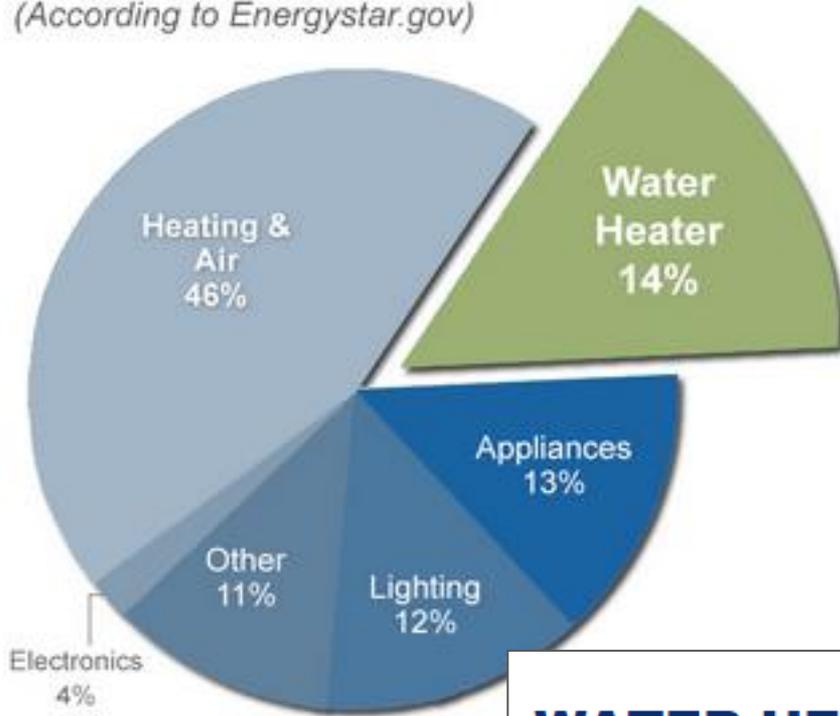
Analysis of Large-Capacity Water Heaters in Electric Thermal Storage Programs

March 2015

AL Cooke RT Camichael, Cadeo Group
DM Anderson ET Mayhorn
DW Winiarski AR Fisher

Average Household Expenses

(According to Energystar.gov)



WATER HEATERS ARE THE SECOND-HIGHEST ENERGY USERS IN U.S. HOUSEHOLDS

Did you know...

- The average household uses **64 gallons** of water each day.
- The average household spends **\$400-\$600** a year on water heating.
- A homeowner's current standard electric water heater uses more energy than their refrigerator, dishwasher, clothes washer and dryer combined.

According to Energystar.gov

Glasgow Project

Location: Glasgow, KY -South Central Kentucky, pop. 15,000.

Background:

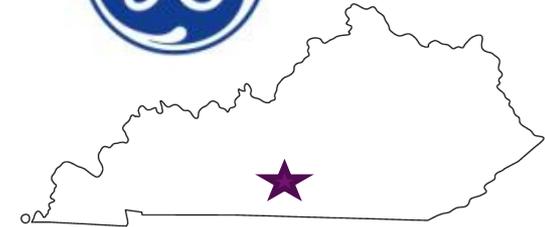
- Joint Project between GE Appliances, TVA and TVA's local distributor Glasgow Electric Plant Board.
- Project initiated Fall of 2011.

Goal:

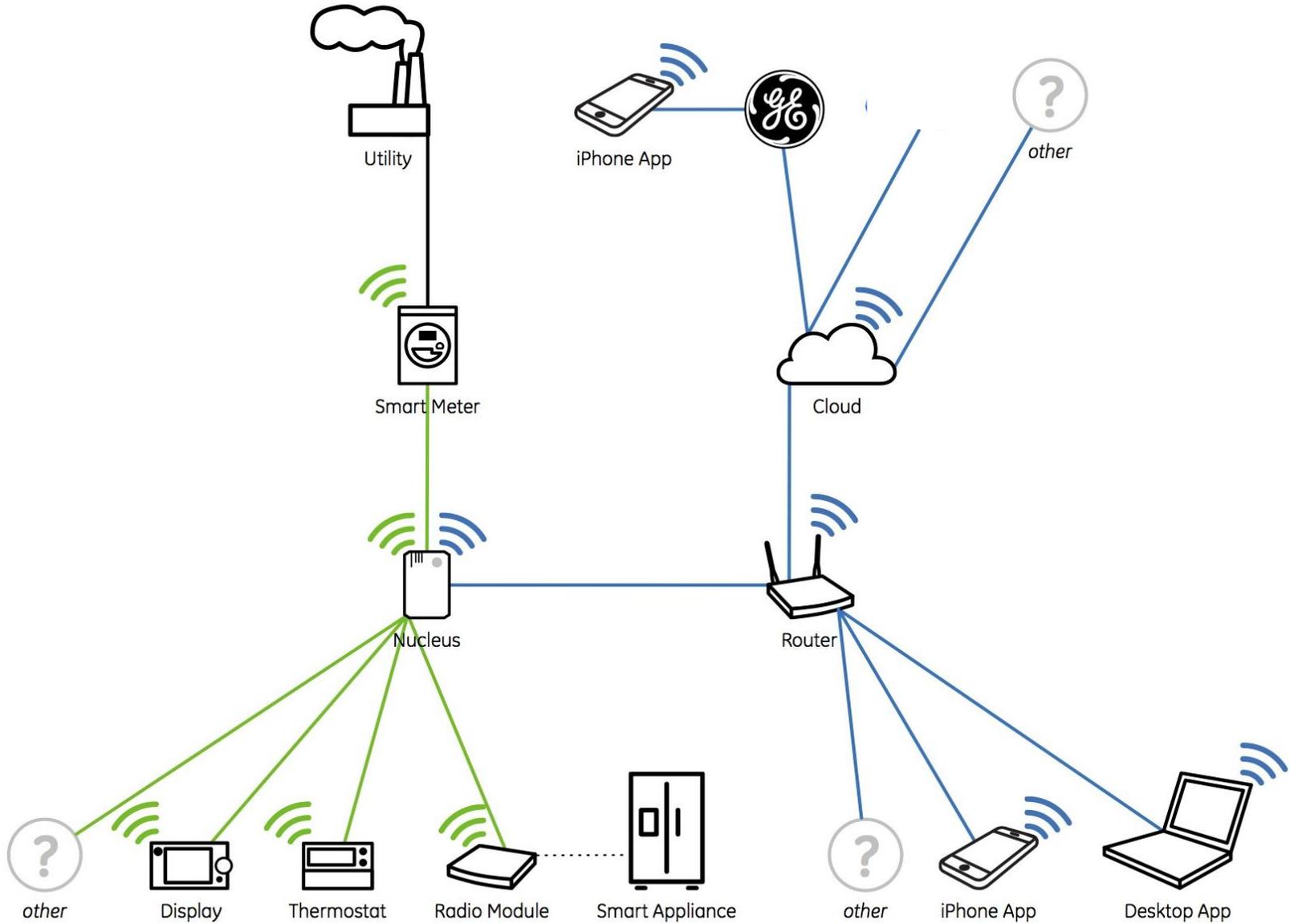
- Prove benefit of Energy Star™ appliances in the field.
- Demonstrate that communicating Smart Appliances can reduce peak demand loads.

Test Procedure:

- 30 Test homes were instrumented to allow for the measurement of energy usage on every major household circuit.
- All homes were baselined for energy consumption
- 20 Test homes received new **Smart Energy Star Appliances** and were re-baselined for energy consumption, 10 test homes were held as controls.
- The 20 test homes were then subjected to wifi based demand response requests from GEPB/TVA.

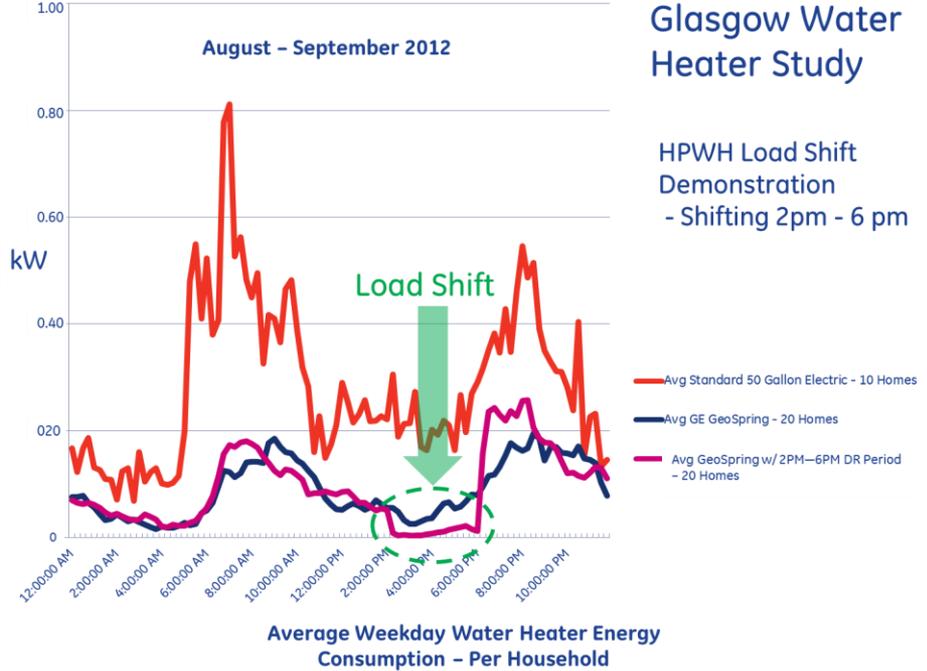
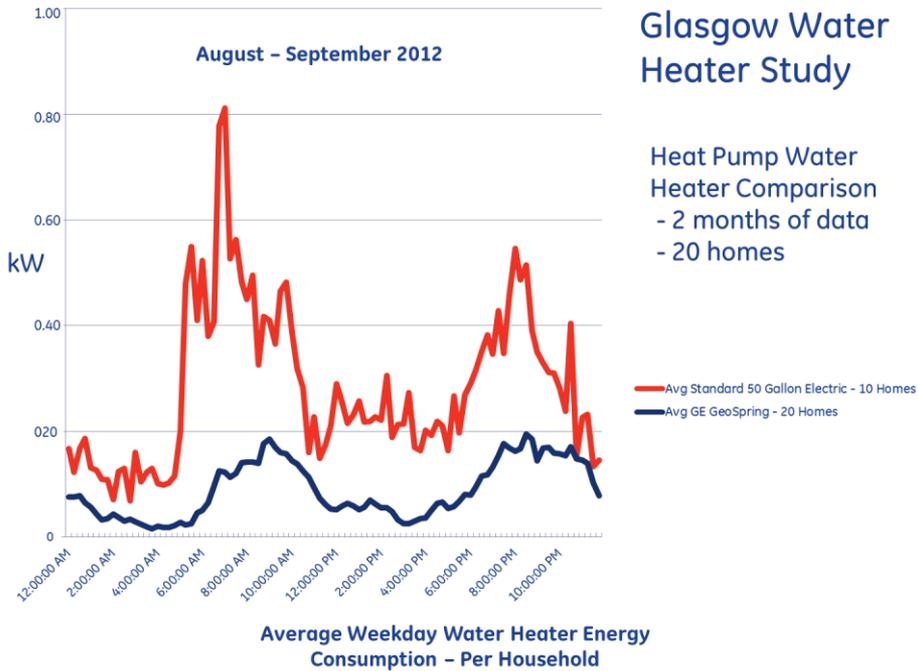


GE Home Energy System



Heat Pump Water Heating and Load Shift – AUG/SEP

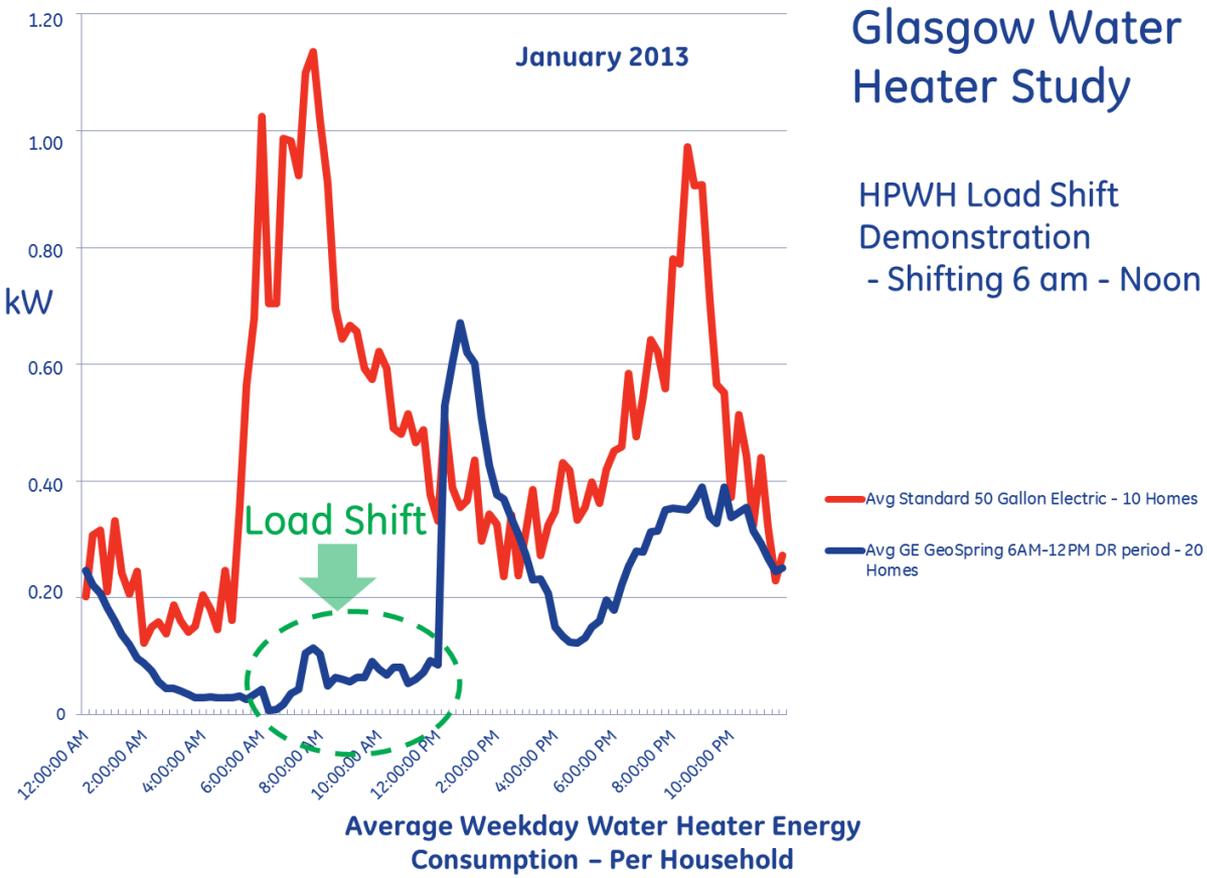
Examples of DR Application using web signaled HPWH



Impact of HPWH vs. Std Electric on Peaks and demonstrated Peak Load shift during months of August and September

Heat Pump Water Heating and Load Shift - JAN

Examples of DR Application using web signaled HPWH... Peak reduction & Peak shifting



Impact of HPWH vs. Std Electric on Peaks and demonstrated Peak Load shift during month of January

Glasgow Homes Energy Consumption Comparison Before & After

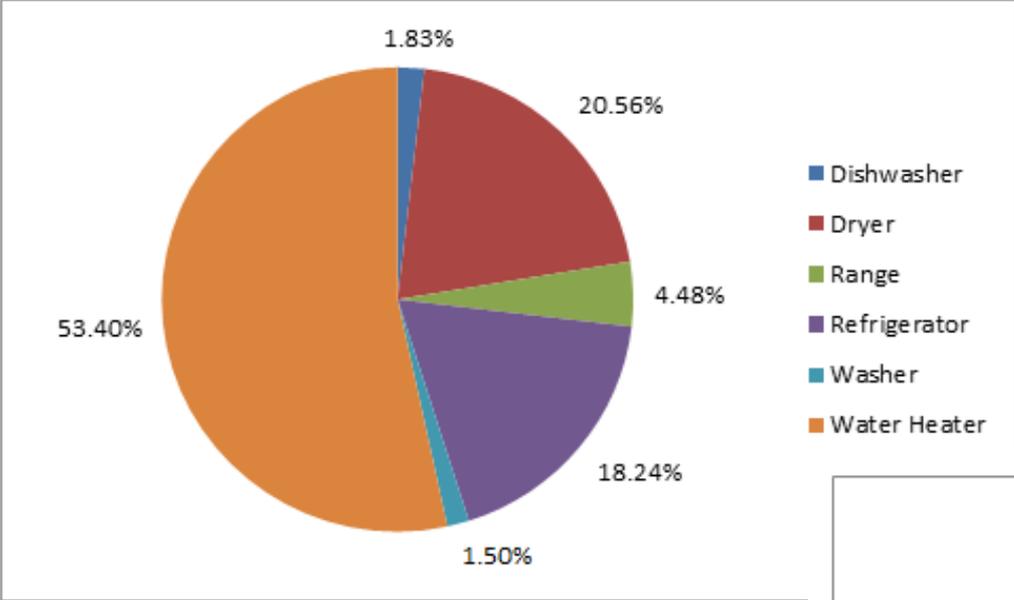


Fig. 4: Phase 1 Energy Consumption by Appliance

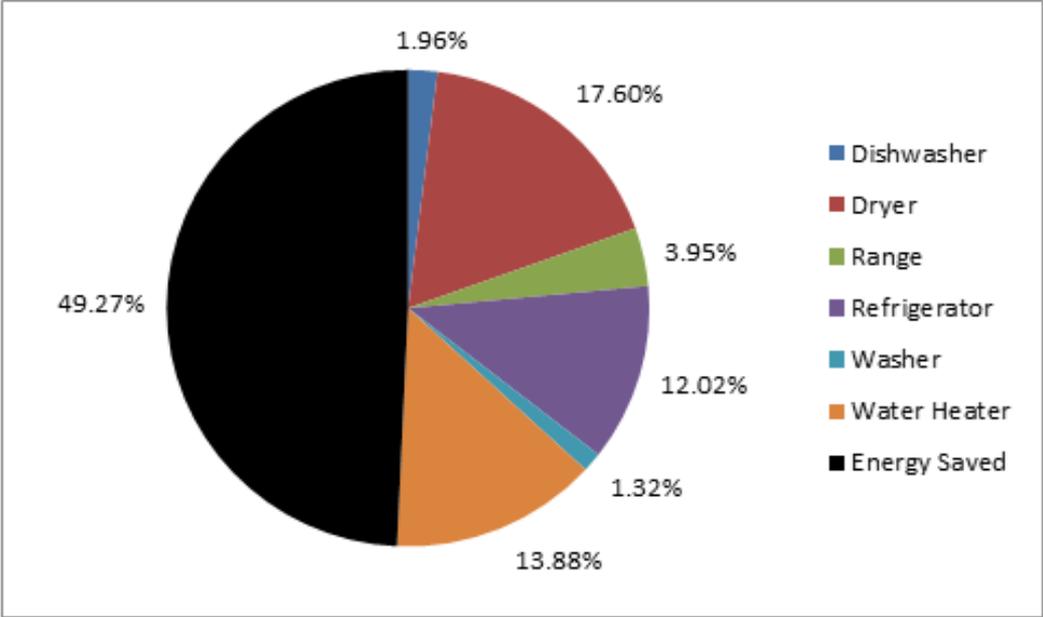


Fig. 5: Phase 2 Energy Consumption by Appliance

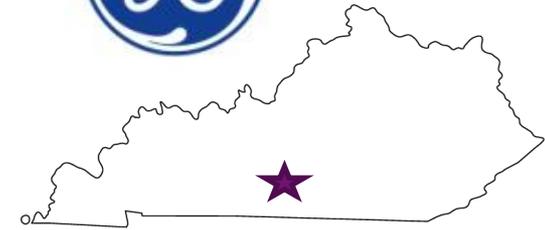
Glasgow Project

Results: Energy Star Appliance Effectiveness

- 20 Test homes experienced an average of 48% reduction in home appliance energy usage. (Washer/Dryer, refrigerator, dishwasher, electric water heater.)
- GE GeoSpring™ Heat Pump Water Heater provided over a 70% reduction in hot water energy consumption.

Results: Demand Response Acceptance

- Over a 30 week test period, with over 2800 load control reduction “requests” (20 homes, 5 appliances each home)
97 % of all reduction requests of Smart Appliances were accepted.
Only 3% of the load reduction requests were rejected by the test consumers.
- Less than 1% of GeoSpring Water heater load reduction requests were rejected.



Campbell Creek 2

Location: Knoxville, TN –Eastern Tennessee, pop. 180,000.

Background:

- Joint Project between GE Appliances, TVA and Oak Ridge National Lab.
- Project initiated Winter of 2013.

Goal:

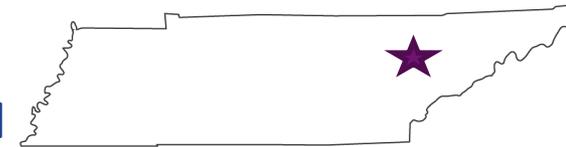
- Prove that Heat Pump water heaters can provide a key grid benefit by overnight high temperature storage of energy from renewable, nuclear or other energy sources.

Test Procedure:

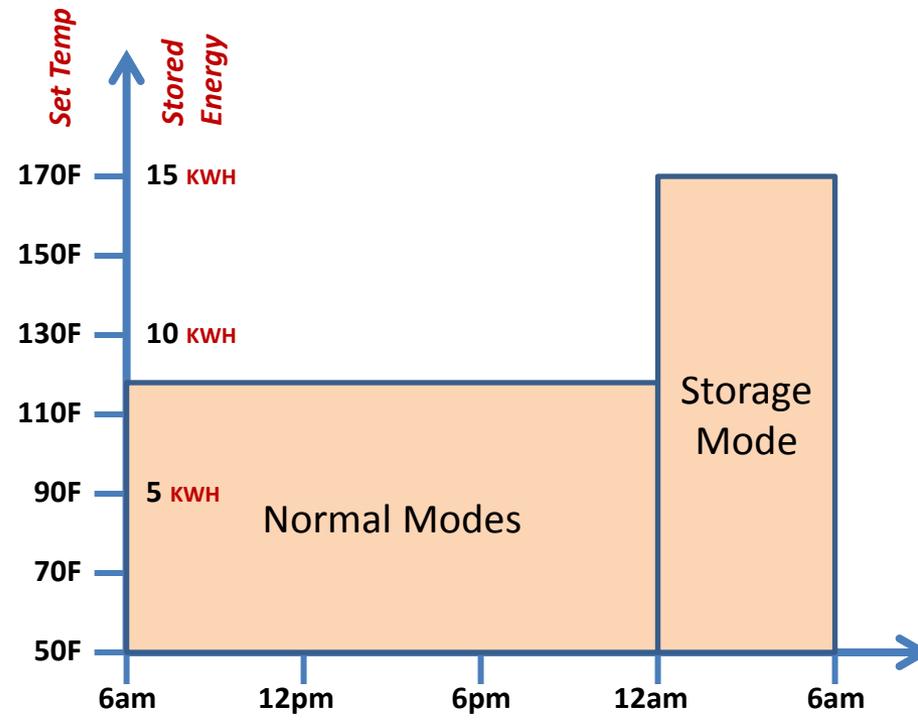
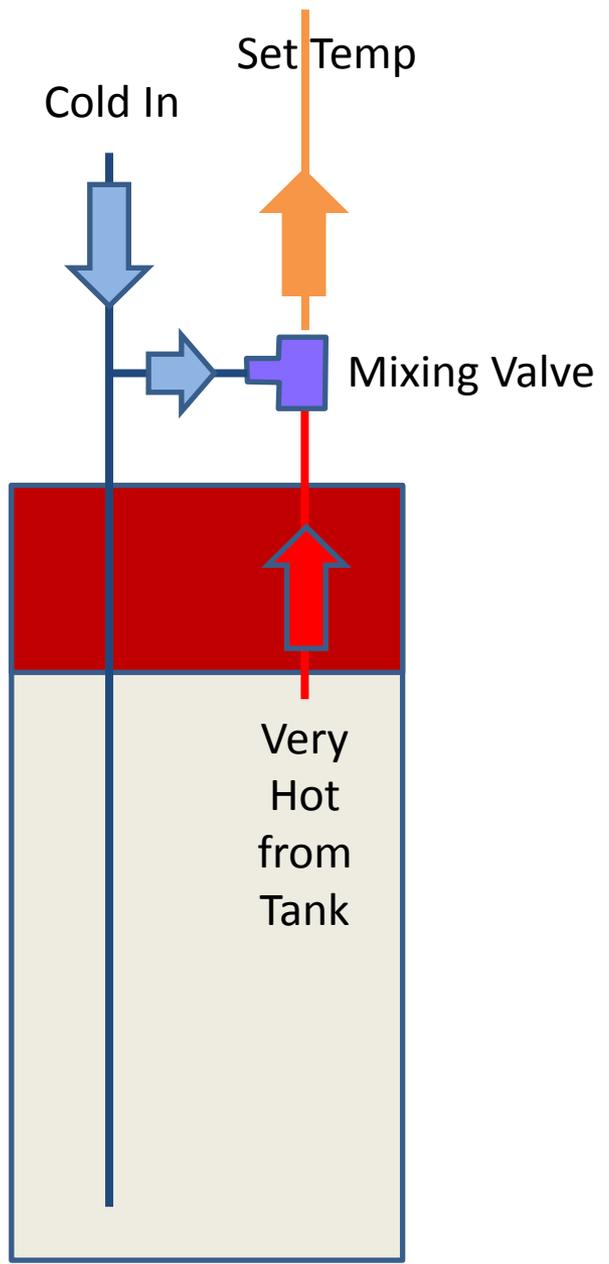
- 3 Test homes were set up with Smart GE GeoSpring™ heat pump water heaters with 170F hot water storage, and consumer scald protection.
- Test homes received energy storage requests from TVA via WiFi signals.

Results:

- Each test home proved capable of storing up to 5 kWh of off hour energy production for use during on-peak load periods at an EF exceeding 1.8.



Mixing Valve Operation



- Normal Modes
 - 100 – 140F
 - Heat Pump
 - Hybrid
 - High Demand
 - Electric
 - Vacation
- Storage Mode
 - 170F
 - Heat Pump or Electric Resistance

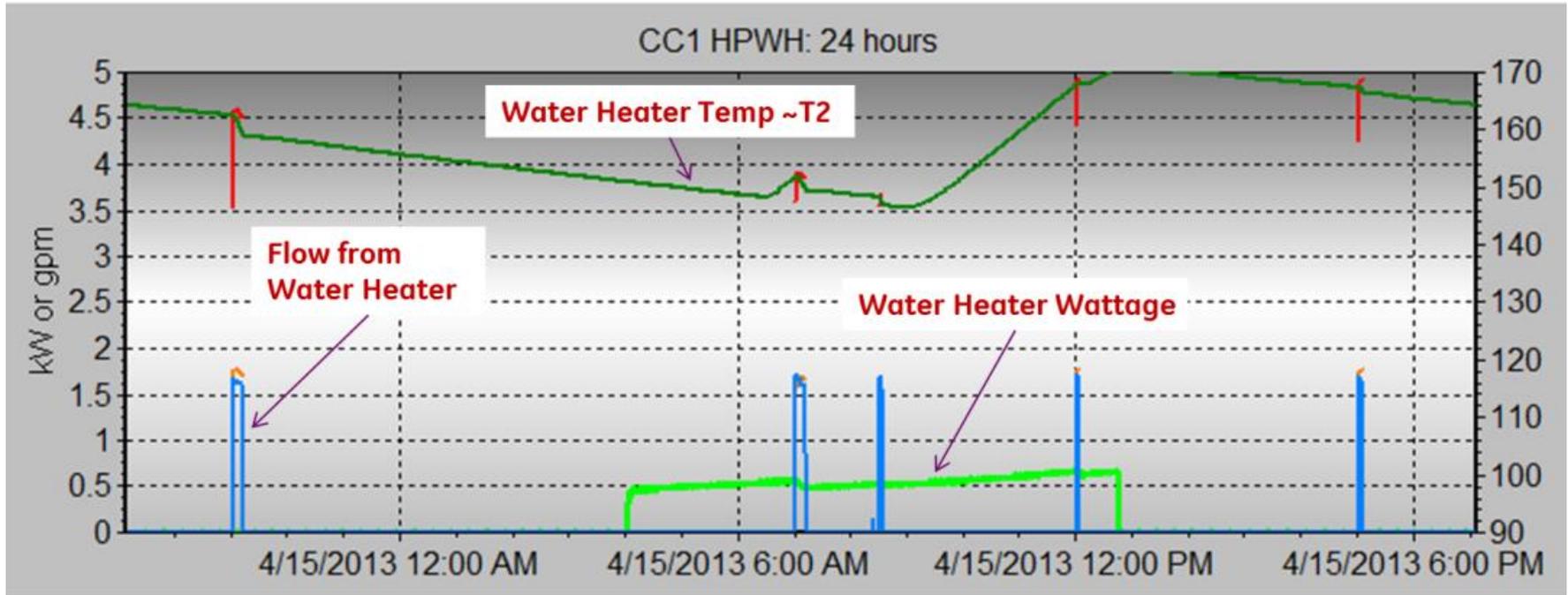


Scald Protection
Thermostatic Mixing Valve



Heat Pump Water Heating to 170F (no elements)

Examples of ETS Application using web signaled HPWH... Non-Laundry day



TVA/ORNL Campbell Creek House 1

- Heat Pump Mode Continuous with Set Point Schedule Changes as noted below

4AM - 170F

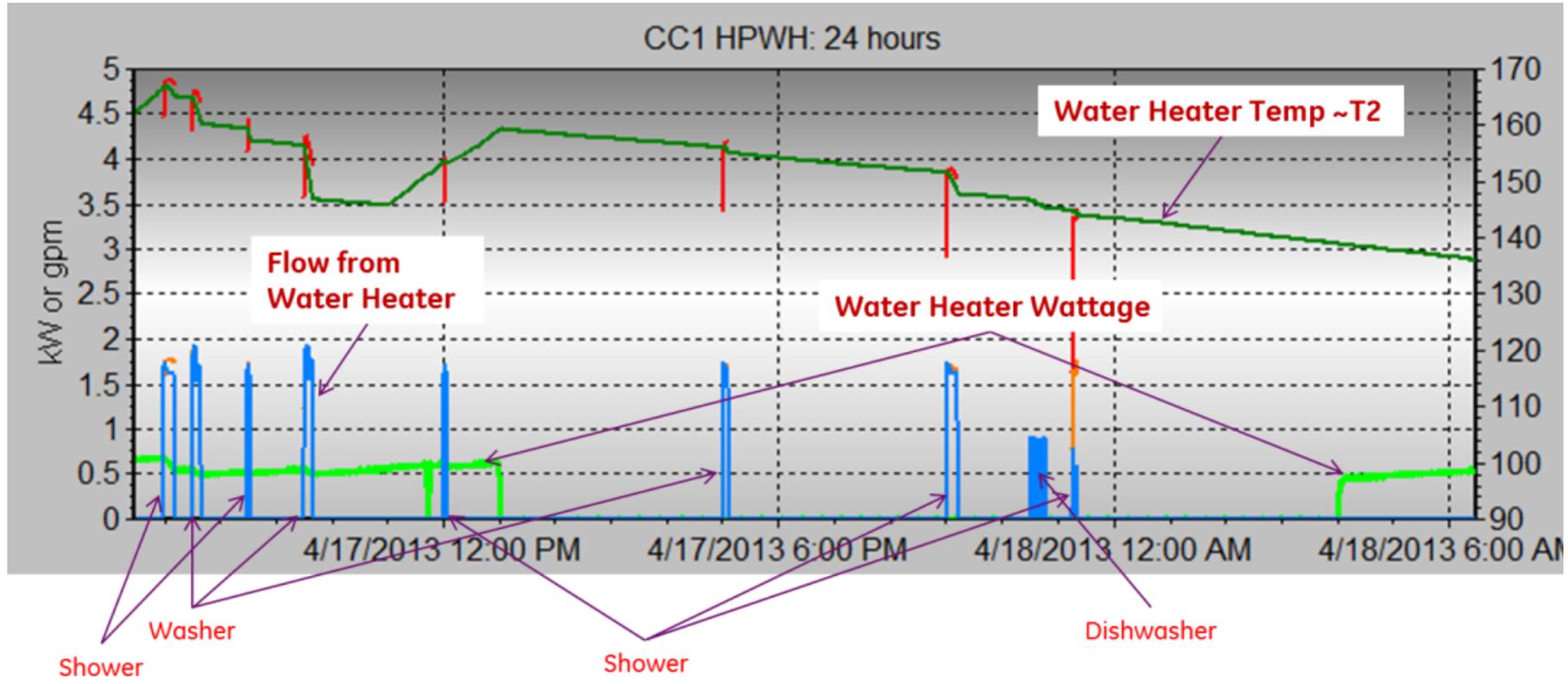
1PM - 120F

9PM - 140F



Heat Pump Water Heating to 170F (no elements)

Examples of ETS Application using web signaled HPWH... Laundry days



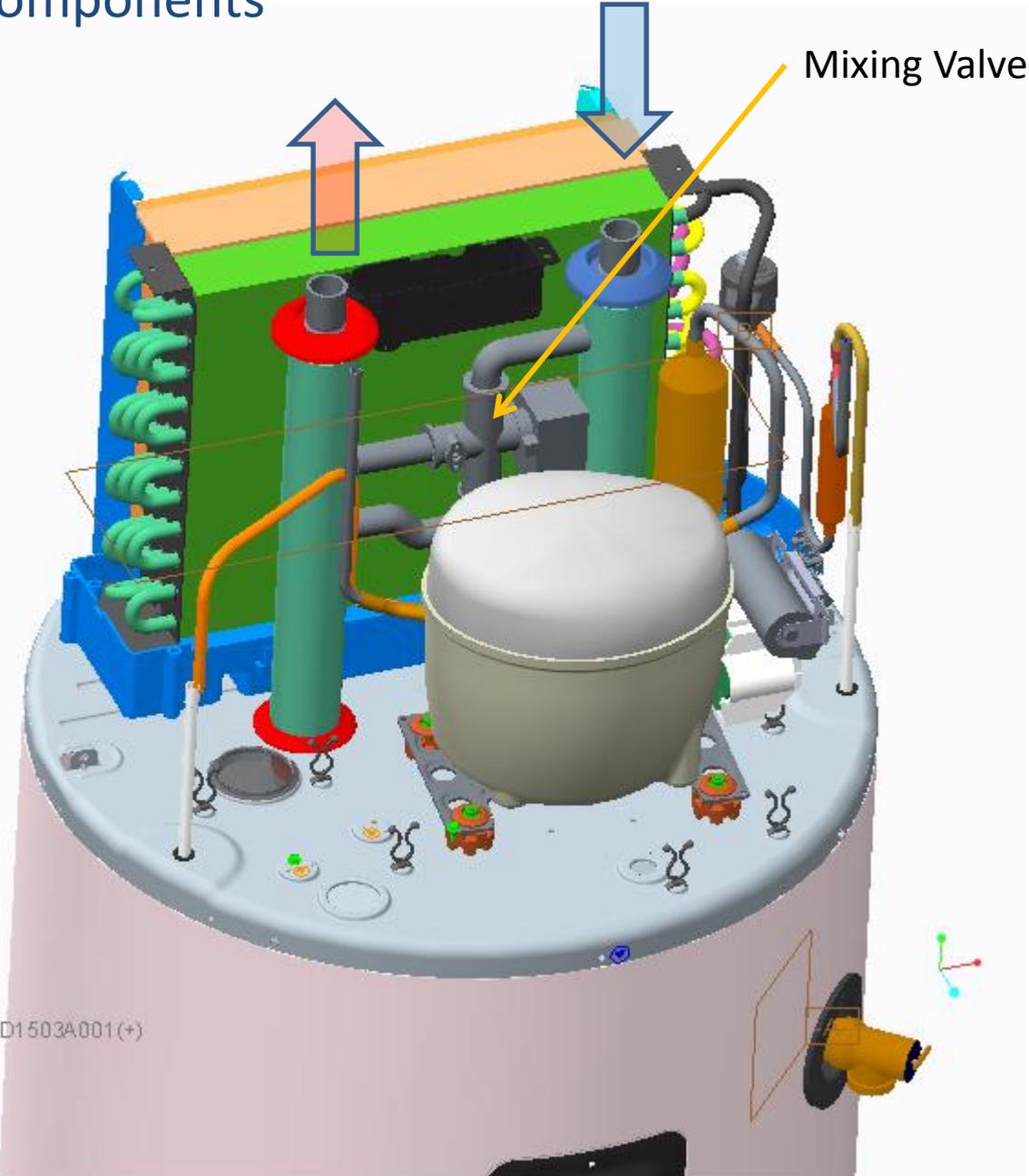
TVA/ORNL Campbell Creek House 1

- Heat Pump Mode Continuous with Set Point Schedule Changes as noted below

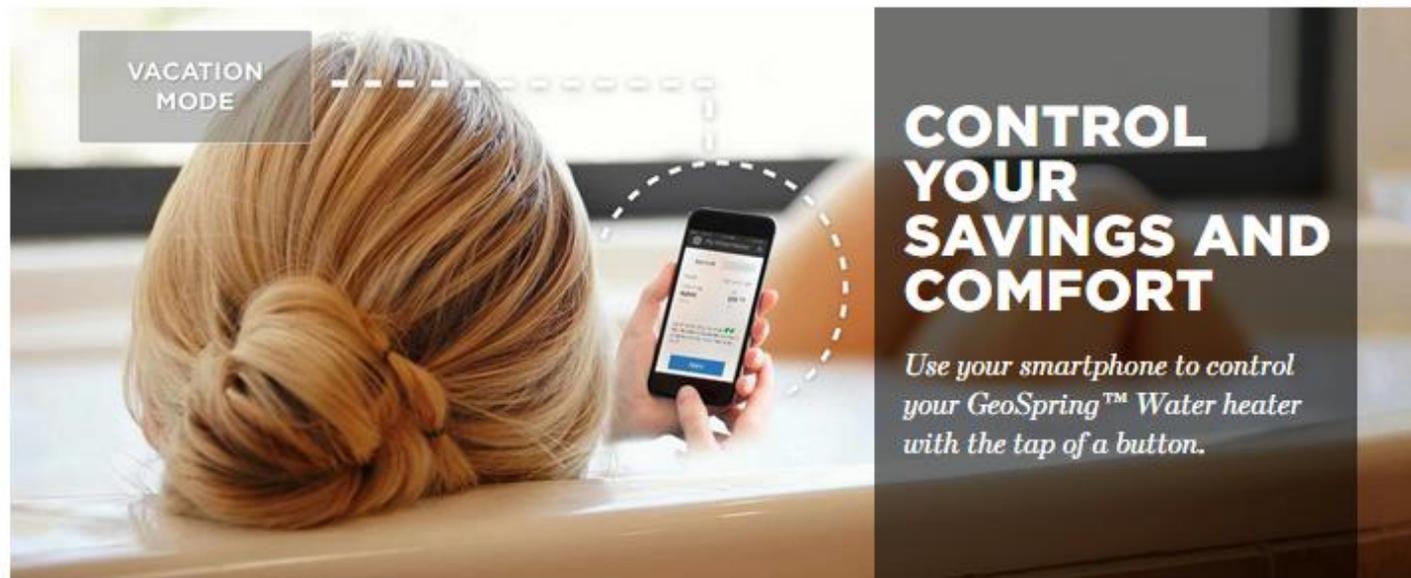
- 4AM - 170F
- 1PM - 120F
- 9PM - 140F



Basic Layout of Components



CONNECTED GEOSPRING™ WATER HEATER



GET PRECISE CONTROL OVER YOUR WATER HEATER FROM YOUR SMARTPHONE.

Get the hot water you want plus the cost savings you need. When you use the ConnectPlus module (purchased separately) with your GeoSpring®, you can control and monitor your water heater using the GeoSpring app on your smartphone.

With the GeoSpring app, you'll be able to:

- Change your water heater operating modes and temperatures
- Select vacation mode
- Receive maintenance alerts

Switch from Hybrid mode to Vacation mode with the tap of a button.

[SEE GEOSPRING WATER HEATERS](#)



**DOWNLOAD THE GEOSPRING APP
ONTO YOUR SMARTPHONE.**



**PLUG THE CONNECTPLUS INTO YOUR
WATER HEATER.**

Required for your water heater to
communicate with the GeoSpring app.

[More about ConnectPlus](#)



**OPEN THE APP AND CONNECT TO
YOUR WATER HEATER.**

WHAT YOU NEED



CONNECTPLUS ▶
PBX10W00Y0

\$49.00

ADD TO CART



GEOSPRING APP
FREE





Ways to Streamline Your Social Media

Recommended

DO Recipes

IF Recipes

if 

then 

Add a random #Wikipedia article to #Feedly every day to increase my knowledge

if 

then 

Add your latest iPhone screenshots to a Dropbox folder

if 

then 

Save my iOS photos to OneDrive (SkyDrive)

GE Appliances GeoSpring™ Channel

◀ All Channels



Let your water heater communicate with you, no matter where you are. [WiFi-enabled GeoSpring™ Hybrid Water Heaters from GE Appliances](#) can respond to your activities and send alerts to your devices.

Connect

Popular GE Appliances GeoSpring™ Recipes

if



then



GE APPLIANCES
GEOSPRING™

Every morning put the water heater in boost mode

by [geappliances](#)

2 👤 0 ❤️

if



then



GE APPLIANCES
GEOSPRING™

Put your water heater in vacation mode every weekend

by [geappliances](#)

1 👤 0 ❤️

if



then



GE APPLIANCES
GEOSPRING™

When your nest thermostat is set to away then put your water heater in vacation mode

by [geappliances](#)

0 👤 0 ❤️

if



then



Every morning put the water heater in boost mode

by [geappliances](#) 2 0

if



then



Put your water heater in vacation mode every weekend

by [geappliances](#) 1 0

if



then



When your nest thermostat is set to away then put your water heater in vacation mode

by [geappliances](#) 0 0

if



then



Get a push notification when your filter is dirty

by [geappliances](#) 0 0

if



then



Send a Pushover notification when your air filter is dirty

by [geappliances](#) 0 0

if



then



Get a push notification when your filter is dirty

by [geappliances](#) 0 0

if **then**

If water heater enters Boost mode, then send a notification.

by [geappliances](#)  0  0

if **then**

Every Monday morning put the water heater in Hybrid mode.

by [geappliances](#)  0  0

if **then**

Track your Heat Pump mode usage on Beeminder

by [geappliances](#)  0  0

if **then**

Put your water heater into vacation mode using Google Calendar events.

by [geappliances](#)  1  0

if **then**

Add an iOS reminder to clean your air filter.

by [geappliances](#)  1  0

DO 

Enter Hybrid mode

by [geappliances](#)  0  0

if



then



Set your water heater mode when you get home

by [geappliances](#)  0  0

if



then



Get an email reminder when it's time to change your air filter

by [geappliances](#)  0  0

if



then



If water heater enters vacation mode, then turn off the lights.

by [geappliances](#)  0  0

if



then



If water heater enters Hybrid mode, then send a notification.

by [geappliances](#)  0  0

if



then



If water heater enters Standard mode, then send a notification.

by [geappliances](#)  0  0

if



then



If water heater enters Heat Pump mode, then send a notification.

by [geappliances](#)  0  0

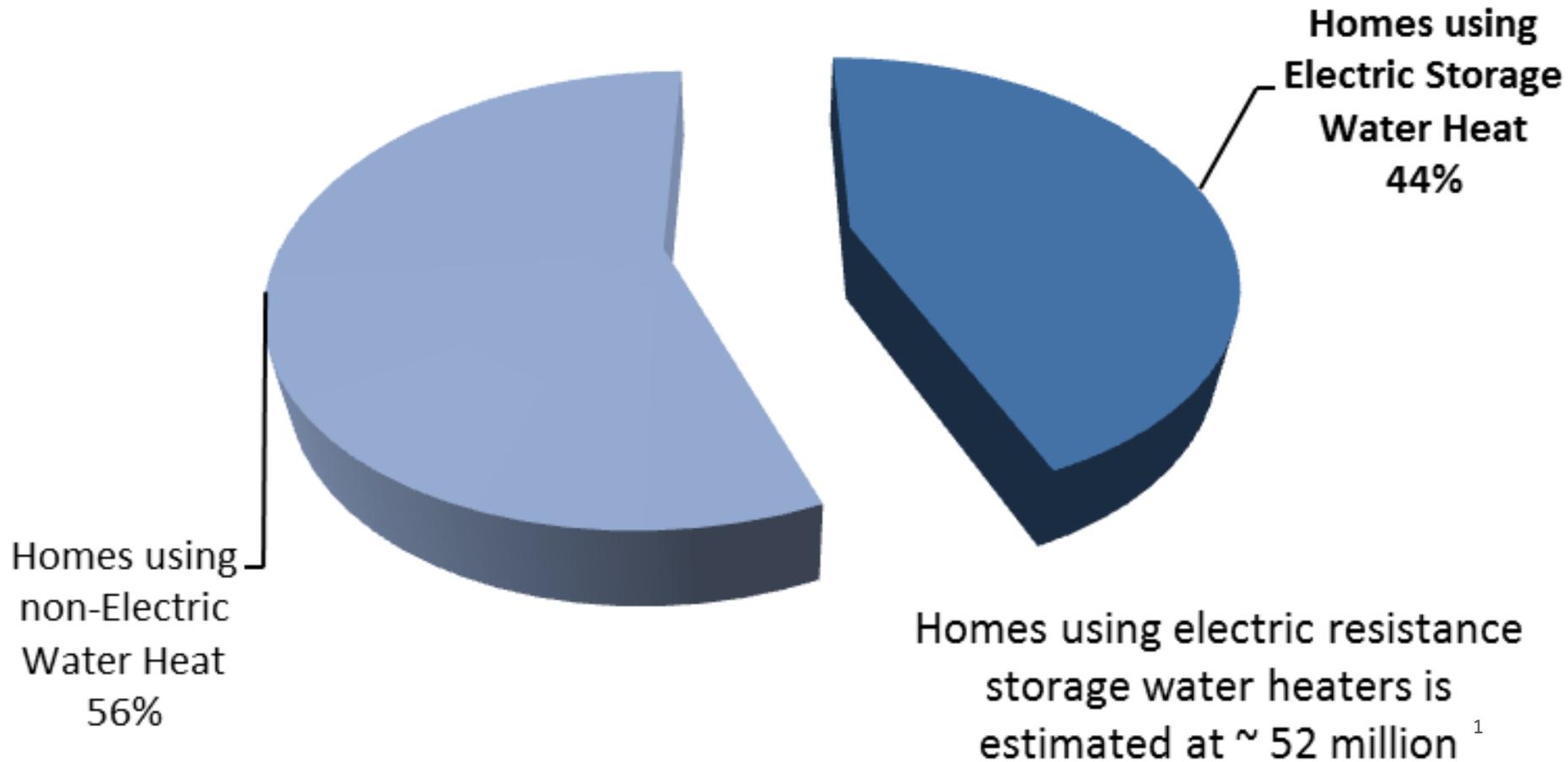


Change happens...



Water Heater Market Overview

Residential Water Heating Fuels



¹ Census Bureau MA335F(09)-1 & MA335F(10)-1

See tutorial regarding confidentiality disclosures. Delete if not needed.



GEOSPRING™ DUCTING KIT

GVK8HS



[Write a review](#)

\$ 199.00

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Call to Order 1-877-959-8688



1 of 4

