

## Heat Pump Water Heater

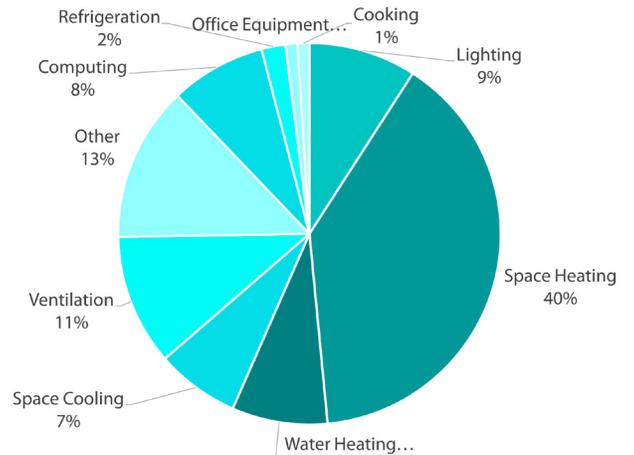
### A smart way of Heating Water

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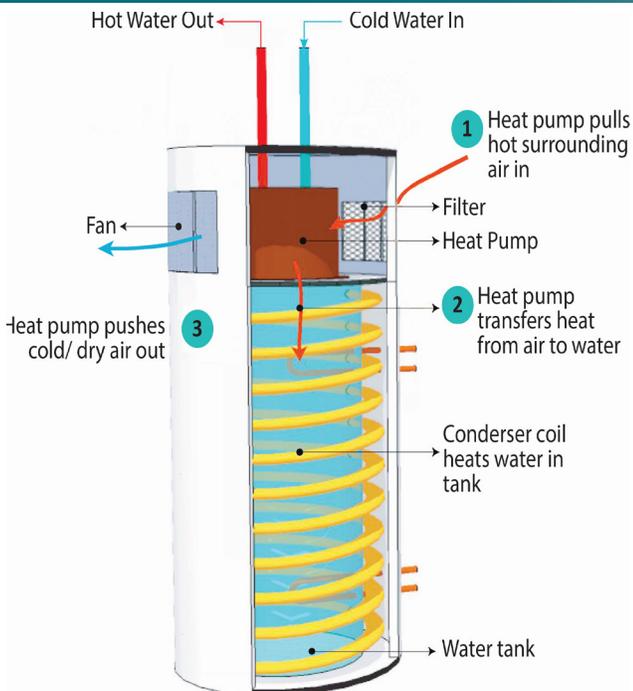
Every year U.S. colleges and universities spend almost 10% of their energy use on water heating (U.S. Energy Information Administration, 2016). By implementing energy efficient water heating technologies these institutions can realize great savings while significantly reducing their greenhouse gas emissions. This can be done without impacting the comfort or convenience of current water heating technologies.

Until about 10 years ago, the most cost-effective way to heat water was with a natural gas water heater. In the past 5-10 years heat pump technology has become more cost-effective. Since heat pumps simply transfer heat instead of generating it, they use less energy and produce far fewer pollutants. Heat pumps are a great solution for space and water heating.



**Energy Consumption at Higher Education Facilities**  
Source: U.S. Energy Information Administration, 2016

## What is a Heat Pump ?



**Heat Pump Water Heater, Components & Working Daigram**  
Image Credits: U.S. Department of Energy

Heat pumps are not new technology. Refrigerators and air conditioners are heat pumps that transfer heat one way out of an enclosed space leaving the space cooler. Heat pumps can reverse this process: moving outside heat into an enclosed space. Units that do this for water are called Heat Pump Water Heaters (HPWH).

The heat source for HPWH's can be either air, water, or the ground. Air-source HPWHs are the most common units, drawing heat from the air in the surrounding room. This summary focuses on air-source HPWHs.



## What are Benefits of Heat Pump System ?

**Energy Efficiency:** HPWHs use 70% less electricity than conventional electric and 85% less energy than conventional gas water heaters.

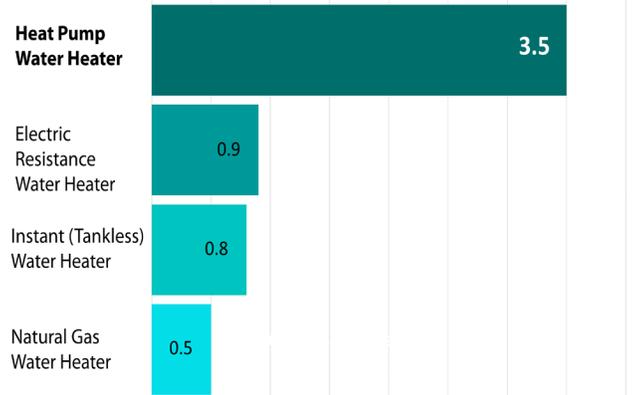
**Space Savings:** As HPWHs do not need venting for combustion, they take up less space than comparable gas units.

**Environmental Benefits:** Heat pumps require less input energy to make the same output, which conserves resources and reduces greenhouse gas emissions.

**Health and Safety:** Heat pumps are safe and reliable requiring less frequent maintenance. They are also easy to install because they do not require venting to remove exhaust gases. Additionally, the risks of indoor combustion fumes like carbon monoxide and CO<sub>2</sub> are eliminated.

**Supplemental Cooling:** As HPWHs draw heat from the air around them, they can provide supplemental cooling to mechanical or electrical rooms, reducing the size and cost of supplemental cooling units for these spaces.

Efficiency of different Water Heaters



**Coefficient of Performance**  
A measure of energy efficiency  
(Higher value = Greater efficiency)

Reference: [CleanTechnica](#)

## What is available in the Market ?

- HPWH are commercially available in a wide range of sizes (from 12 kW to 650 kW). This allows designers to select high efficiency units for small residential up to very large commercial projects.
- HPWHs can provide hot water up to 150° F, and can operate in ambient temperatures between 40° F -140° F.
- Stay tuned for HPWHs that replace existing refrigerants with CO<sub>2</sub> (R744). These HPWHs provide hot water up to 170° F at even higher efficiency. They are new to U.S. markets, and options are still limited. As CO<sub>2</sub> HPWHs become more widely available, designers will have more options for environmentally friendly water heating systems.

### How much can you save?

A college with 250,000 square feet of building space could save \$20,000 per year in energy costs. Many electric utility companies in Illinois provide incentives and rebates for the installation of HPWHs. Converting all electric water heaters to HPWH could save American consumers \$7.8 billion in energy costs and 140 billion pounds in greenhouse gas emission annually.

## Who we are

The Smart Energy Design Assistance Center assists buildings and communities in achieving energy efficiency, saving money, improving indoor air quality, and becoming more sustainable. SEDAC is an applied research program at the University of Illinois at Urbana-Champaign. SEDAC services to save energy and money include:

Quick Advice | Energy Assessments | New Construction Design Assistance | Long-term Climate Action Planning | Retro-Commissioning

