



ENERGY STAR[®] Emerging Technology Award:

Air to Water Heat Pumps

ENERGY STAR Products Labeling Program



The ENERGY STAR Emerging Technology Award

Launched in 2011 to raise the profile of innovative technologies that have the potential to significantly reduce greenhouse gas emissions once more widely adopted

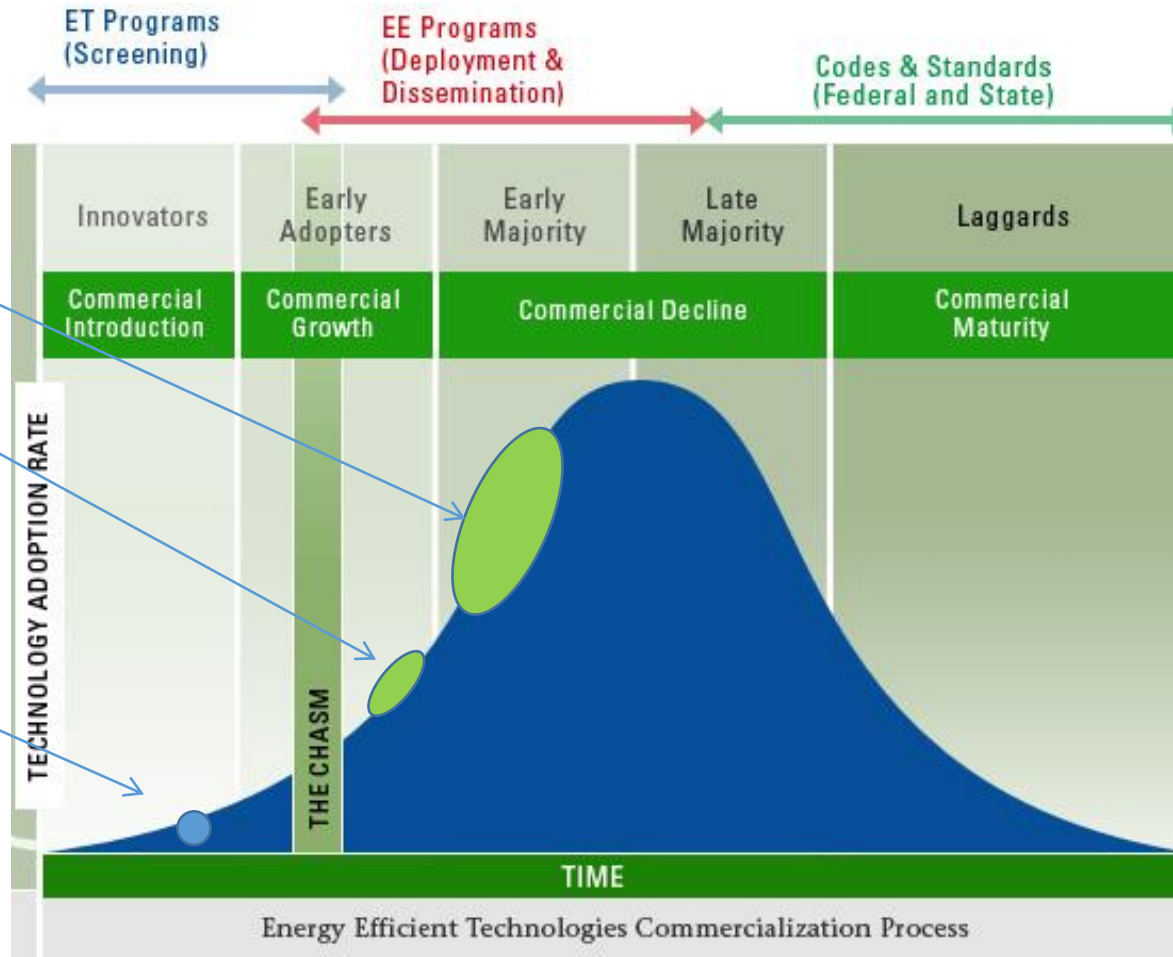
- 1-2 product categories annually
 - may not yet meet key principles associated with categories eligible for ENERGY STAR label, or
 - may be relatively complex to properly install and operate
- Products must be
 - Commercially available from more than one reputable supplier
 - Likely to lead to significant GHG reductions; no other harms

The Role of Emerging Tech

ENERGY STAR

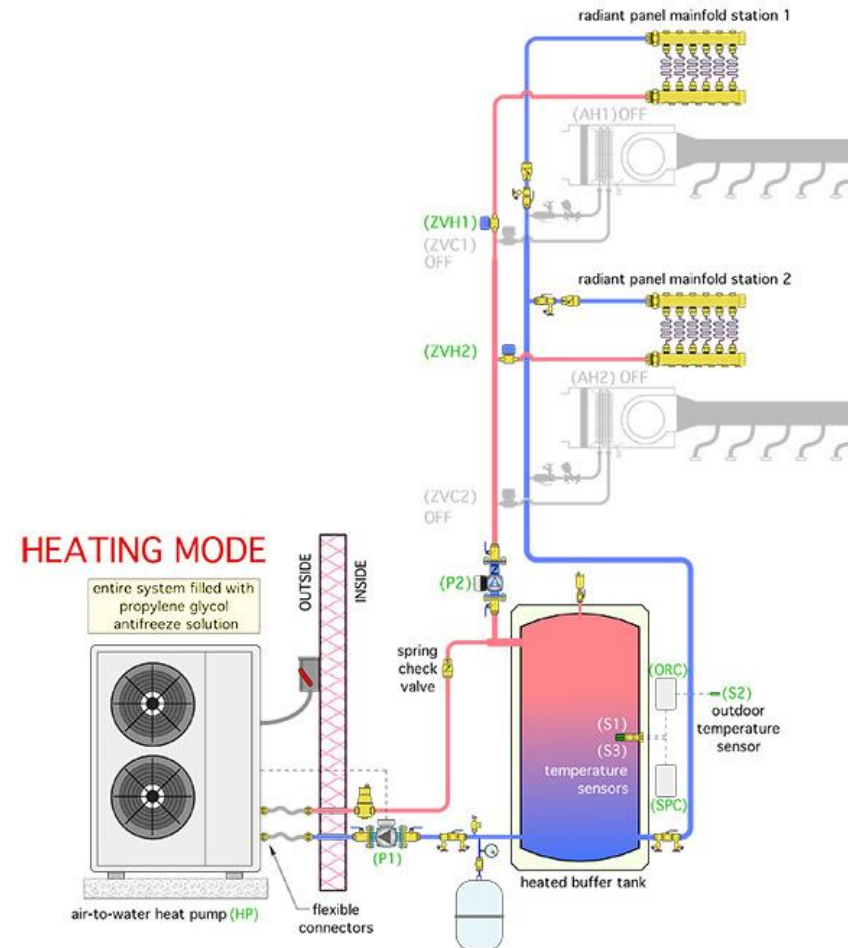
**ENERGY STAR
Most Efficient**

**Emerging Tech: The
Chasm**



Air-to-Water (ATW) Heat Pumps

- ATW heat pumps transfer heat from outside air using water or a mix of water and glycol, and transport heat into a home to provide **space heating** through hydronic distribution
- These systems can also be used in a cooling mode creating chilled fluid and running it through an air coil to distribute **air conditioning**
- Compared to a typical gas condensing boiler system, ATW heat pumps can offer **energy savings up to 47%** with a seasonal Coefficient of Performance (COP) of 1.7 - 3.0.



Source: Heating, Plumbing, and Air Conditioning (HPAC) Magazine

ATW Heat Pumps

- ATW systems also demonstrate superior performance at low outdoor temperatures when compared with *traditional* air source heat pumps
 - Like ccASHP, appropriate for use in cold regions (and elsewhere).
- They can also :
 - With a storage tank, **provide homeowners with efficient domestic water heating**, eliminating the need for a separate water heater
 - All fans are located outside the home, **providing quiet operation**
 - **Allows a retrofit to provide cooling** in hydronically-heated homes, without running extensive ducts through the home.
- Market Size*:
 - Global market of 1.8M units/year
 - Europe ~250k units in 2016, China about 1M per year
 - Brand new market in US/North America

Installed Residential Boilers

- Natural Gas Steam & Hot Water Heating:
 - New England and Mid Atlantic Regions – 3.9 million housing units
 - Total U.S. – 6.6 million housing units
- Fuel Oil Steam & Hot Water Heating:
 - New England and Mid Atlantic Regions – 1.6 million housing units
 - Total U.S. – 1.7 million housing units

DOE Boiler Shipments

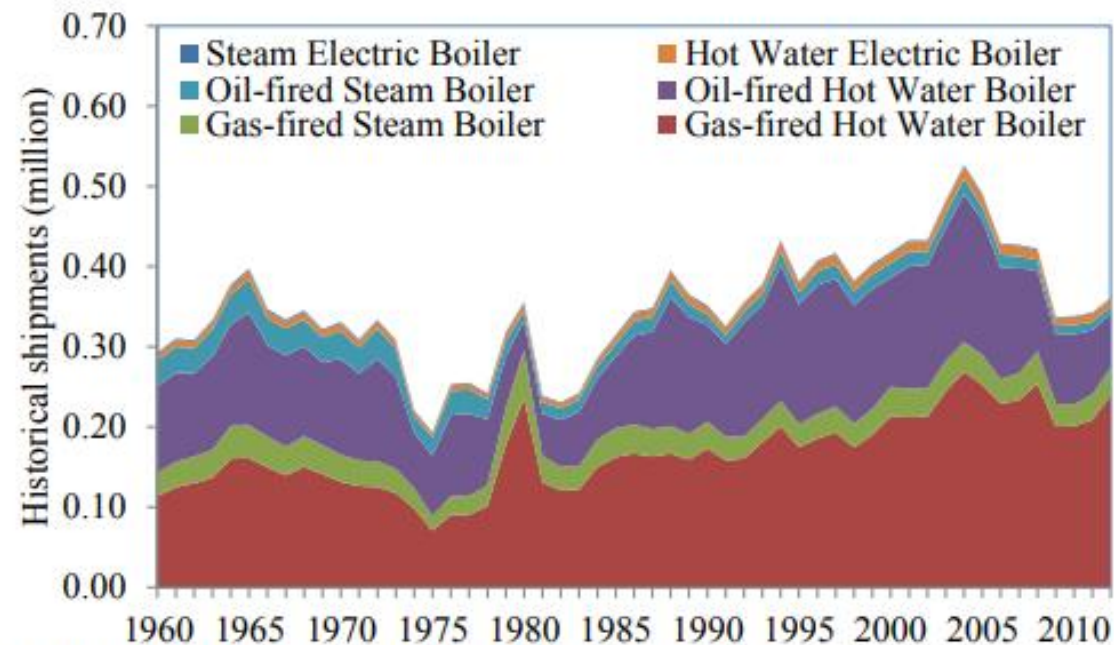


Figure 3.2.6 Historical Shipments of Residential Boilers

Source: TECHNICAL SUPPORT DOCUMENT: ENERGY EFFICIENCY PROGRAM FOR CONSUMER PRODUCTS AND COMMERCIAL AND INDUSTRIAL EQUIPMENT: RESIDENTIAL BOILERS. March 12, 2015

ENERGY STAR 2019 Emerging Technology Award: ATW Heat Pumps

Criteria

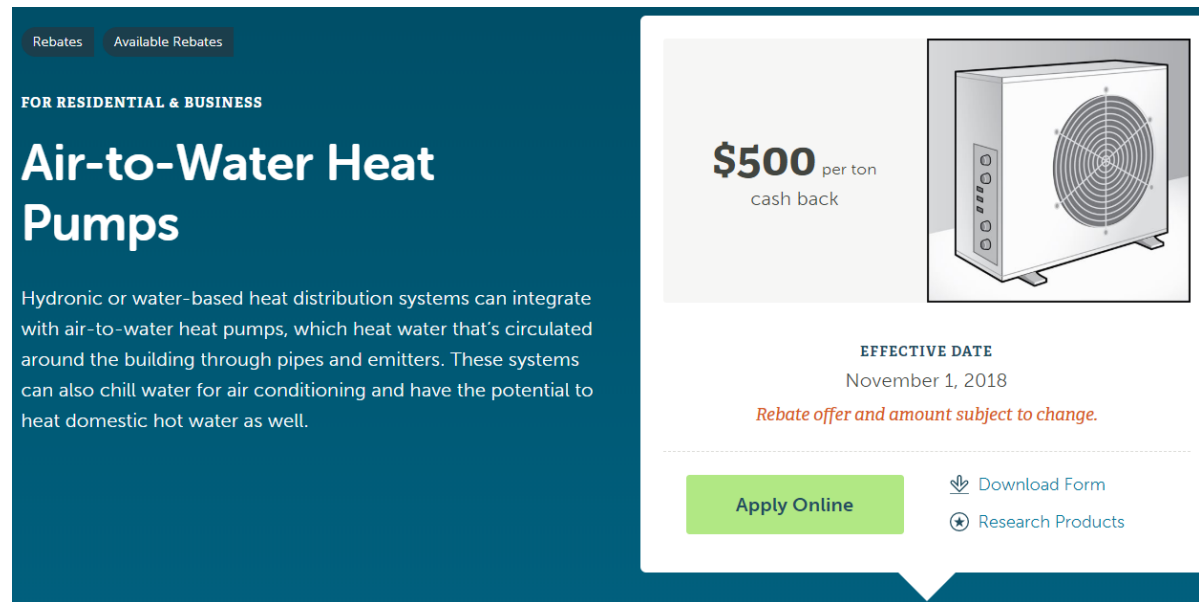
**ENERGY STAR® 2019 Emerging Technology Award Requirements:
Air-to-Water Heat Pumps¹ with a Rated Cooling Capacity < 65,000 Btu/h**

Performance Metric	Criteria	Test Method/Required Documentation
Air-to-Water Heat Pump Performance		
Energy Efficiency Requirements	Heating Coefficient of Performance (COP _H) shall be ≥ 1.7 at full load capacity and the following conditions: <ul style="list-style-type: none"> • Dry bulb air temperature of 5°F • Leaving water temperature of 110°F COP _H and capacity (in BTUs) will be reported	AHRI Standard 550/590 2018 Standard for Performance Rating of Water-chilling and Heat Pump Water-heating Packages Using the Vapor Compression Cycle
Reporting Requirements	COP _H and capacity (in BTUs) at air temperature of 47°F dry bulb, 43°F wet bulb, and a leaving water temperature of 105°F	
	COP _H and capacity (in BTUs) at air temperature of 17°F dry bulb, 15°F wet bulb, and a leaving water temperature of 105°F	
	Integrated Part-Load Value (IPLV) to be reported if the heat pump is capable of providing space cooling	
	Refrigerant type used	
Energy measurements must be performed at an ISO/IEC 17025 accredited lab ²		
Warranty Minimum	One year on compressor and all other parts	Copy of warranty agreement
Certification	Must meet all applicable U.S. electrical safety requirements	Copy of case files
Additional Company Requirements		
Product Commercial Status	This Award is only granted to products that are available for sale in the U.S. Products must meet one of the following criteria: 1) available for sale at multiple supplier locations, <i>or</i> 2) have commercial orders pending and firm plans to sell products to customers within 3 months of the Award application date.	

- EPA announced the 2019 Emerging Technology Award category in March
- No awarded products yet but EPA expects several this summer

Incentivizing ATW Heat Pumps

- Efficiency Vermont offering a [\\$500 rebate](#) for ATW heat pumps that meet a minimum COP



The screenshot displays a webpage for rebates. At the top, there are tabs for 'Rebates' and 'Available Rebates'. Below this, it specifies 'FOR RESIDENTIAL & BUSINESS'. The main heading is 'Air-to-Water Heat Pumps'. A descriptive paragraph explains that hydronic or water-based heat distribution systems can integrate with air-to-water heat pumps, which heat water circulated around the building through pipes and emitters, and can also chill water for air conditioning and heat domestic hot water. To the right, a large graphic shows '\$500 per ton cash back' next to an illustration of an air-to-water heat pump unit. Below the graphic, the 'EFFECTIVE DATE' is listed as 'November 1, 2018', with a note that the 'Rebate offer and amount subject to change.' At the bottom, there are three buttons: 'Apply Online' (a green button), 'Download Form' (with a download icon), and 'Research Products' (with a star icon).

- As this market grows, more incentives are expected from utilities and state/local organizations

For more information on ATW heat pumps, visit
[https://www.energystar.gov/about/awards/2019 air-to-water heat pumps](https://www.energystar.gov/about/awards/2019_air-to-water_heat_pumps)

If you have any question about the Emerging Technology Award,
visit:

www.energystar.gov/emergingtech

Or email us at:

EmergingTech@energystar.gov



Criteria to be Eligible

- Commercially available, but not widely adopted (<5% market share)
- Offered by more than one supplier
- Third party-verified
- Likely to significantly reduce greenhouse gases at competitive costs
- Environmentally acceptable
- Supported by partners who are adequately financed with established business records
- Well matched to EPA/ENERGY STAR competencies and appropriate roles