**Building Science Education Solution Center -** **The Business Case for Heat Pump Water Heaters**

**Proficiency Level 2:** Understand

# Learning Objective 2.1:

* Explain Heat Pump Water Heater current trends, market potential, and customer segments

# Lecture Notes 2.1:

***Growing Market Potential***  
The introduction of heat pumps into the water heater market is disrupting many of the existing installer business models that are based on a bid over the phone process that emphasizes like-for-like replacement. The decision to replace existing water heaters used to be a straightforward decision – simply replace the older tank with a newer model. Most upgrades consisted of going from a storage tank to a tankless system. However, today’s market is more complex to navigate. The market now includes energy efficient heat pump water heaters, incentives, tax credits and customers motivated by the desire to limit their carbon footprint.

***How HPWHs Operate***  
The average household may already have multiple types of heat pumps. Refrigerators, freezers, central and window mount air conditioners all use the same basic technology as heat pumps. Simply put, heat pumps move heat energy from one place to another. In the case of air conditioners, the heat energy is moved from where it's not wanted (inside the house) to outside the house. In the case of refrigerators, heat energy is moved from the inside of the refrigerator to outside the refrigerator. Heat pump water heaters remove heat from the surrounding areas and move it to the water inside the tank.

***Customer Segments***  
Now let’s consider the different customer segments that are more likely to invest in higher-cost equipment. This changing marketplace presents a business opportunity for installers to increase their market share while maintaining the level of profit margin. Like any product, HPWHs are not the best product for every installation. This training will help those contractors wishing to diversify their water heater options identify when HPWHs are a good fit for homeowners AND the contractor’s bottom line.

The Northwest Energy Efficiency Alliance (NEEA), a utility-sponsored nonprofit organization, has been interviewing purchasers of HPWHs for the last 5 years to better understand consumer decision making behind their purchase of a heat pump water heater. At a high level, the top six reasons are:

* Customers motivated by environmentally minded reasons
* Customers already having a heat pump for space conditioning in their home
* Customers undergoing remodels and re-piping
* Customers interested in long term savings
* Customers interested in the availability of tax credits and utility incentives
* Customers that seek out smart devices and are tech savvy

***Key Differences***  
While installing HPWHs in sites that meet the volumetric requirements is very similar to installing other types of storage water heaters, there are some key differences that you’ll need to consider. The primary considerations include electrical requirements and condensate management. The next slides will go into detail on these topics. In addition, there are some more subtle differences to take into account in order to achieve high levels of customer satisfaction. Heat pump water heaters generate a low-level noise while operating, and they also exhaust cooler than room temperature air that can lead to comfort complaints if not dealt with properly.

# Problem Set 2.1:

1. Potential HPWH customers may have a variety of motivations. Please list 3.
2. What are some of the possible differences between installing a HPWH and a standard tank type water heater:

# Learning Objective 2.2:

* Identify installation scenarios and best practices

# Lecture Notes 2.2:

***Installation Scenarios***  
There are two primary install scenarios for heat pump water heaters. These are when replacing standard electric storage tank water heaters and/or existing gas water heaters with HPWHs. The electric-to-electric scenario tends to be a more standard replacement and install since it does not involve providing new electrical connections. Converting from a gas water heater to a HPWH can be more difficult as it may involve electrical upgrades and gas flue reconfiguration.

Of course, there are other factors that will influence the installation of any water heater – such as sizing and locations – while some may be particular to heat pump water heaters. These HPWH-specific factors include the previously mentioned electrical requirements and condensate disposal, as well as considering that when the manufacturer’s minimum volumetric requirements are not met, ducting and or venting of the space containing the water heater may be needed. The volumetric requirement is the minimum cubic feet of surrounding space in which the tank can efficiently operate. You will find that each model clearly details this information in the installation manual for that model. These requirements range from 450 cubic feet to 700 cubic feet. It is recommended that installers new to the installation of heat pump water heaters focus on installs that meet the volumetric requirement before tackling more complicated installations that require ducting and or venting. Garage and open basement installations typically meet these requirements.

***Electrical Considerations***  
Currently, most new homes have an electrical service of 200A. However, many older homes may have electrical service of less than 100A. Since the power needed for a 240-volt HPWH must be adequate for both the heat pump system and the backup electrical resistance element, either 25 or 30 amps are required for the units. If a standard electric water heater is replaced with a HPWH, this will not be an issue. 120-volt models typically require a 15-amp breaker.

***Gas to Electric Conversions***  
Converting from gas water heaters to HPWHs often requires some wait time for an electrician to schedule and complete an electrical upgrade. This will not solve the immediate problem of the customer wanting hot water today. Companies that specialize in HPWH sales have formulated workarounds to solve this problem. They include a loaner gas water heater that is removed when the HPWH is installed, or a 120-volt HPWH that can be plugged into an appropriate outlet. One permanent solution is, if circumstances allow, to permanently install a 120-volt HPWH.

Talk to your electrician about using smart breakers and/or smart splitters. These devices allow appliances to use and share the same circuit and may present a less expensive upgrade.

***120-Volt Models***  
120-volt models can be ideal when replacing gas water heaters since they may not require electrical upgrades. 120-volt HWPH models only have the heat pump system, and do not have the additional resistance heater found in 240-volt models. These units, sometimes called plug-in HPWHs, are equipped with a standard three prong plug. The water heaters must not use extension cords and the outlet utilized must be grounded. Depending on the model, it may require a dedicated circuit, while other models can be used on a shared circuit.

***C******ondensate Management***  
The creation of condensate is a standard part of HPWH operation and should be addressed accordingly when installing a HPWH. To address condensation, a floor or sink drain can be used. Unlike the condensate produced by condensing furnaces and water heaters, the condensate is not acidic, so neutralizers are not required. If close to a condensate pump that serves an existing central AC unit, in most cases that condensate pump can manage the extra load produced by the HPWH. In many cases the condensate can be run to the outside. It is important to keep the condensate as sloped and as straight as possible.

Remember: Gravity is your friend.

**Problem Set 2.2:**

1. What additional steps are needed if the location of the HPWH is less than the required minimum volume?
2. What are locations that typically do not require venting or ducting
3. What options does an installer have when converting from a gas water heater to an HPWH to get same day hot water if electrical upgrades may cause a delay?