

WAC 480-109 DOCKET UE-131723

WRITTEN COMMENTS

HEAT PUMP WATER HEATERS IN THE PACIFIC N.W.

Heat pump water heaters have a significant potential in reducing resident and commercial electric consumption where water is presently heated using resistance electrical energy. Studies show that about 20-25% of residential energy consumption is used to heat water. Electricity and natural gas supply the bulk of this energy. Oil, LPG, and solid fuel heaters have a minor role.

The efficiency of electric water heating can only be improved by using a heat pump. There are no other options other than storage tank and pipe insulation. Point of use electric water heaters (instantaneous style) can reduce tank and pipe thermal loss but can also increase the peaking requirements for the utility.

Most electric utilities tolerate point of use heaters but do not encourage them. My personal opinion is they should not be allowed (even though I have 2 bathrooms each with a 12 KW instant heater in my house). Lack of residential demand charges have made these attractive to the owner.

A widely accepted rule of thumb for average heat pump efficiency in this (Puget Sound) region is 2 BTU out for every BTU in for air to air heat pumps. Water to water style, or air to water style, can be somewhat better than the depending on water temperature but are more expensive to install.

TODAYS HPWH MARKET

There are about 10 unitary HPWH that are NEEA approved (eligible for rebate from the utility co.) These are compact air to water units build to look like and fit into a conventional water heater space. Typical output is about 10,000 to 15,000 BTU per hour. They discharge cold evaporator air into the surrounding environment. A couple of the brands have made a duct kit available to carry the cold air outside. While solving one problem this creates another! This exhausting adds to the negative pressure problem that already effects many structures.

In parts of the country where structure cooling is predominate these unitary units work well. However, their compact design makes repair difficult and

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they are essentially plug, play, and throw away to the tune of about \$2000. every time. Good for the manufacture but poor for the consumer.

Split systems are a better choice for the Pacific NW but none are available or NEEA approved. There is a couple of models made in China, one in Australia, Europe and South Africa. These split systems generally use a conventional storage tank with gas or electric back-up. A conventional storage tank instead of a integral storage tank is more economically maintainable but less compact than the unitary style.

There are also some up sized systems that provide hydronic heat in addition to hot water. There are no domestic manufacturers of these systems for residential applications though some domestic companies do custom commercial systems.

A major issue (installation cost) of split systems is the refrigerant piping connecting the evaporator to the condenser. Some cost saving variations include putting both condenser and evaporator outside and piping only hot and cold water through the wall. With this arrangement the refrigerant loop can be factory filled and sealed like in a unitary system. Another variation is putting the compressor and condenser inside and only the evaporator outside. The structure gets a significant heat gain from the compressor/condenser losses but the compressor noise may need addressing.

Another significant variation is to not use a reversing valve but defrost by directly heating the iced up evaporator coil with electricity. Defrosting is an important issue, and costly too. A large evaporator heat exchanger and liberal air flow will minimize the need for defrost but not eliminate it.

## FEDERAL REGULATION

In 2015 Federal Regulation are scheduled to go into effect requiring that all Hot water tanks over 50 gallons must meet the new efficiency standards. The only way you can meet this standard on an electric tank is with a HPWH. It will be interesting to see how this plays out. I see all kinds of problems ahead as well as opportunities.

## HPWH HAVE NO TRADITIONAL HOME

Heat pumps have belonged to the HVAC people since the early 1970's when

they first came into wide use because their first applications were cooling applications. Water heaters have traditionally been handled by plumbers .

Things haven't changed much. This has left HPWH's stranded in a kind of no mans land. Plumbers seem reluctant to learn about the refrigerant cycle and electronics and the HVAC guys are reluctant to compromise their elite status and the salary that goes with it!

## REGIONAL DIFFERENCES

The USA is not a single market for HPWH. The southern version and the northern version are going to be different. Though the performance of heat pumps (air source) is excellent in Puget Sound, the perception still persists that heat pumps belong south of the Mason/Dixon Line.

WILL 2015 BE THE YEAR THAT THE NORTHERN TIER HPWH'S COME INTO THERE OWN OR WILL 2015 BE THE YEAR TO FIGURE OUT HOW TO SKIRT THE REGULTION OR LOBBY FOR ITS REPEAL ENTIRELY? WHERE ARE YOU GOING TO BE?

Energy conservation is not being held back by technology shortcomings. It is held back by energy economics and human inertia.

Parker Holden  
Olympia, WA 98506

360-259-2866