

Heat driven white goods

District heating can be used to replace electricity in dishwashers, washing machines and tumble dryers. From an energy systems perspective, it is wise to use heat and not electricity for heating purposes whenever possible. Heat-driven white goods can reduce the electricity use by up to 90 %. Read more about the [best available technology](#).

This technology can be used in any city looking to increase its energy efficiency. Even without a district heating system, domestic hot water (DHW)-connected white goods can be beneficial. The technology is especially suited for new-built, heat-sparse areas, where heat-driven white goods may increase the usefulness of district heating in energy-efficient buildings.

Estimate impact



The CELSIUS demonstrator for [district heating to white goods](#). Here, district heating is used instead of electricity in washing machines and tumble dryers. Photo: Anna Boss.

Use this simple tool to estimate the energy savings of using heat driven white goods.

Number of households:	1000
Categories of white goods:	<input checked="" type="checkbox"/> Dish washers
	<input checked="" type="checkbox"/> Washing machines
	<input checked="" type="checkbox"/> Tumble dryers
Type of white goods:	<input type="text" value="Heat circuit connection (HWC)"/>
Estimated electricity saving:	447 MWh/year

The estimation is based on the following assumptions:

1. There is an even distribution between households of families with kids, older couples and young couples
2. There is an even distribution between households in small houses and apartments

Data from multiple sources ^{[1][2]}.

Case studies

A CELSIUS demonstrator has been established for district heating to white goods. In the demonstrator, which is located in Gårdsten, Gothenburg, Sweden, district heating water of a supply temperature of approx. 80 °C is supplied to professional washing machines and tumble dryers. The white goods are placed in shared washing rooms of several apartment buildings, in total serving about 1 000 tenants. Read more on the [demonstrator page](#).

Best available technology

There are two types of technical solutions existing on the market today that reduces the electricity use in white goods. The common denominator is that instead of using electricity they use heated water, either from the district heating network or from the domestic hot water system inside the house or apartment. The solution with a domestic hot water (DHW) connection is fairly common on the market and all major manufacturers of white goods offer this in part of their product series whereas the heat driven machines with a heating water circuit (HWC) connection are only available from a very limited range of manufacturers. Read more about the two technologies:

- [Technology: Heating water circuit \(HWC\)-connected white goods](#)
- [Technology: Domestic hot water \(DHW\)-connected white goods](#).

Comparison between HWC and DHW-connected white goods

As for DHW-connected white goods, there are HWC-connected white goods available on the market for individual households as well as for "professional use", e.g. for apartment buildings. At the end of 2014, Asko was the only manufacturer of heat driven machines present on the market that delivered heat driven products for individual households. The Asko HWC-connected white goods product range includes dishwashers, washing machines and tumble dryers, and are offered in two sizes, one for individual household use and one for professional use. Asko has delivered the white goods to the [CELSIUS demonstrator](#) of district heating to white goods.

Heat driven white goods come with a higher price tag and will also demand extra piping and consequently lead to higher installation costs. In return, the electricity usage can be reduced by as much as 90% during optimal conditions. It can also help reduce the electric power demand. With low heat prices and favourable temperature levels on the district heating system the use of heat driven white goods could decrease the environmental impact by reducing the electricity usage. If green electricity is used, however, the environmental benefits are not as clear. In the bigger picture, increased competitiveness of district heating should also be considered, especially in heat-sparse areas (e.g. areas with low-energy houses) where the machines can increase the heat demand.

Conventional machines that have a possibility for a domestic hot water connection offer an easy way of reducing the electricity demand. Connecting the domestic hot water to the machine is of no use, however, if the domestic hot water is produced by an electric boiler. It would just mean an unnecessary extra step to heat the water with electricity that would generate more heat losses due to the distribution to the machine. It would in this case be more efficient to use the conventional standard electric heating system in the machine. If the household uses district heating for the domestic hot water, then by connecting the machine to the domestic hot water it reduces the electricity use in the machine and replaces it by energy from district heating.

The Swedish District Heating Association has in the report "Fjärrvärmedrivna vitvaror"^[1] (Heat driven white goods) underlined that in order for heat driven white goods to be an economically viable alternative it is important to have a long time frame and a high usage rate on the machines. This means that the most favourable place to install heat driven white goods is in apartment buildings where many people share the use of the machines and where they are under a high level of usage. If these laundry rooms also are placed near the district heating substation it is even more favourable since the piping costs are lowered.

Installation costs are reported to be approximately 220 euros higher for heat driven white goods compared to conventional machines^[1]. The purchase price is also significantly higher than an average standard machine. The table below shows the additional purchase price for the different types of heat driven machines.

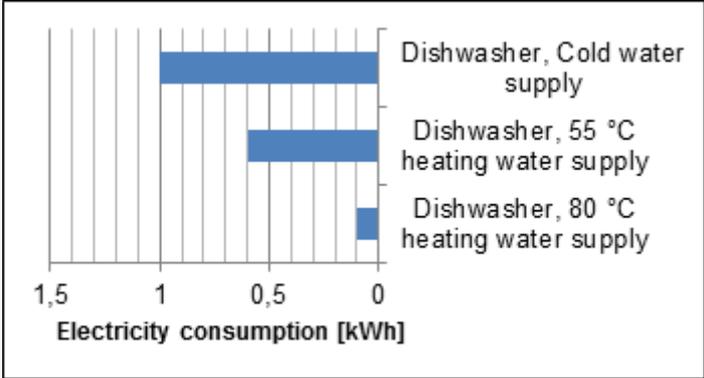
Additional purchase costs for heat driven white goods

Type of white goods	Price, EUR	Additional purchase price (compared to conventional), EUR
Dishwasher	~ 900-950	~ 325-380
Washing machine	~ 900	~ 325
Tumble dryer	~ 700	~ 430

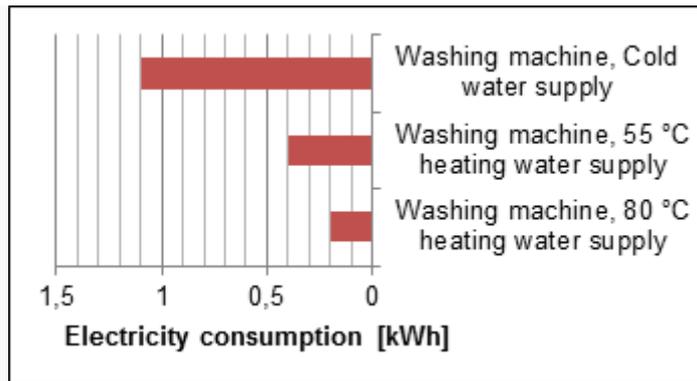
There are several other costs that are difficult to generalize but are important to take into account for each specific house or apartment complex, whether it is new construction of a building or a retrofit. For example, design of heating system, extra costs for substation, e.g. extra heat exchanger, extra piping material from substation to each unit and so on. What also heavily affects the decision is the local heat/electricity price ratio.

A comparison of the electricity consumption of white goods when connected to water supplies of different temperatures is presented in the figure below. The data concerns white goods from the Asko HWC range when different programs are run^[1]. The cases where the temperature of the supply heating water is 80 °C represent HWC-connected white goods while the cases where the supply temperature is 55 °C represent DHW-connected white goods. The presented data is for "Eco" programs which minimize the consumption of electric energy, although "Quick" programs exist that use a combination of electricity and hot water in order to minimize program time. The cases where the water supply is "Cold water" represent reference levels for determining electric energy savings for the prior cases.

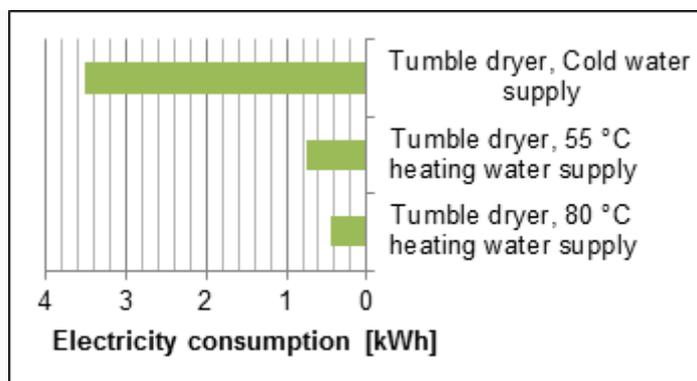
- **Energy consumption of various types of white goods**



Dishwashers^[1]



Washing machines^[1]



Tumble dryers^[1]

References

1. [Jump up to:1.0 1.1 1.2 1.3 1.4 1.5 1.6](#) Persson T., Renström R., (2013) Fjärrvärmedrivna vitvaror (in Swedish) Fjärrsyn rapport 2013:21
2. [Jump up](#) Larsson, J. (2011) Riktlinjer angående val av systemlösning för "vitvarukretsar" (in Swedish). VCON VVS-konsult

CELSIUS contacts

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For further engagement on this subject you are welcome to turn to your CELSIUS city contact person or use the [contact form](#) for guidance to relevant workshops, site visits or the expert team.