

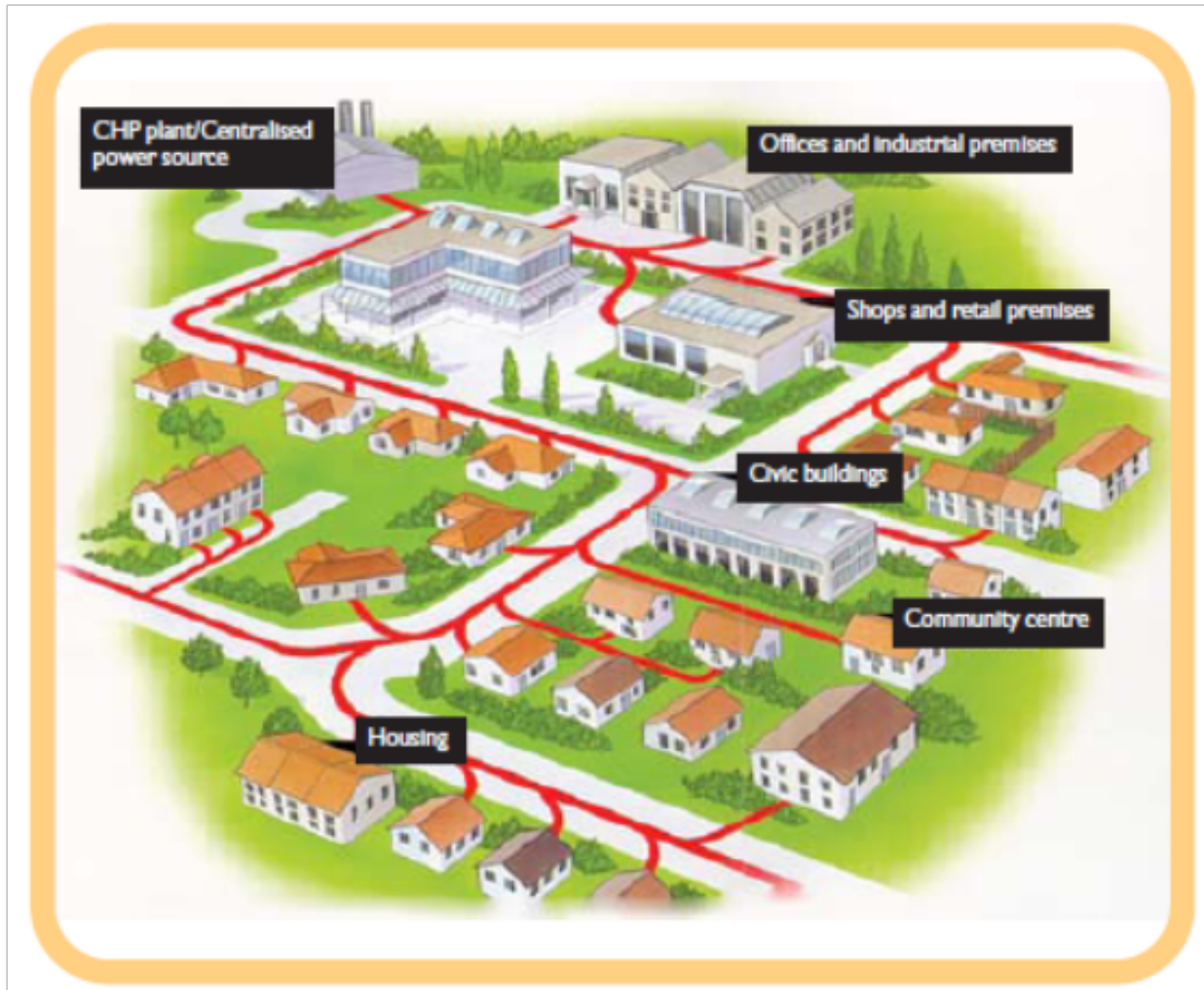
# Module 5.8

## District Heating

## Module 5.8 District Heating

- On completion of this module learners will be able to:
  - List the key components of a district heating system
  - Distinguish between direct and indirect systems
  - State the main advantages of district heating

- District heating – a system that delivers heat to more than one dwelling from a central source
- Central source may be waste heat from power generation or a dedicated boiler/renewable energy system
- Ideal for location of high density housing e.g. apartment blocks



Source: Community Heating – a guide  
Energy Saving Trust

# Key components of a district heating system

- Central heat source
- Distribution system
- Hydraulic user interface

- Central sources

- Heat sources may be large scale supplying entire communities or small scale supplying a single apartment block
- Heat can be derived from a variety of sources
  - Waste from power generation such as CHP
  - Energy from waste
  - Waste heat from industry
  - Geothermal and solar
  - Boilers

In Denmark in 2002  
heat sources used for  
district heating  
comprised of

Natural gas 30%

Coal 24%

Waste 23%

Biomass 15%

Oil 7%



**Explanation of symbols**

**Plant type**

- Centralised plant
- De-centralised CHP
- DH plant without electricity production
- Industrial co-generated heat and electricity

**Primary fuel**

- Coal
- Natural gas
- Oil
- Biomass
- Biogas
- Waste

**Natural gas transmission**

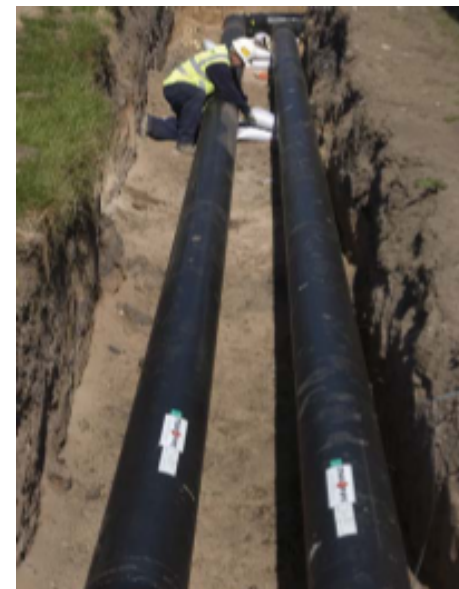
- Primary natural gas pipeline
- Secondary natural gas pipeline

Source: Heat Supply in  
Denmark, Danish  
Energy Authority 2005

- Distribution system
  - Distributed system generally consists of pre-insulated pipework laid underground with connections to each building



Source: Community Heating – a guide  
Energy Saving Trust



Source: CE299 – Applicability of district heating for  
new dwellings  
Energy Saving Trust

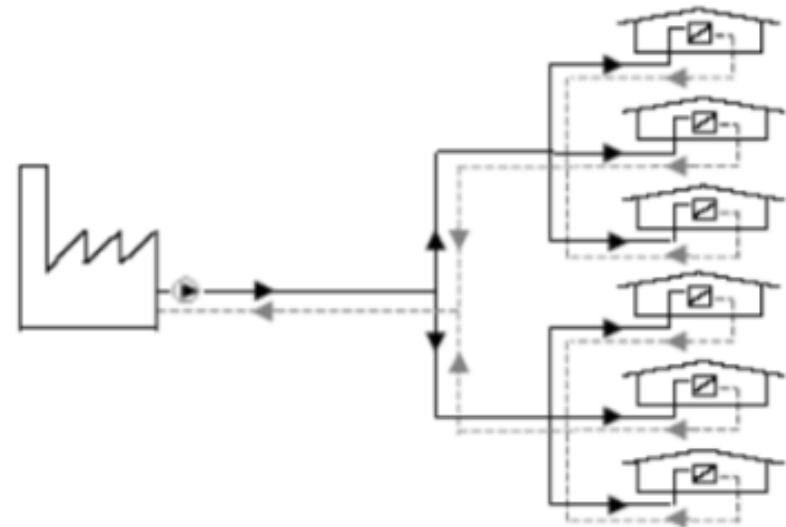
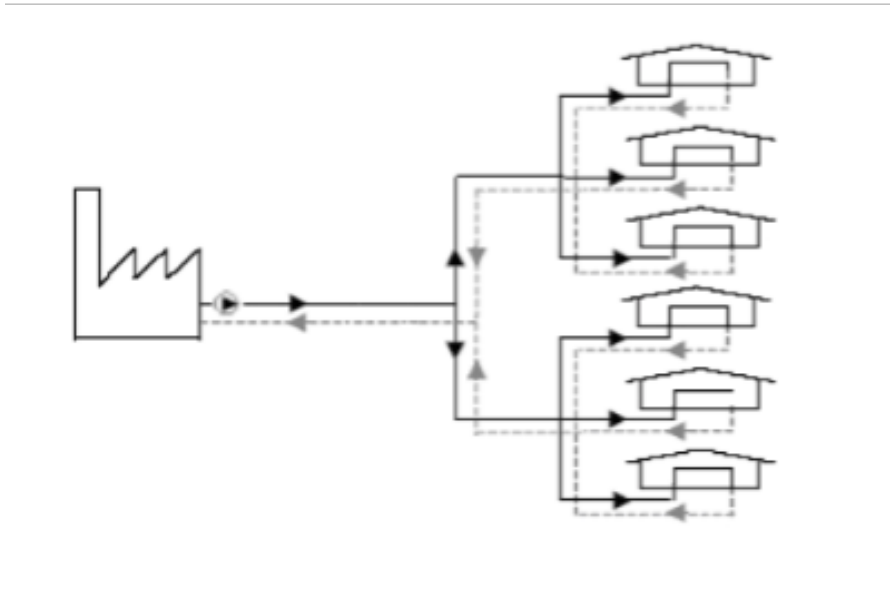
- User Connection

- Hydraulic Interface Unit/Customer Interface Unit/Substation replaces conventional boiler in the dwelling
- Unit consists of a metered flow and return from the distribution system. This connects to a conventional heating system such as radiators and hot water cylinder.
- In some systems the cylinder can be replaced by a compact plate heat exchanger to provide instantaneous hot water.

Customers can be connected to the district heating system directly or indirectly

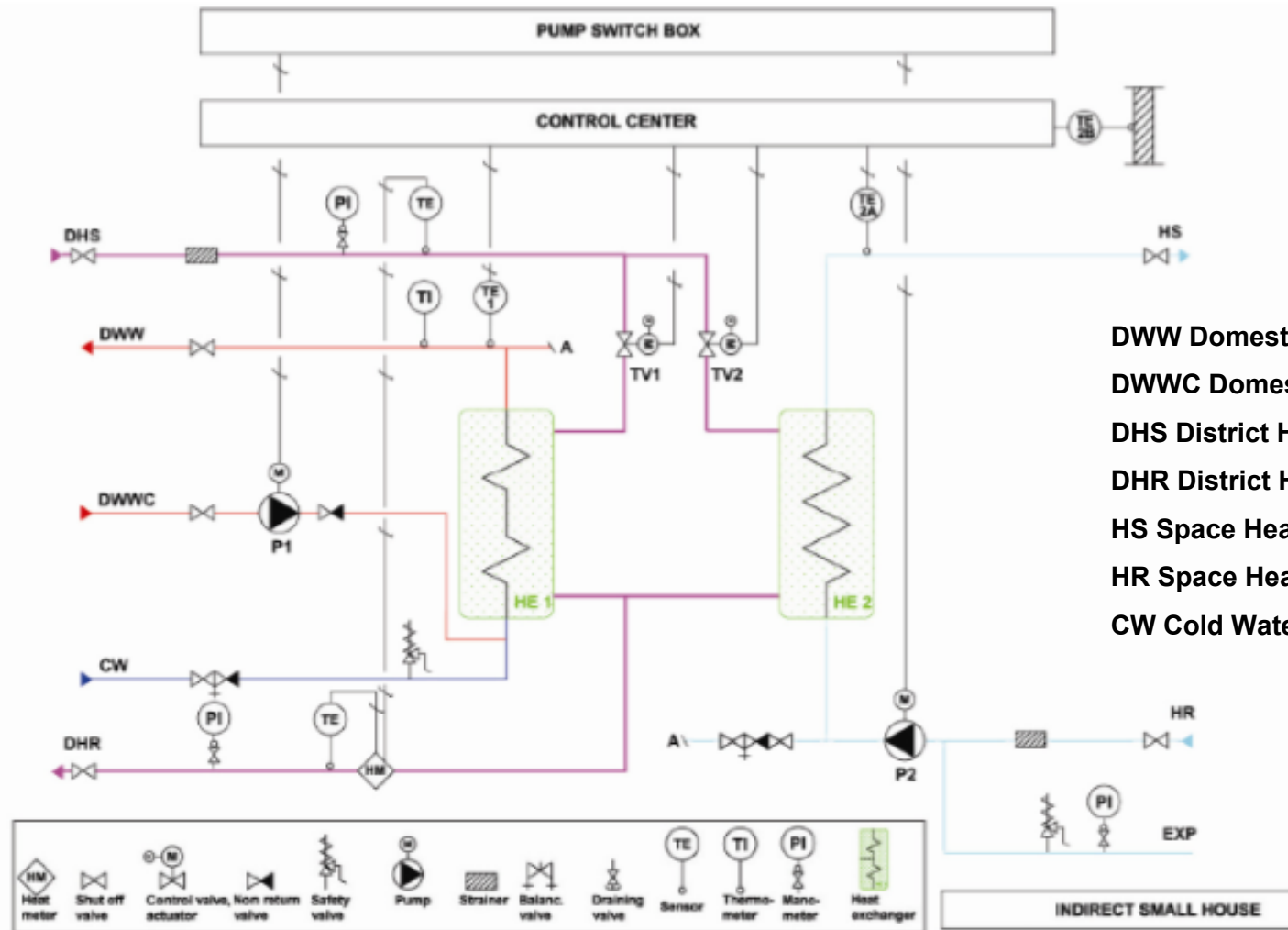
**Direct connection:** this system does not include any heat exchanger, so the same district heating water is inside the secondary network (radiators, floor heating etc.)

**Indirect connection:** in this system a heat exchanger provides the hydraulic separation from the district heating water.



Source: Guidelines for District Heating Substations, EuroHeat & Power, October 2008

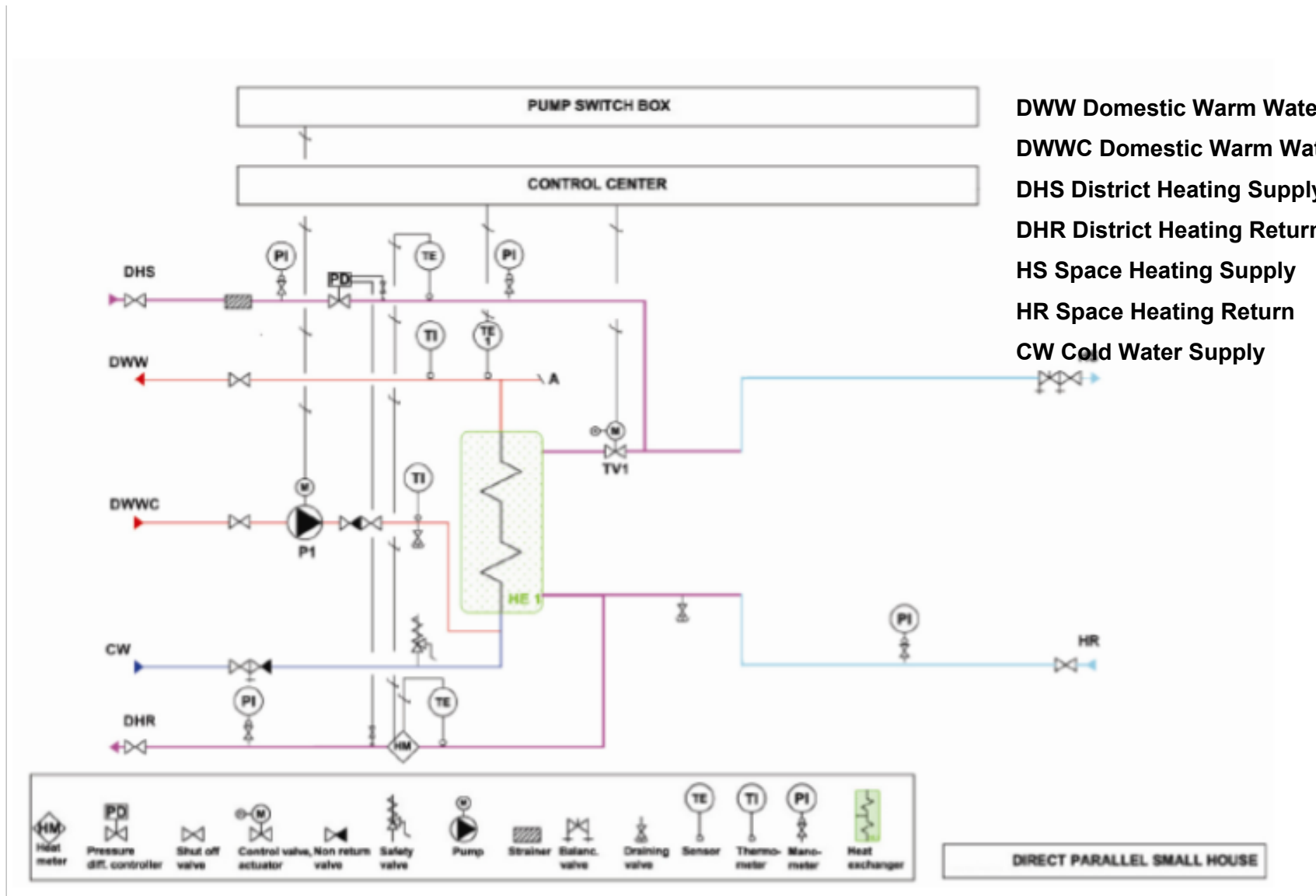
# Indirect connection



**DWW Domestic Warm Water**  
**DWWC Domestic Warm water Circulation**  
**DHS District Heating Supply**  
**DHR District Heating Return**  
**HS Space Heating Supply**  
**HR Space Heating Return**  
**CW Cold Water Supply**

Source: Guidelines for District Heating Substations, EuroHeat & Power, October 2008

# Direct connection



Source: Guidelines for District Heating Substations, EuroHeat & Power, October 2008

Example of hydraulic interface unit

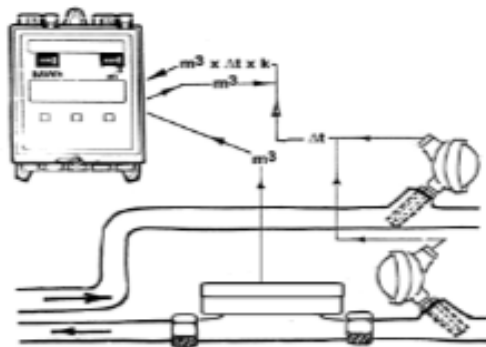


Source: Danfoss, Akva Lux Vx

**Akva Lux VX**  
**District heating substation for indirect heating and domestic hot water systems**

- Heat Meter

used to calculate the energy use for the dwelling from the district heating system in kWh



Components:

- the calculator calculating energy consumption;
- the temperature sensor pair in the forward and the return pipe;
- the flow sensor - measuring the amount of district heating water running through the meter.



Source: Guidelines for District Heating Substations, EuroHeat & Power, October 2008

# Penetration of District Heating

Percentage of dwellings served by district heating	
Country	Proportion
Denmark	62 %
France	58%
Germany	13.3 %
Ireland	negligible
UK	Percentage not quoted
Source Ecoheat4EU <a href="http://www.ecoheat4eu">www.ecoheat4eu</a>	

## ● Advantages of district heating

- Significant savings in primary energy when CHP is used as part of the central plant.
- Renewable fuels contribute to a significant reduction in CO2 emissions.
- Savings due to high efficiency plant, bulk fuel purchasing and economic electricity from CHP can be passed on to consumer as lower charges.
- Lower charges leads to an increased ability to access heating in fuel poverty cases which in turn leads to a reduction in cold related illnesses.
- Modern district heating systems have high levels of control in individual dwellings.
- Compact heat exchangers in place of hot water storage cylinders frees up space.
- From a safety point of view, if electric cooking is used it means there is no requirement for gas to be piped through the building.

- Suggested reading
  - CE299 The applicability of district heating for new dwellings, Energy Saving Trust, [www.energysavingtrust.org.uk](http://www.energysavingtrust.org.uk)
  - Community Heating – a guide Energy Efficiency Best Practice in Housing, Energy Saving Trust, [www.energysavingtrust.org.uk](http://www.energysavingtrust.org.uk)
  - Heat Supply in Denmark, Danish Energy Authority, [www.ens.dk](http://www.ens.dk)
  - Guidelines for District Heating Substations, Euroheat & Power, [www.euroheat.org](http://www.euroheat.org)