



# Roadmap on the Development of District Heating in Azerbaijan until 2020

## INOGATE Technical Secretariat & Integrated Programme

### Klaus Fafner

BUILDING PARTNERSHIPS FOR ENERGY SECURITY

# What technologies do we have at hand?



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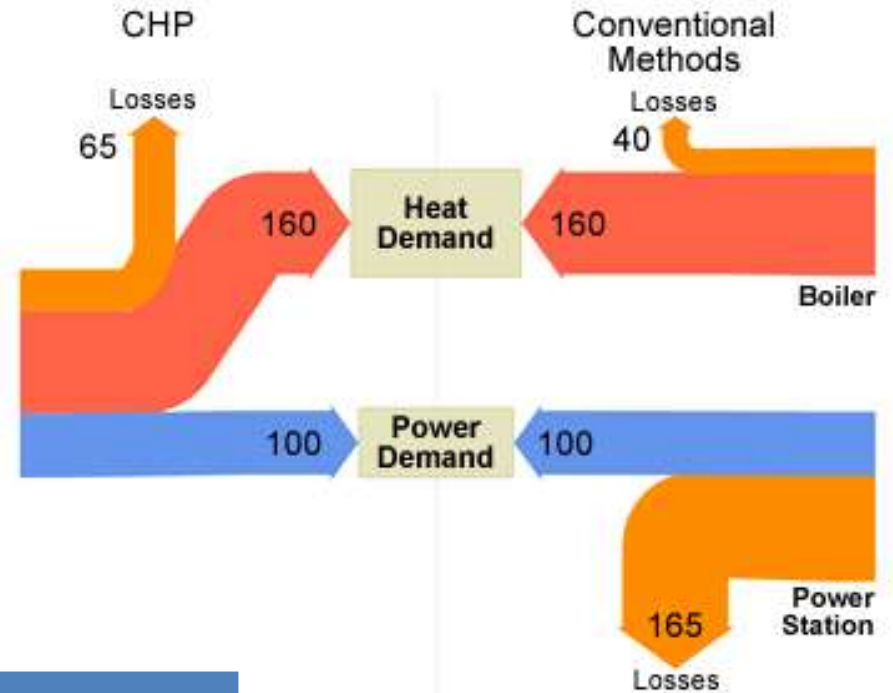
# What technologies do we have at hand?

## Combined Heat and Power (CHP)



Combined heat and power production saves a lot of losses

By adding 60 units of fuel we can save 200 units in a boiler.



	Electricity	Heat
Boiler	0 %	85 %
Power plant	40 %	0 %
CHP	36%	49 %

# What technologies do we have at hand?

## Large-scale Heat Pumps



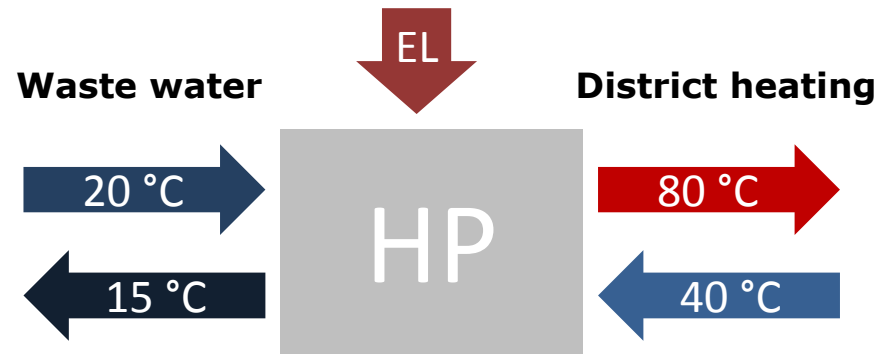
Provides heat at 70-90 °C

The higher the temperature of the heat source the better

E.g. output from waste water treatment plant (15 °C)

COP = 2.5 – 4.0 depending on the circumstances:

That is for each unit of electricity used, 2.5 to 4 units of heat is produced.





# What technologies do we have at hand?

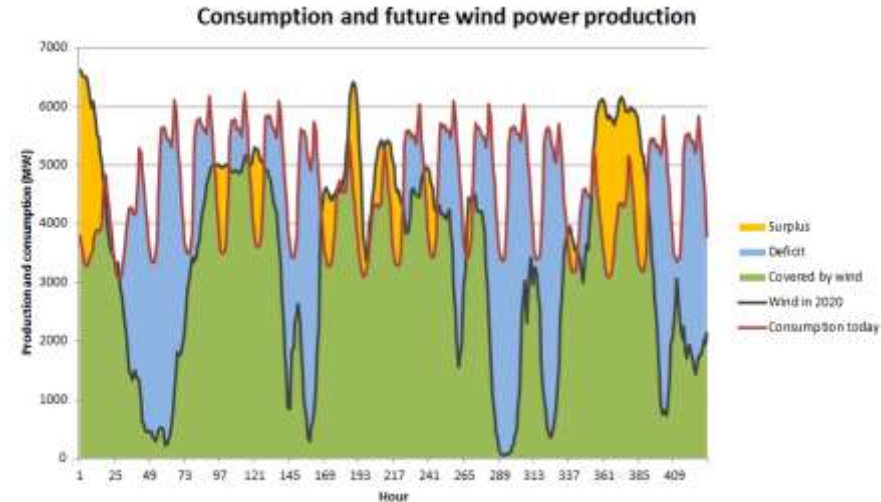
## Electric boilers

Integration of wind power.

Cheap to install.

Converts electricity to heat directly.

Better than stopping wind turbines.



# What technologies do we have at hand?



## Biomass Boilers

Can use wood, straw and other residues.

Difficult fuels can only be utilized in an environmentally acceptable way in large boilers.

Baseload or peak capacity in combination with other renewables.

Also for CHP!



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# What technologies do we have at hand?

## Waste to Energy

### Waste management hierarchy

1. Not to generate waste
2. Recycling of all materials
3. Energy production
  - 25 % for electricity and
  - 60-80 % for heat



### The alternative

- Deposit on landfills
- More greenhouse gas emissions.





# What technologies do we have at hand?

## Biogas to Energy

Biogas from industrial biomass waste, household waste and from farm animals.

Difficult to avoid smells from the processes

Biogas can be upgraded to natural gas quality or used directly for heat production.

Especially for CHP!



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# What technologies do we have at hand?

## Geothermal Energy

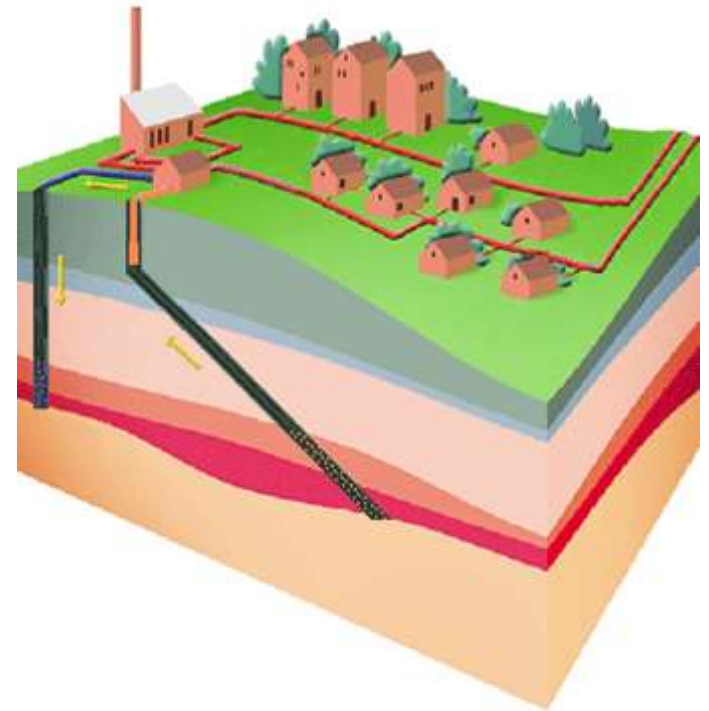
Hot water is pumped from 1.5 to 3 km underground

Temperatures of app. 70 °C  
(increases by 2,5 °C/ 100 m)

Direct use or temperature boost  
through heat pump

High drilling costs and uncertainty

Not to be confused with ground  
source heat pumps!



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# What technologies do we have at hand?

## Large-scale Solar Heating

The worlds largest solar heating plant is located by Marstal in Denmark and has been planned by Rambøll

Large scale solar heating is now competitive with natural gas boilers in Denmark.

160,000 m<sup>2</sup> currently in DK

Massive expansion expected  
200,000 m<sup>2</sup> per year during  
next ten years!



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# What technologies do we have at hand?

## Large-scale Solar Heating

When production is higher than consumption, the heat accumulator is charged. The accumulator is discharged when the production is below the consumption.

Smaller heat accumulators are for short-term storage. Huge heat accumulators are for seasonal storage

Height 65 m, diameter 20 m, 3.000 GJ (717 Gcal), 98 deg. C.

Height 25 m, Diameter 18.5 m 720 GJ (172 Gcal), 98 deg. C.



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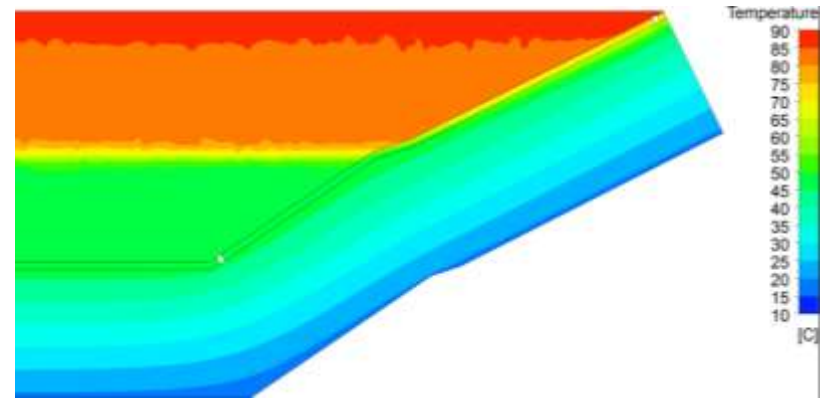
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# What technologies do we have at hand?

## Large-scale Solar Heating

Almost proven technology  
Large pond with floating lid  
Denmark has the world's largest  
heat storage and solar plant

New: 200.000 m<sup>3</sup> of hot water  
pit and 70.000 m<sup>2</sup> of solar  
panels



Klaus Fafner 4 New Tech



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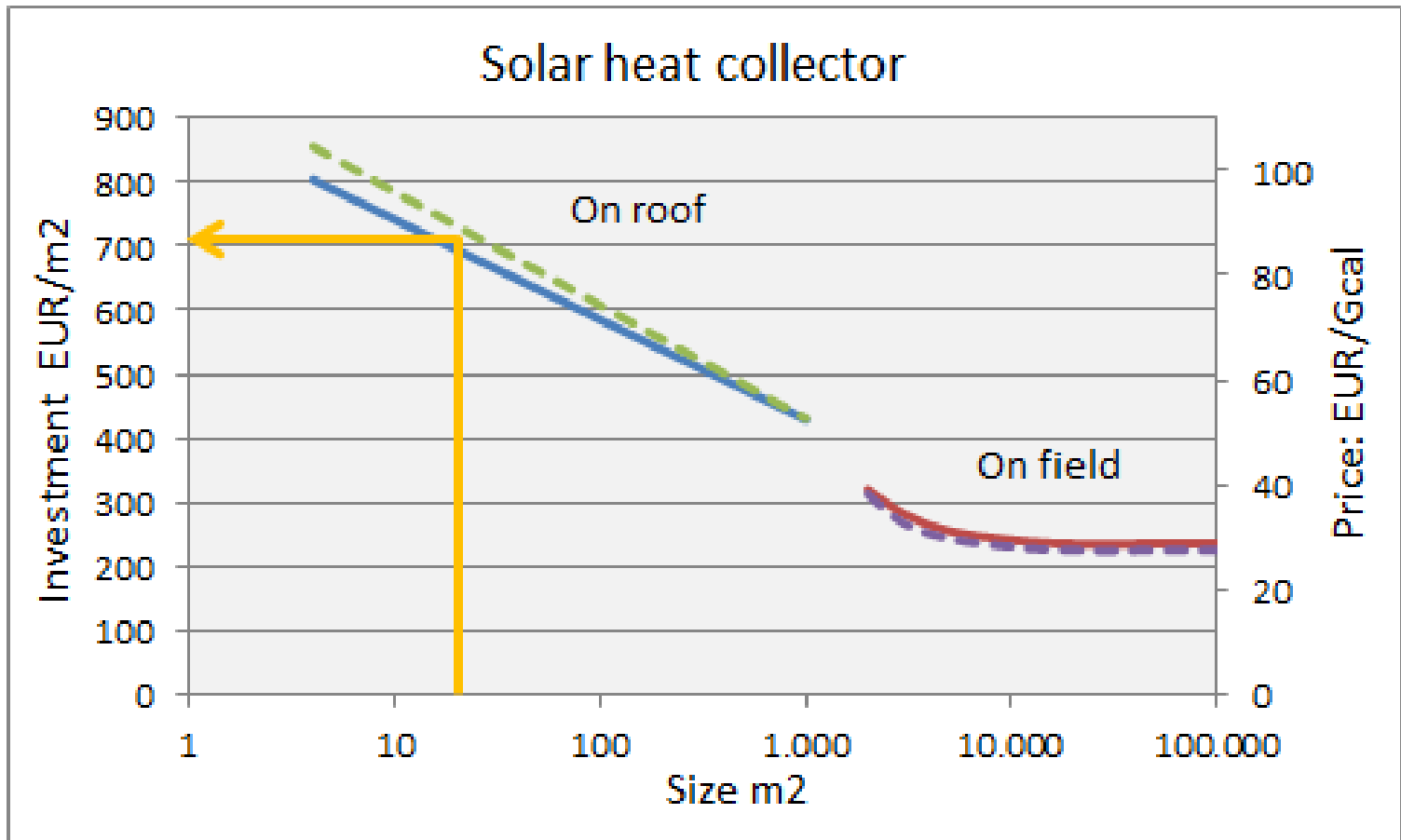




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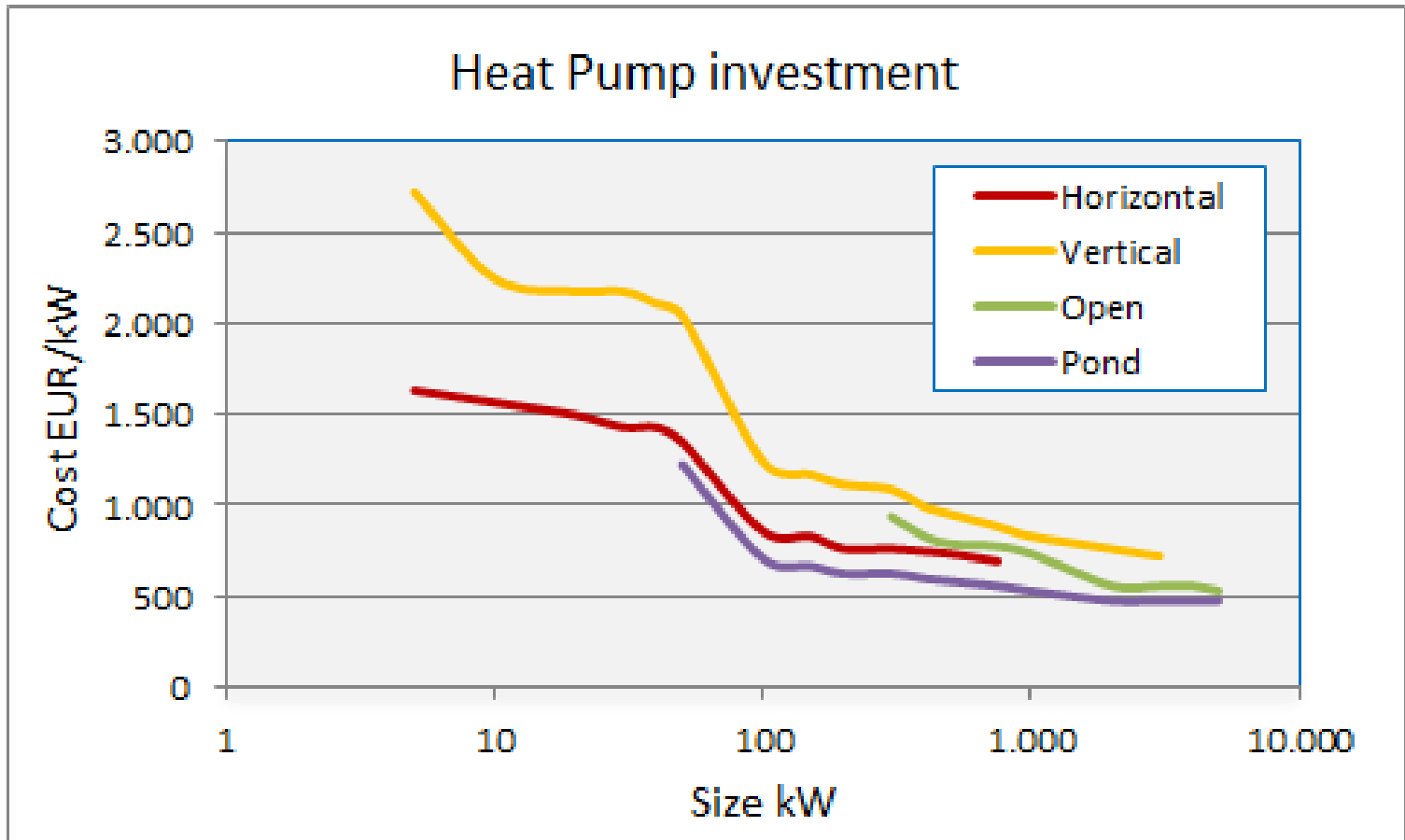


Cost are much lower for large-scale systems



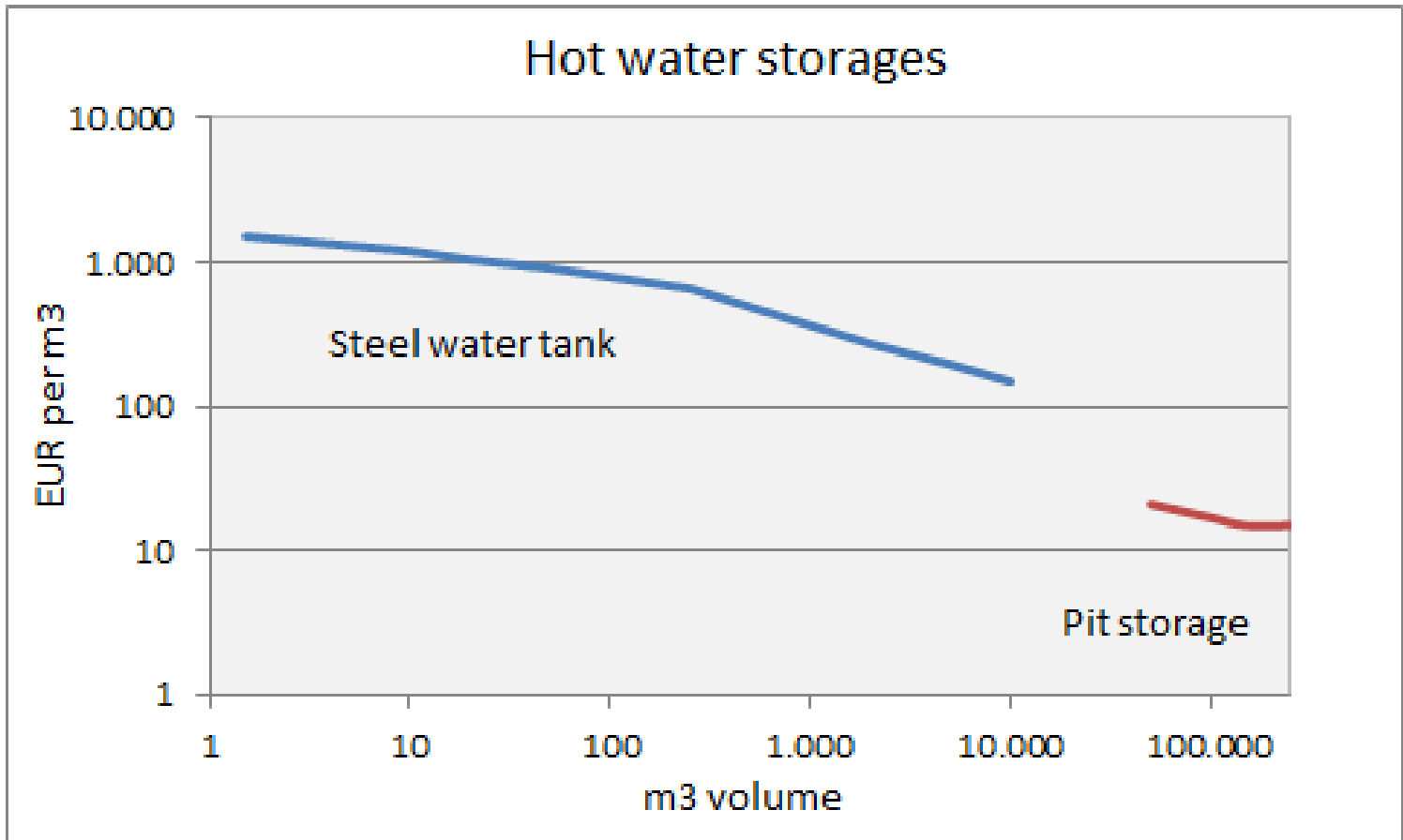
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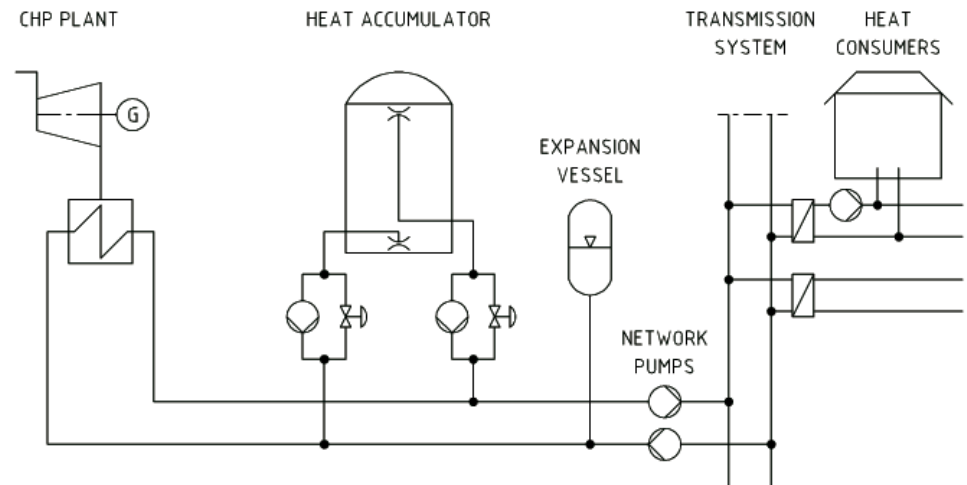
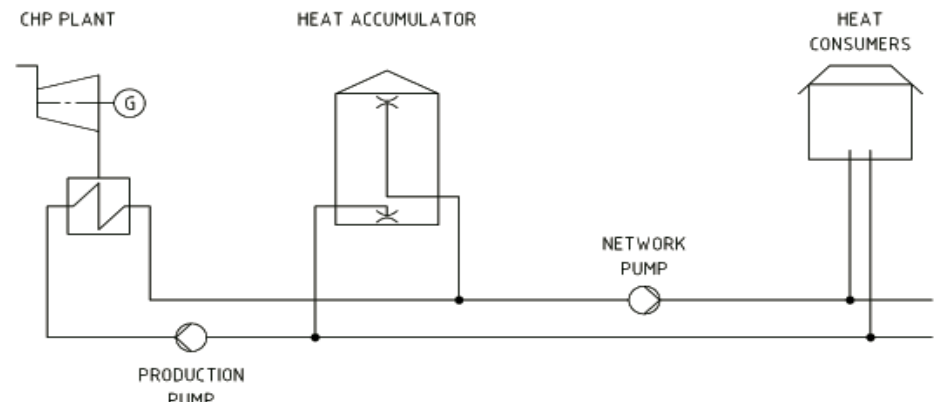
## Different solutions different benefits, different costs

Below a 100 degree C  
supply temperature,  
design: atmospheric tank.

Above 100 degree C the  
heat accumulator tank  
design: A pressure vessel

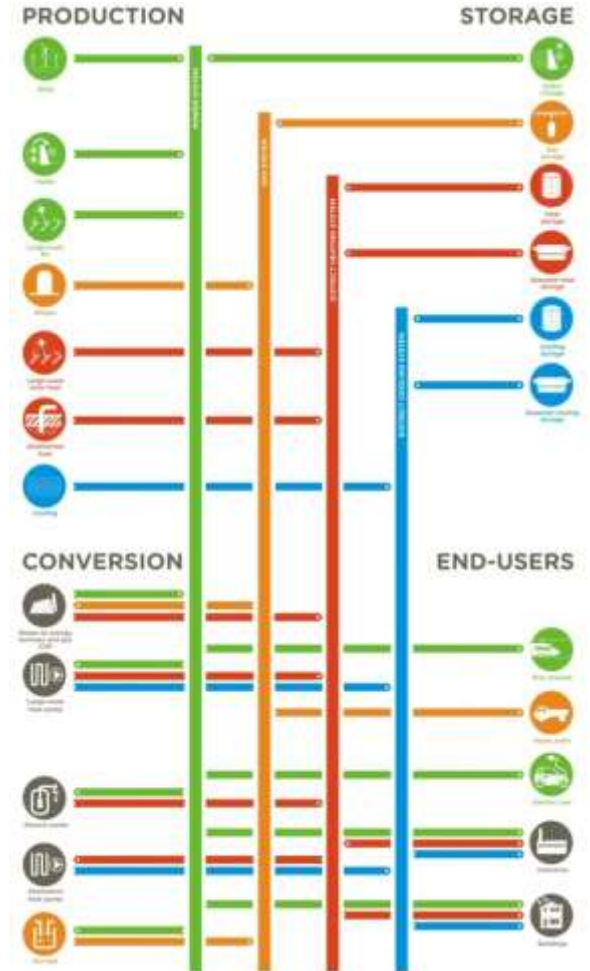
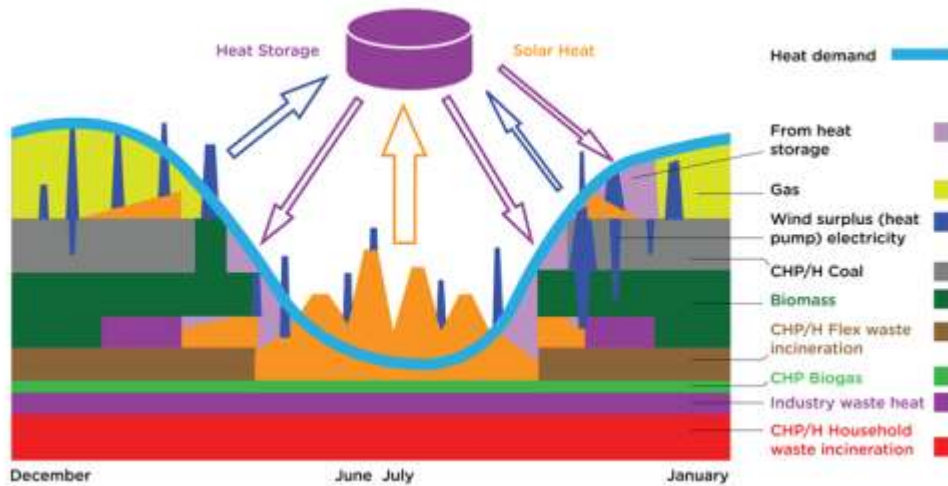
Heat accumulator  
integrated in a DH  
system.

Heat accumulator with  
hydraulic separation from  
a DH system.





# Smart Grid Coordination of Technologies



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# Load dispatch

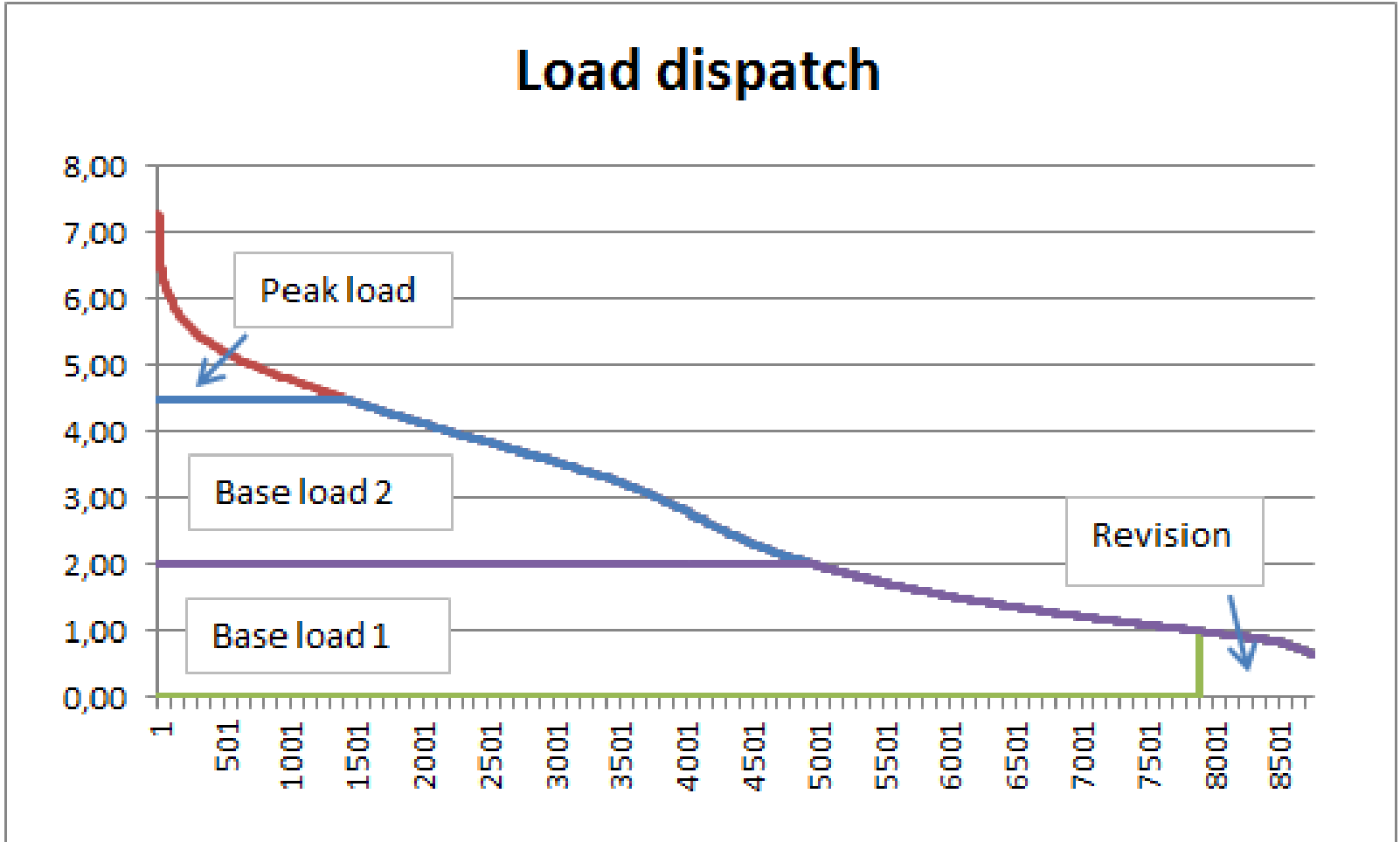
## Coordination of Technologies



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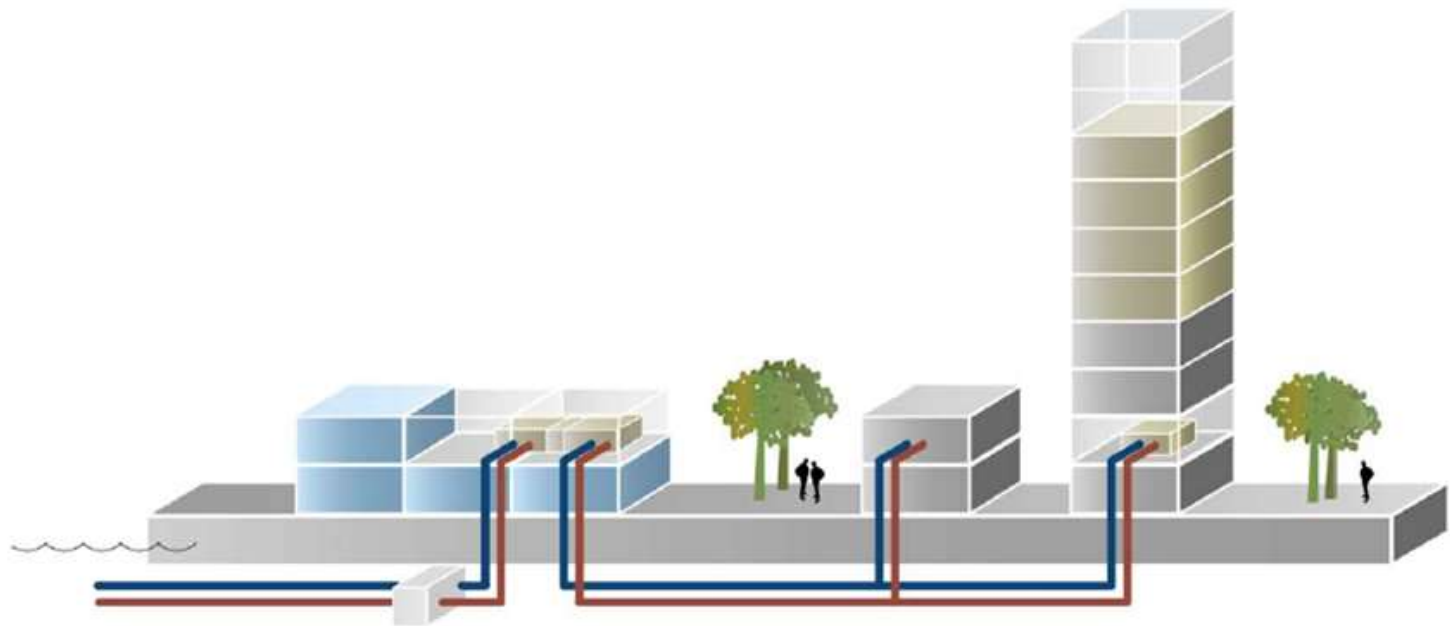
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# District Cooling Just an Infrastructure



Supplying cooling for buildings as cold water in pipelines  
Pipes can be used for cold water as well as for hot water



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# Heat Planning as Basis



Energy Infrastructure is **long term** investments

Buildings ~ 100 years

District energy ~ 50 years

Power plants ~ 40 years

Boilers ~ 25 years

Political cycles are short ~ 4 years

Political consensus needed

Leads to stable frameworks

Investor certainty

Cooperation usually leads to far better solutions!

It doesn't matter if you're green, we **all** have to be green







**Thank you for your attention!**

**Klaus Fafner  
klf@ramboll.com**

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