

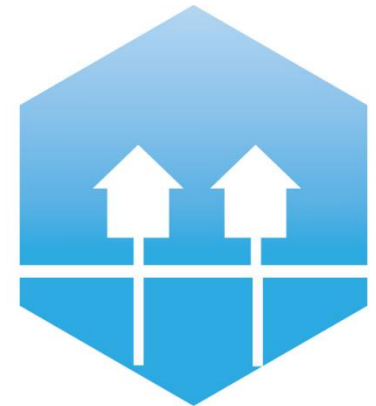
2nd International Conference on Smart Energy Systems and 4th Generation District Heating
Aalborg, 27-28 September 2016

Energy System Benefits of Low-temperature District Heating

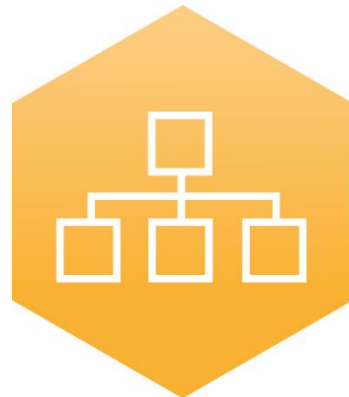


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4th Generation District Heating
Technologies and Systems

Agenda



- 1. Purpose and aim**
- 2. Parameters included**
- 3. Analysis method**
- 4. Preliminary results**
- 5. Perspectives**



Purpose of the study



Which district heating concept is best suitable in the future energy system in Denmark?

- **Decisions within future heat supply**
- **Planning of pipe networks**
- **Balance between district heating and savings**

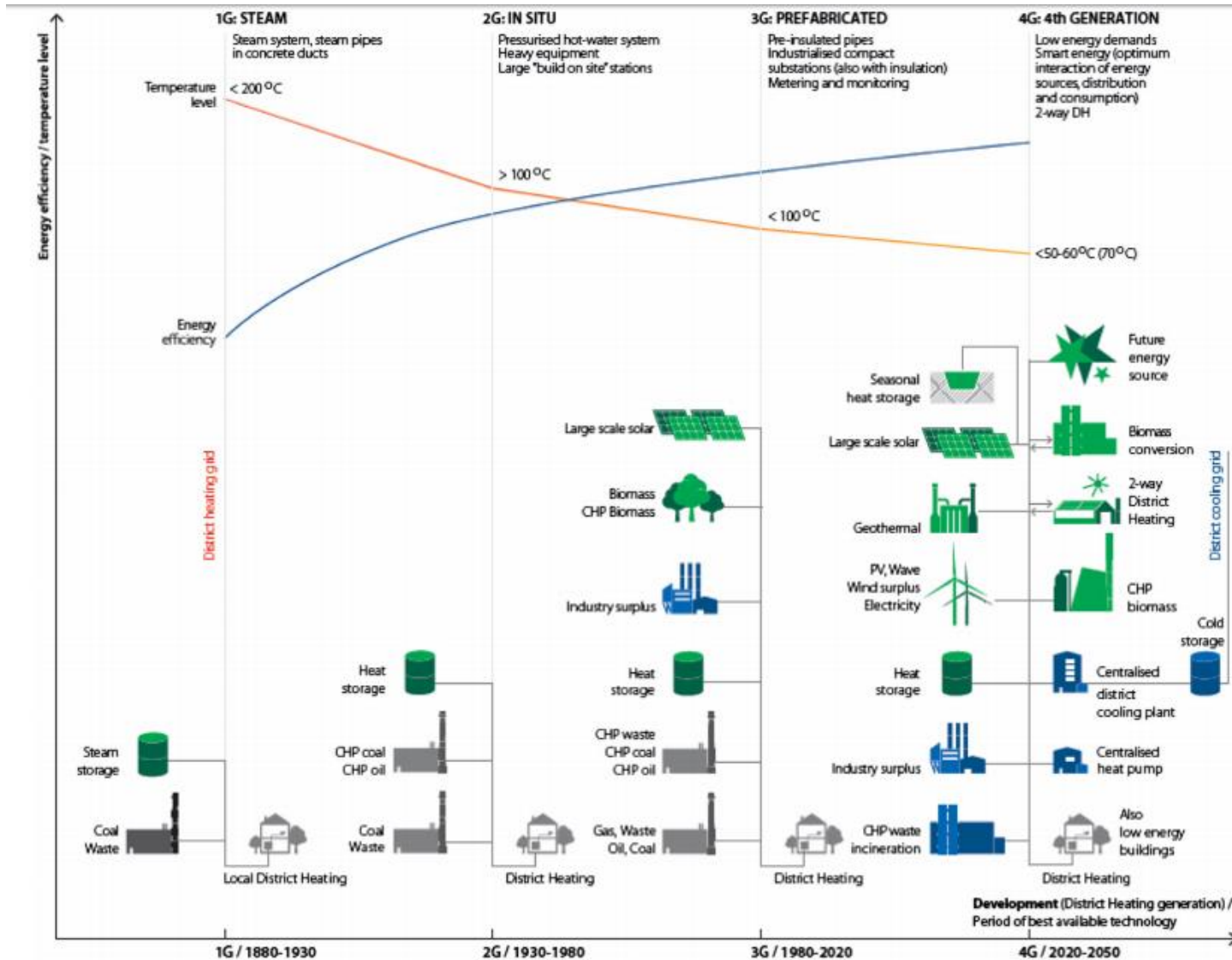


Aim of the study



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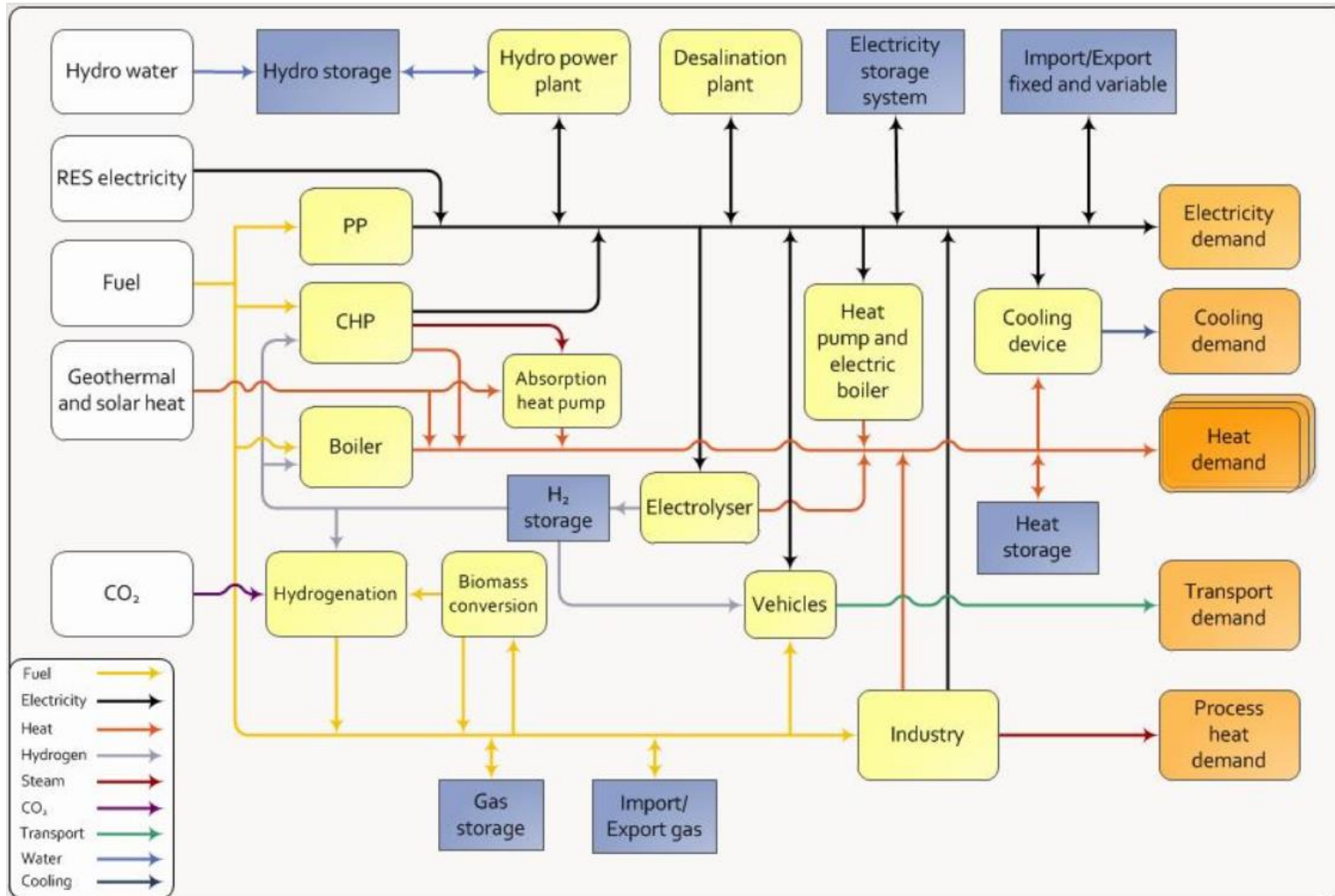


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Analysis method (1)



- **Comparison of scenarios on costs and fuel consumption:**
 - Conventional (80/40°C)
 - Low temperature (55/25°C)
 - Ultra-low temperature (45/25°C)
- **IDA Energy Vision (2035 and 2050) models**
- **EnergyPLAN used for simulation**



Parameters included



Units	Parameter
CHP units	Electric and thermal efficiencies
Boilers	Thermal efficiency
Heat pumps	COP
Solar and geothermal	Thermal efficiency
Waste and excess heat	Heat input
Pipe network	Heat loss
Consumer substations	Electricity demand for hot water preparation and heat loss



Parameter examples



	Conventional	Low	Ultra-low
	80/40	55/25	45/25
CHP el.	0.52	0.54	0.54
CHP th.	0.39	0.37	0.37
Boilers	0.95	1.0	1.02
Heat loss	17.5	15.5	13.6
Solar th.	1.0	1.15	1.19
Geothermal	1.0	1.1	1.1



Analysis method (2)



Inclusion of hourly temperature data to reflect seasonal and daily variation

- **Supply and return temperatures**
- **Heat pump heat source**
- **Solar thermal**

Reduced need for capacity in the supply

- **Power plants and boilers**
- **CHP and heat pumps?**



Preliminary results



- **Low temperature and Ultra-Low temperature scenarios shows similar savings**
- **Results for 2035 and 2050 are similar**
- **Heat sources in summer are plenty in scenarios with lower DH temperatures**

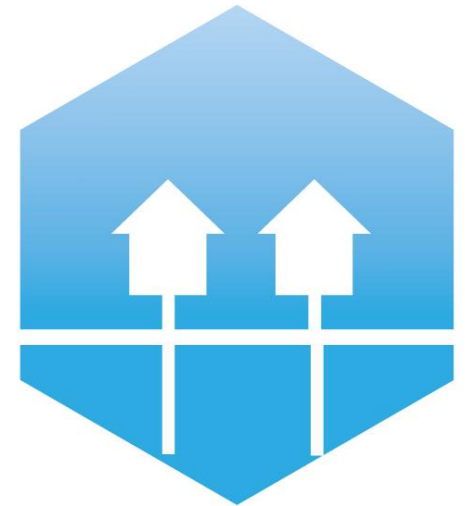
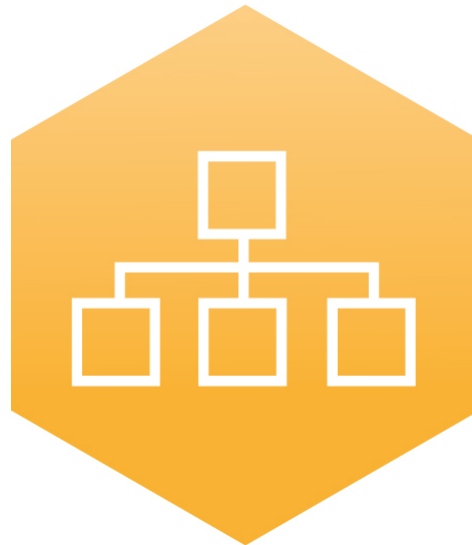


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Thank you for the attention



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