

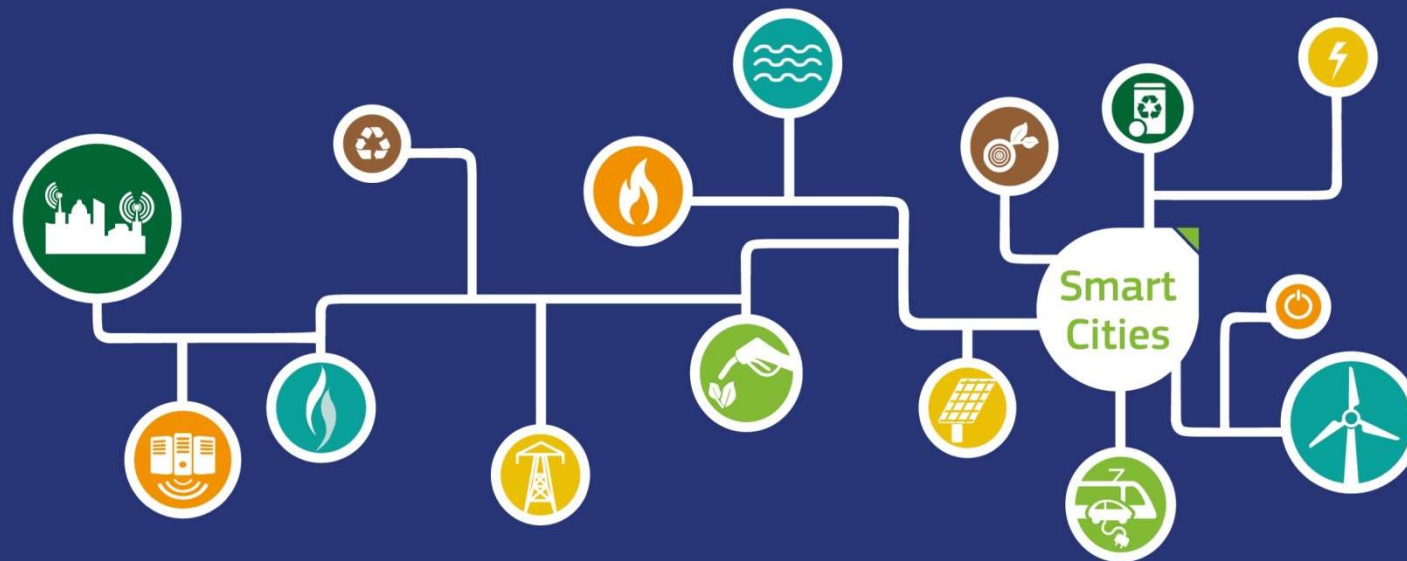
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2 & 3 OCTOBER | BUDAPEST, HUNGARY

Cooling with cold energy from drinking water

Otto Reinstra – Waternet, Amsterdam

otto.reinstra@waternet.nl



#SS4C17

WWW.SCISCONFERENCE2017.EU

In a nutshell

- **Supply of cold from a drinking water pipeline to a pharmaceutical plant**
- Winter cold from 700 mm drinking water pipeline
- Used directly & stored in an ATES system
- Saves € and CO₂
- Drinking water downstream (slightly) warmer
- Part of the City-zen project



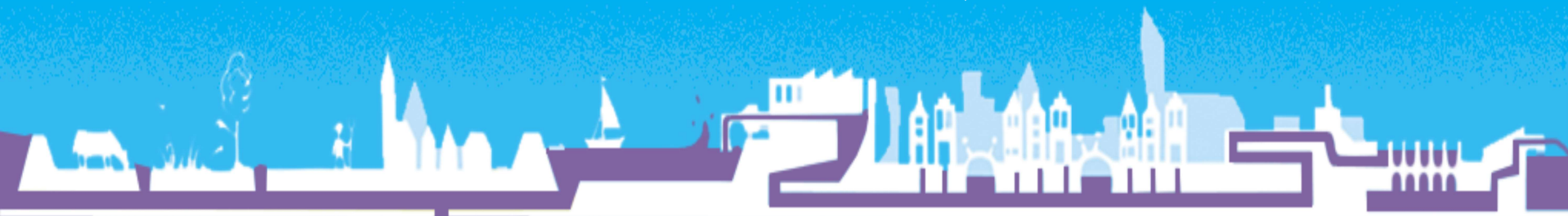
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Waternet Amsterdam

Public water cycle company

Surface water
Drinking water
Waste water
High water protection

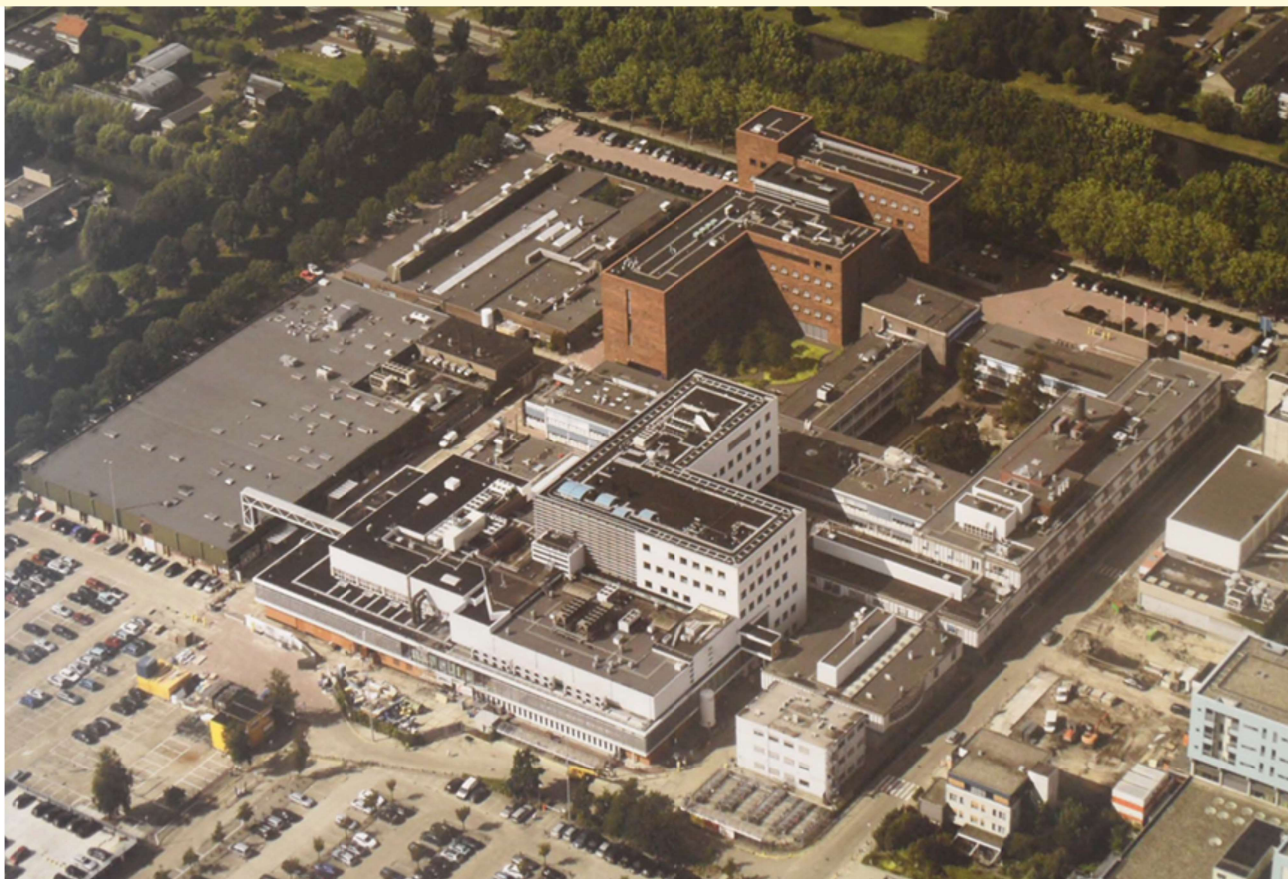


waternet

Sanquin Blood Supply



Sanquin blood supply



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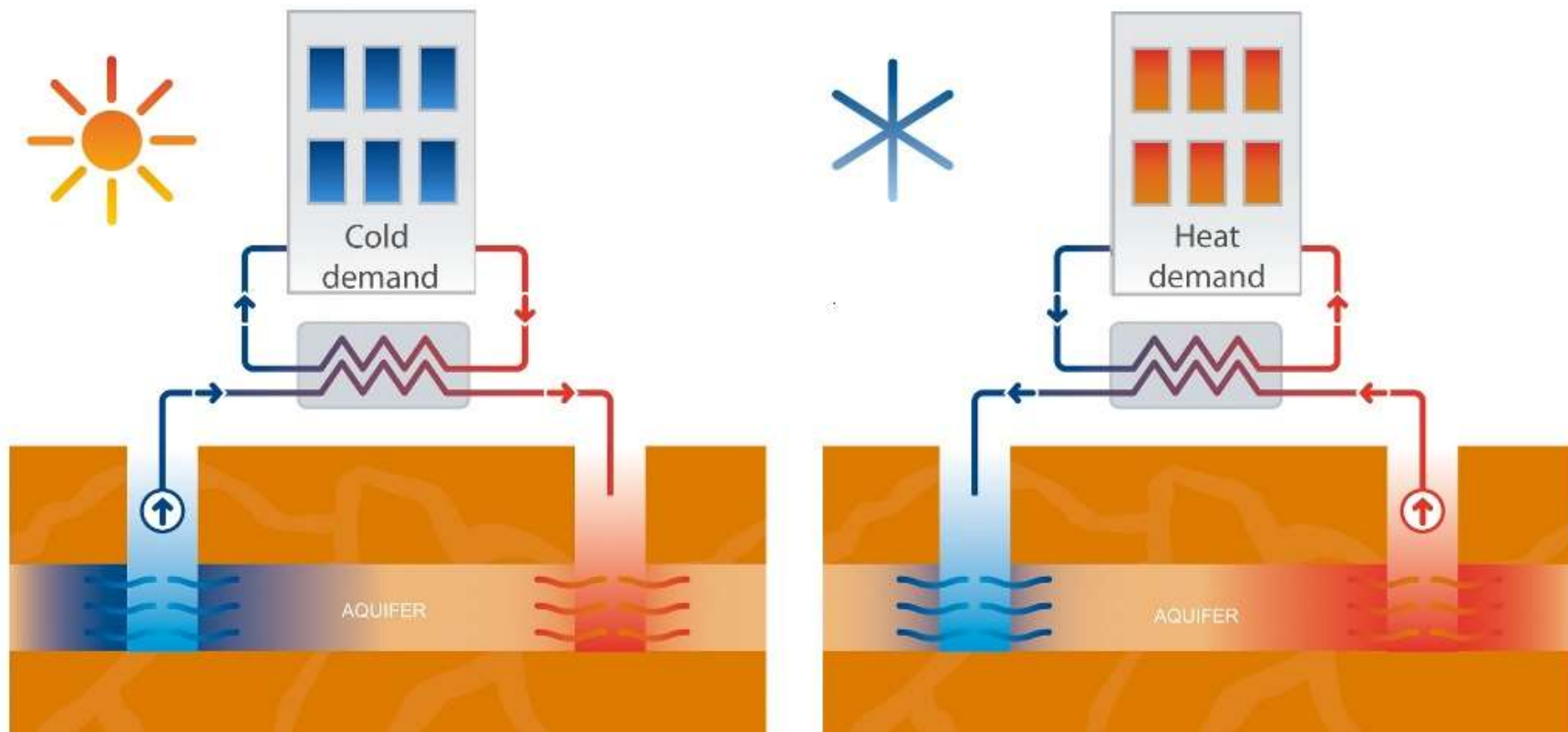


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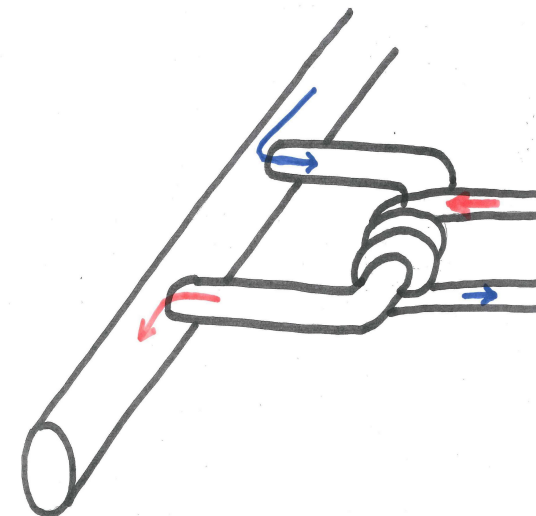
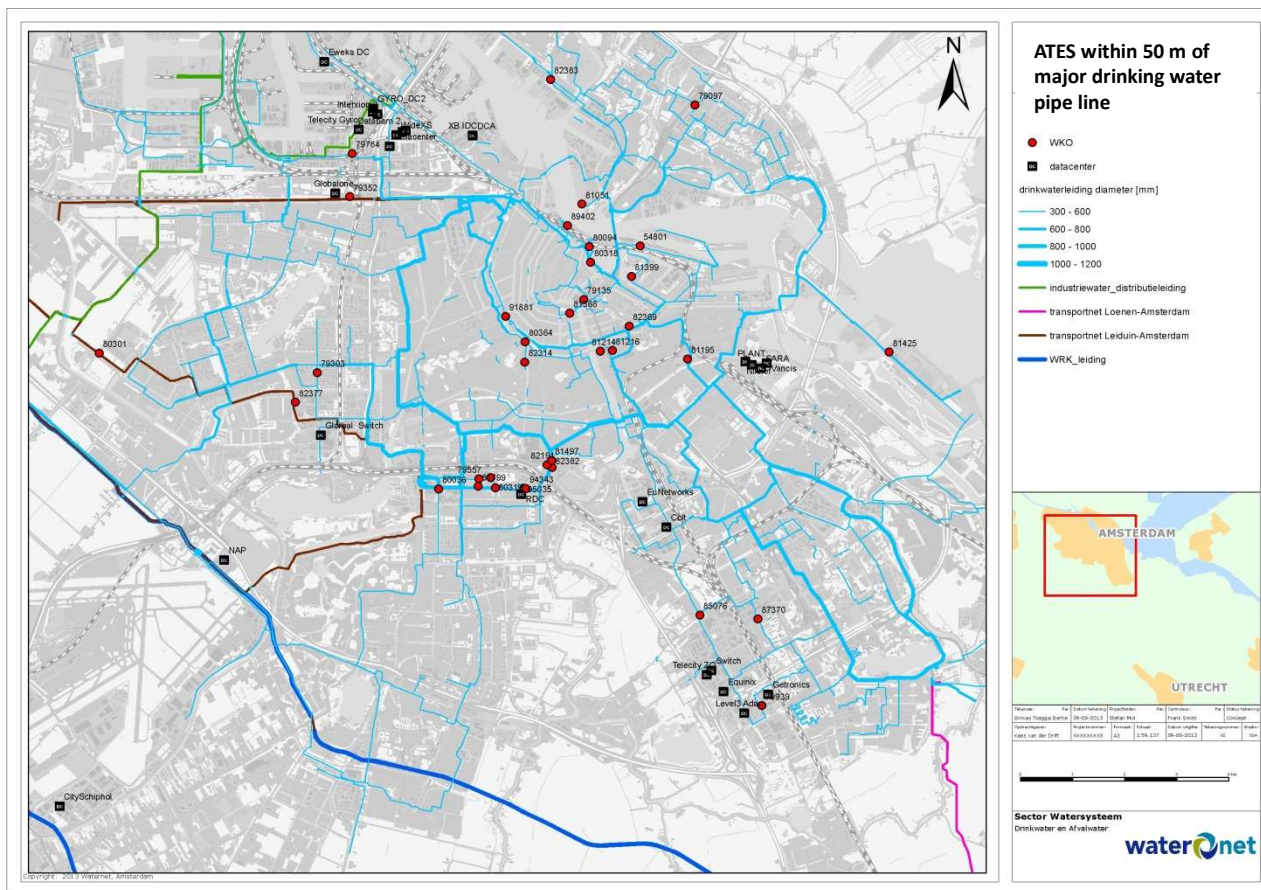
ATES: Aquifer Thermal Energy Storage



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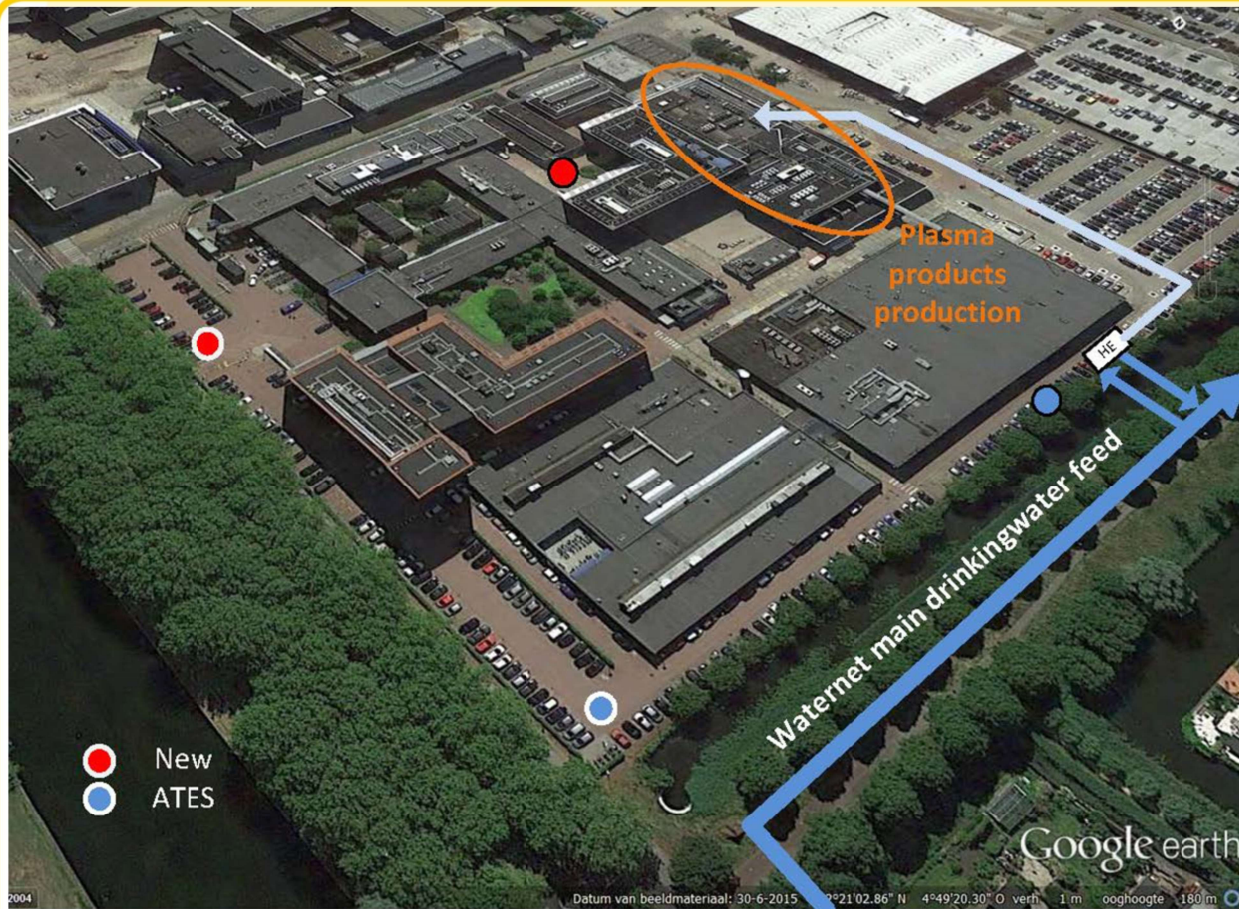
Survey



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Value proposition



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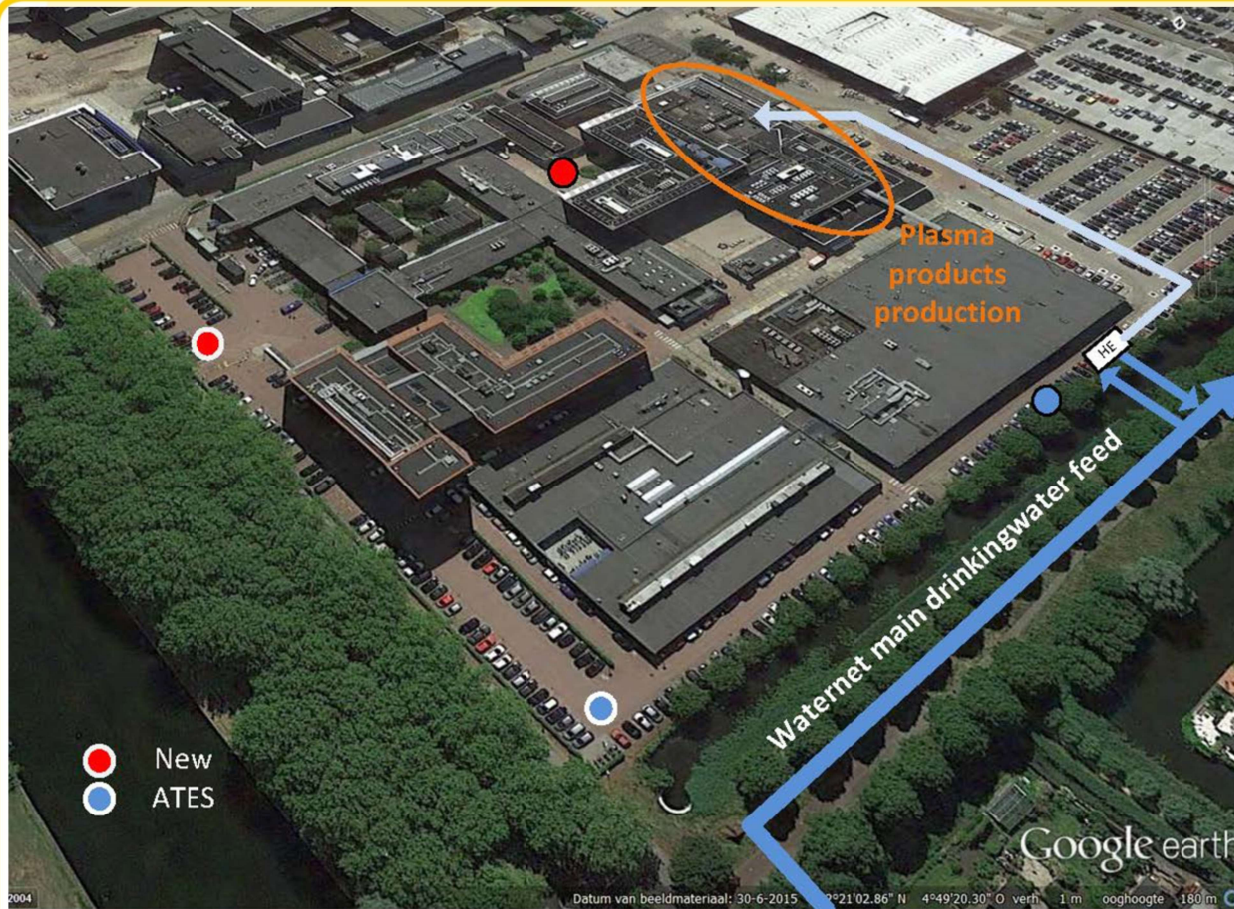


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Value proposition



- Costs?
- Energy?
- Other factors?
- Risks?

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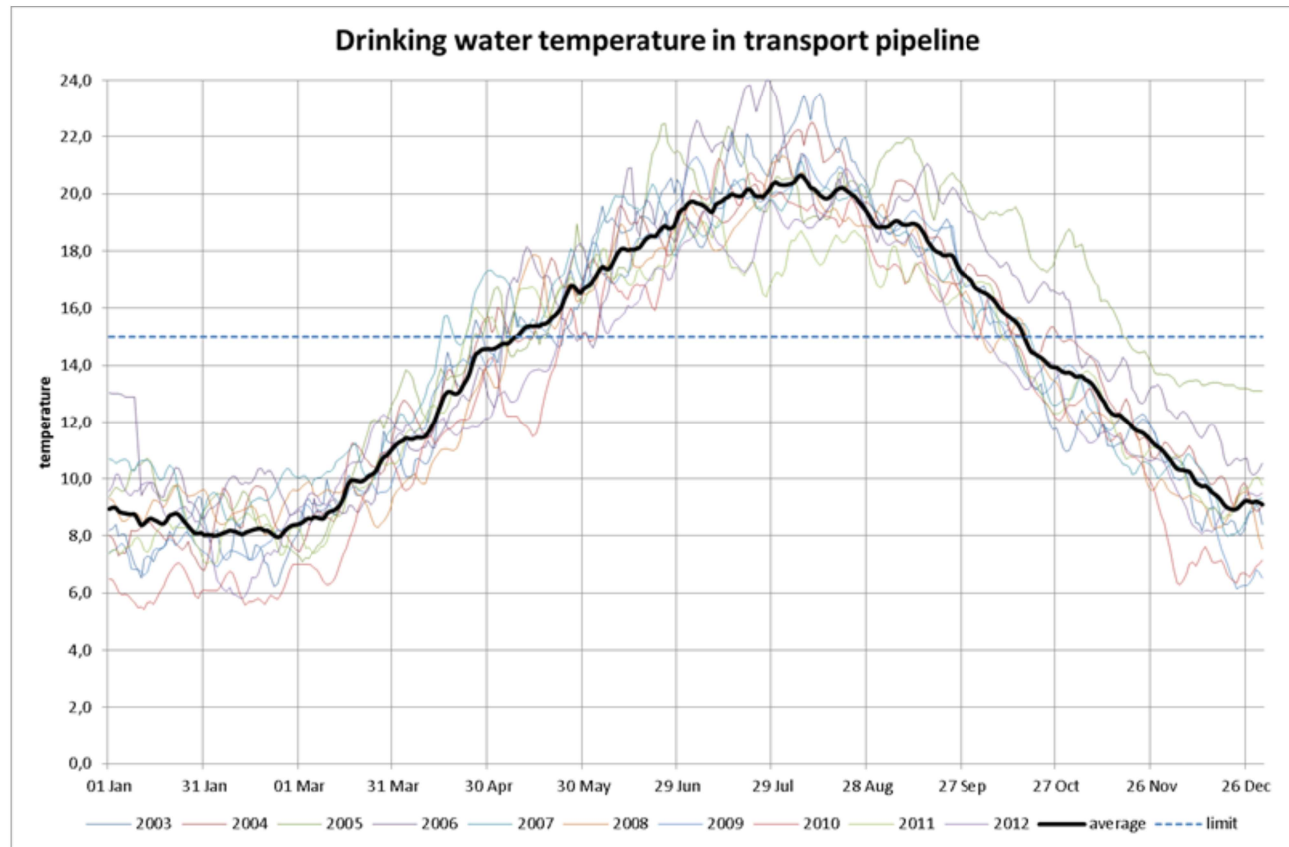


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Feasibility



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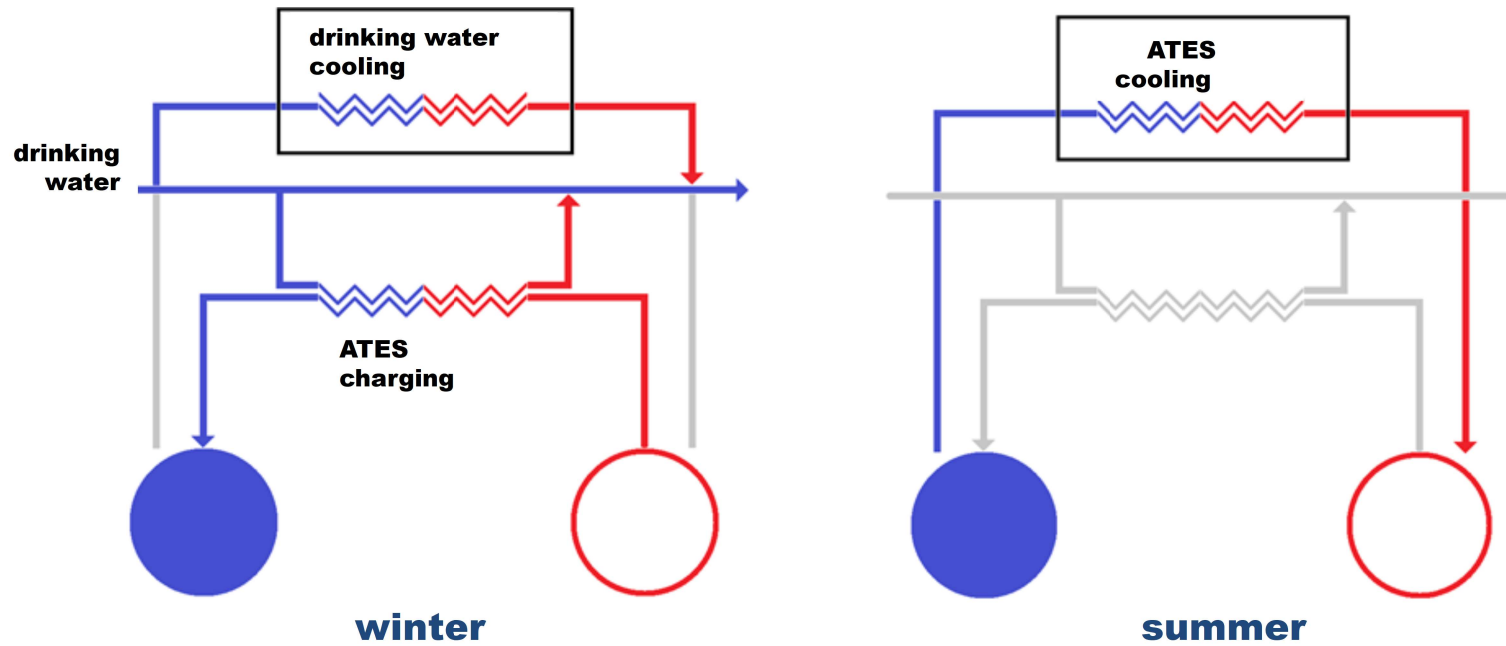


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Design



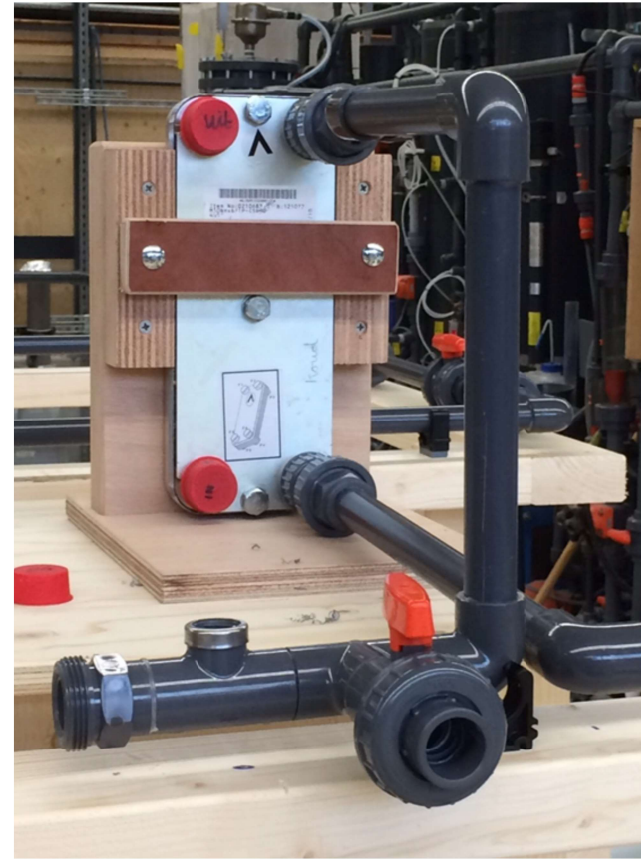
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Research



waternet



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Business case

- Total cost of ownership
 - Cooling with drinking water
 - Traditional cooling machines

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Business case

<i>Investment</i>	traditional	1,3Mln. €	
	cooling from drinking water	2,5Mln. €	
<i>TCO</i>	traditional	8,0Mln. €	
	cooling from drinking water	5,8Mln. €	
<i>E-consumption</i>	traditional	2000MWh/y	
	cooling from drinking water	500MWh/y	
	CO2 saved	1.100	T/year

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Project start: november 2016



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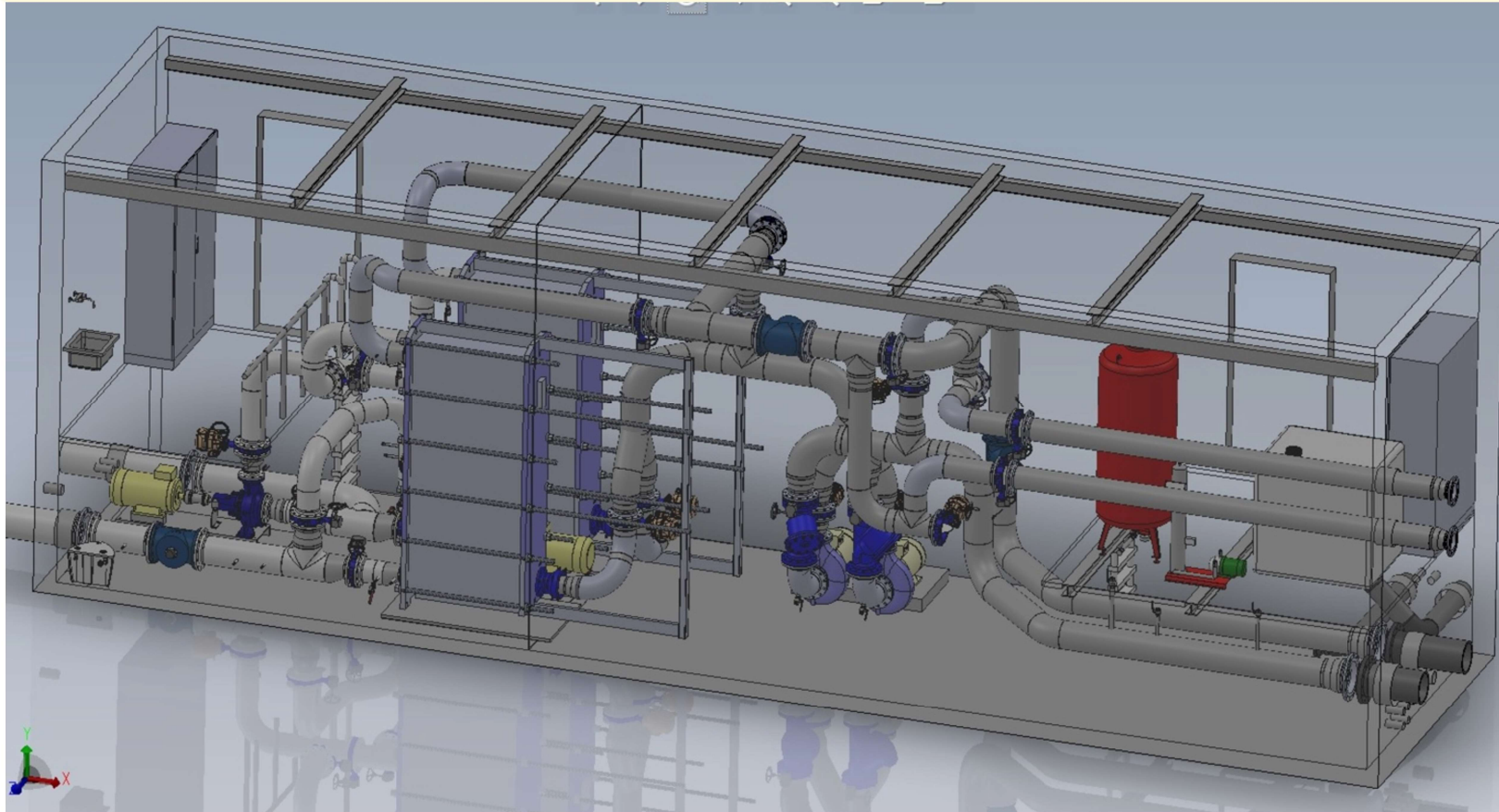
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A detailed 3D schematic of a water treatment system. The system includes a large rectangular tank with internal baffles, a pump assembly with a yellow motor, and various pipes and valves. Numerous components are labeled with red callouts and codes: E001, TT003, E002, TT004, PI002, MOV002, P002, PI004, LS002, TT006, HV010, HV034, HV033, TT007, HV009, FT001, MOV004, P001, MOV001, PT001, TT002, LS001, MOV003, TT005, PI003, LS003, TI002, HV018, HV016, TI001, HV017, PI001, and E001. The system is shown in a perspective view, highlighting the complex piping and mechanical components.

 **waternet**
waterschap amstel gooi en vecht
gemeente amsterdam

[illegible]

Waternet – Sanquin installations



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Prefabricated module



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Installation July 2017



Start of operations: november

2017
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Succes factors

- Right timing
- Long-term commitment
- Personal relationships
- Trust
- Open about costs and benefits
- Perseverance
- European support (City-zen)

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Communication & dissemination



Municipality & stakeholders

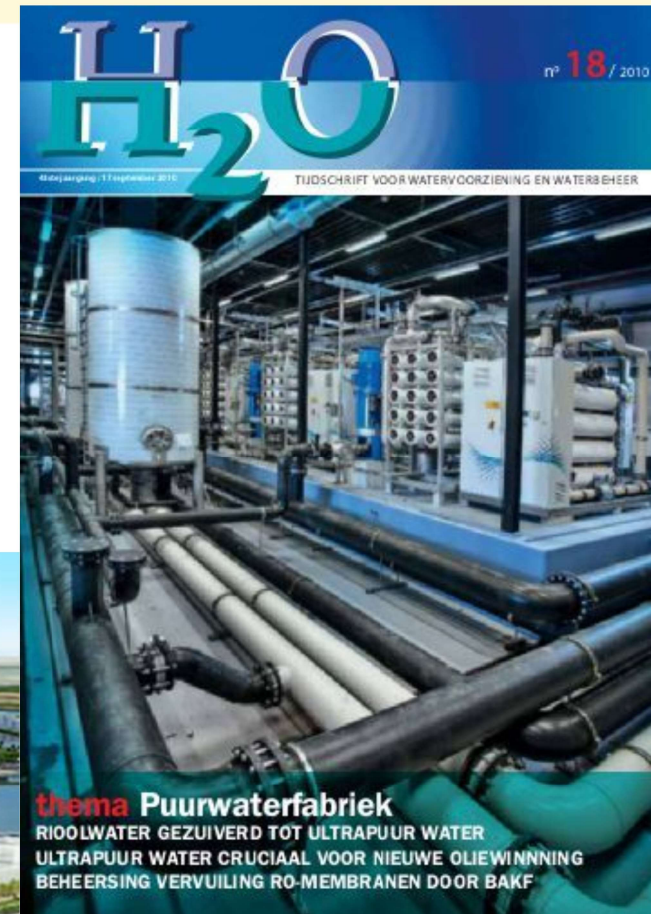
Communication & dissemination



Communication & dissemination



Communication & dissemination



Communication & dissemination



amsterdam
**smart
city**



Immediate social impact

- Citizen involvement: at this point low
- Benefit: drinking water 0,5° warmer in the winter for 250.000 users

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Lessons learned

- Reliance on public networks is a big step in many sectors
- Personal networks are important
- Geography is important
- Storage is key
- Investment & exploitation is relatively easy in a business environment. Not so easy in residential areas
- Public utilities companies are trusted

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What makes this solution replicable



Innovation

- Drinking water for cooling
- Small temperature difference and large flow = significant amount of energy
- Concept works for cooling, but also for heating
- Public water company in the role of energy provider



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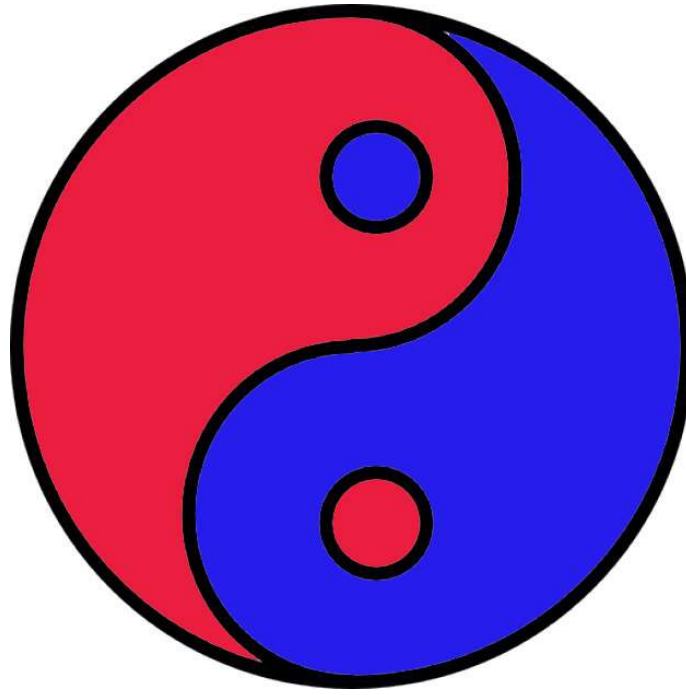


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Long term impact



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Other low temp projects in Amsterdam

- Warmth supply from drinking water for a neighborhood ATES (implemented).
- Warmth supply from waste water for a new neighborhood heating system (6000 houses) (proposed)
- Cold supply from main raw water transport pipe line to cool data centers (cooling capacity 10x greater than Sanquin project) (proposed)

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Governance issues

- Role of low temperature energy in city energy planning
- From centralized systems to community systems?
 - Role of centralized utilities providers?
- Invest in new infrastructures?
 - Or wait for the energy transition to happen?
- Involvement of commercial parties is problematic
 - Positive TCO but high investments, slow payback
 - Long-term infrastructures: long-term commitment
 - Monopolistic supply of energy

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Q&A and Discussion

Questions?

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Q&A and Discussion

In locations where a low-temperature cooling and heating network is the most energy-neutral option, individual users should not be given a free market choice.

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Q&A and Discussion

Low temperature cooling and heating infrastructures require long-term commitment and therefore stand in the way of future innovations in the energy sector

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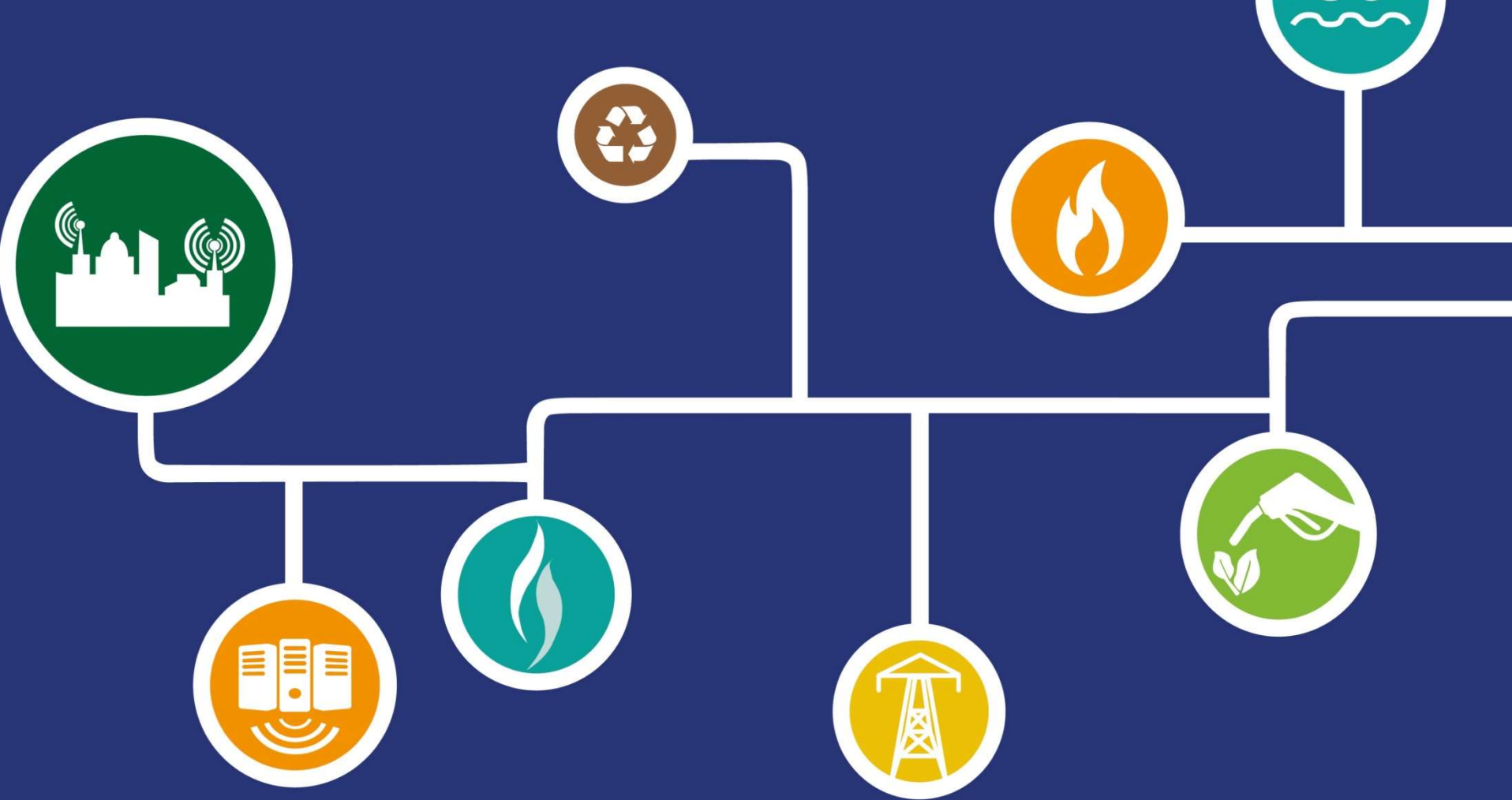
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Q&A and Discussion

Low temperature cooling / heating is a long-term infrastructural solution. It should be financed with public funds, and the risks should be socialized

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THANK YOU !