



Digital Heat Roadmap

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Introduction

Definition: What makes a heat network a digital heat network?

No univocal definition yet...

...but some criteria:

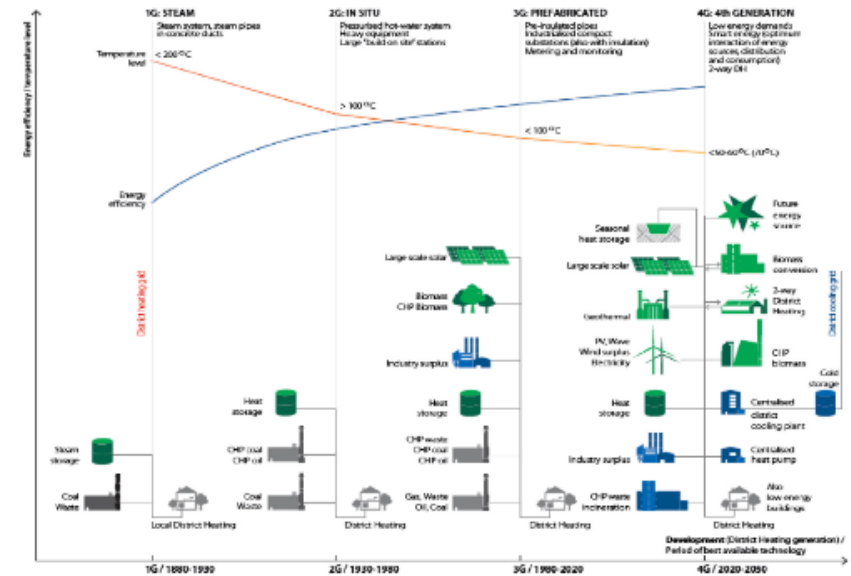
- Large number of sensors present in the network
- Automated recording, transfer and storage of data
- Automated analyses of data
- The analyses are used:
 - Not only automated billing
 - But to optimize the network operation



Introduction

The importance of digitalisation

- Digitalisation is a prerequisite in 4th generation heat networks
- Digitalisation makes heat networks
 - More sustainable
 - More renewable energy, more excess heat, lower temperature levels
 - More reliable
 - Safe guarding systems for heat networks
 - More profitable
 - Lower losses
 - Reduction of expensive fossil fuel consumption
 - Optimal usage of CHP, heat pumps,...



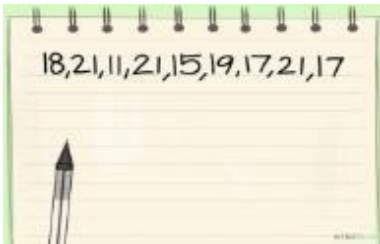
Introduction

From data to information to knowledge to wisdom

Machine

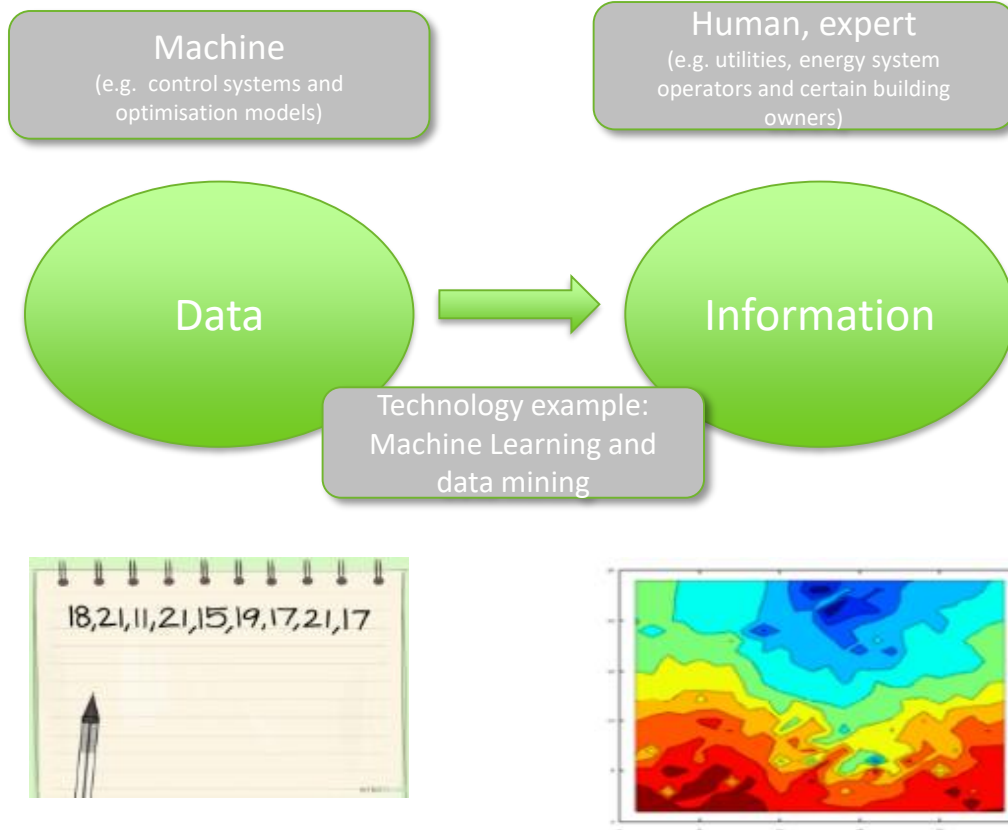
(e.g. control systems and
optimisation models)

Data



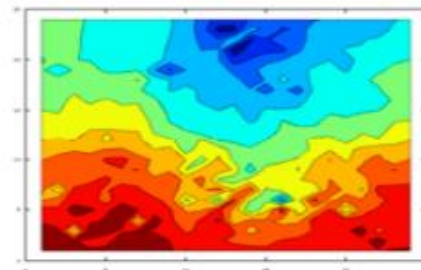
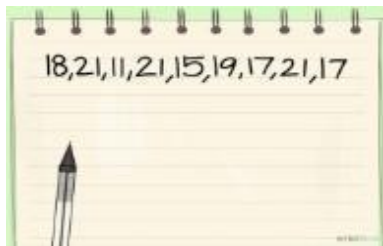
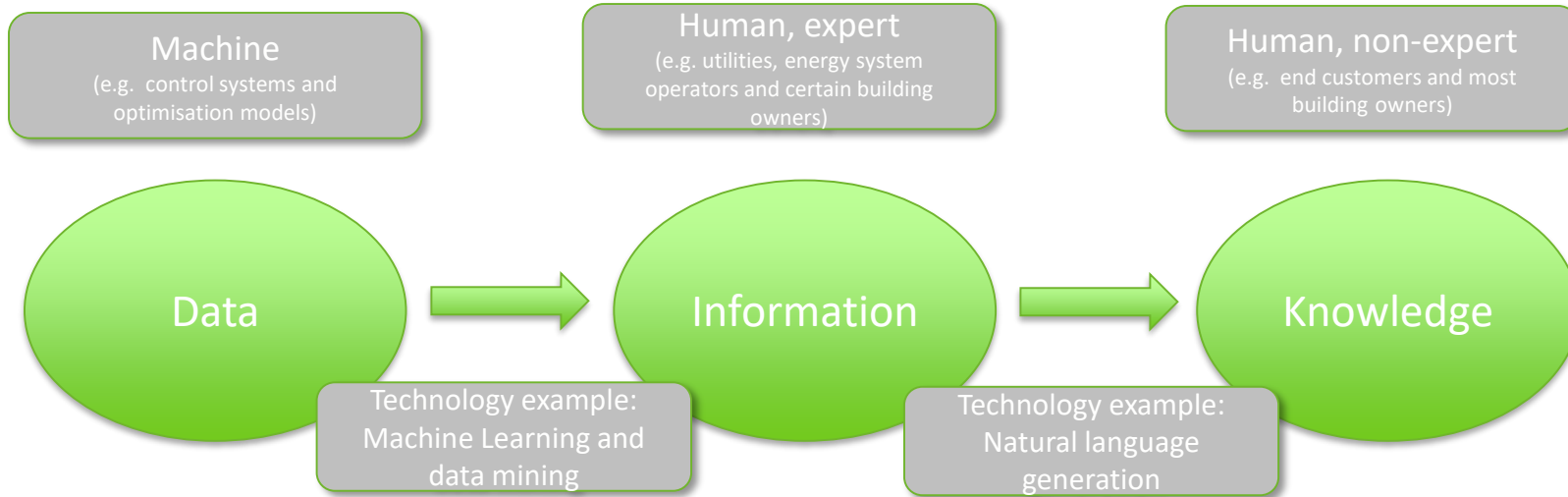
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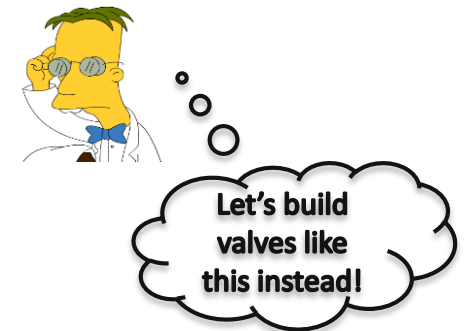
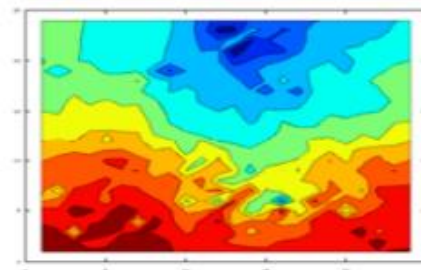
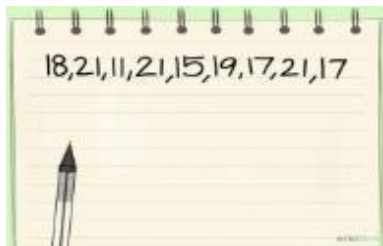
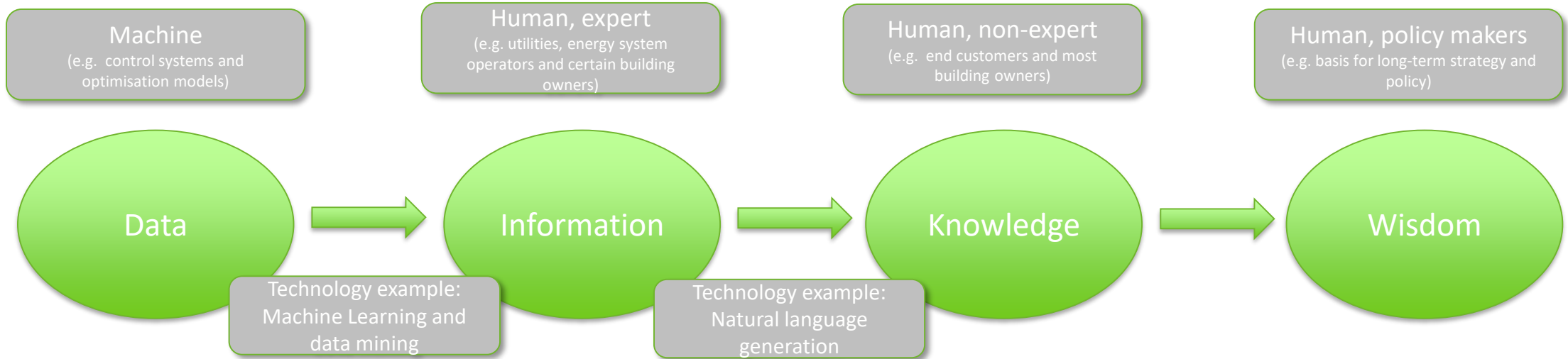
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Introduction

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THE CONTINUUM OF UNDERSTANDING

Introduction

Digital heat roadmap



- To offer insights on how digitalization impacts the industry
- State-of-art
- Objectives, targets and recommendations
- Topics:
 - Production level
 - Distribution level
 - Buildings level
 - Consumption level
 - Design & planning
 - Sector Coupling & integration of multiple sources

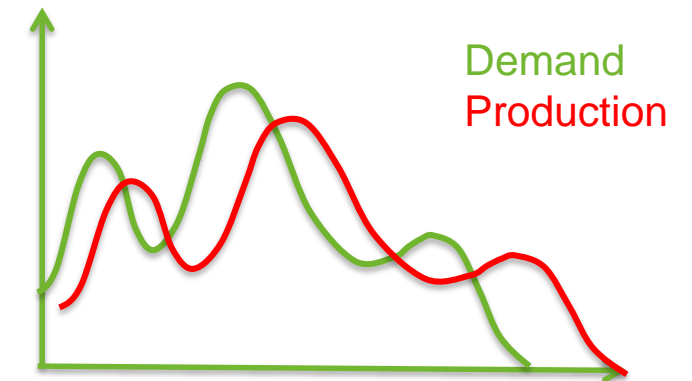
Possibilities of digitalisation

Production level

The challenge: Integration of highly fluctuating sources (e.g. solar heat, excess heat).

The solution: smart network controllers

- Influencing the production profile by ‘activation’ of available flexibility in the network
 - Thermal storage buffers
 - ‘Intrinsic’ flexibility (buildings, water in network)
- Aim:
 - Peak shaving
 - Support of the electric grid (CHP, HP, ORC)
 - Maximisation of profits (CHP) / minimisation of costs (HP)
 - Plant scheduling



Possibilities of digitalisation

Distribution level

Additional digital functionalities:

- Operational analysis and predictive maintenance
 - Identify bottle necks in the network
 - Leakage detection
- Management of under-dimensioned piping systems
- Pressure optimization
 - Dynamic instead of static pressure head
- Operational thermal optimization
 - Dynamic supply temperature control
 - The network pipes as thermal storage



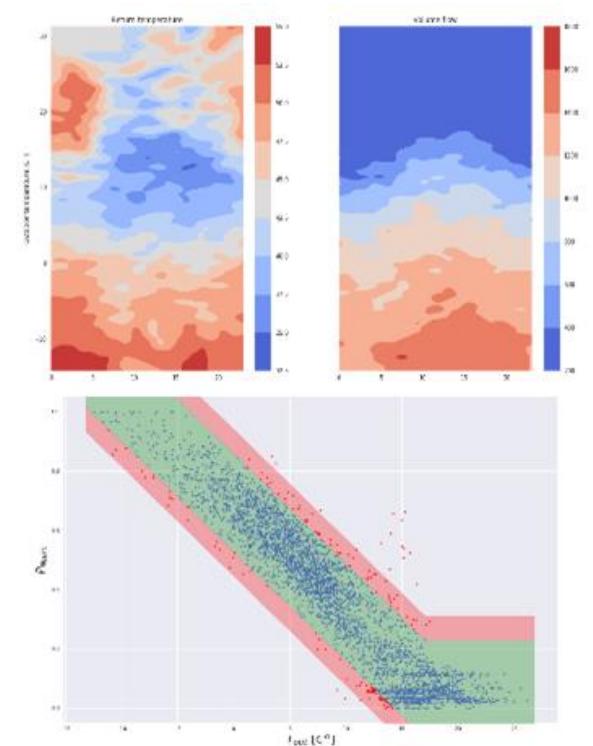
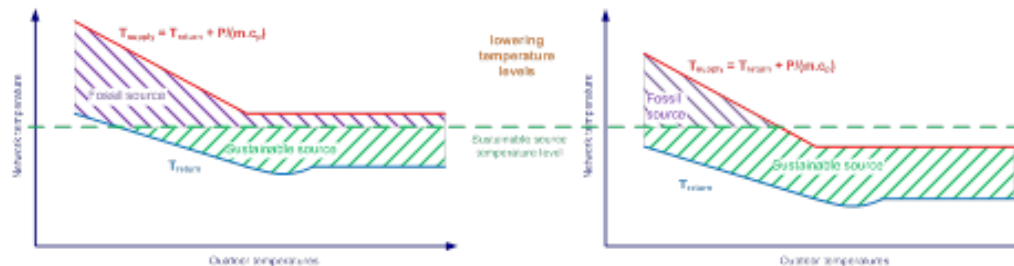
Possibilities of digitalisation

Building level

Since heat networks are demand driven, the building level is crucial for the whole network.

Smart meters for:

- Detection of faulty installations
 - Poorly performing substations
 - Faults in HVAC systems, i.e. leakages, anomalous consumption
- Inefficient use of resources
 - Peak loads
- Minimization of return temperature to promote LT sources



Possibilities of digitalisation

Consumption level

Visualisation tools for end-users

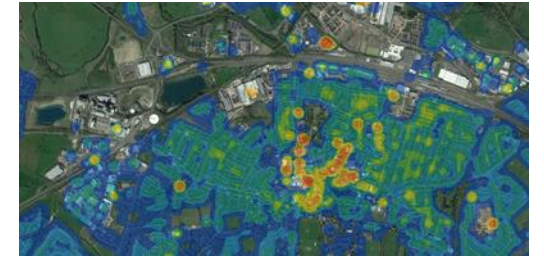
- Increasing awareness of end-users' energy consumption
- Suggestions of energy savings
- Optimize behaviour of optimal het network operation
 - Night setback issue



Possibilities of digitalisation

Design and planning

Planning of DH networks is not straightforward, since it depends on many technical and non-technical conditions. Therefore, optimum planning is challenging.



Source: EM Magazine

Digitalisation can support the decision making process by:

- Tools to dynamically simulate the network behaviour
- Tools to provide optimal type, routing and dimensioning of the network, and the temperature levels
- Tools to support the design of hybrid solutions:
 - DH in combination with PV, solar thermal, (micro-)CHP, batteries, heat pumps, storages on central or decentralised level

Possibilities of digitalisation

Sector coupling and integration of multiple sources

Traditionally electricity, heat, cold and gas networks are treated as individual sectors. Opportunities to optimize the overall energy system lie in the combination of these networks.

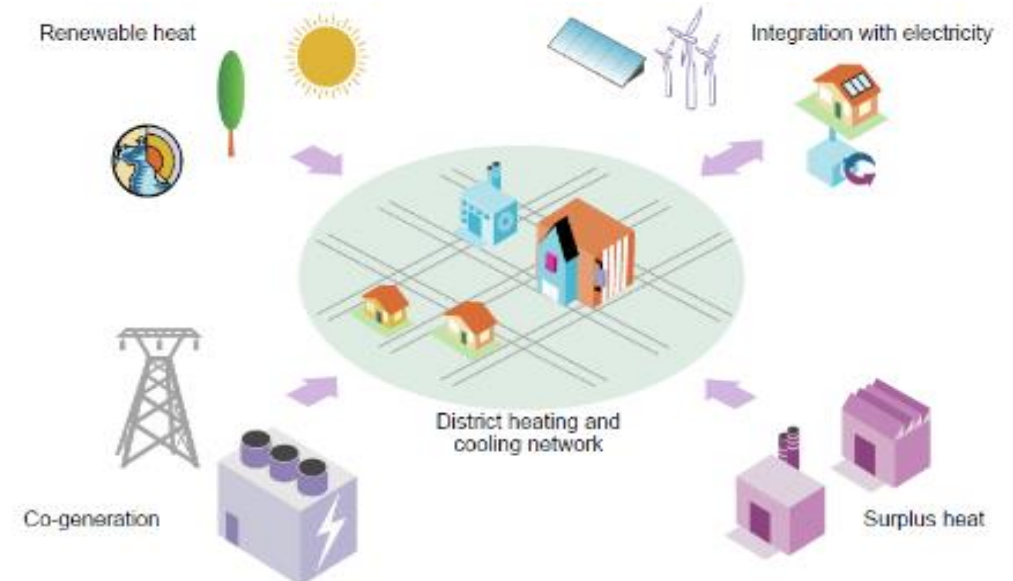
An example, combining heat and electricity grids:

- Electric grids: highly fluctuating RES (PV, wind) but little flexibility in the network.
- Heat networks: lots of flexibility (thermal mass of buildings, network pipes)

By coupling these networks, the DH network can support the balance in the electricity grid and reduce curtailment of valuable RES.

Coupling points:

- DHC customers, at their private installations
- DHC distribution substations, at the various heat/cold sources and storages
- DHC production units (HP, CHP, ORC...)



Digital Heat Roadmap

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- Work in progress

- Final version available in the coming weeks





DIGITAL HEAT IS COOL!

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