



› INTEGRATED PLANNING, DESIGN AND OPERATION OF 4TH GENERATION DISTRICT HEATING AND COOLING NETWORKS

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CONTEXT: BIG PICTURE

- › Heating/cooling accounts for 46% of all consumed energy in Europe, 85% is powered by fossil fuels.
- › Every day, > 1.0 G€ of fossil fuels are imported into Europe (from Russia, Middle East)
- › Every day, > 1.3 G€ of thermal energy is discarded as an unused by-product of electricity generation
- › Theoretically, there is plenty of waste- and natural heat for all heat demand.

- › District heating/cooling networks (DHCN) connects thermal production and consumption
- › Efficiently exploiting waste- and natural heat with 4th generation DHCN:
 - › Coordination of multiple, decentralized, possibly uncontrollable thermal sources (e.g. solar thermal)
 - › Integration of low temperature heat sources (e.g. waste heat)
 - › Efficient distribution
 - › Interaction with other energy infrastructures (e.g. electricity, gas), both direct (conversion technology) and indirect (coupled markets)

CONTEXT: MARKET

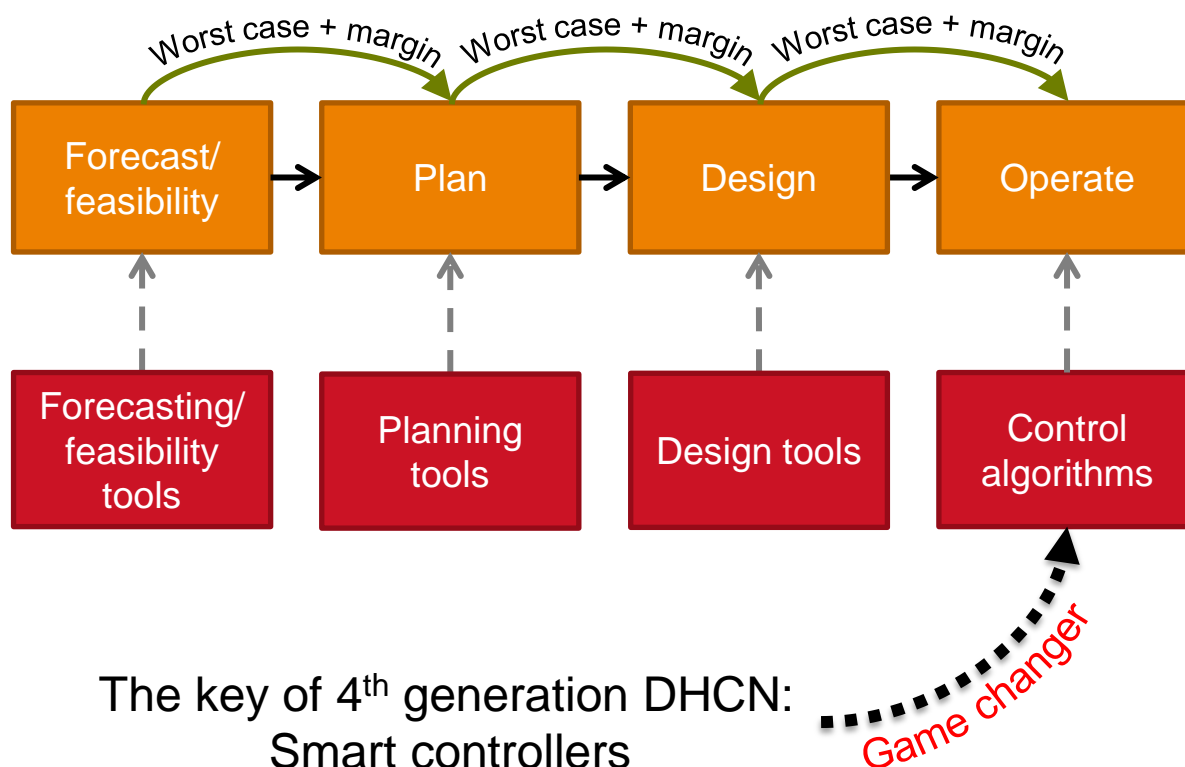
- › Profitability of conventional DHCN under pressure, future uncertain:
 - › DHCN requires large investments
 - › Volatile/rising prices of fossil fuels/CO₂ emissions
 - › Volatile/rising prices of biomass
 - › Volatile/falling revenues of CHP: thermal must-runs during times of low electricity prices
 - › Scarcity of high temperature waste heat industry that is willing to sign decade-long contracts
 - › Falling space heating demand due to building refurbishments

4th generation DHCN addresses most/all these points, however:

How to properly plan/design such a 4th generation network?

Conventional DHCN development (static)

From big picture to operational details based on peak load



- › Design based on worst case peak loads, with additional margins
- › Different software tools (and parties) per phase
- › Tools aimed at conventional DHCN

Over-dimensioning increases CAPEX and OPEX

P•WERMATCHER
smartgrid technology

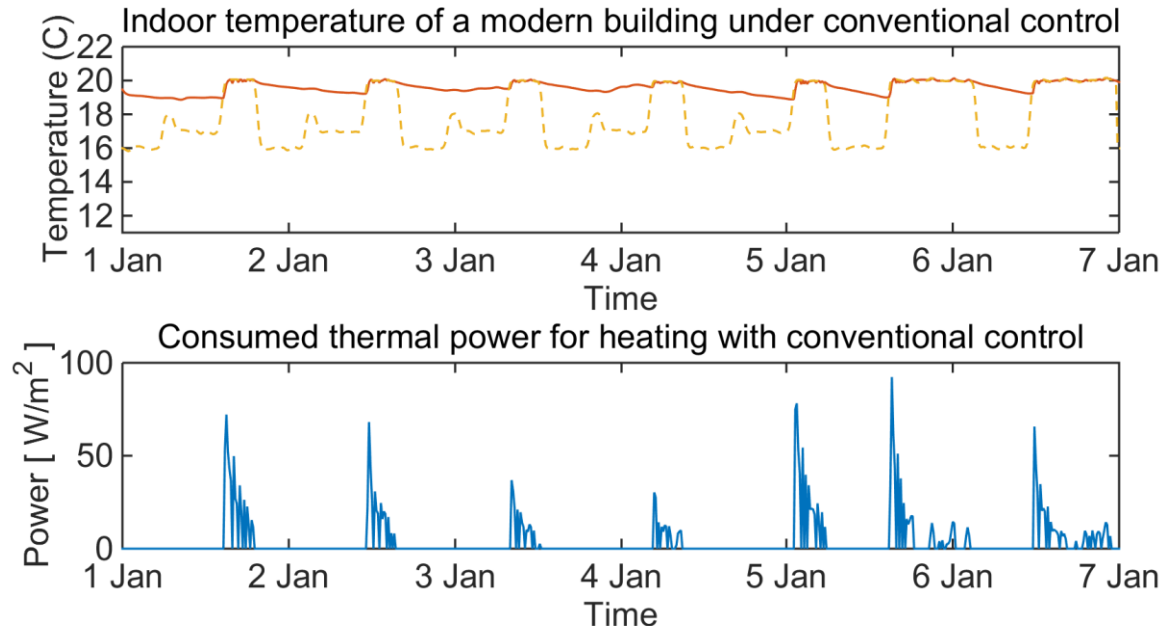
**MULTI
COMMODITY MATCHER**

HeatMatcher

Smart control with cascading benefits: game changer

System-wide optimization (smart control): coordination of sources, storage and consumers

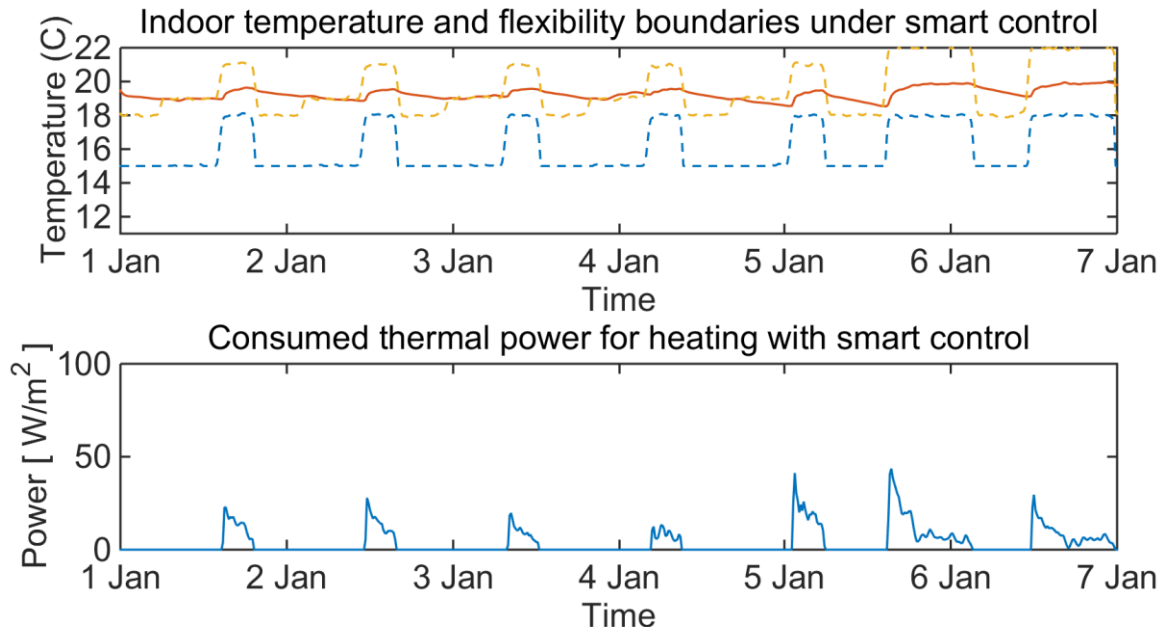
- › Example: peak shaving by demand management in a new district with modern houses



Smart control with cascading benefits: game changer

System-wide optimization (smart control): coordination of sources, storage and consumers

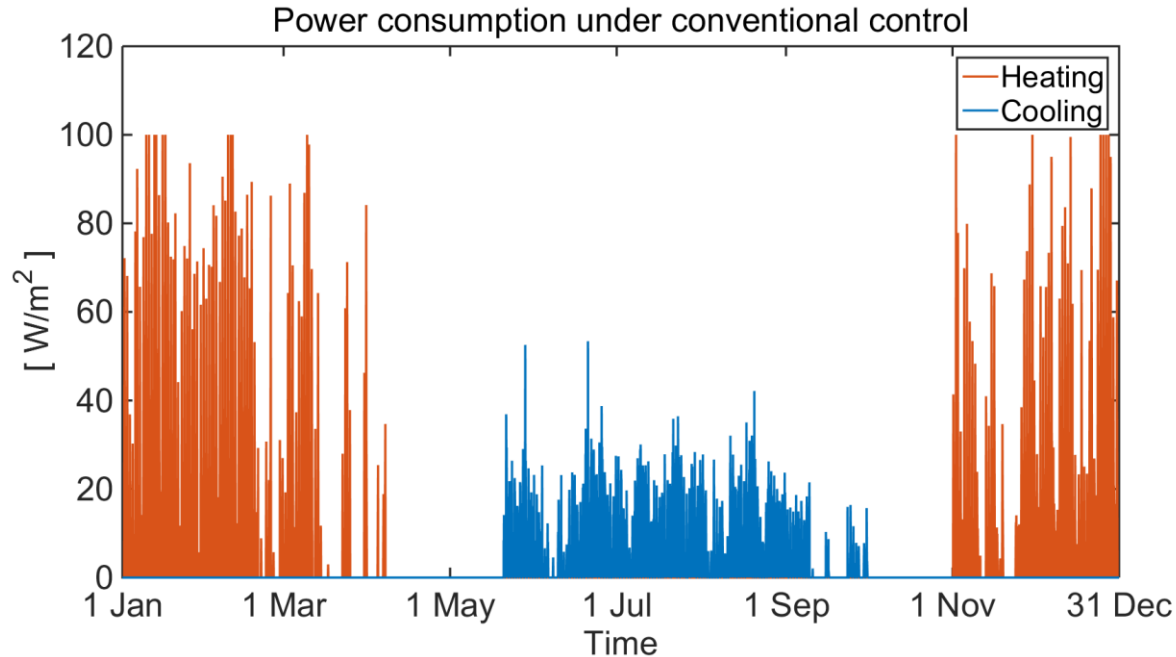
- Example: peak shaving by demand management in a new district with modern houses



Smart control with cascading benefits: game changer

System-wide optimization (smart control): coordination of sources, storage and consumers

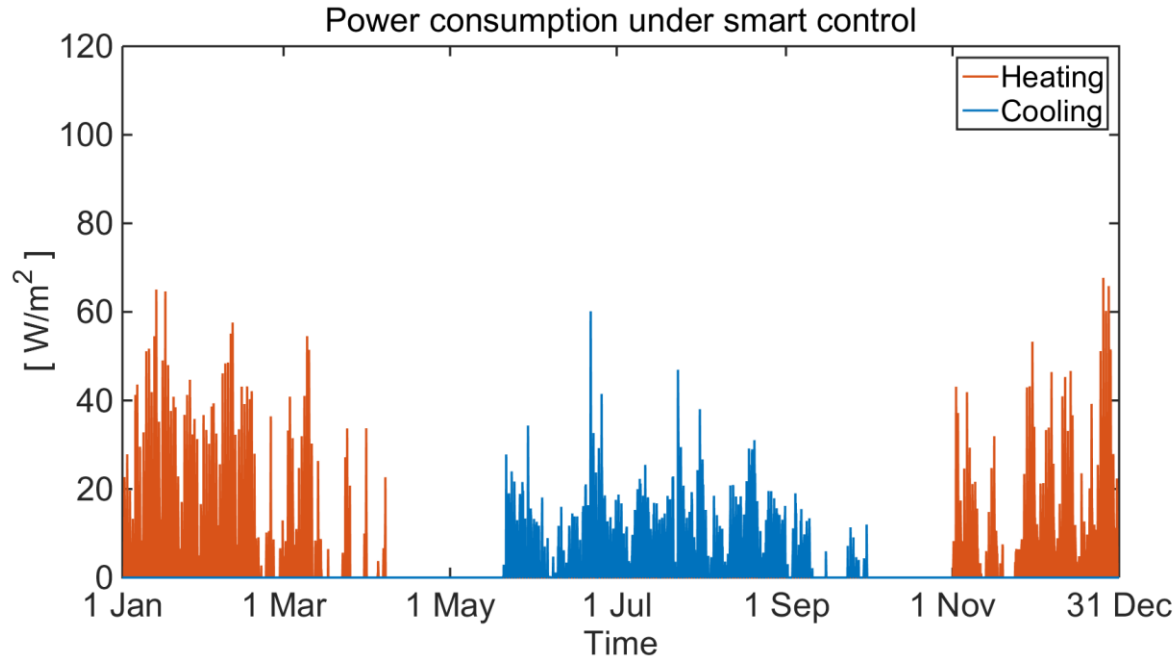
- › Example: peak shaving by demand management in a new district with modern houses



Smart control with cascading benefits: game changer

System-wide optimization (smart control): coordination of sources, storage and consumers

- Example: peak shaving by demand management in a new district with modern houses

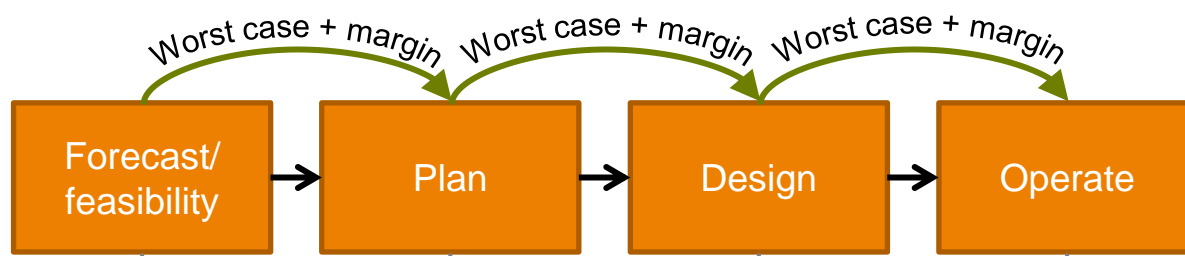


MULTI
COMMODITY MATCHER

33% peak shaving

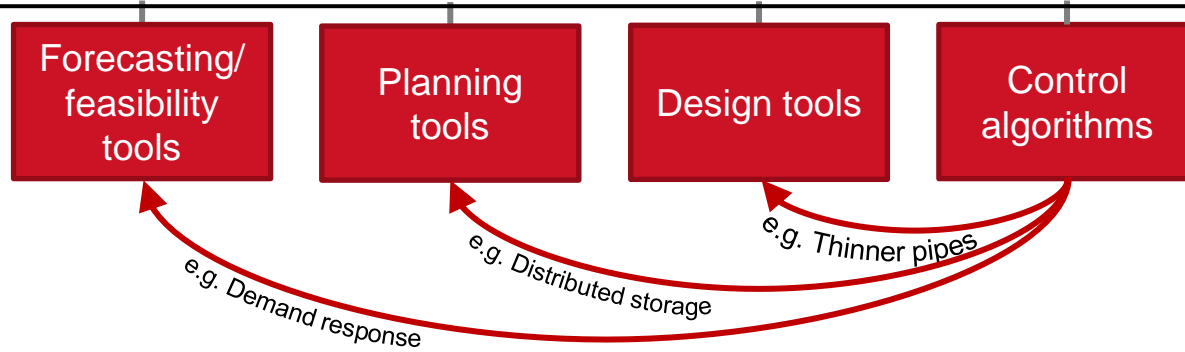
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4th Generation DHCN development (dynamic)

Smart thermal operation influences forecasting, planning and design

- › Smart control enables system-wide optimization, which is leveraged into efficient design
- › Holistic approach over all network time scales, from minutes (operation) to decades (investment)

Lean, dynamic networks with lower CAPEX and OPEX

TNO CHESS

- Controlled Hybrid Energy Systems Simulator (CHESS), based on FP7 E-Hub project



H2020 PROPOSAL **SODA4HEAT** (*PENDING*)

Smart **O**ptimization and **D**esign pl**A**tform for **4th** generation district **h**eating and cooling networks

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vito
vision on technology

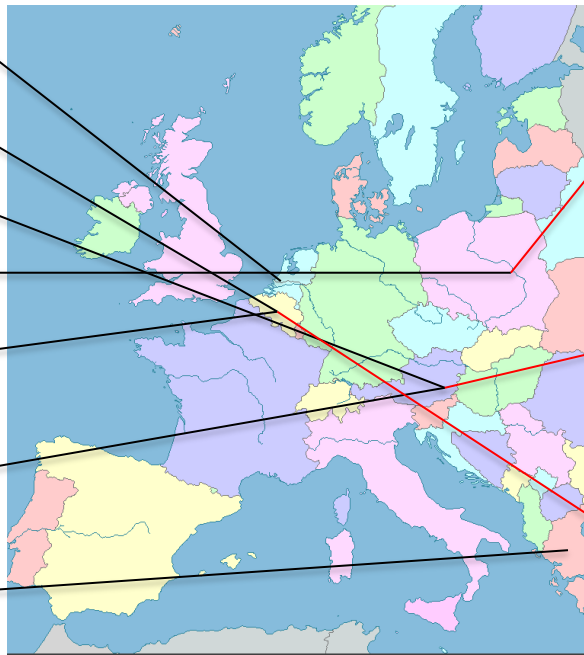
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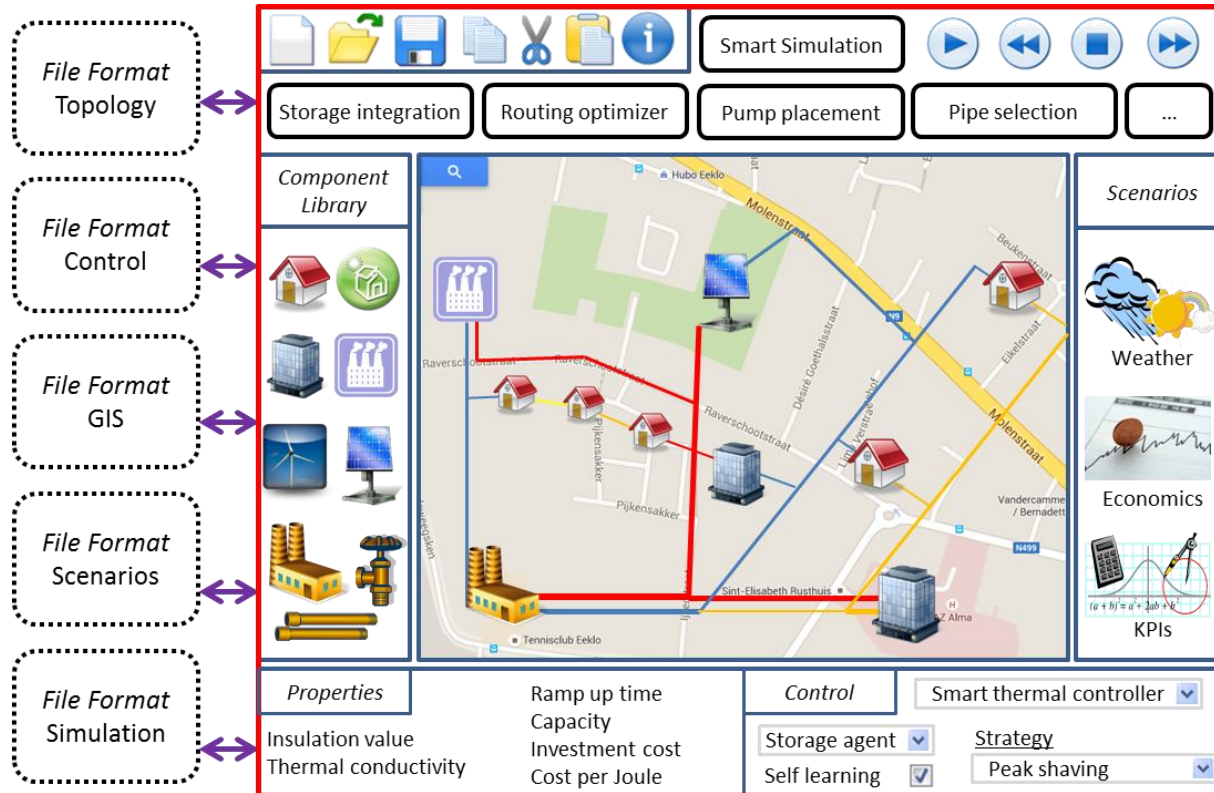
Refurbishment of
Warsaw's 2nd
generation network

Extension of Gamlitz-
Ehrenhausen-Retznei
3rd generation network



Greenfield design
of 4th generation
network in Eeklo

H2020 PROPOSAL **SODA4HEAT** (*PENDING*)



Results

1. Software platform
Open source
2. Smart simulation module
Compiled free
3. Design optimization modules
Compiled licensed

Join us!

- Stakeholders group (advisory role, software demo's, etc.)
- Open source community
- Cooperation

› **THANK YOU FOR YOUR
ATTENTION**

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