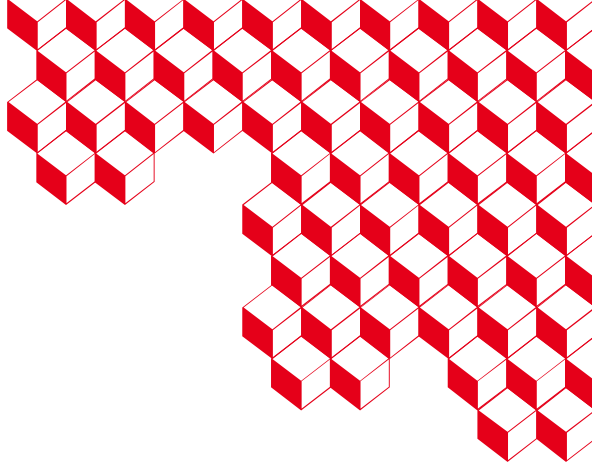


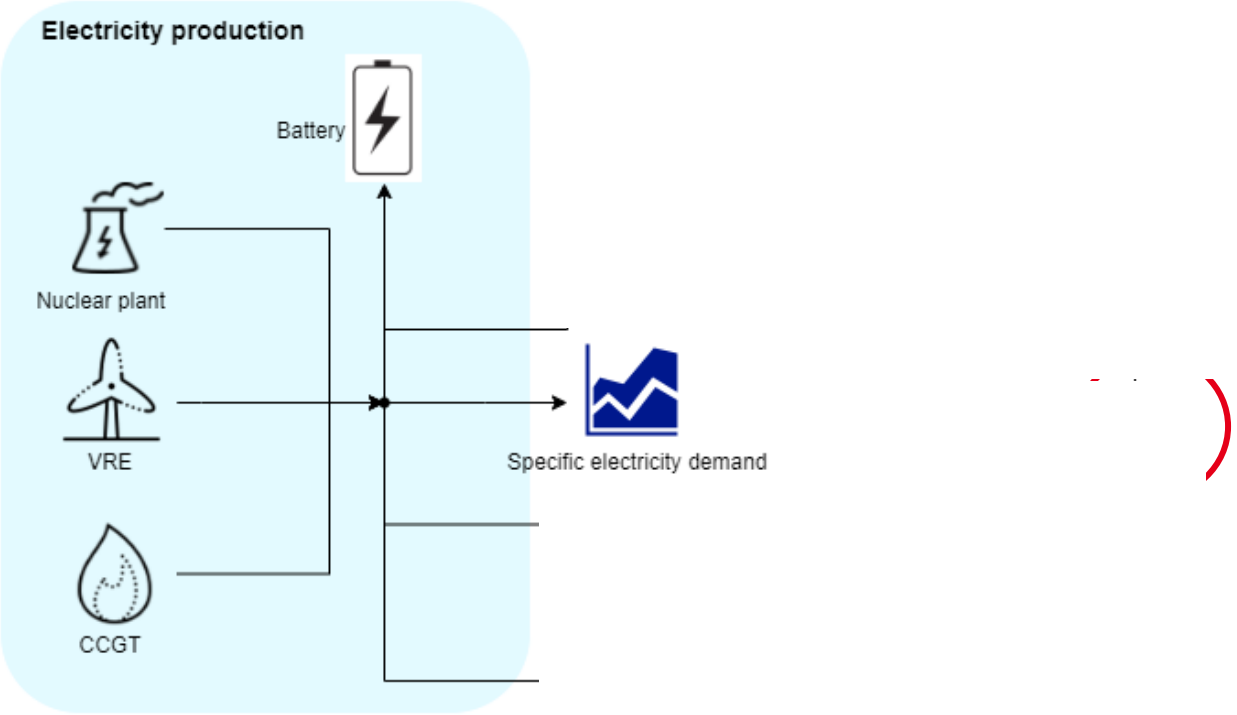
Modelling an electricity-and-heat coupled system

Should the heat production be diluted or non-diluted?

Lukas Hofmann – PhD student (2nd year) – **CEA**

openmod open energy modelling initiative

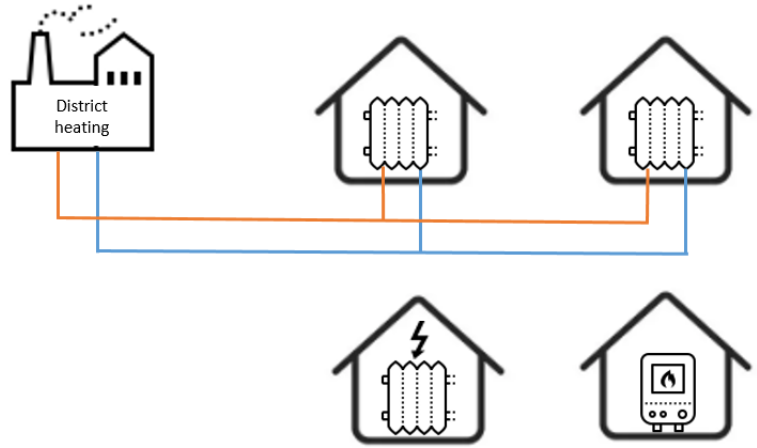
What are we talking about?



A simplified multi-vector optimisation model

The (non-)dilution dilemma

- **Individual** and **district heating** mixes are currently non-diluted
- Energy models do not systematically take this constraint into account
- Allowing the dilution offers a wider scope of possibilities …
- … but prevents an accurate cost calculation of the thermal system



Credit: iStock

→ *It is confusing … What should we do?*

Let’s assess if the non-dilution affects the results at all

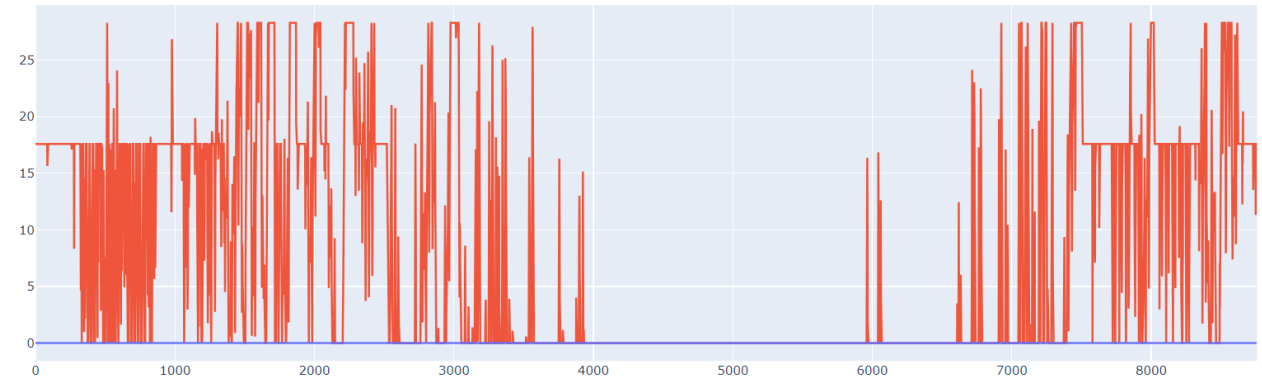
Methodology :

- Created a heat-and-electricity “**toy**” cost optimisation **model** (sizing & dispatch – MILP)
- Run the model over one year at an hourly resolution
- Observed the differences

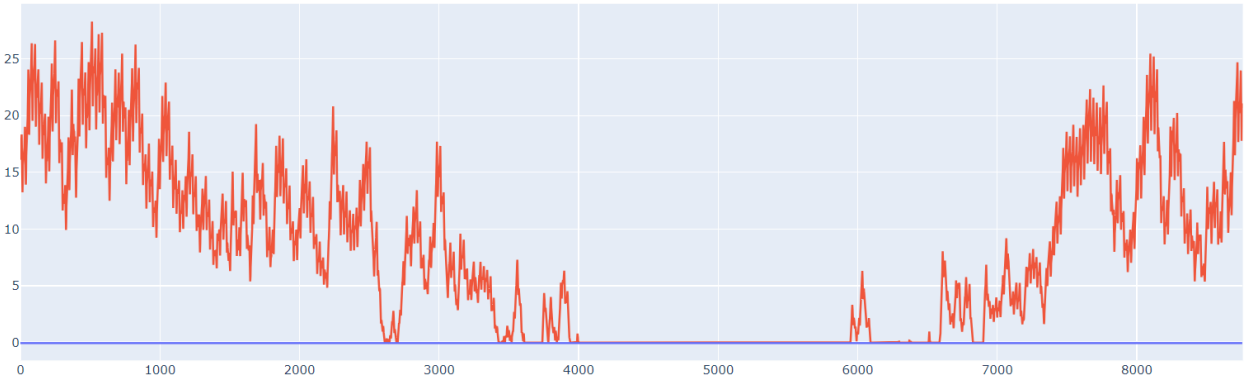
What we observed – *when applying the non-dilution constraint*

→ District heating becomes **less competitive** because it loses its short-term flexibility to address any heat demand

Injected heat *(GW) from the district heating during one year (hours)*



Diluted



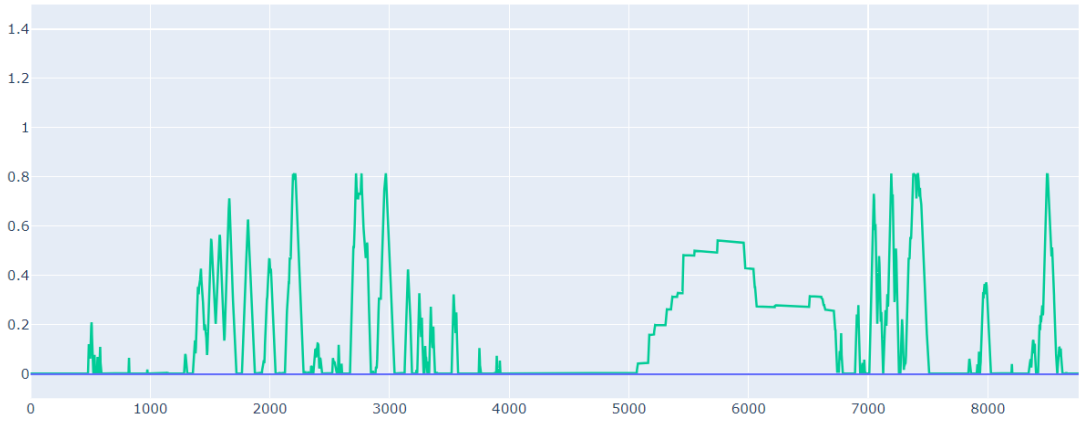
Non-diluted

What we observed – *when applying the non-dilution constraint*

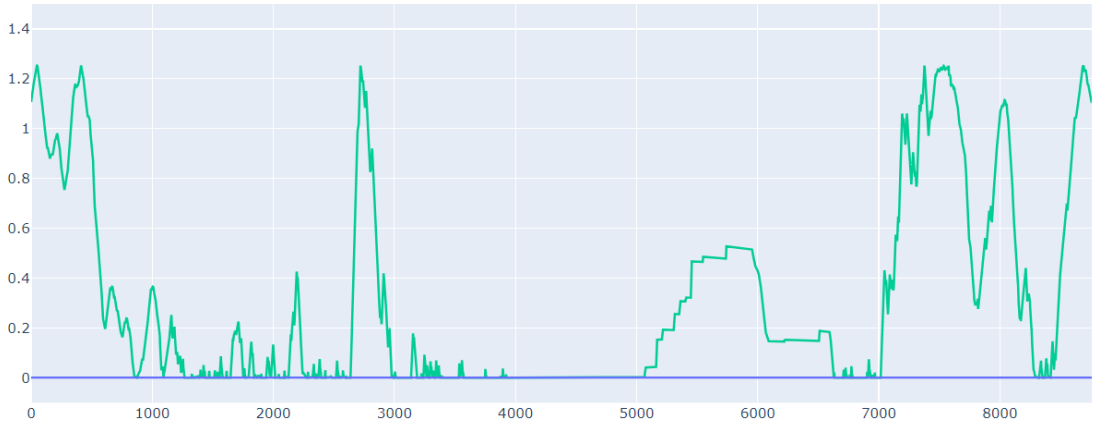
→The thermal energy storage **is greatly impacted**

- Less discharge capacity (- 15 %)
- Greater storage capacity (+ 60 %)
- Change of behaviour (less charge-and-discharge cycle, more energy stored on longer periods

State of charge *(TWh) of the thermal energy storage during one year (hours)*



Diluted



Non-diluted

To dilute or not to dilute?

To not dilute!

Diluting individual and centralized mixes gives wrong district heating competitiveness and wrong thermal storage behaviour

Next step :

What about the dilution between the individual heating devices?

Results are based on a single toy model and rely on the model's assumptions

Illustration credit: iStock

Thank you!

Presenter :

Lukas Hofmann
PhD student (2nd year)
CEA/DES/ITESE
lukas.hofmann@cea.fr

PhD supervisors :

Arthur Clerjon – arthur.clerjon@cea.fr
Philippe Azaïs – philippe.azais@cea.fr
Fabien Perdu – fabien.perdu@cea.fr
Roland Bavière – roland.baviere@cea.fr