CLIMATE NEUTRAL DATA CENTER

WEBINAR

CAN THE INTERNET HEAT OUR COMMUNITIES?

Potential of data centre heat reuse in Europe.

15:00-16:30 CET | 25 June 2024

CISPE.cloud

EUROPEAN DATA CENTRE ASSOCIATION

CLIMATE NEUTRAL DATA CENTER

WEBINAR

CAN THE INTERNET HEAT OUR COMMUNITIES?

15:00-16:30 CET | 25 June

Emma Fryer
Director Public Policy
MODERATOR

Nikolaos Kontinakis
Policy Officer DG ENER

Bela Waldhauser
CEO

Marco Bolchi
Executive Director

Pauline Lucas
Policy Director

Felix Kriedemann
Project Manager

CISPE.cloud

EUROPEAN DATA CENTRE ASSOCIATION

Webinar guidelines

- Use the Q&A button for your questions.
- Please indicate your name, the name of your organisation and possibly the speaker to whom you would like to pose a question.
- The slides and recording of the webinar will be shared with all participants after the webinar.

CLIMATE NEUTRAL DATA CENTER

CAN THE INTERNET HEAT OUR COMMUNITIES?

Join the survey at
slido.com
#3155263

CISPE.cloud

EUROPEAN DATA CENTRE ASSOCIATION

CLIMATE NEUTRAL DATA CENTER

CAN THE INTERNET HEAT OUR COMMUNITIES?

Join the survey
at slido.com
#3155263

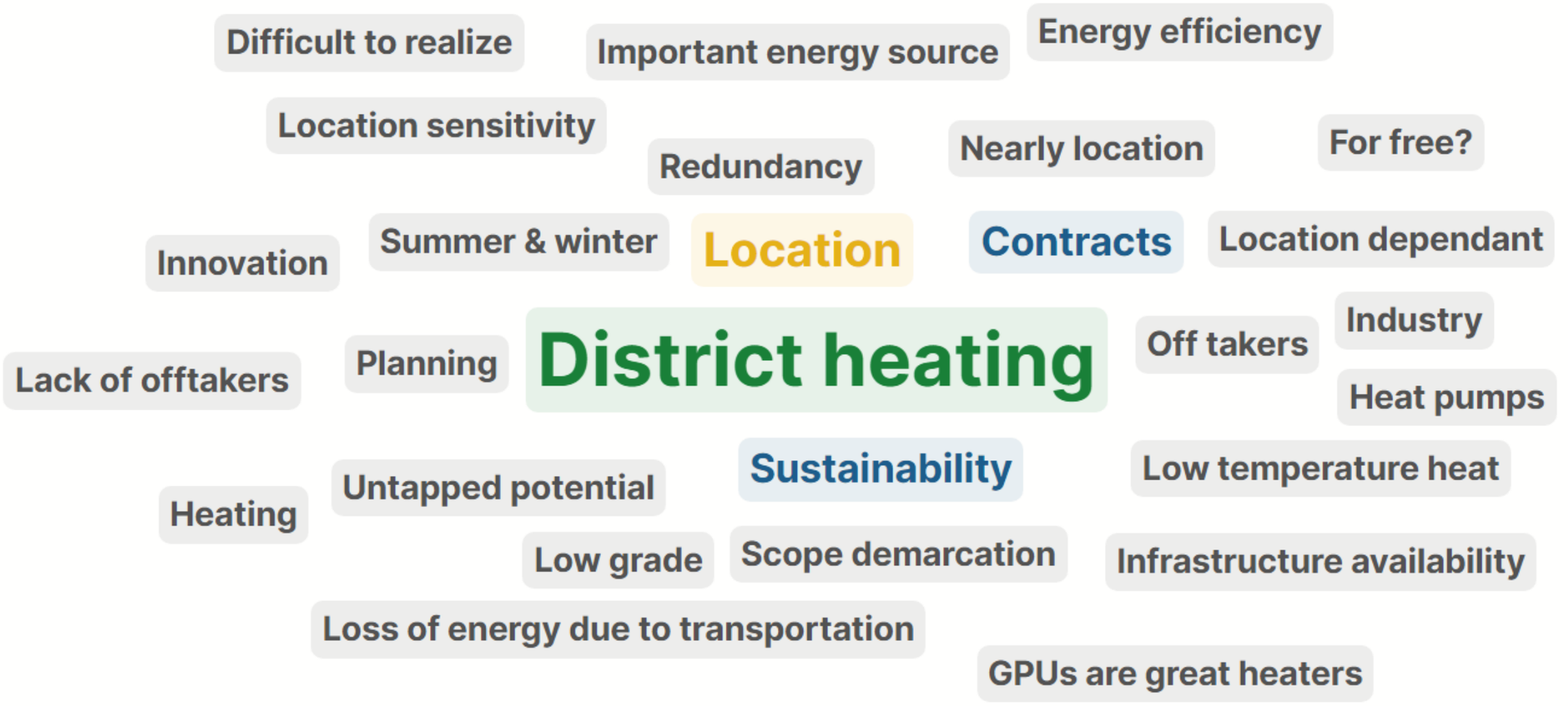
Which topics come to your mind when you think about data centre heat reuse?

CISPE.cloud

EUROPEAN DATA CENTRE ASSOCIATION

Active poll 37

Which topics come to your mind when you think about data centre heat reuse?



CAN THE INTERNET HEAT OUR COMMUNITIES?

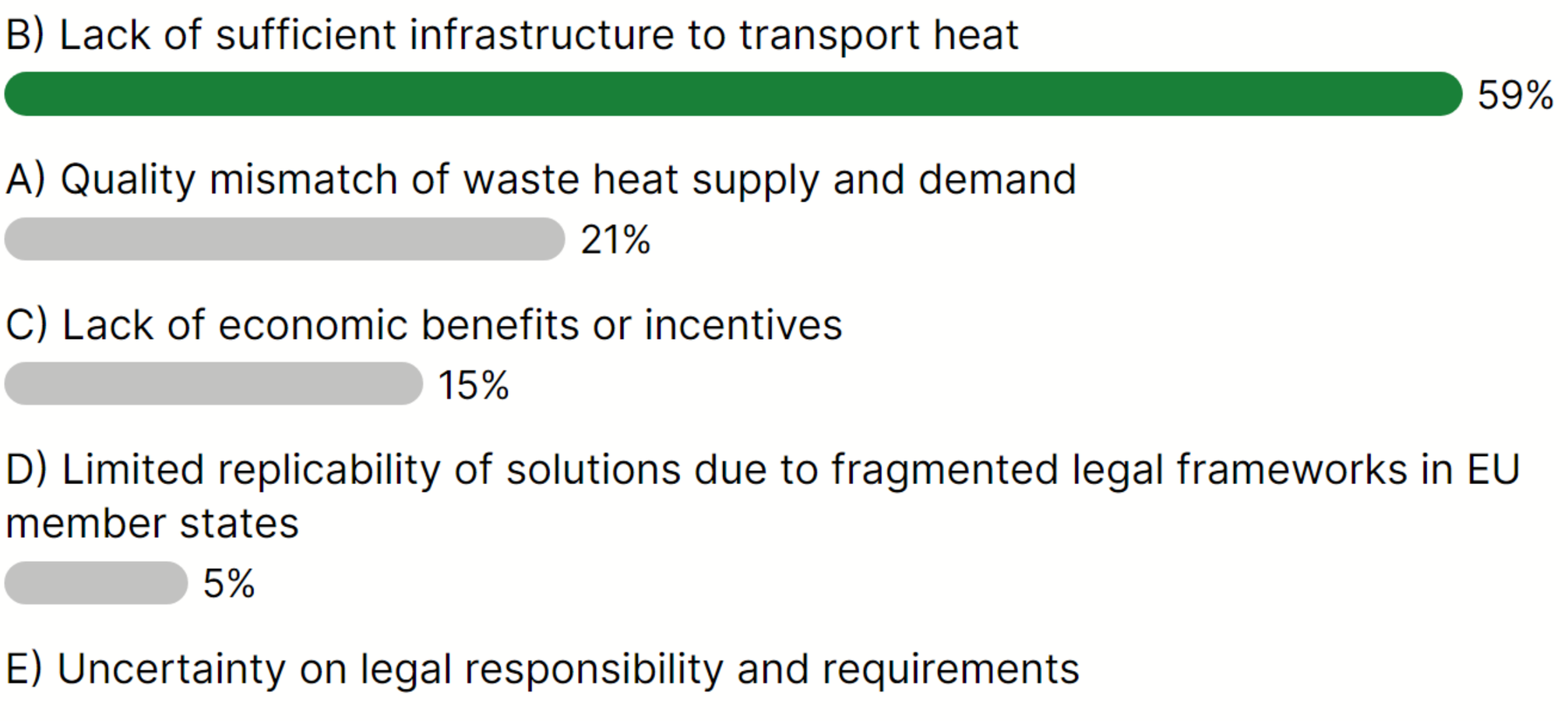
Join the survey at slido.com #3155263

In your opinion, which of the following constitutes the biggest challenge for the uptake of data centre heat reuse?

a) Quality mismatch of waste heat supply and demand
b) Lack of sufficient infrastructure to transport heat
c) Lack of economic benefits or incentives
d) Limited replicability of solutions due to fragmented legal frameworks in EU member states
e) Uncertainty on legal responsibility and requirements

Active poll 39

In your opinion, which of the following constitutes the biggest challenge for the uptake of data centre heat reuse?



CAN THE INTERNET HEAT OUR COMMUNITIES?

Join the survey at slido.com #3155263

In your opinion, which of the following actions would be the most important to increase the uptake of heat from data centres?

a) Standardising contractual models and collaborative frameworks in all EU member states

b) Providing funding for heat reuse infrastructure, feasibility studies and tools

c) Incentivising the use of liquid-cooled systems in new data centres

d) Supporting schemes and incentives for heat reuse for data centres and off-takers

Active poll 43

In your opinion, which of the following actions would be the most important to increase the uptake of heat from data centres?

D) Supporting schemes and incentives for heat reuse for data centres and off-takers

44%

B) Providing funding for heat reuse infrastructure, feasibility studies and tools

30%

A) Standardising contractual models and collaborative frameworks in all EU member states

16%

C) Incentivising the use of liquid-cooled systems in new data centres

9%

CLIMATE NEUTRAL DATA CENTER

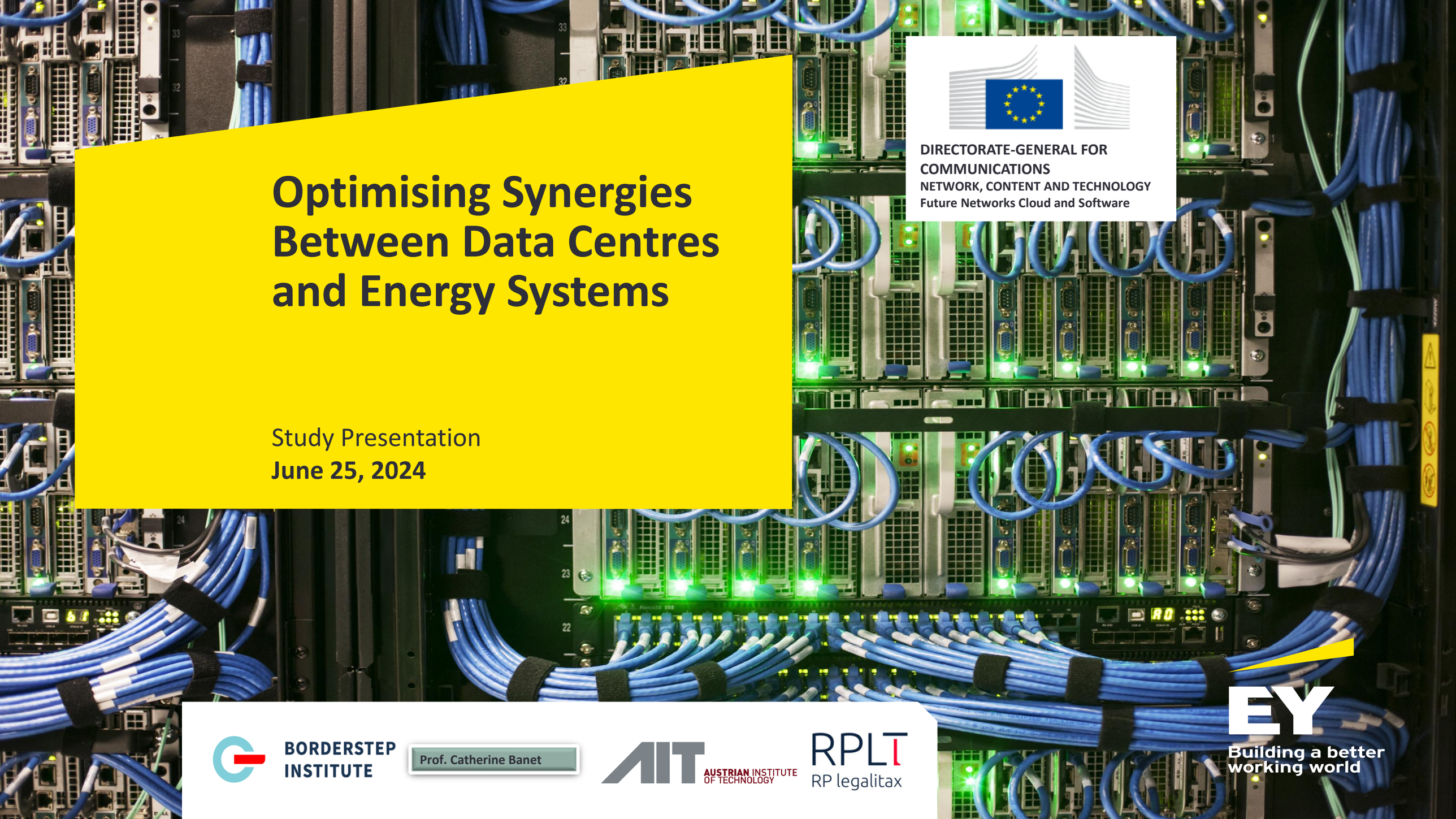
CAN THE INTERNET HEAT OUR COMMUNITIES?

Marco Bolchi
Executive Director

Study on “Optimising Synergies between Data Centre and Energy Systems” (DCESS)

CISPE.cloud

EUROPEAN DATA CENTRE ASSOCIATION



Optimising Synergies Between Data Centres and Energy Systems

Study Presentation

June 25, 2024

DIRECTORATE-GENERAL FOR COMMUNICATIONS
NETWORK, CONTENT AND TECHNOLOGY
Future Networks Cloud and Software

BORDERSTEP INSTITUTE

Prof. Catherine Banet

AIT AUSTRIAN INSTITUTE OF TECHNOLOGY

RPLT RP legalitax

EY Building a better working world

Study Objectives and Methodology

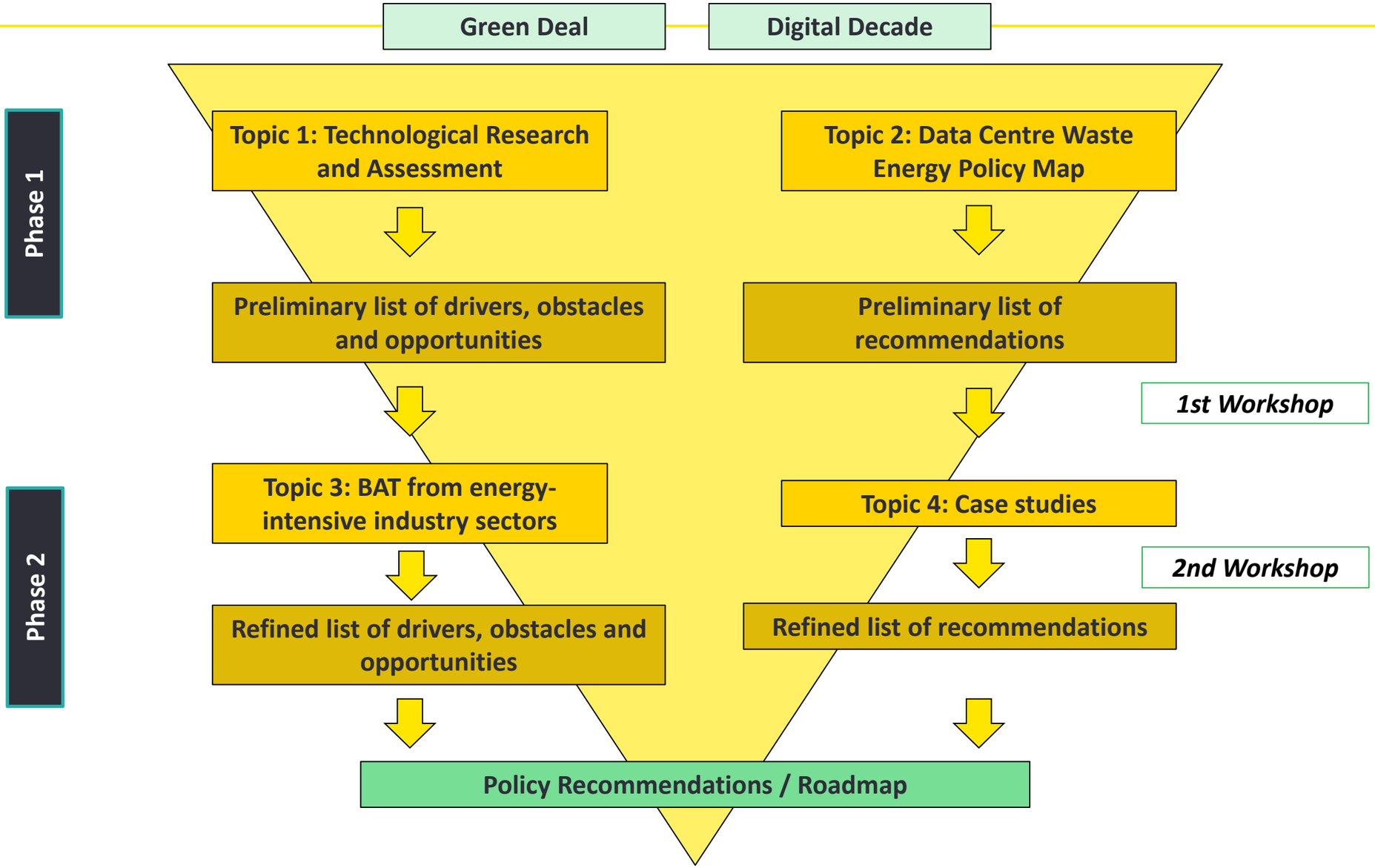
Introduction:

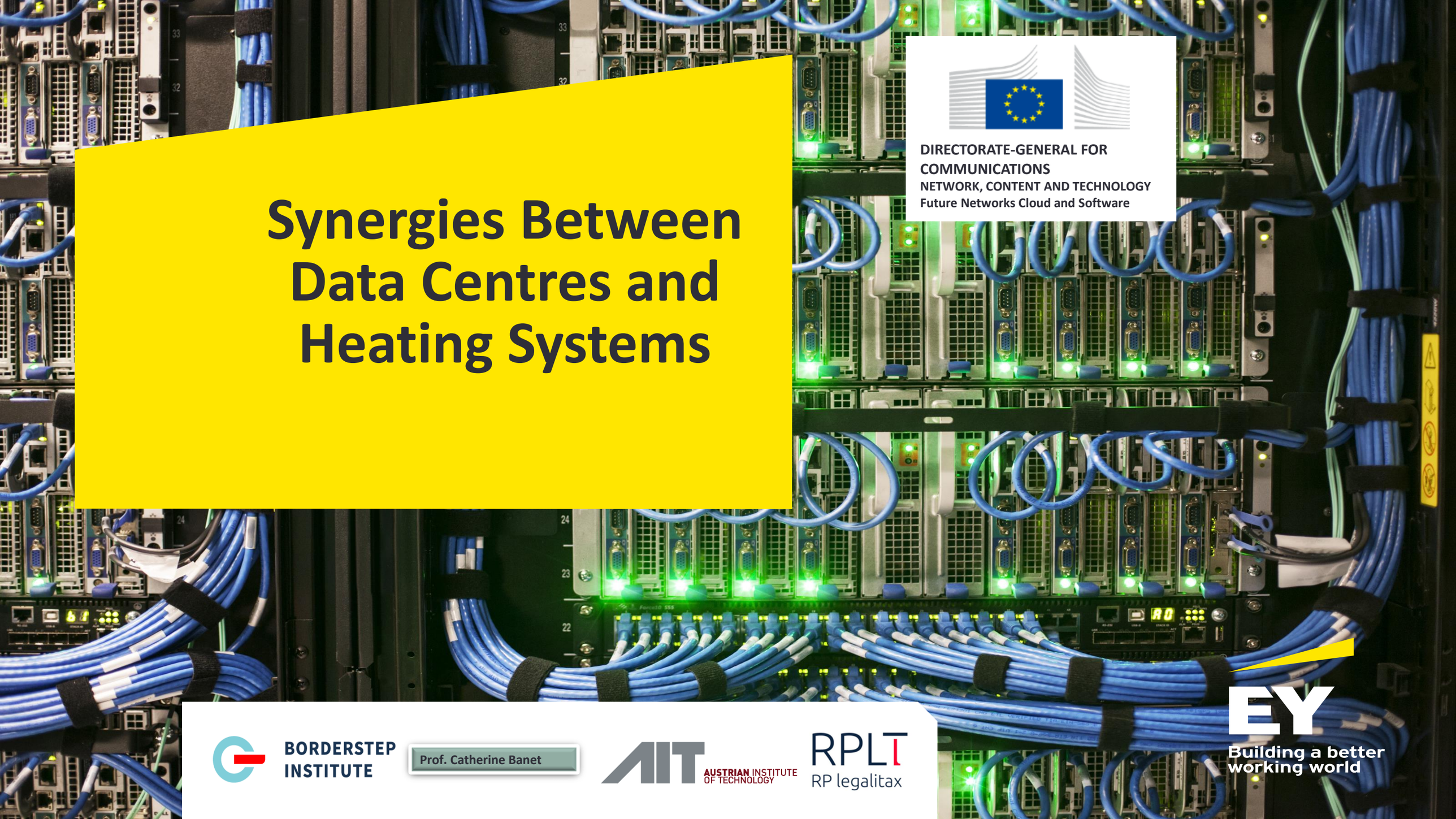
- Commissioned by the European Commission's DG CNECT, the study aims to explore the optimisation of synergies between data centres and energy systems. The ultimate goal is to achieve highly energy-efficient and climate-neutral data centres in line with the Green Deal and Digital Decade goals by 2030.

Objectives of the Study:

- Conduct a comprehensive mapping and technological research to assess new approaches for enhancing the energy efficiency of data centres and their integration into general energy and water systems.
- Identify the drivers, obstacles, and potential opportunities for successfully integrating data centres into general energy systems.
- Compare the integration strategies employed by other energy and emission-intensive sectors to evaluate potential lessons that can be applied to data centres.
- Identify potential case studies that showcase the successful integration of data centres into energy systems.
- Develop policy recommendations based on the findings and insights from the study.

Study Framework





Synergies Between Data Centres and Heating Systems

DIRECTORATE-GENERAL FOR COMMUNICATIONS
NETWORK, CONTENT AND TECHNOLOGY
Future Networks Cloud and Software

BORDERSTEP INSTITUTE

Prof. Catherine Banet

AIT AUSTRIAN INSTITUTE OF TECHNOLOGY

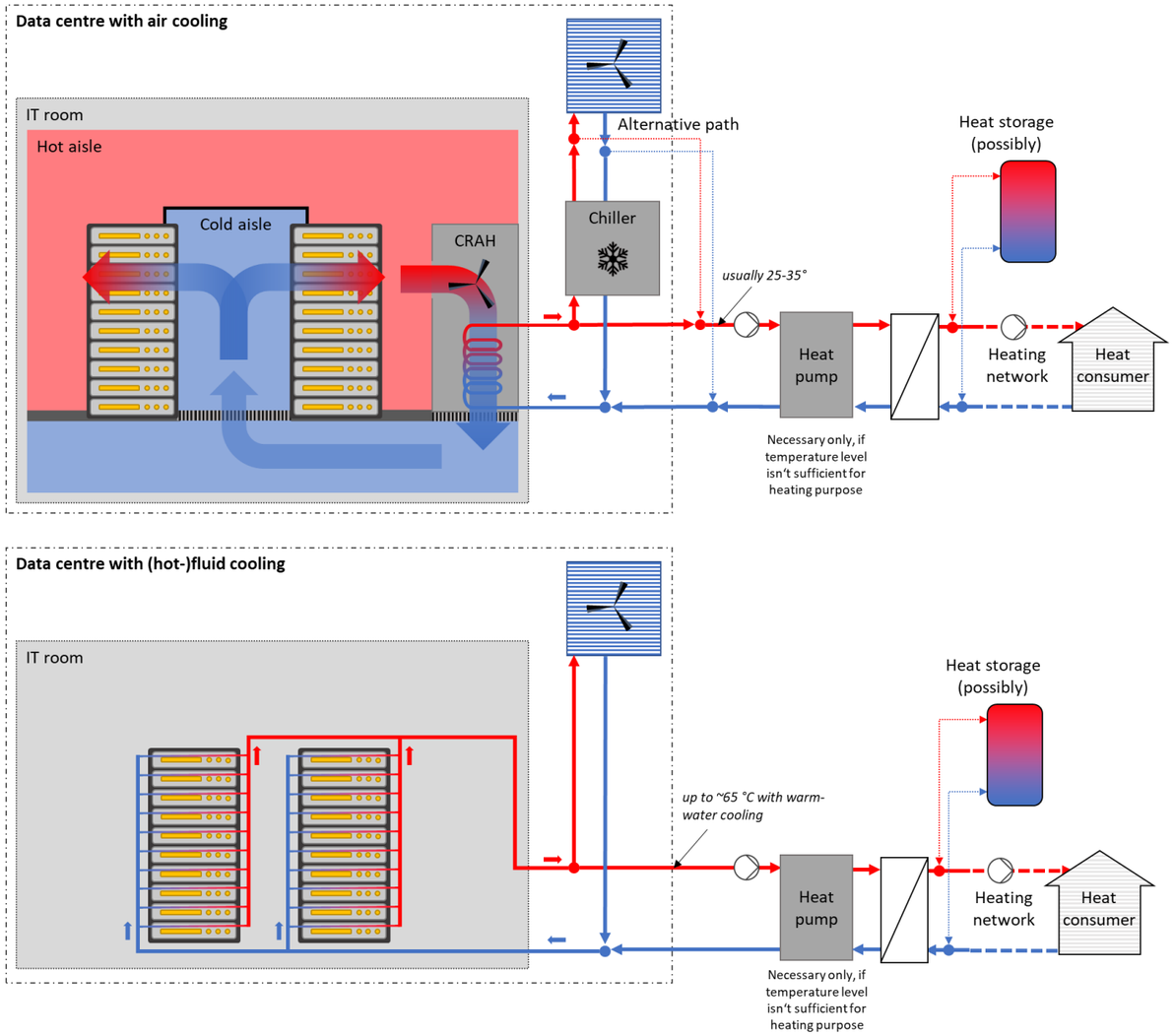
RPLT RP legalitax

EY Building a better working world

Summary of Technological Research and Assessment

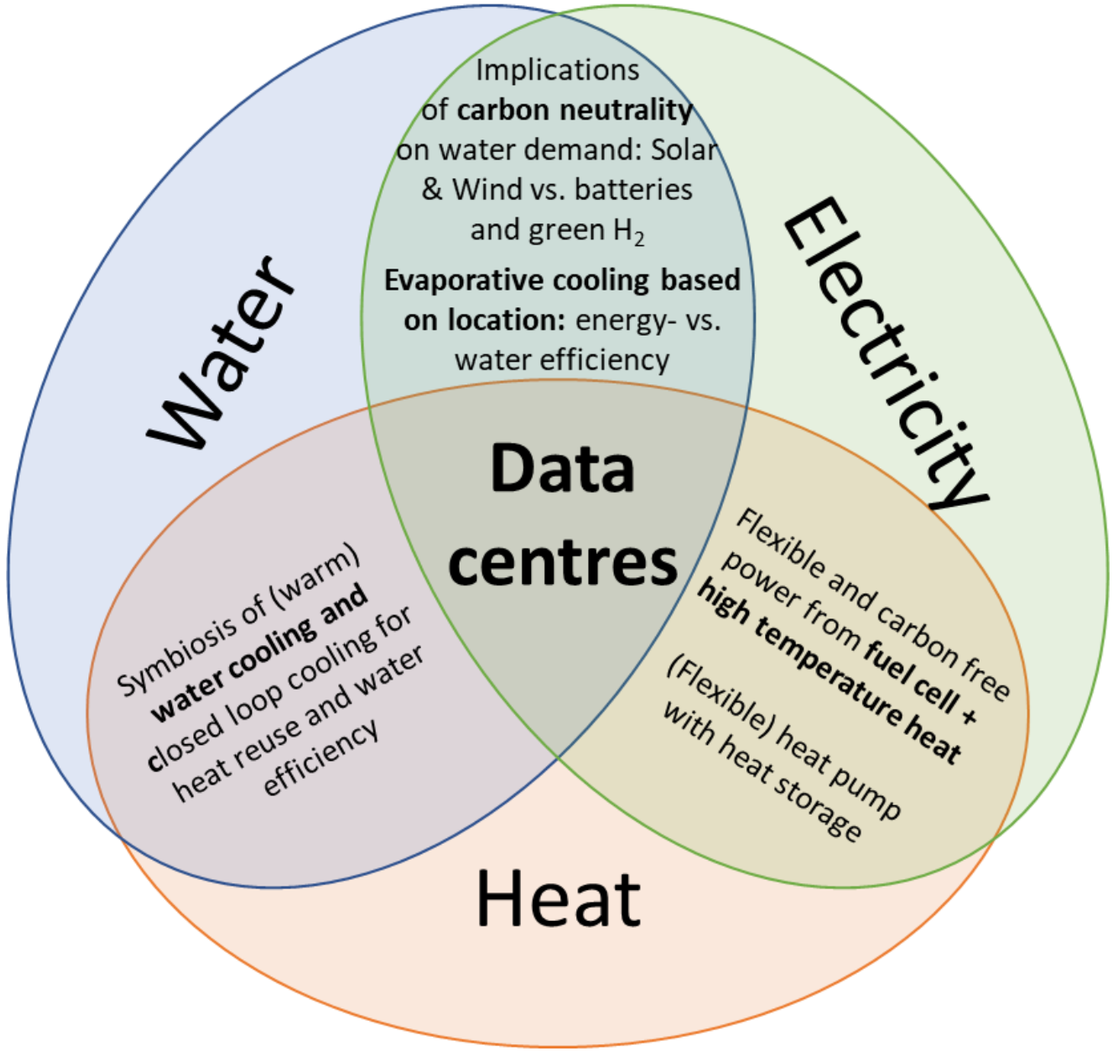
Heat Reuse

- Already feasible from a technological perspective
- Only economically feasible in some cases/locations – but this is expected to extend within the next few years
- New type of low temperature heat users and heat grids will enable much better heat reuse



Summary of Technological Research and Assessment

- Many interdependencies between the sectors
- Cooling technology is highly dependent on-site conditions, such as water availability/scarcity
- Reasonable waste heat utilisation mainly possible where there is a high local heat demand (<10 km)
- The green transformation in the electricity sector also affects indirect water consumption



BORDERSTEP INSTITUTE | Prof. Catherine Banet | AIT AUSTRIAN INSTITUTE OF TECHNOLOGY | RPLT RP legalitax | EY

Best Available Technologies from Energy-Intensive Industry Sectors

BATs related to the heating systems

Usage of waste heat via heat exchangers and heat pumps

- In most cases data centres operate 24/7 throughout the year
- 100% electricity for IT-equipment can be used as waste heat with the potential for additional revenue
- Usually low-grade heat, requires heat pumps to be used in a district heating (DH) network:
  - Emergence of low-temperature district heating networks
  - Heat pumps can provide flexibility to the grid
- Lack of heat consumers[1]

Combined heat & power plant (CHP)

- More efficient than conventional grid electricity
- Reduce electricity demand from grid and provide heat (supplied to district heating network or used in absorption chillers)
- Renewable fuels have to be used to contribute to emission reduction
- Decreasing heating demand & lower eletricity prices may reduce economic feasiblity

[1] Bytes2Heat_Stimmungsbild der Abwärmenutzung aus Rechenzentren 2023 (deneff.org)

Case Studies – Synergies with Heating Networks

Main levers

Integration into existing heating networks

DCs as integral parts of energy ecosystems

Challenges: High temperature needed and reliable heat provisioning

The potential for efficient heat transmission and profitable contracts

Example:

Stockholm Data Parks

OVHcloud

Cloud&Heat

Green IT Cube

Overcome seasonal discrepancy

High heat demand in winter, surplus heat in summer

→ Heat storage

Example:

Equinix

Match waste heat with heat demand

Locate DCs close to district heating networks

Consider alternative consumers, e.g. agriculture or aquaculture

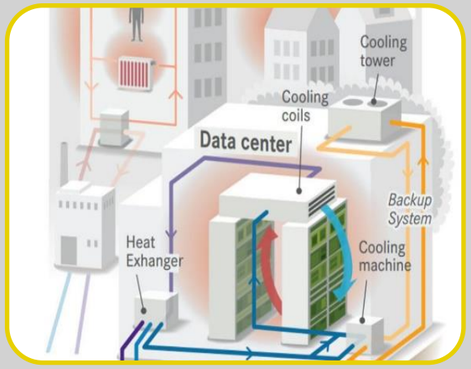
Examples:

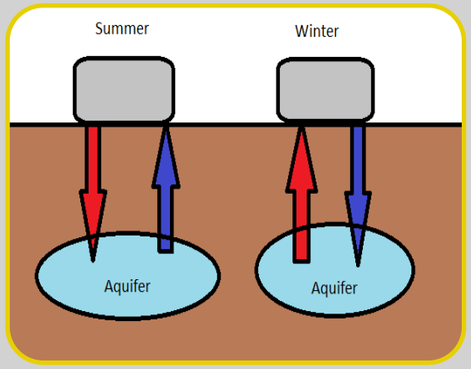
Cloud&Heat

Lefdal Mine Data Center

Stockholm Data Parks

Case Studies – Synergies with Heating Networks





Stockholm Data Parks

Collaboration between city, energy provider and DC operators

Make the city attractive for DCs

Cooling as a Service for free

Equinix

Aquifer Thermal Energy Storage

Cold water from underground supports chillers in summer

Stored heat can be used in winter

Cloud&Heat

DCs with hot water cooling

Container principle to be placed in urban areas

Waste heat has higher temperature so no/less additional heating needed

Efficient heat transmission with water as transfer medium

Actionable Advice and Roadmap: Heat Reuse

Actionable advice: Heat reuse

- **Drivers/Obstacles to be addressed:**
  - Low temperature heat network.
  - The need for specific and clear regulatory framework on the synergies between data centres and energy networks.
  - New market opportunities.
  - Financial incentives for grid support.

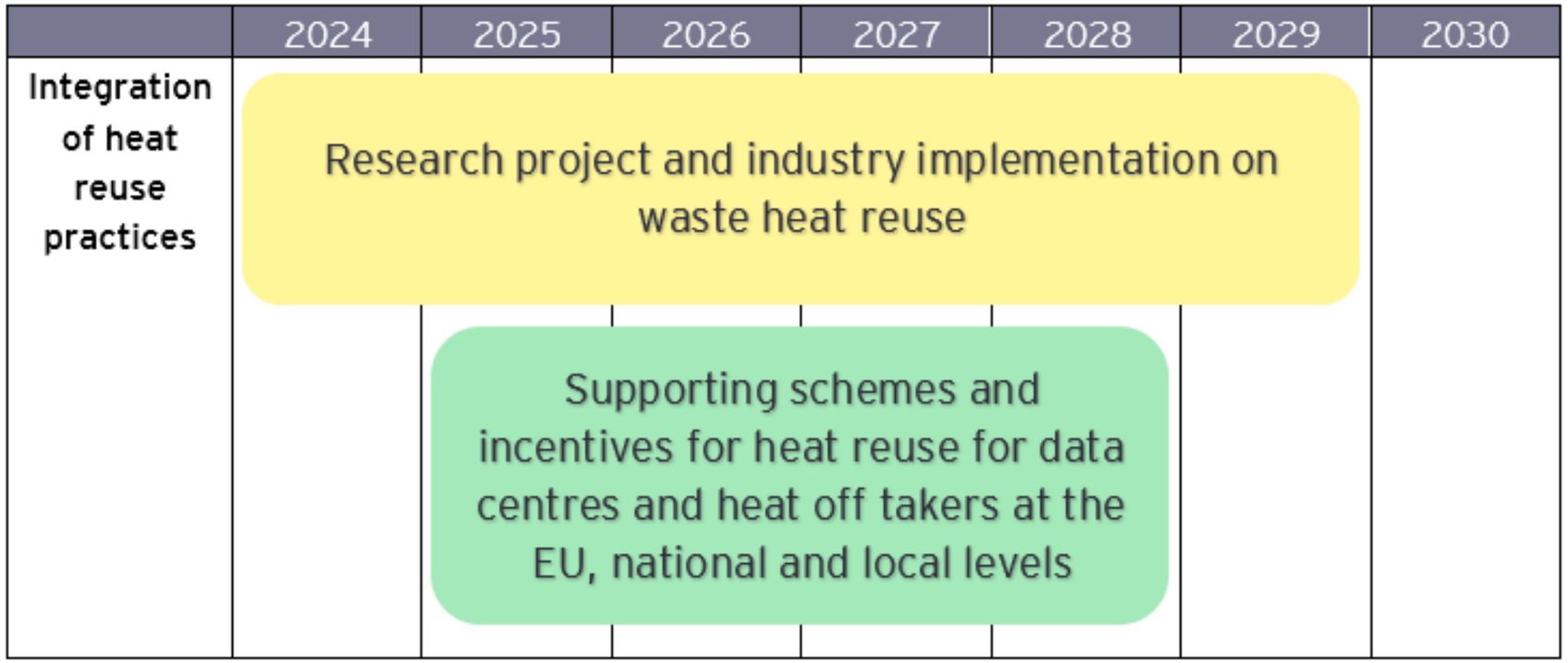
- **Gaps identified:** In parallel with the energy consumption of DCs, this will be converted into heat, which is then removed from DCs. This waste heat can then be chanelled to the heating network and minimise the reliance on fossil fuels for heating purposes, but in practice, the implementation has not been widespread in the EU.

- **Target:** Data centres to reuse as much heat as possible with regards to the heating demand from potential local heat off takers during certain times of the year. In regions where this is applicable, the minimum heat utilisation ratio of 0.1 as defined by the Energy Reuse Factor (ERF) should be reached by 2030.

- **Actors involved:** DC operators, heat offtakers (e.g. heating network operators and other heating network consumers), regulatory authorities, local authorities, research institutions/academia

Actionable Advice and Roadmap: Heat Reuse

- **Timeline**



Main owner (non-exhaustive)	
	DC operators
	Regulatory authorities

Actionable Advice and Roadmap: Heat Reuse

- **Steps to take:**
  - The technology for **waste heat reuse** is already viable and implemented in several practices across the EU. Innovative heat reuse technologies are currently being developed, such as the 4GDH and 5GDH systems. Generally, three factors need to be considered for the effectiveness:
    - The comparison between the potential excess heat output from a data centre and the heating demand of possible consumers.
    - The temperature level and density of the waste heat (relative to the required temperature of the potential offtakers).
    - The distance from the data centres to the potential offtakers.
  - **Regulatory/public authorities can establish policies and guidelines to promote heat reuse**. This can also involve the potential offtakers to bring about the recognition on heat reuse by providing incentives. Moreover, relevant authorities can work with the heating network operators to increase investment and better integrate DCs into the infrastructure.

Thank You

DIRECTORATE-GENERAL FOR COMMUNICATIONS
NETWORK, CONTENT AND TECHNOLOGY
Future Networks Cloud and Software

BORDERSTEP INSTITUTE

Prof. Catherine Banet

AIT AUSTRIAN INSTITUTE OF TECHNOLOGY

RPLT RP legalitax

EY Building a better working world

CLIMATE NEUTRAL DATA CENTER

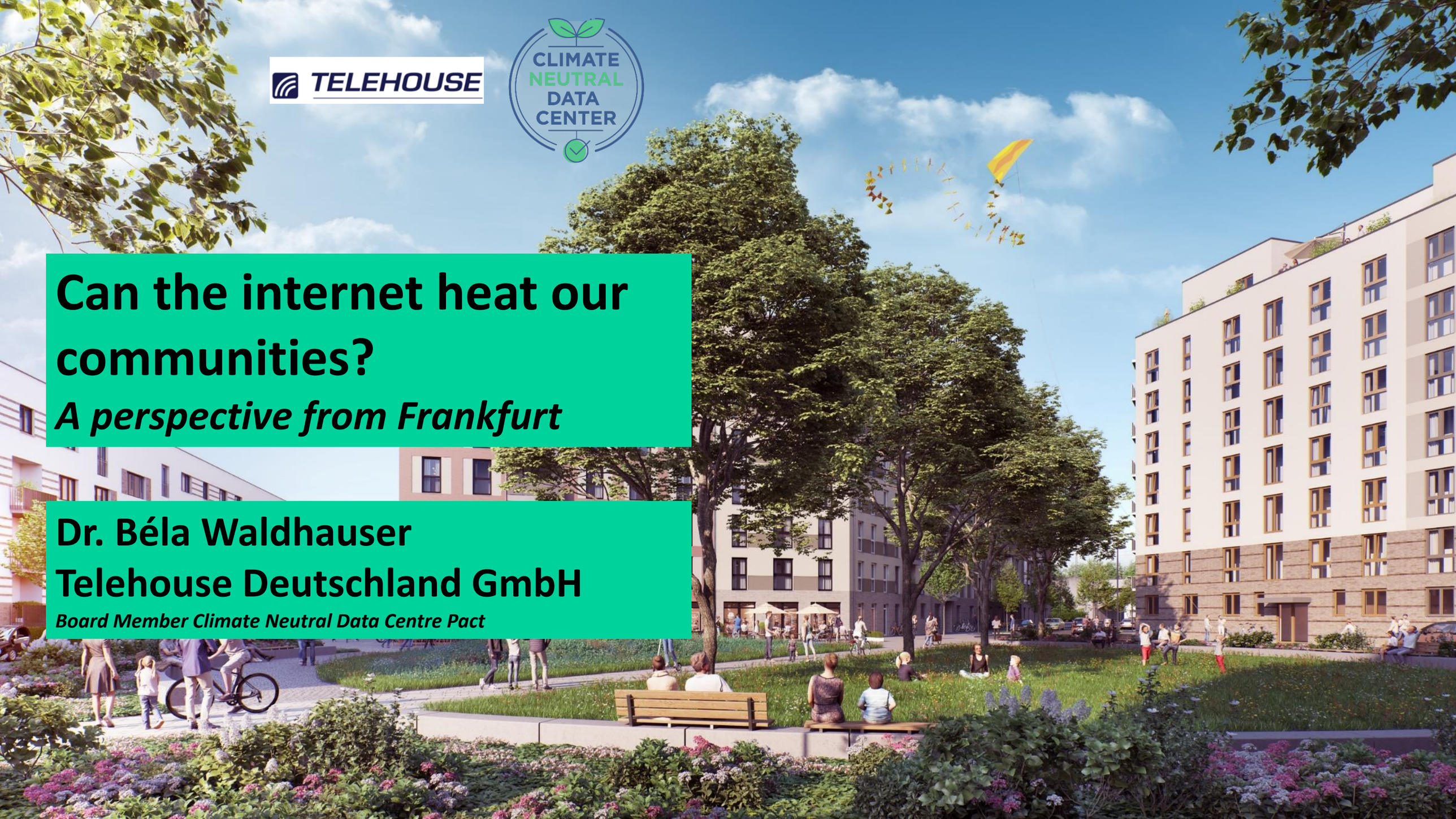
CAN THE INTERNET HEAT OUR COMMUNITIES?

Can the internet heat our communities? A perspective from Frankfurt

Bela Waldhauser
CEO

CISPE.cloud

EUROPEAN DATA CENTRE ASSOCIATION



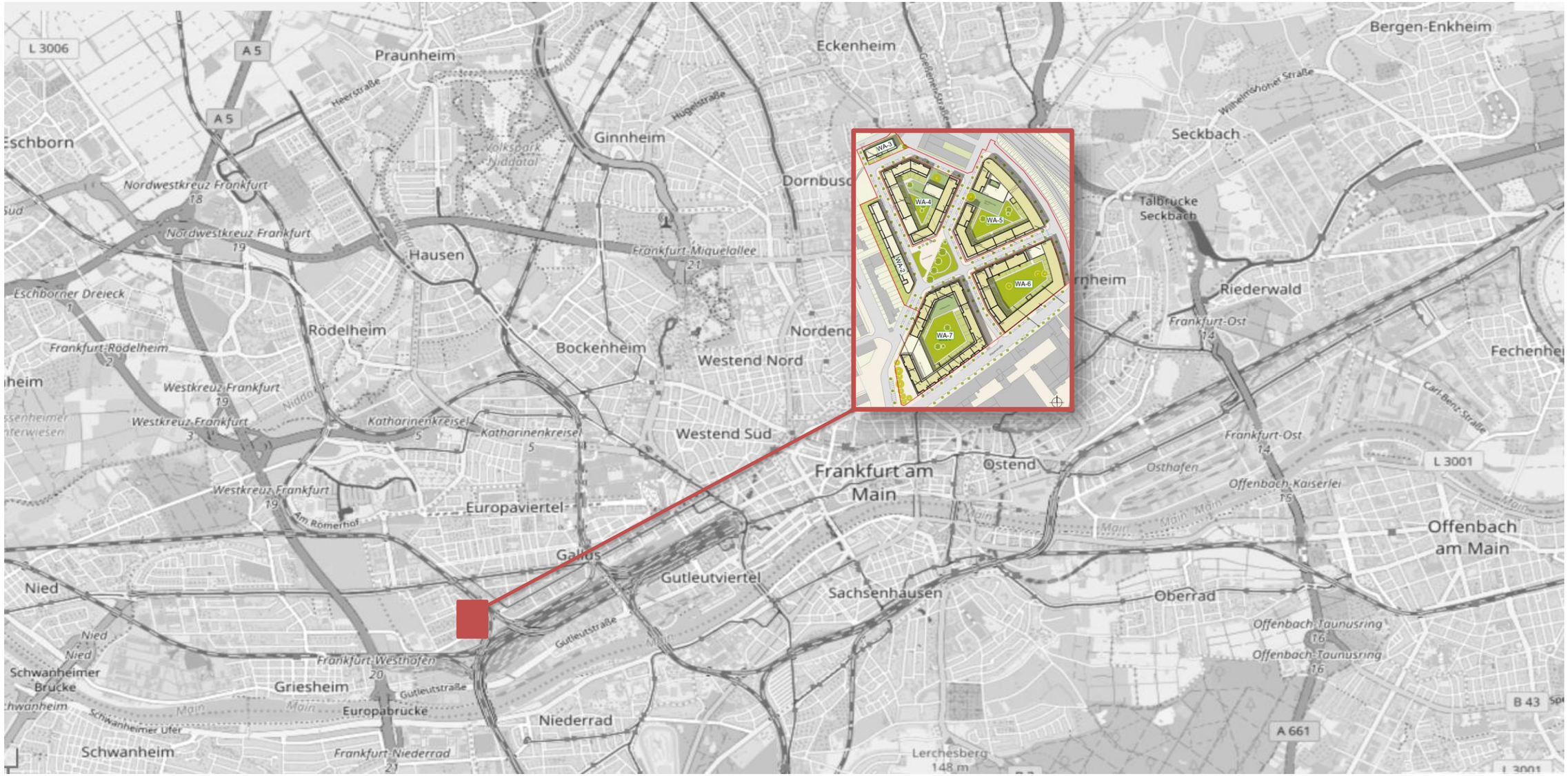
Can the internet heat our communities?

A perspective from Frankfurt

Dr. Béla Waldhauser
Telehouse Deutschland GmbH
Board Member Climate Neutral Data Centre Pact

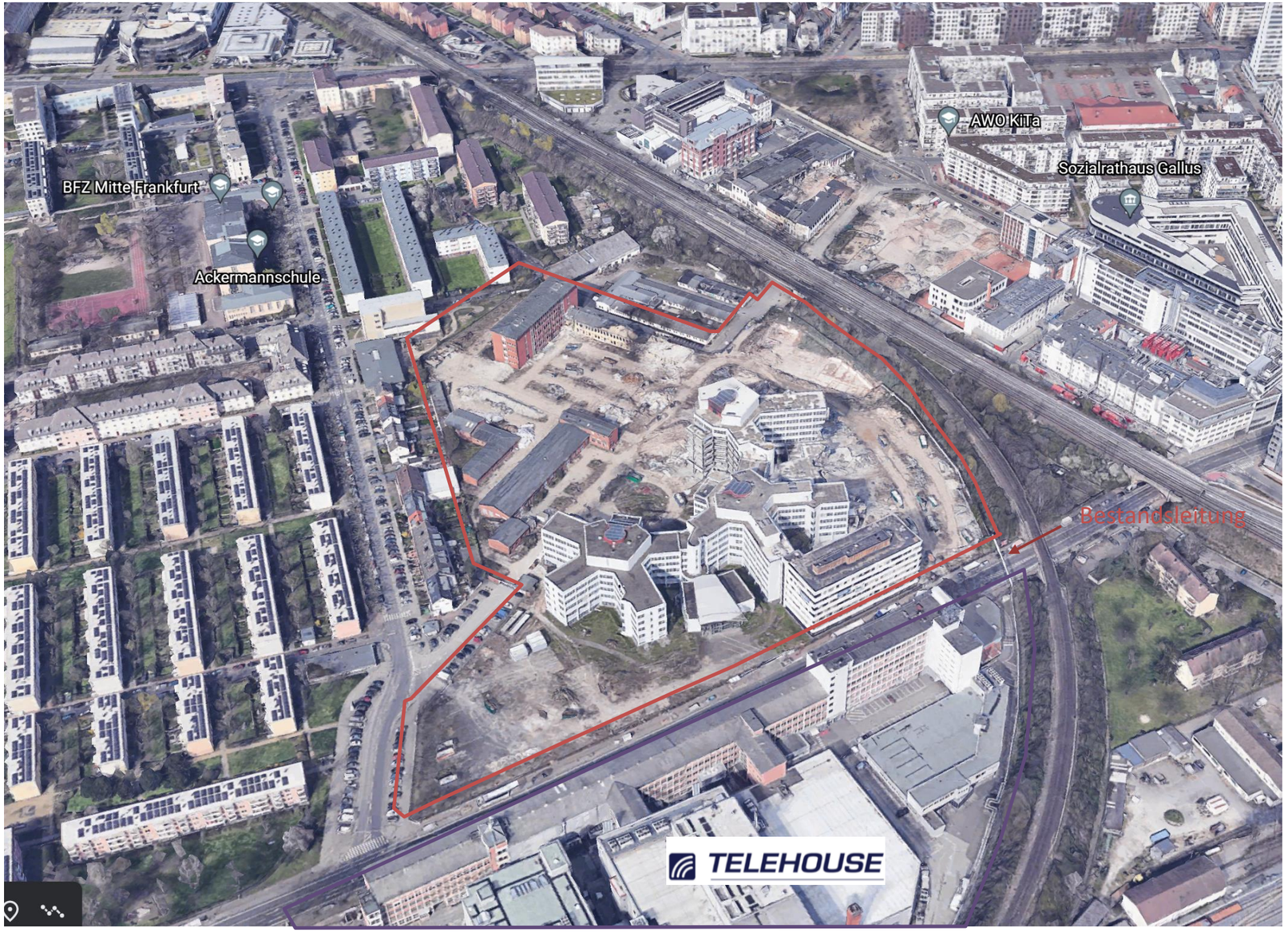
Westville (Franky) in Frankfurt

TELEHOUSE



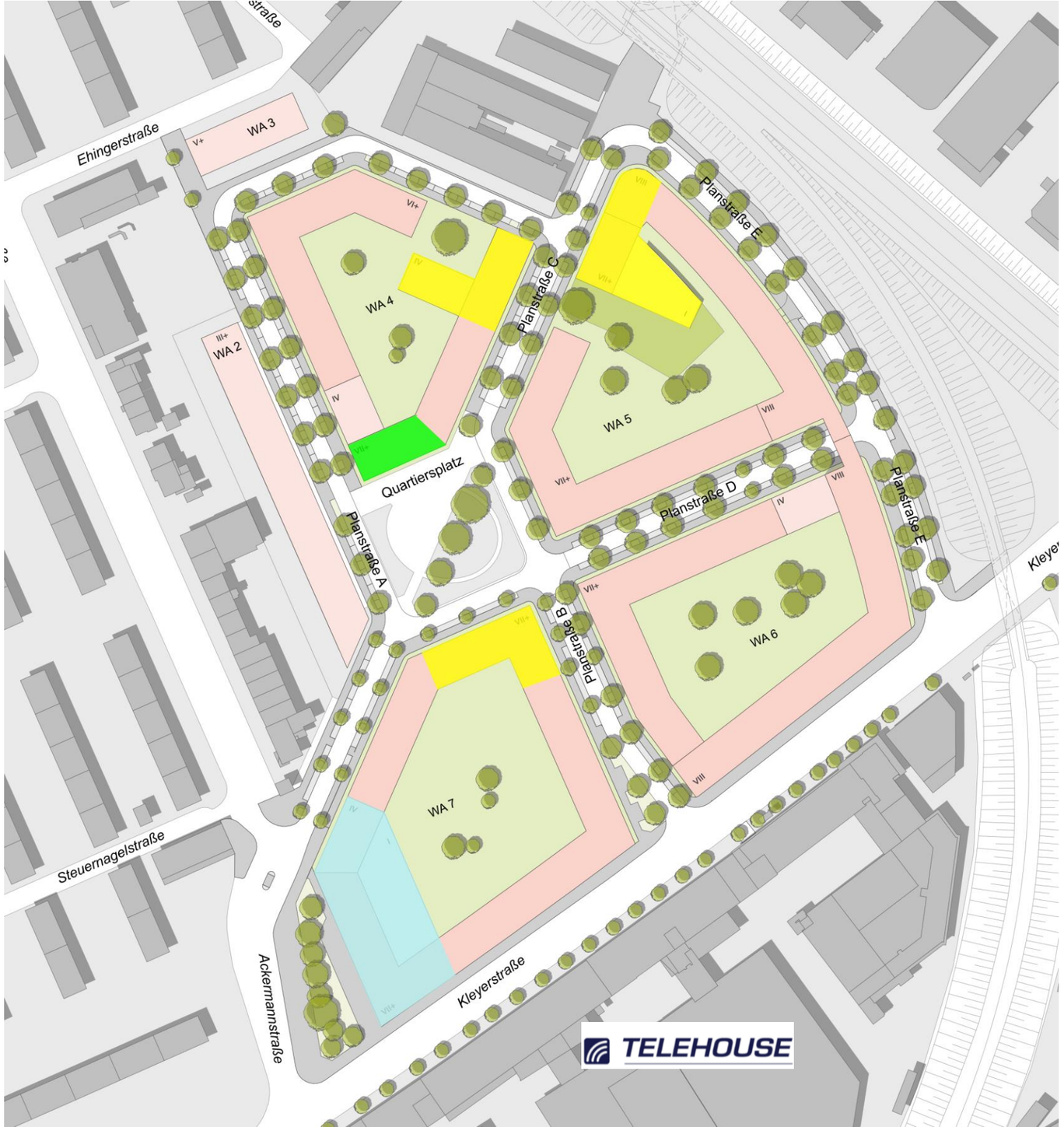
FRANKY was…

- ca. 5,5 ha Industrial area
- B-Plan 905
- Neighborhood partially industrial, partially residential
- Substantial contamination



FRANKY - future

- **Residential use**
  - 1,330 rented flats
  - 30% government-funded,
  - KfW-55.
- **Infrastructure**
  - 3 Kindergartens,
  - Local amenities,
  - Bakery, Coiffeur,
  - Restaurant at Quartiersplatz,
  - Traffic infrastructure and ICT connectivity.
- **Stationary traffic**
  - 1,080 parking places.



Heat supply concept

- **Pilot project**

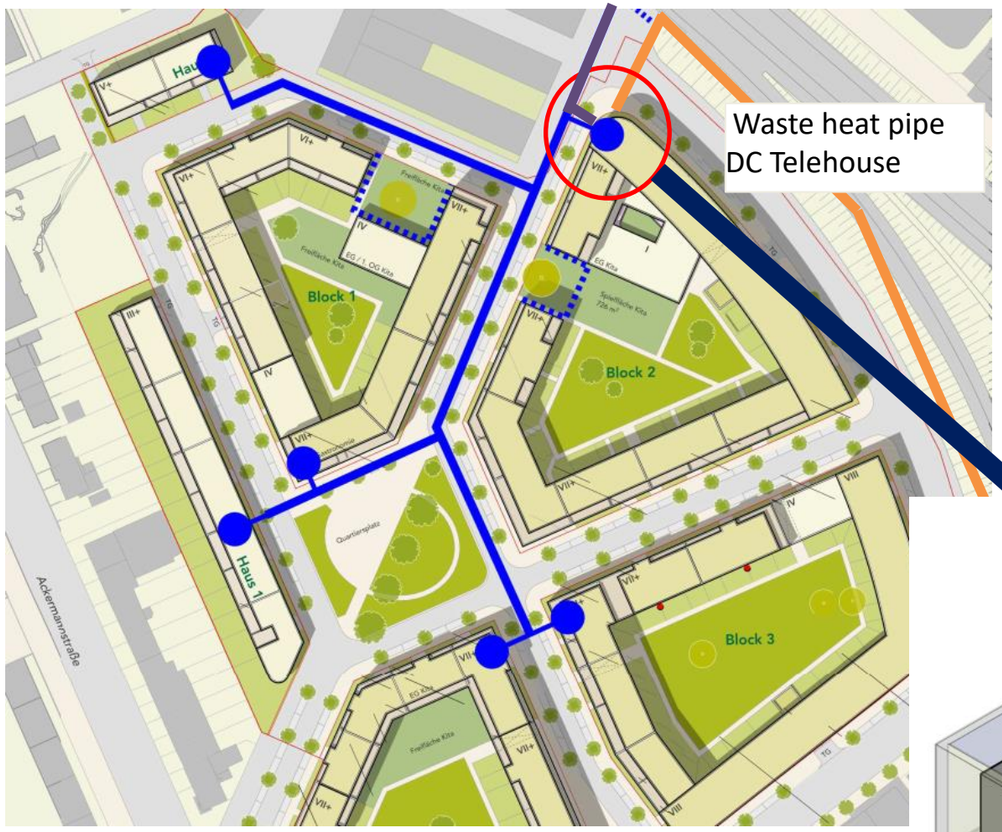
INSTONE REAL ESTATE mainova TELEHOUSE

- **Use waste heat** from Telehouse Data Center

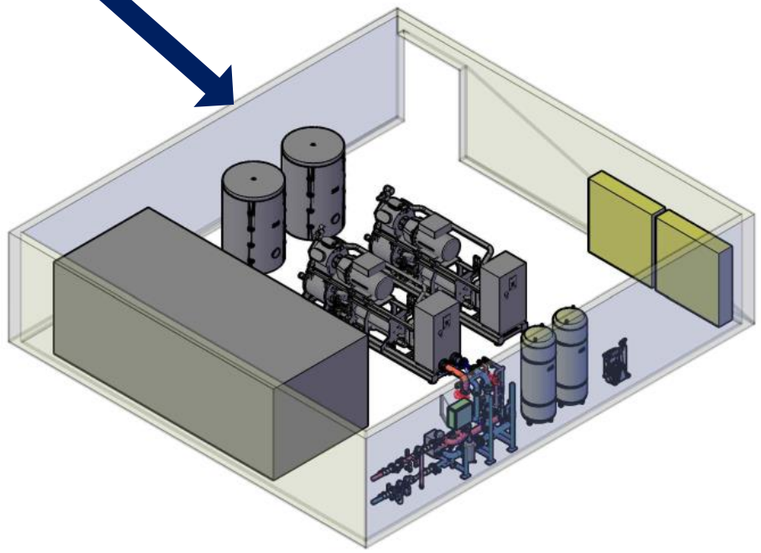
  → **min. 60 %** of the necessary heat usage for FRANKY!

  → **Savings of min. 400 tons CO_2 per annum!**

TELEHOUSE



- Mainova-Contracting, 15 years contract term
- Waste heat temperature ~ 30°C, Cooling water circuit DC
- Temperature local heat supply: 70°/40°C
- Heating load: ~ 3 MW
- Amount of heat: ~4.000 MWh/a



- 2 large heat pumps each 320 kW_{th}
- District heating transfer station ~ 3 MW_{th}
- Buffer storage, periphery, control system

Challenges

- **All parties involved must want the project!**

- **Local heating concept**

- **Advantage new building – no issues with existing buildings / heat supply concept**

- **Low temperature underfloor heating (low temperature rise)**

- **Existing district heating system works at very high temperatures (90° - 120° Celsius)**

TELEHOUSE

Vision

- New district heating systems: working at low temperatures (60° - 70° Celsius)
- Obligation to use waste heat?! Issues with different data centre types
- Not only waste heat from data centers
- Data center customers should use more liquid cooled servers:

  Waste heat temperature would rise to 50°-55° degrees Celcius

TELEHOUSE

Data centres as Gamechangers

- **Residential quarter Franky**
  - **1.330 Apartments, 3 daycare centers, as well as stores and restaurants**
  - **approx. 3.000 people**
  - **Heat demand up to 3 MW**
  - **approx. 4 Million kWh/year**

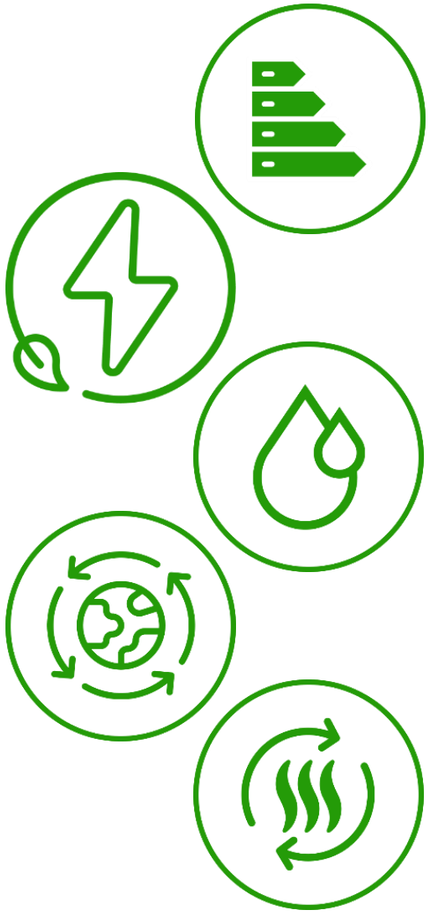
- **Heat utilisation** of Telehouse Data centres

  → **At least 60 %** of energy used in the quarter comes from Telehouse

  → **Savings of at least 400 Tons of CO_2 per year!**

The Climate Neutral Data Centre Pact

- Founded in 2021, driven by industry members and associations
- Initiative of the European Data Centre Association (EUDCA) and Cloud Service Infrastructure Providers (CISPE)
- Developed with help from DG CNECT
- Commitment to climate neutrality by 2030



Minimum energy efficiency targets

100% Green Energy in 2030

maximum water usage targets

Heat reuse goals in discussion

Circular Economy goals in discussion

The Climate Neutral Data Centre Pact

Circular Energy Working Group – Driving heat reuse forward

- Facilitate reporting data on heat reuse capabilities to facilitate information sharing between operators and off takers
- Standardising the definition of “heat reuse ready” and promote readiness in planning
- Defining criteria for economic feasibility assessment, including requirements for SMEs.

TELEHOUSE

Thank you!

CLIMATE NEUTRAL DATA CENTER

CAN THE INTERNET HEAT OUR COMMUNITIES?

Examples of Community-led Heating & Cooling (CH&C)

Felix Kriedemann
Project Manager

CISPE.cloud

EUROPEAN DATA CENTRE ASSOCIATION

Can the internet heat our communities?

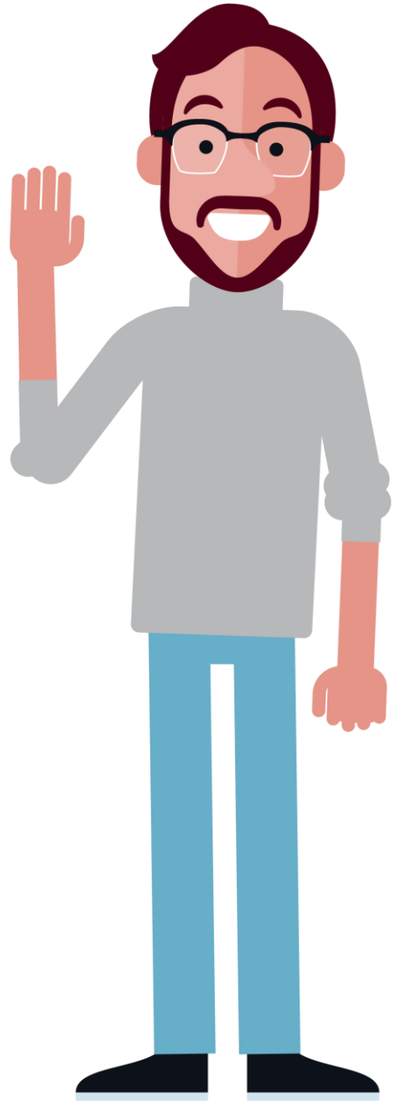
Examples of Community-led Heating & Cooling (CH&C)

Felix Kriedemann, Project Manager, REScoop.eu

25th June 2024

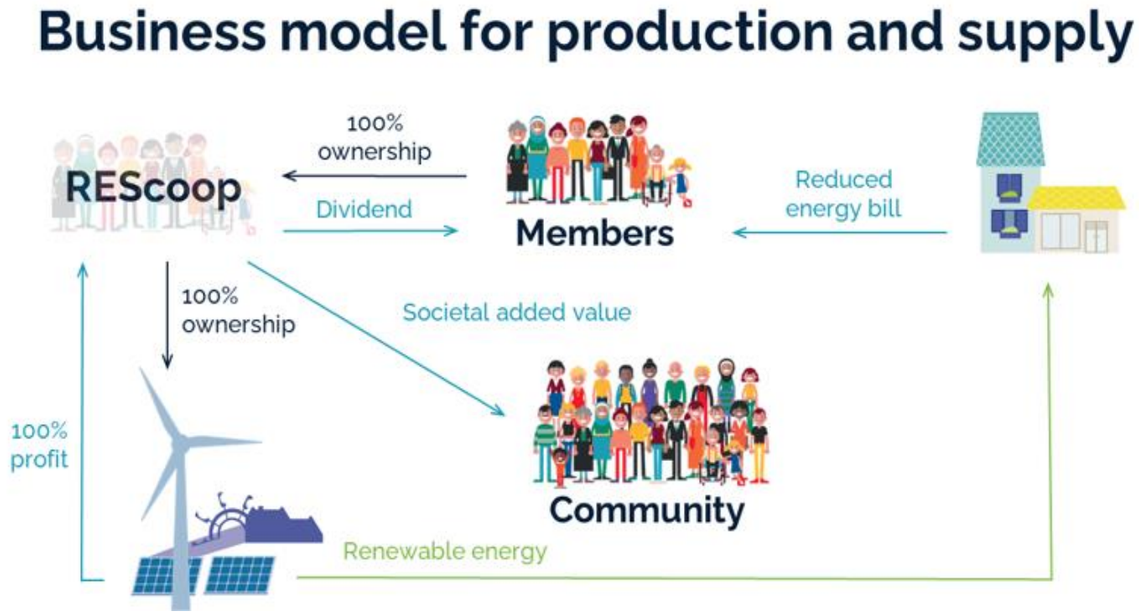
Overview

- Citizen-led initiatives
  - ✓ Energy Communities
  - ✓ EU legislation
  - ✓ Community Heating and Cooling (CH&C)
  - ✓ Examples from data centres



Benefits of community energy ownership

1. Revenues from local renewables meet local needs (e.g. supply, other services, education, renovations/EE, energy poverty)
2. Democratic community ownership, empowerment
3. Benefits for participants (energy bill savings, return on investment, social & environmental benefits etc)
4. Public acceptance
5. Alleviation of energy poverty
6. Promotion of uptake of clean energy



EU Regulatory Framework for Energy Communities – 1st Generation Laws

- **Potential** of Energy Communities: 50% of EU citizens producing their own energy by 2050 (= 45% of total energy demand)
- 2019: EU's Clean Energy for all Europeans Package

➢ Citizens -> Passive energy consumers

-> Active participants in the transition

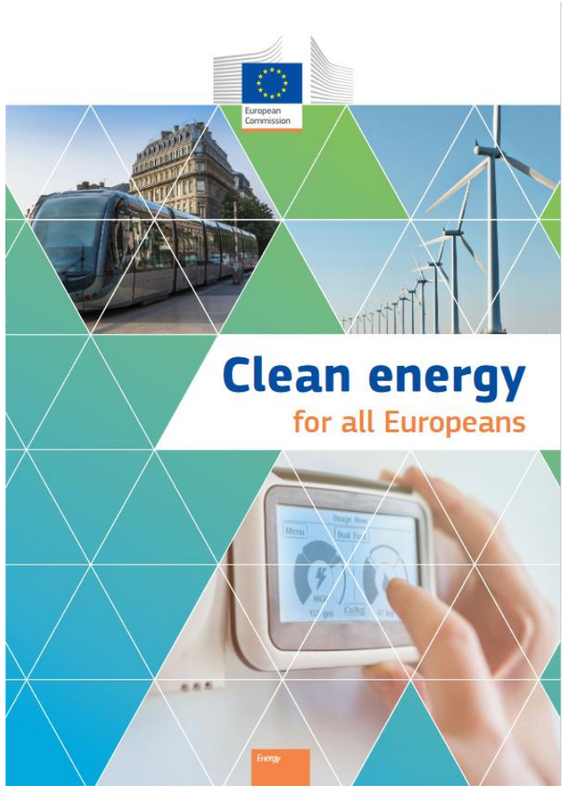
➢ Recognises the importance of energy communities to achieve our climate targets

➢ Forces Member States to ensure certain rights, and establish certain enabling frameworks, to guarantee equal conditions for energy communities.

Recast Directive 2018/2001 (Renewable Energy Directive II, or REDII)

Recast Directive 2019/944 (the Internal Electricity Market Directive, or IEMD)

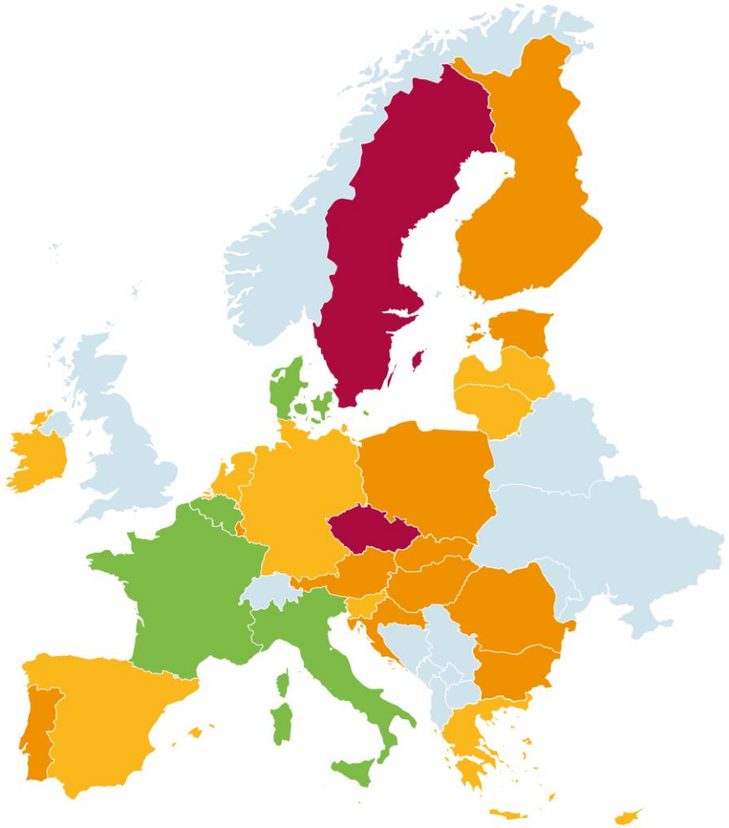
Recast Regulation 2019/943 (the Internal Electricity Market Regulation, or IEMR)



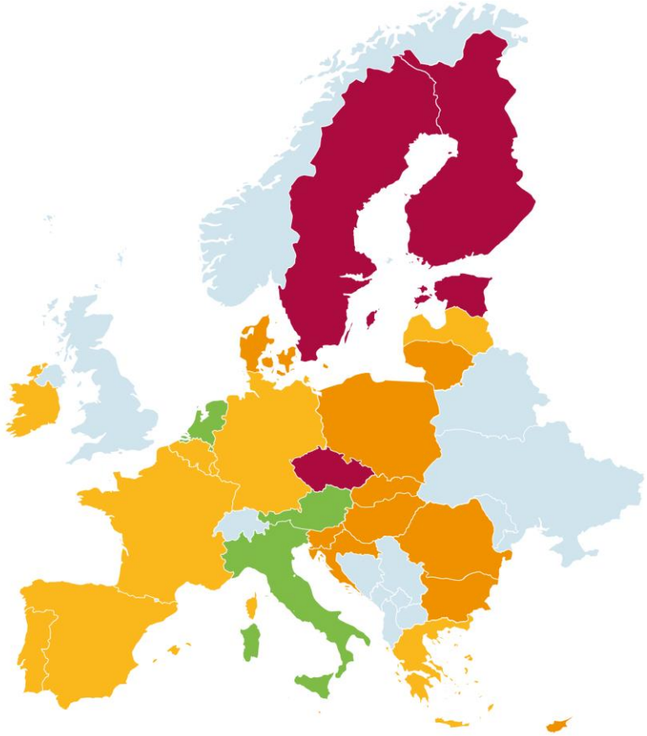
Link: https://op.europa.eu/en/publication-detail/-/publication/b4e46873-7528-11e9-9f05-01aa75ed71a1/language-en?WT.mc_id=Searchresult&WT.ria_c=null&WT.ria_f=3608&WT.ria_ev=search

Link: https://energy.ec.europa.eu/topics/energy-strategy/clean-energy-all-europeans-package_es

REScoop.eu Transposition tracker



Transposition tracker - definitions



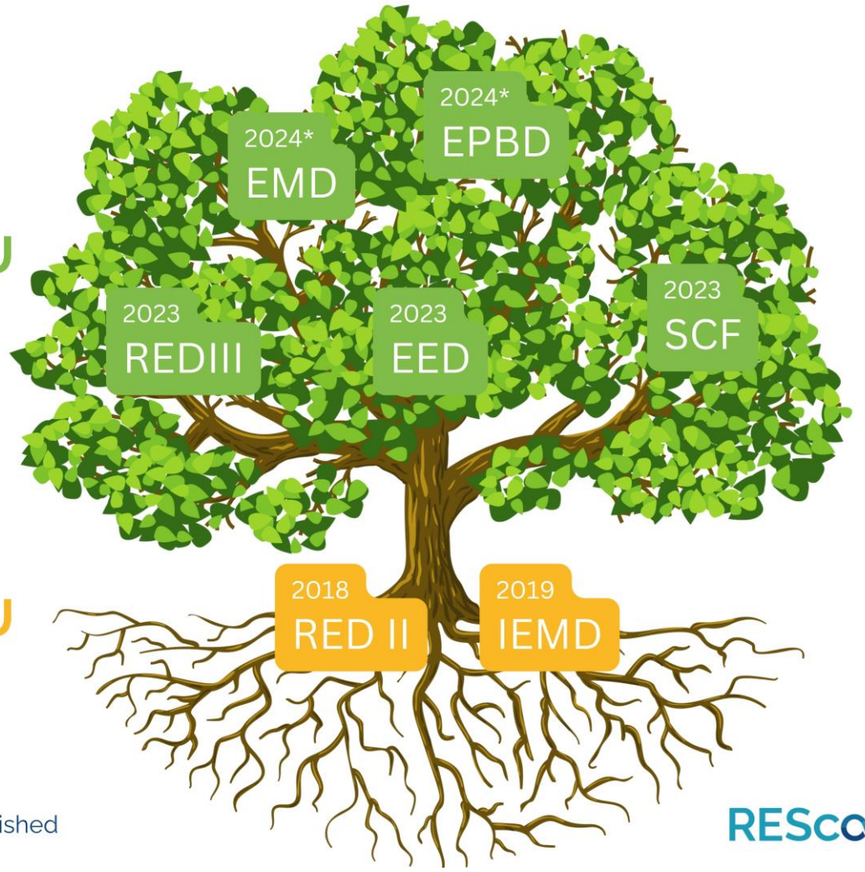
Transposition tracker – enabling frameworks/support schemes

EU Regulatory Framework for Energy Communities – 2nd Generation Laws

EU legislation for energy communities

Second generation EU legislation

First generation EU legislation



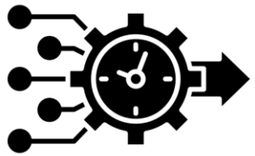
*files yet to be officially published

Where can energy communities be active?
- Energy savings obligation
- Energy poverty alleviation
- Citizen-Led Renovations
- Local H&C plans
- Off-shore wind
- Multi-level mapping of RES potential
- Energy sharing

RESCOOP.EU

Community-led H&C: Drivers & Barriers

- Drivers:



  - Democratic ownership of heating and cooling networks
    - One-person-one-vote rule
    - Especially relevant for natural monopolies (i.e. H&C)
  - Not-for-profit
    - Focus on affordability and social benefits
    - Denmark: Level-playing field is not-for-profit principle
  - Transparency
  - Creation of local value

- Barriers:

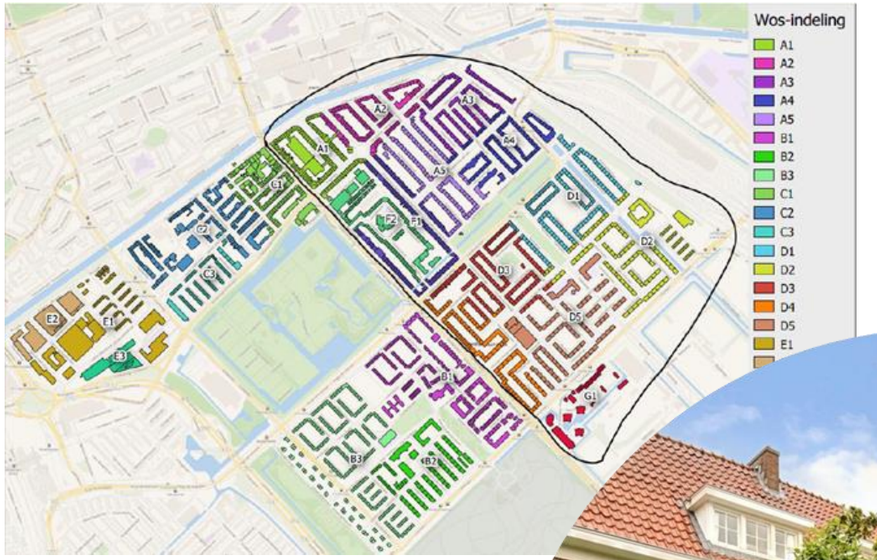
  - Lack of support
    - Administrative, capacity, knowledge
  - Lack of imagination
    - People have trouble imagining citizens doing such a big project
  - Complexity
  - Access to capital

Case Study: Avedøre DH Cooperative

- Waste heat from data center is used in DH grid, with a heat pump.
- Owned & controlled by all of its consumers -> 4,500
  - **Social economy**: Non-profit district heating utility (in line with EU definitions)
    - -10% heating bills for citizens
    - Owner of data centre is member in Energy Community Avedøre (1 vote/shareholder)
  - **Energy democracy**: Has become a platform for local energy ideas

Case Study: Meer Energie

- Middenmeer district in Amsterdam
  - Residential area: 5,000 citizens, 7 schools, 2 churches, SMEs
  - District heating uses waste heat from data centre
- Collaboration between Energy community (MeerEnergie) + Municipality + Infrastructure operator



Useful resources

- Transposition Guidance (REScoop.eu, ClientEarth): https://www.rescoop.eu/news-and-events/press/energy-communities-under-the-clean-energy-package
- Guidelines on Community Heating and Cooling: https://www.rescoop.eu/toolbox/guidelines-on-community-heating-and-cooling
- Briefing for municipalities on CH&C: https://www.rescoop.eu/toolbox/its-better-when-were-together-briefing-for-municipalities-and-social-housing-providers-on-community-heating-and-cooling
- Community Power: Model legal frameworks for citizen-owned energy (ClientEarth): https://www.communitypower.eu/images/Clientearth_report.pdf
- RePowerEU Briefing: https://www.rescoop.eu/toolbox/repower-communities-not-fossil-fuels
- Transposition Tracker (REScoop.eu): https://www.rescoop.eu/policy#transposition-tracker
- Financing Tracker: https://www.rescoop.eu/financing-tracker
- Potential for energy citizens in the EU (CE Delft): https://cedelft.eu/publications/the-potential-of-energy-citizens-in-the-european-union/
- Assessment report of potentials for RES community energy in the target regions (COME RES): https://come-res.eu/resource?t=Assessment%20report%20of%20potentials%20for%20RES%20community%20energy%20in%20the%20target%20regions
- Community Energy Strategy: Full Report (DECC, UK): https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/275163/20140126Community_Energy_Strategy.pdf
- The local economic impact of citizen projects (Energie Partagee): https://energie-partagee.org/ressource/etude-retombees-eco-2/
- Meer Energie: https://meerenergie.amsterdam/
- Avedore energy community: https://www.dat.aau.dk/energy-communities-take-local-ownership-of-the-green-transition-n74817

RESCOOP.EU

www.rescoop.eu

felix.kriedemann@rescoop.eu

@rescoop.eu

REScoopVideos

rescoop.eu

@REScoop.eu

REScoop.eu

CLIMATE NEUTRAL DATA CENTER

CAN THE INTERNET HEAT OUR COMMUNITIES?

Moderated discussion

Emma Fryer
Director Public Policy
MODERATOR

Nikolaos Kontinakis
Policy Officer DG ENER

Bela Waldhauser
CEO

Marco Bolchi
Executive Director

Pauline Lucas
Policy Director

Felix Kriedemann
Project Manager

Submit your questions in the Zoom chat

CISPE.cloud

EUROPEAN DATA CENTRE ASSOCIATION

CLIMATE NEUTRAL DATA CENTER

CAN THE INTERNET HEAT OUR COMMUNITIES?

Q&A

CISPE.cloud

EUROPEAN DATA CENTRE ASSOCIATION

Thank you for joining!