Understanding the opportunity for data centre heat recovery

Matt Wegner
Postgraduate Researcher
Heating and Cooling Group - School of Engineering
London South Bank University

Data centre heat energy reuse opportunities

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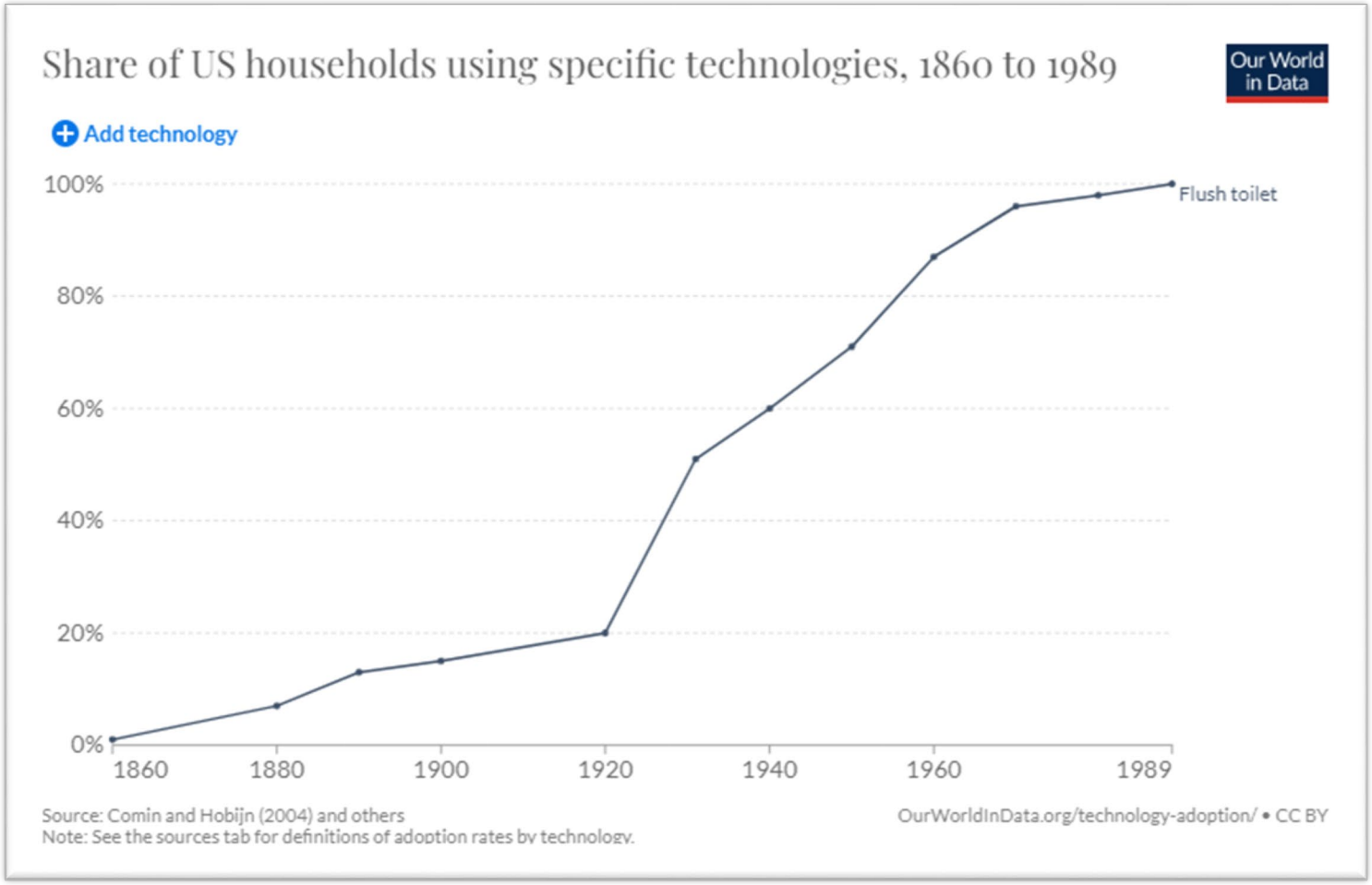
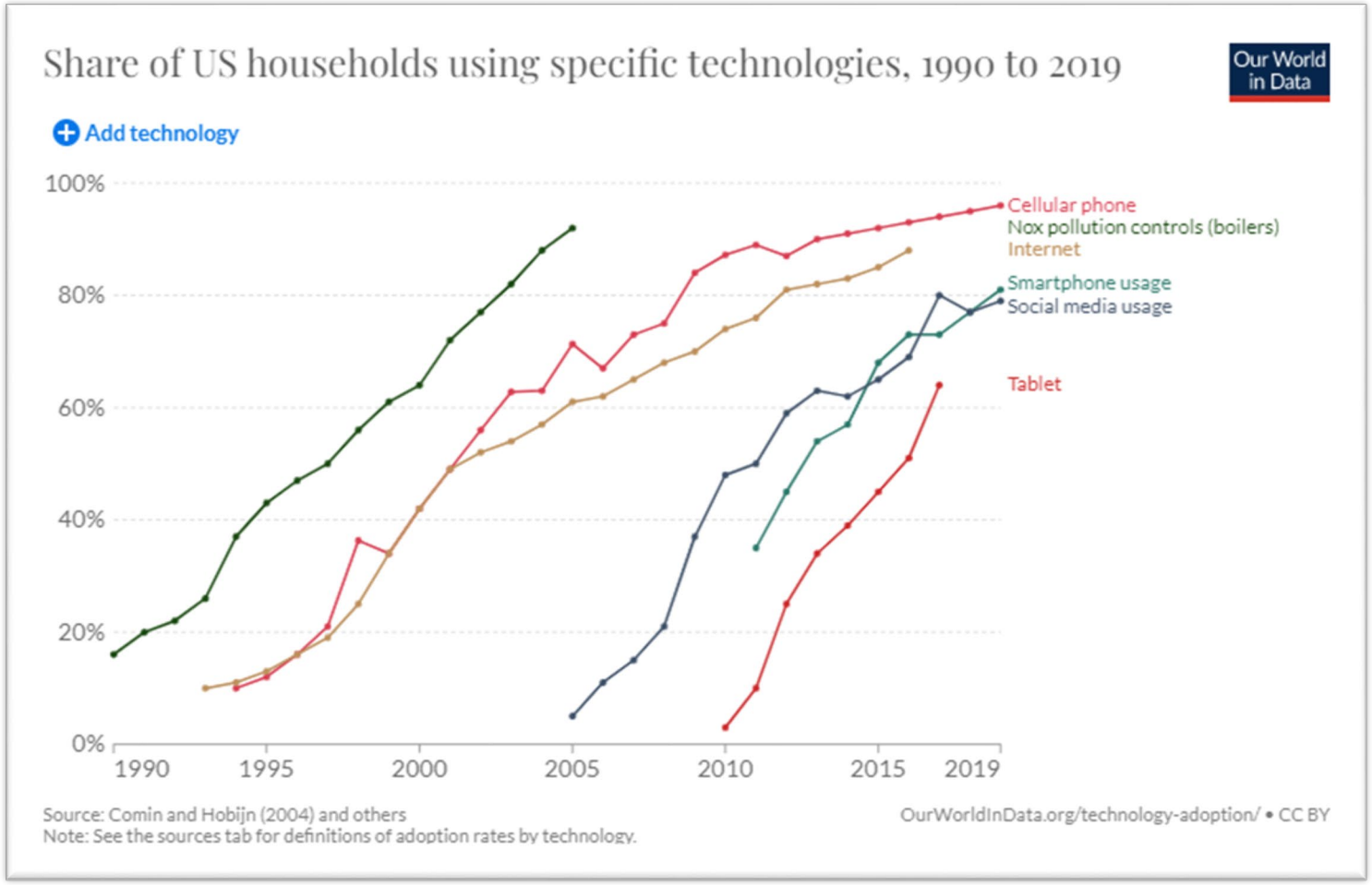


Source: https://ourworldindata.org/technology-adoption

Does the slope look similar?



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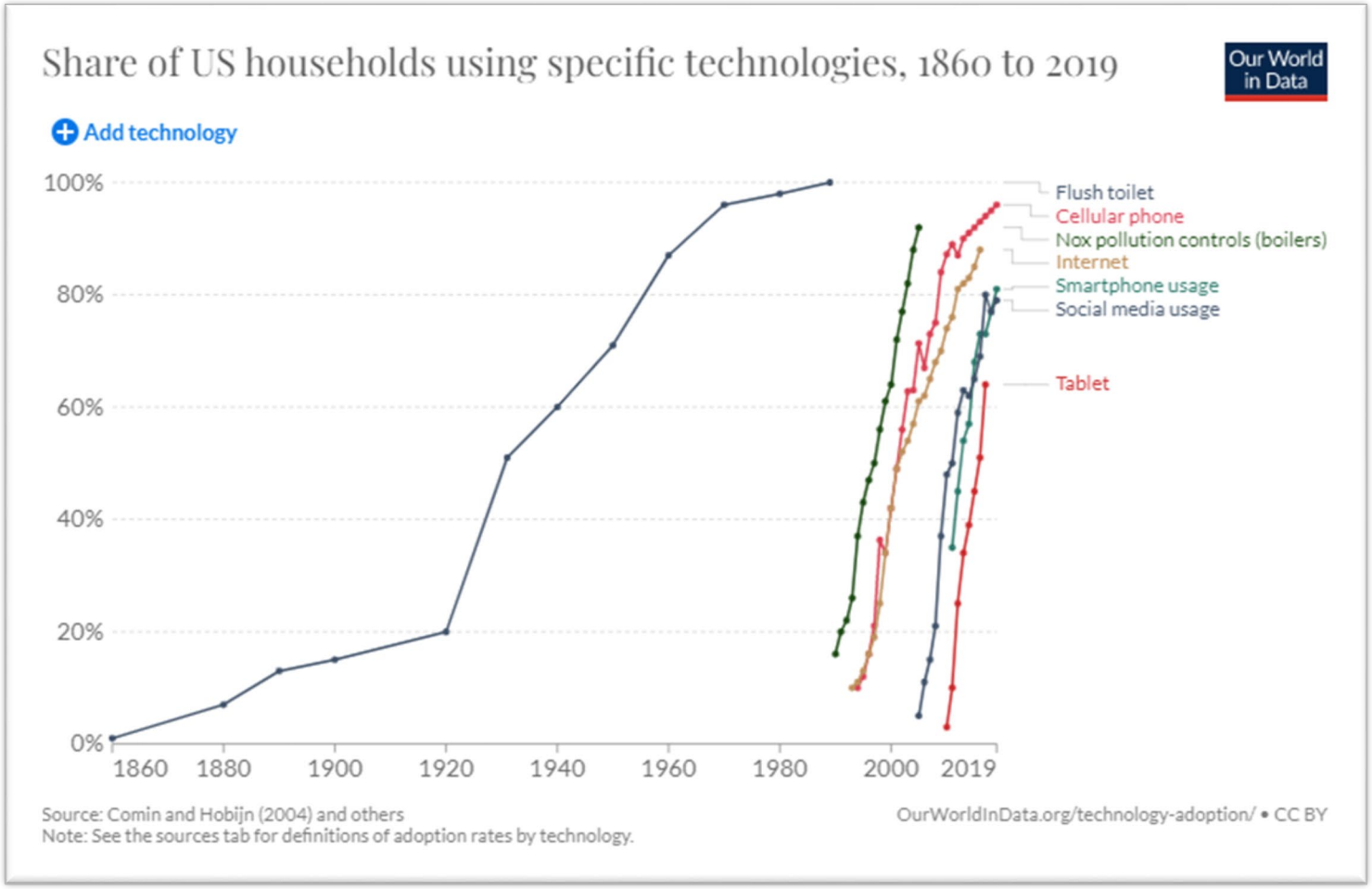
How about now?



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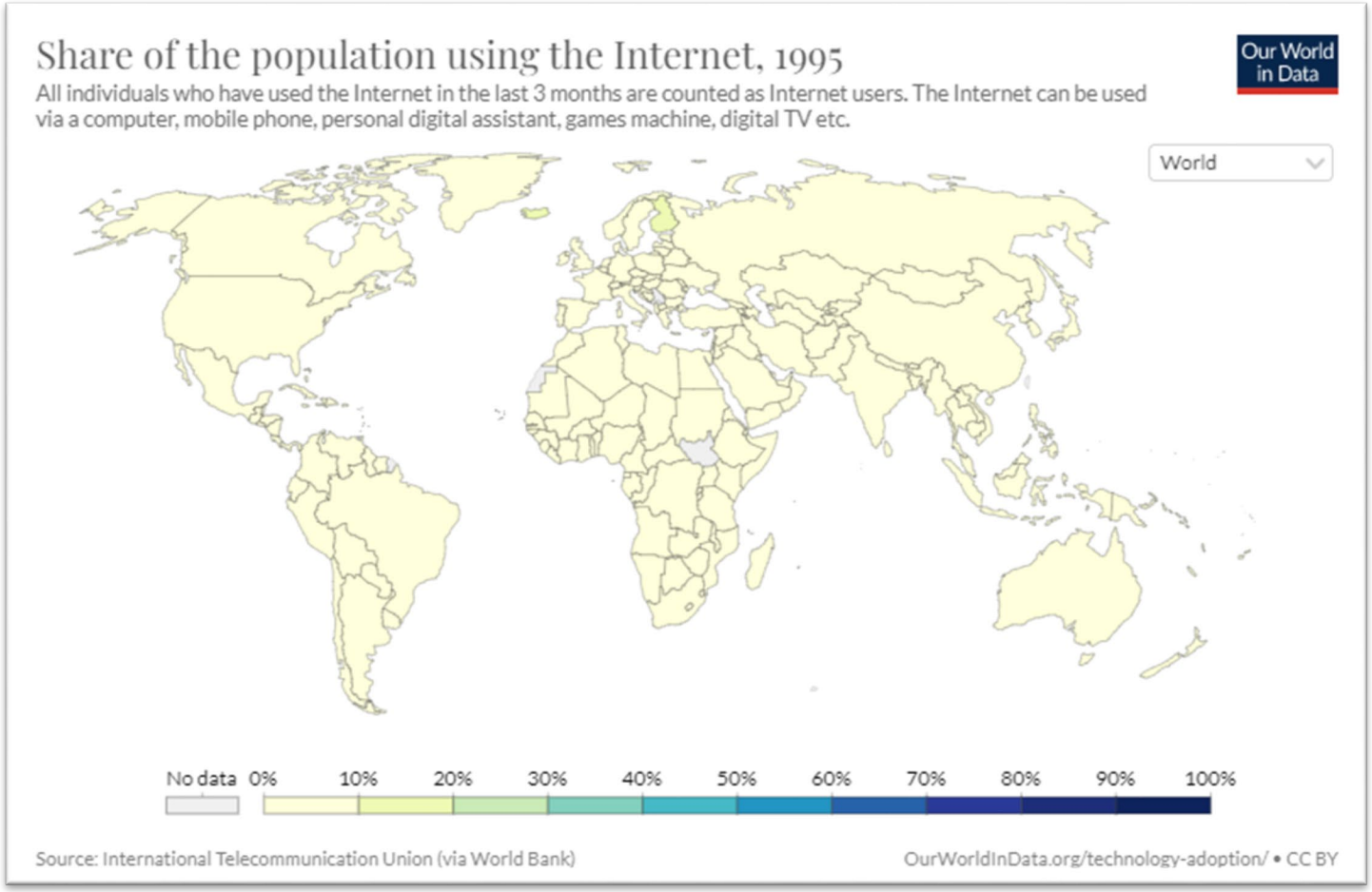
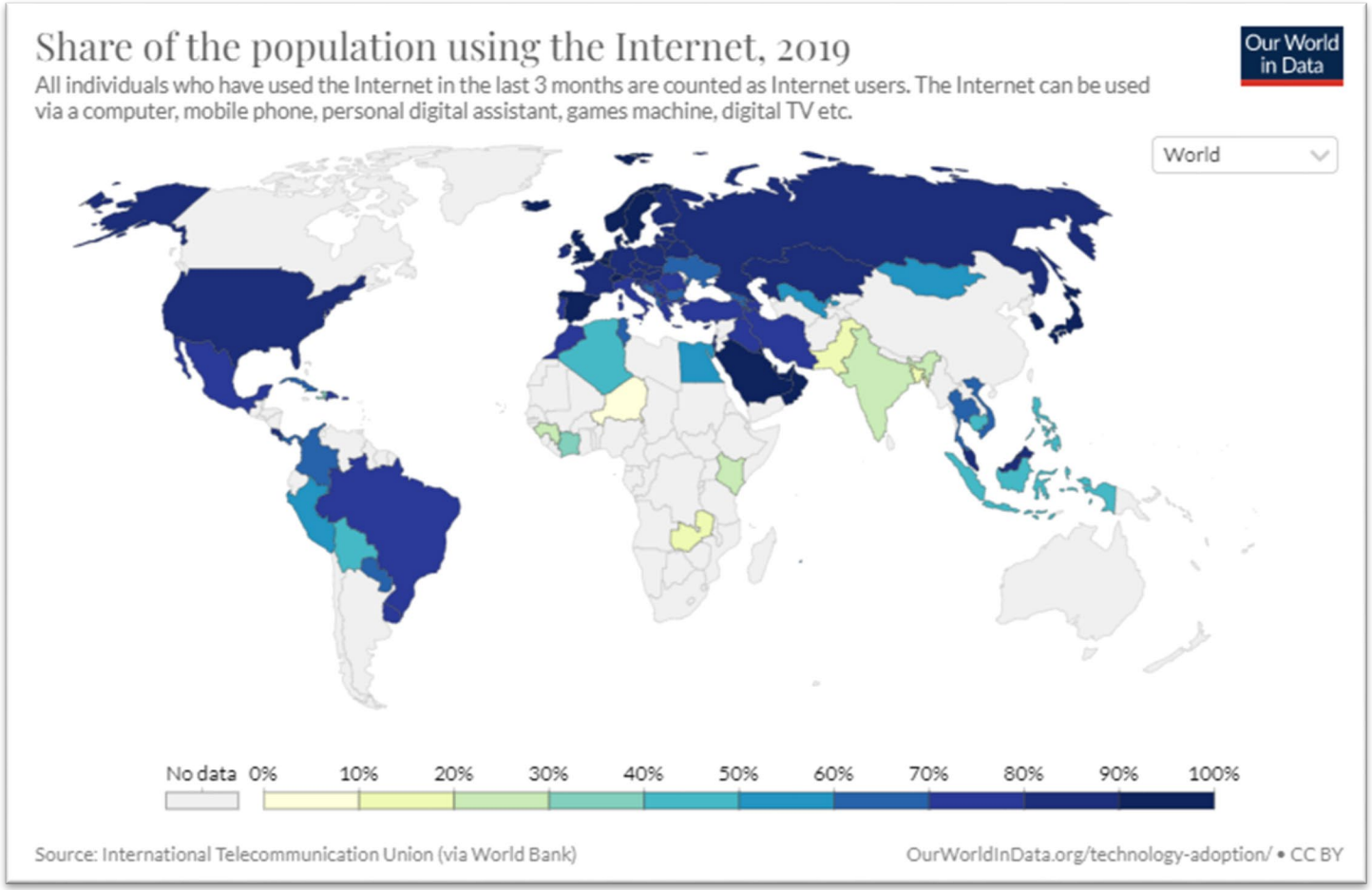
Everything changes



Source: https://ourworldindata.org/technology-adoption

Faster.



Source: https://ourworldindata.org/technology-adoption

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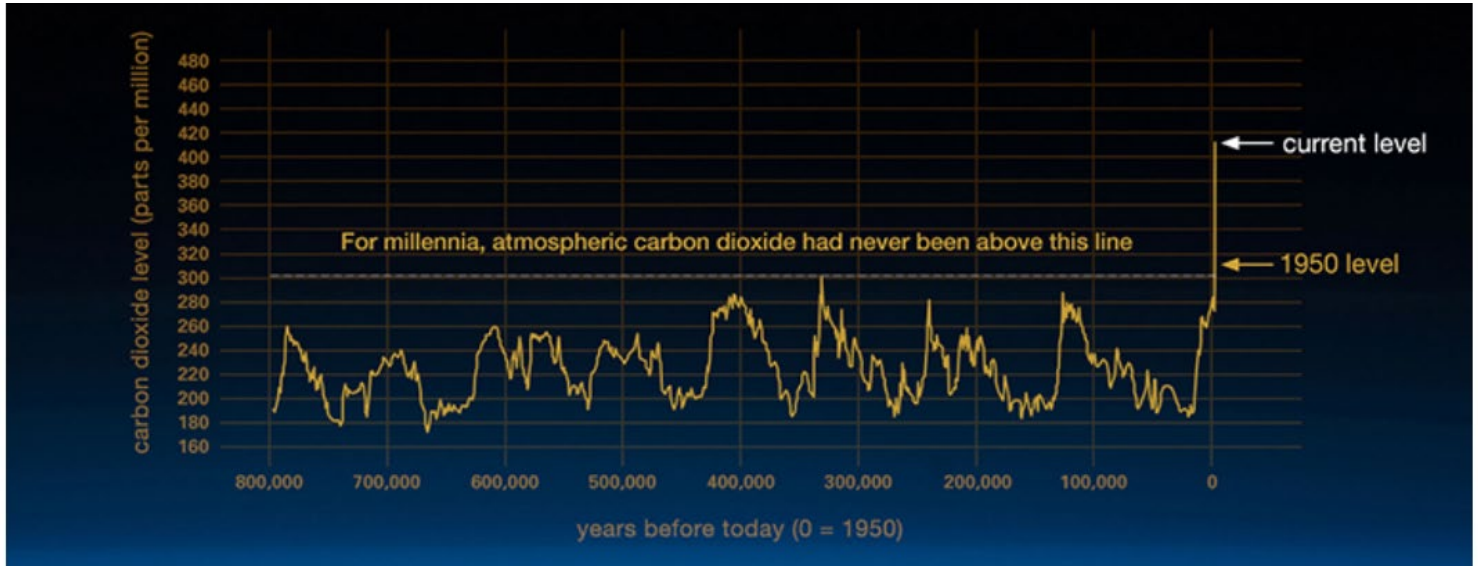
Every major change requires a paradigm shift.



Source: https://climate.nasa.gov/climate_resources/24/graphic-the-relentless-rise-of-carbon-dioxide/

"If working apart we are a force powerful enough to destabilise our planet, surely working together we are powerful enough to save it.“

-- Sir David Attenborough, address to world leaders at COP26

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The data centre industry has the power to provide a step change in heat decarbonisation

Source: https://www.google.co.uk/about/datacenters/gallery/

The opportunity

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HM Government

Heat and Buildings Strategy

Presented to Parliament by the Secretary of State for Business, Energy and Industrial Strategy by Command of Her Majesty

October 2021

Technology	Heat networks
Description	Heat networks use hot water in pipes to deliver heating (and in some cases cold water for cooling) to many consumers from a centralised heat source. As this pipe infrastructure can be used to deliver heating from a range of different heat sources, they can be decarbonised by switching to a low-carbon source of heat.

Types	Low-carbon heat sources for heat networks can include:
	• 'waste heat' sources (supported in some cases by large-scale heat pumps to upgrade the heat temperatures)
	  • industrial processes
	  • data centres
	  • underground transportation
	  • sewage

[197] BEIS internal analysis, using the 'National Household Model' (2017) (https://data.gov.uk/dataset/957eadbe-43b6-4d8d-b931-8594cb346ecd/national-household-model), based on consideration of thermal and electrical constraints at dwelling levels.

[198] Fluorinated gases (F-gases), such as HFCs, are man-made. Though they do not damage the atmospheric ozone layer, they are greenhouse gases with a far greater global warming potential than carbon dioxide.

[199] Guidance on current and upcoming bans on F-gases can be found at: https://www.gov.uk/government/collections/fluorinated-gas-f-gas-guidance-for-users-producers-and-traders.

The opportunity

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setting a date to ensure that all homes meet a Net Zero minimum energy performance standard before 2050, where cost-effective, practical and affordable.

20. **Significantly reducing energy consumption of commercial, and industrial buildings by 2030:** This will deliver significant emissions reductions and deliver cost savings for businesses by: setting privately-rented commercial buildings a minimum efficiency standard of EPC band B by 2030 in England and Wales, introducing a new and innovative performance-based energy rating for large commercial and industrial buildings, over 1,000m^2 which use more energy than all other commercial and industrial buildings, while only accounting for about 7% of the stock[27] and can deliver significant energy and emission reductions, consulting on regulating the owner-occupier sector later this year

21. **Launch a new world-class policy framework for energy-related products:** We will continue to pursue and explore policies that increase use of energy efficient, smart and sustainable products and maximise their associated benefits, following our departure from the EU. We plan to launch our new Energy Related Products Policy Framework which will be published in due course and include illustrative proposals on a range of products including cookers, boilers (including consideration of hybrids), showers, taps and heat emitters. The introduction of this new framework will reduce consumer bills, reduce energy consumption, and reduce emissions by ensuring that when consumers invest in new products, they are buying products that have been made to high efficiency standards.

22. **Considering how to ensure flexible demand and supply (including through smart technologies and energy storage) is taken into account across the full range of energy performance, fuel poverty and heat policies, including regulation and subsidy schemes:** We will build on existing work to consider how to recognise technologies in the Standard Assessment Procedure (SAP) methodology, so that buildings are decarbonised in a way that works for the consumer and the wider energy system.

23. **Developing a workforce pipeline with the skills to meet the requirements of Net Zero transition:** Government is working closely with industry to ensure that installers have up-to-date, high-quality training and that they are not undercut by installers who offer cheaper, low-quality installations. This involves developing new core competencies and agreed training criteria for installing low-carbon heating systems and ensuring energy efficiency improvements are delivered to high standards, using quality and certification schemes, and specification standards.

[27] BEIS internal analysis of BEIS (2016), 'Building Energy Efficiency Survey' (https://www.gov.uk/government/publications/building-energy-efficiency-survey-bees). Private buildings only. Excluding energy used for manufacturing and refining.

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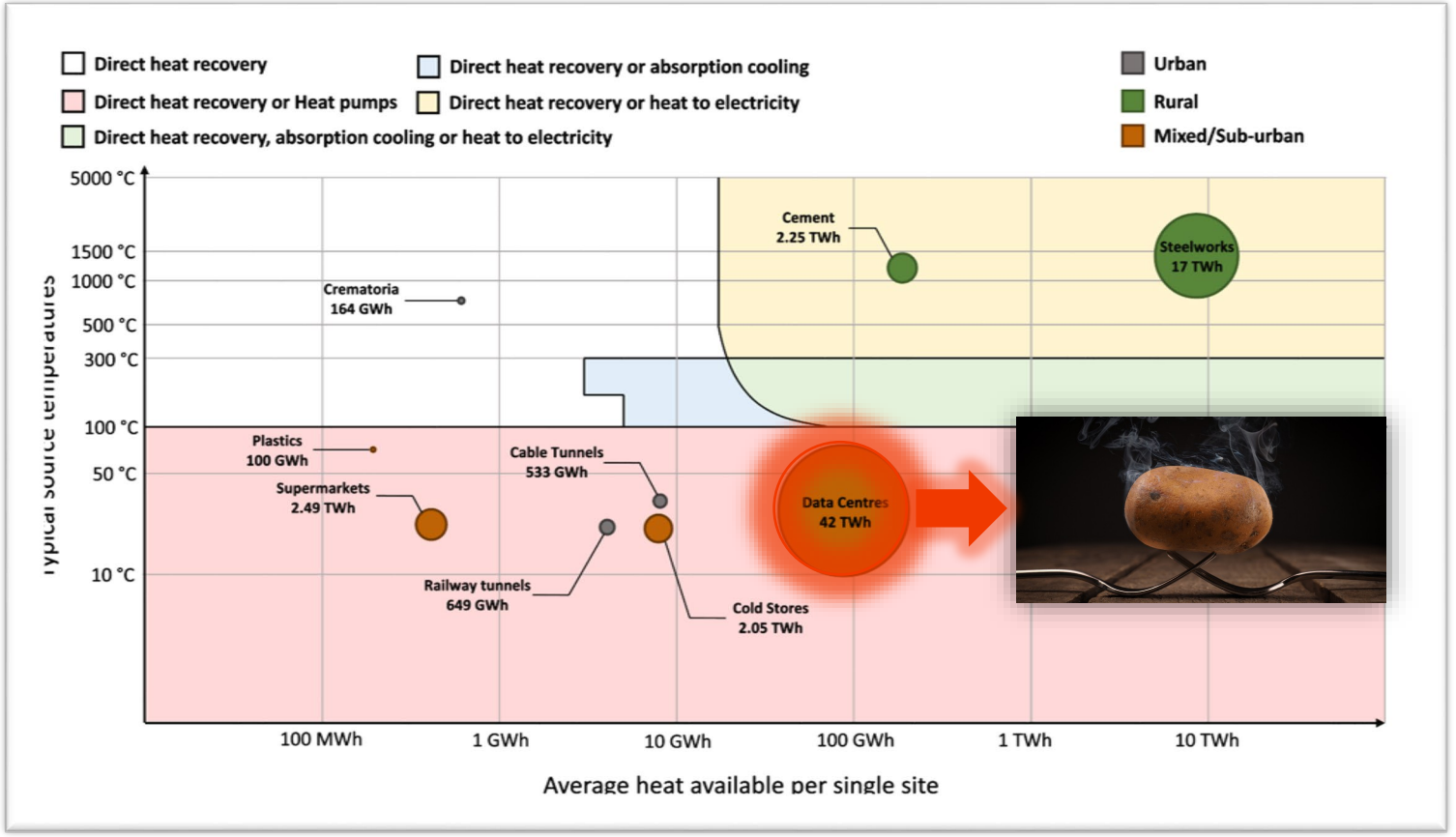
- Renewable electrical energy, whether purchased or generated, is not enough if heat is wasted
- Heat recovery allows to close the loop and become truly carbon neutral

Why data centres?

- Data centres consume around 4% of UK's electrical energy, converting it into heat
- Energy output equivalent to approx 10% of the Nation's hot water and space heating demand



Typical temperature, location, and recommended method of capture of urban waste heat

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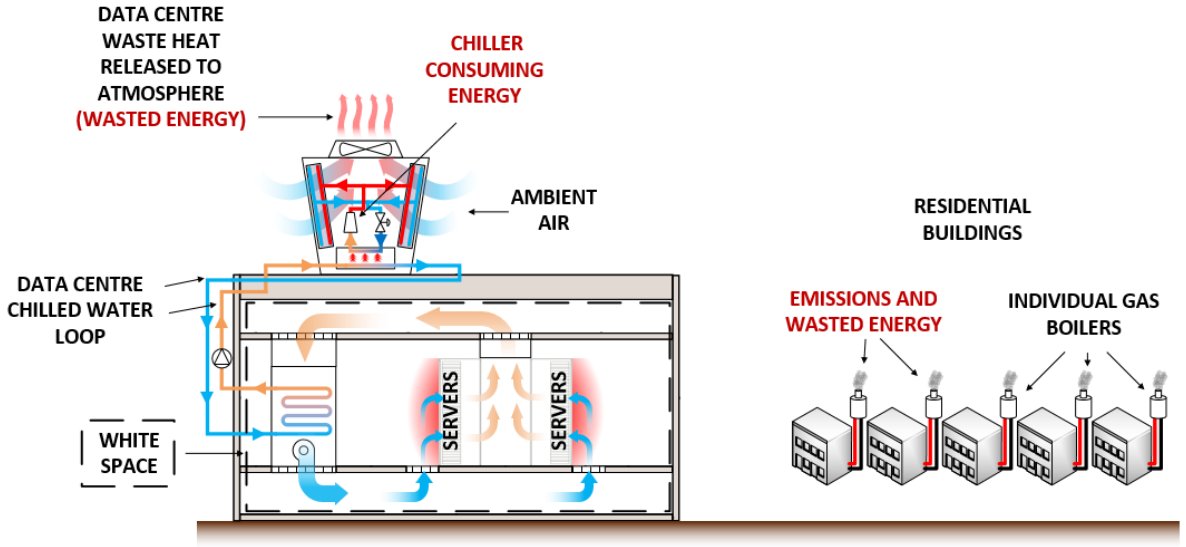
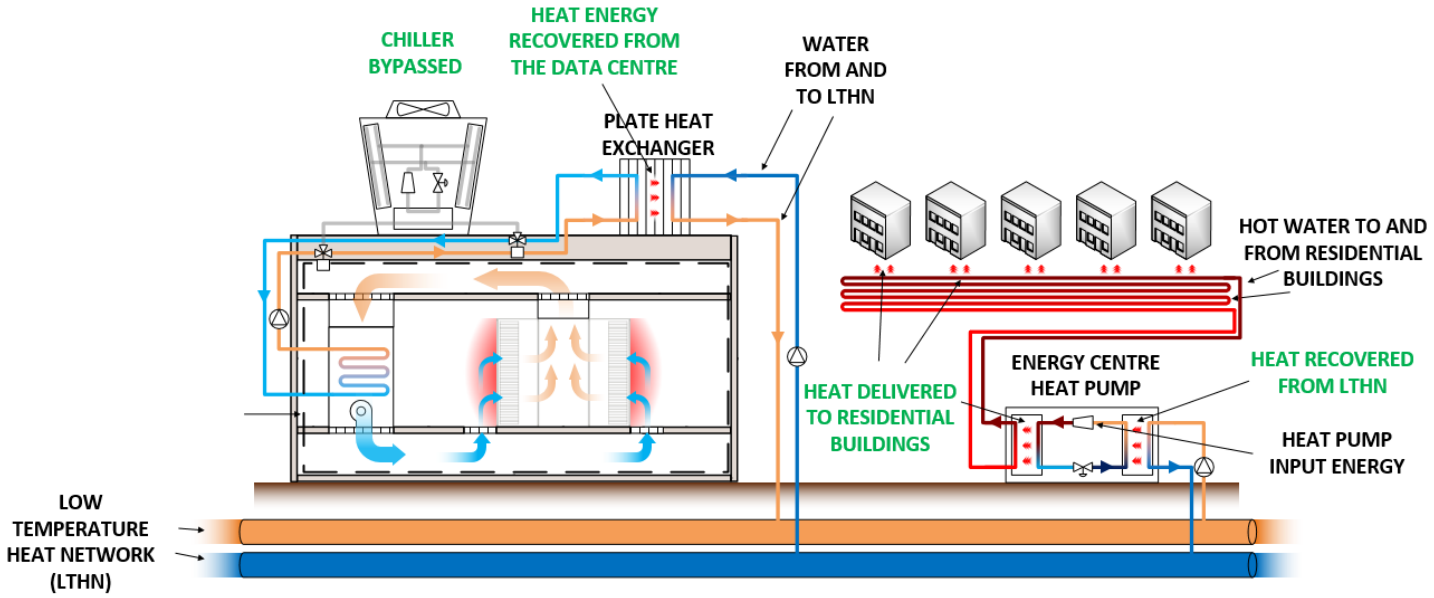
Business as usual:



Heat recovery:



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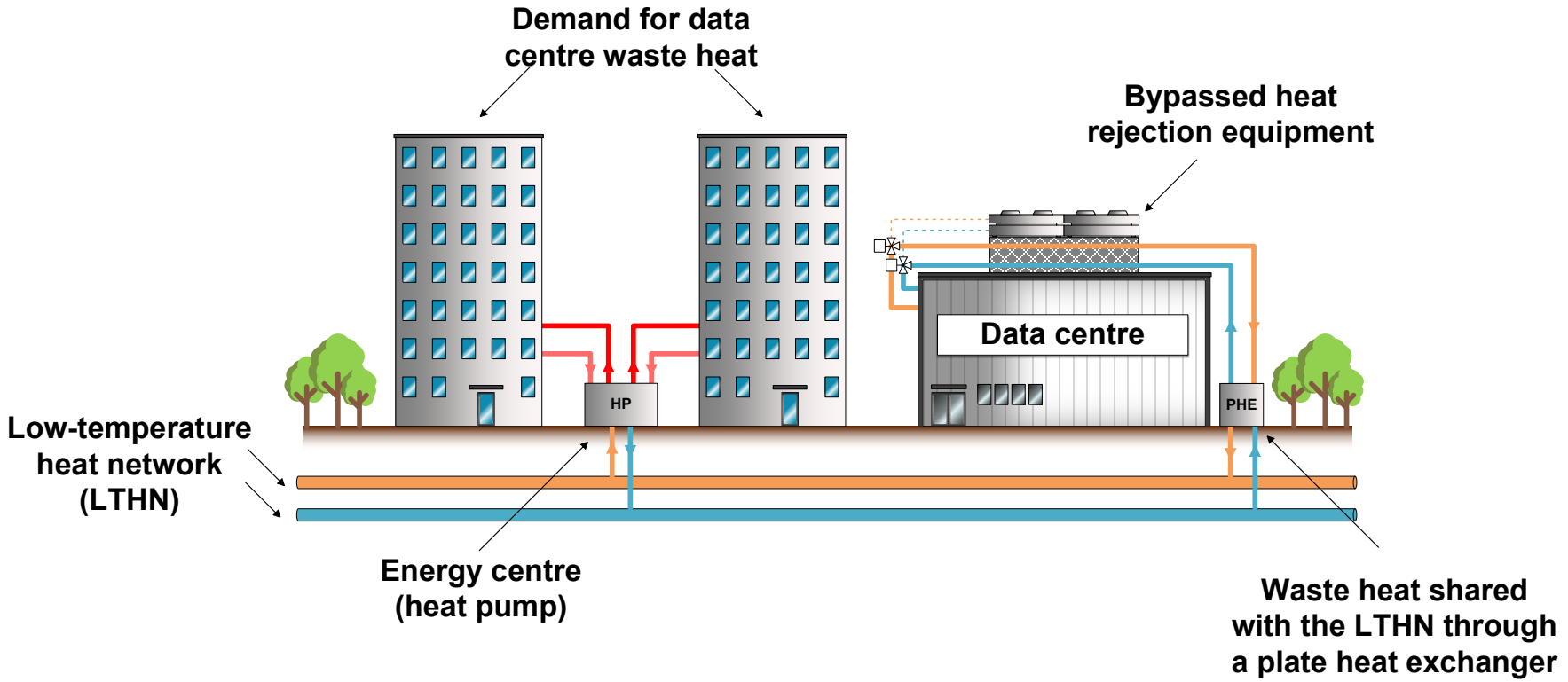
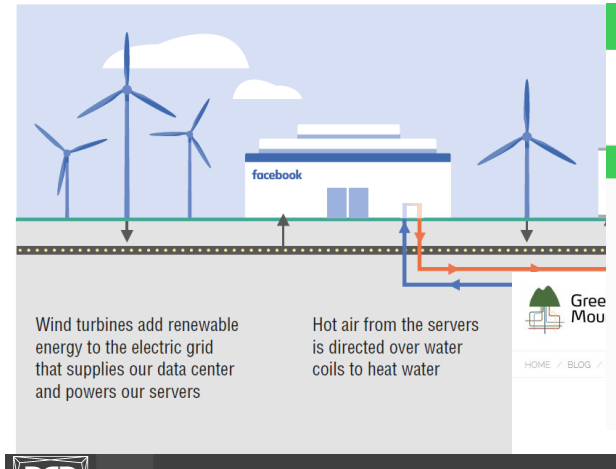


Odense data centre: heat recovery process



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The world's first climate positive data c

In the city of Falun, Sweden, the world's first climate positive data center is nov
in the world, meeting the highest security requirements with world-class perfor
Falu Energi & Vatten in collaboration with the entrepreneurial company EcoDC
energy efficient solutions and products to the project.

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DigiPlex plugs into district heating in Stockholm

Waste heat from established data center now goes to good use

March 12, 2018 By: Peter Judge Be the first to comment

Nordic data center operator DigiPlex will connect its Stockholm data center to the local district heating system, providing enough hot air to warm 10,000 apartments, thanks to a deal signed with Stockholm Exergi, (formerly Fortum Värme).

The project will be the fist time an operational data center, with an indirect evaporative air-to-air cooling solution, is retrofitted to recover excess heat, the two organizations say.

Browsing hurts the planet

"Every time we browse the Internet, stream a TV series or use the cloud, a process starts in a data center. If that data center is a power-hungry, fossil fuel-fired one that releases excess heat into the atmosphere, we as individuals are contributing to climate change," said Gisle Eckhoff, DigiPlex CEO. "Digitization needs to support improved sustainability."


Digiplex Stockholm

Land-based lobster farming will use waste heat from data center

competence dc1-stavanger norway sustainability

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Norwegian government to demand data centers try plugging into district heating systems

Proposal goes beyond EU rules

February 19, 2021 By: Peter Judge 1 Comment

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CyrusOne to research waste heat reuse at Amsterdam I data center

But will need to heat up the water com

September 16, 2020 By: Sebastian Moss Be the first to comment

CyrusOne is partnering with the Municipality of Haarlem a
capturing waste heat at its Amsterdam I data center.

The data center REIT is examining the economic and tech
from the facility's water cooling process, enhancing it and
network to help heat 15,000 homes in the municipality. Ha
gas by 2040, meaning that it needs to find other ways to h

Warming Meerwijk

There is one problem. Like most data centers, CyrusOne's waste heat comes out at an average temperature of 30°C (86°F), which is simultaneously too low for the district heating network (which needs water at 70°C), and too hot for the facility's cooling needs. So, the three stakeholders have proposed using a heat pump to transfer heat from the returning water into


– Cyrus

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DATA CENTER Frontier

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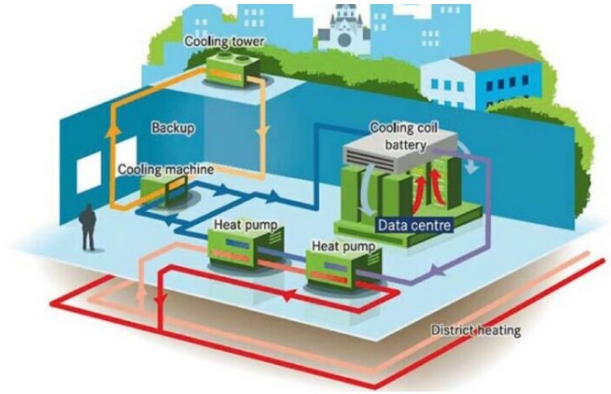
Waste Heat Utilization is the Data Center Industry's Next Step Toward Net-Zero Energy

BY VOICES OF THE INDUSTRY - AUGUST 21, 2020



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November 2019 - Data Center | Energy Efficiency

HEAT RECOVERY FROM DATA CENTERS: A WIN-WIN SITUATION

Data centers and society both have much to gain from the use of waste heat, a topic elaborated upon in a white paper and by Béla Waldhauser, Leader of the eco Data Center Infrastructure Group.

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Research challenges

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- Data centre energy demand estimates are hard to achieve as sector lacks transparency
- Case studies required to prove that the technology works and to encourage more early adopters

“It’s impossible to know how we can get to where we need to be, if we don’t know where we are right now.”

-- Michael J. Oghia, Sustainable Digital Infrastructure Alliance e.V. (SDIA)

The research

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- Anonymous <10min survey → https://www.surveymonkey.co.uk/r/dc-heat

Benefits:

- Involvement in a ground breaking project
- Free evaluation report
- Free benchmarking
  (link to results live throughout the duration of the study)

Optional:

- Detailed energy modelling case study (under NDA)

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"A society grows great when old men plant trees whose shade they know they shall never sit in."

-- Greek proverb

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Thank you

Matt Wegner

wegnerm2@lsbu.ac.uk

@m4ttwegner