

Data centers should be integrated into a green energy system

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The growing need for energy for data centers jeopardizes the EU's climate goal of reducing CO₂ emissions and being CO₂-neutral by 2050. Eg, in Denmark, data centers within 10 years will increase the country's total energy consumption by 17 percent, according to the Danish Council on Climate Change in 2019. So the data centers are a huge challenge, and it requires new thinking—globally.

In a report, the Danish project Cool-Data—supported by the Innovation Fund Denmark—now presents a new approach to documenting the data centers' climate footprint and reducing the CO₂ load.

The data centers use power to operate the IT equipment and cool the servers, while the cooling itself produces a lot of [heat](#). This speaks in favor of integrating the entire process, says Claire Bergaentzlé, researcher at Cool-Data and assistant professor at DTU Management:

"To accelerate the green transition, there is a need to integrate the data centers in the surrounding energy system to adapt the [power consumption](#) with the production of renewable energy and use the waste heat."

Indicators do not include the waste heat

Today, data centers around the world calculate their climate impact based on international standard methods with indicators of energy efficiency and CO₂ reduction. However, the methods are too generic to show real problems or progress, and the relevant authorities rarely keep an eye on the results.

In addition, the inventory methods do not take into account the climate improvement to be found in the data centers' enormous need for cooling of the server park if the waste heat is recycled in the local area or internally. Therefore, there is no immediate incentive to do so.

This is a problem because data centers can become a green resource for the heat supply. This is shown by experiments at Cool-Data's partner GEV in Grindsted, where the heat from the server room is used as [district heating](#), while the other partner Naviair at Copenhagen Airport uses the heat internally in the buildings.

"Our research shows that if data centers use energy in a flexible way and follow the wind energy production in Europe, they will become more climate-friendly. If we, at the same time, pass on the waste heat, then the district heating will also save CO₂. That is why it is a win-win for everyone," says Claire Bergaentzlé.

Cool-Data, therefore, presents a proposal for new indicators, which operate in five main areas which contribute to the green transition if the data centers are integrated into the energy system: energy efficiency, renewable energy, flexibility, CO₂ reduction, and waste heat.

The danger of greenwashing

According to the project manager for Cool-Data and senior researcher at DTU Compute Dominik Franjo Dominković, it is absolutely crucial that data centers have indicators that describe the flexibility of electricity consumption in real-time in relation to [green electricity](#), and not as the current indicators that calculate the result on an annual basis.

"It could easily become greenwashing. If data centers use one Gigawatt of power and buy the same amount of wind turbine power at another time, then there is a mismatch between when they use power and buy green power. We believe that the indicators should be able to describe changes when they occur. It is difficult to implement, but it is important that we get it implemented," says Dominik Franjo Dominkovic.

At the same time, Cool-Data also likes to point out that it is a misconception to think that it is great just to reuse [waste heat](#).

"If the electricity is initially produced using coal, then you send coal on to the district heating customers, and then it does not help the climate. If we are to succeed in creating sustainable data centers, it requires that we look at both the electricity grid and the district heating network, says

Claire Bergaentzlé.

Need for common line

There is increasing international awareness about the data centers' energy impact, and there are various climate-friendly solutions. Nevertheless, the medium-sized data centers, in particular, are lagging behind with the green transition.

Cool-Data's report has been presented to the Danish data centers' industry organization the Danish Data Center Industry (DDI). Cool-Data is also in dialog with DDI's focus project TIDA, Test & Innovation Datacenter Denmark, where they work on making all data centers climate-friendly through procurement of green electricity, infrastructure optimization, recycling of surplus heat, sustainable construction, and integration with the environment.

In October, the report's conclusions were also presented at an international [energy](#) and climate conference in Dubrovnik, Croatia.

Later in November, Cool-Data will meet with the EU-funded project ECO-Qube, which also works with AI-based management of cooling processes in data centers, to discuss a joint proposal to the EU on how data centers should report their sustainability to make sure the list of indicators benefits the green transition as much as possible.

Cool-Data's report "New performance indicators for fully integrated and decarbonized data centers" works specifically with the link between green power and district heating in [data centers](#), but conclusions and indicators can easily be adapted to countries and areas where there are other heating processes.

More information: New performance indicators for fully integrated

and decarbonised data centres. doi.org/10.11581/DTU:00000112

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