Pathways to a fossil free internet in Europe

greenweb.org

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Groenlinks PvdA Digital Summit

Hello, I'm Chris!

My background:

Loco2 - Low CO2 Travel in Europe by train

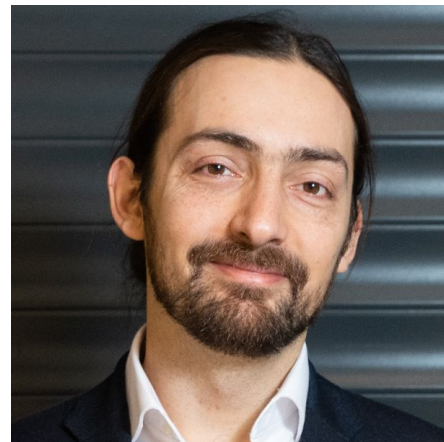**A.M.E.E (Avoid Mass Extinction Engine)** - CO2 calculation as an API

Green Software Foundation - policy working group co-chair

Branch Magazine - contributor, co-founding editor

climateAction.tech - community organiser since 2018

Environment Variables podcast - host since 2022

Green Web Foundation - exec director, my day job

The Green Web Foundation is working towards a fossil-free internet by 2030.

The internet should be a global public good — healthy for the planet and for the people who use it.

What we'll cover

1. Why a fossil free internet

2. Getting to a fossil free internet in Europe

3. Actually getting there

4. Q and A

Why a fossil free internet?

The internet is the biggest machine in the world, and today, it mostly runs on fossil fuels.
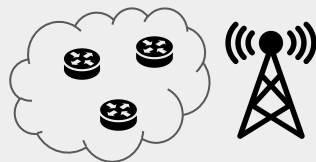
How do digital services cause emissions?

End user device usage

Powering end user devices - laptops, workstations, smartphones and tablets

Network transfer

Powering core networks, mobile networks, on-premise wifi and fixed routers

Datacentre usage

Powering and cooling servers

Production and disposal

Energy usage from making all of the above - processing raw silicon and other raw materials into integrated circuits, batteries, metal casings, etc

How big is tech's carbon footprint?

Estimates vary, but between 2% and 4% of global carbon emissions is safe to use.

10

Non climate reasons for a fossil free internet

Fossil-free reduces reliance on unaligned actors

Distribution of fossil fuels is inherently unequal: Most countries are fossil fuel *importers.* Europe is a net importer.

Reliance on Russian Gas: Europe still spends more money buying Russian gas than on supporting Ukraine each year.

Reliance on new actors: From reliance on fossil gas from Russia, to reliance on fossil gas from USA & Qatar.

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Mohamad Safa ✓
@mhdksafa

If the United States saw what the United States is doing in the United States, the United States would invade the United States to liberate the United States from the tyranny of the United States.
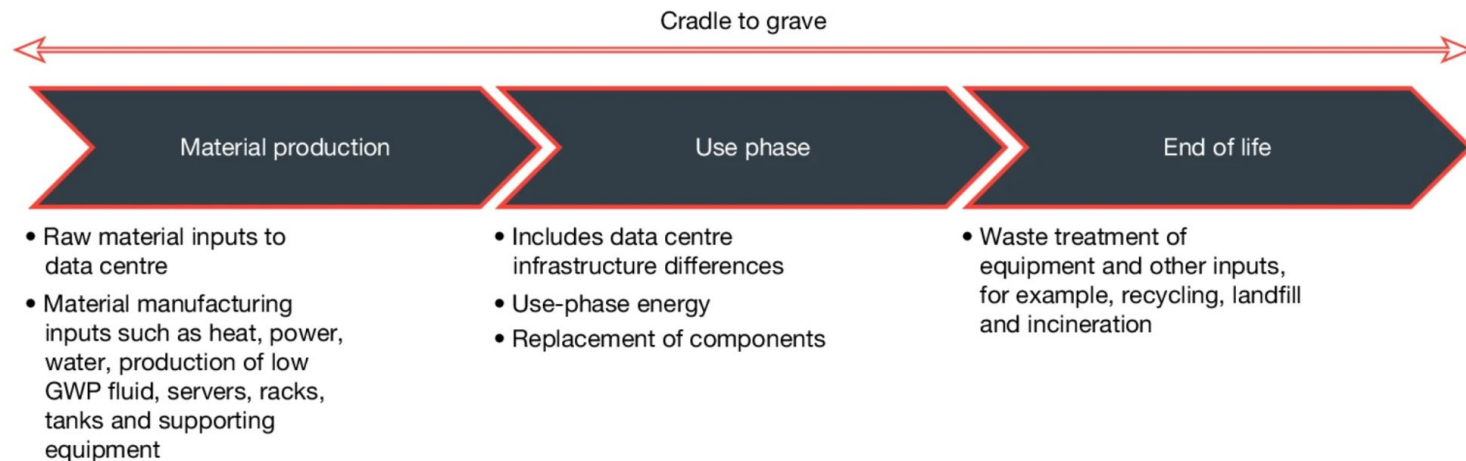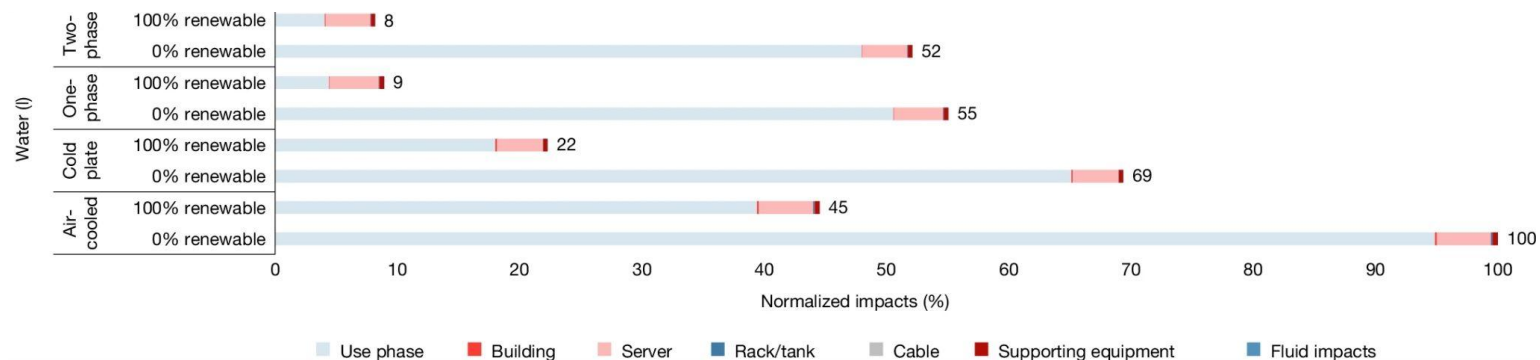
7:33 AM · 08 Jun 25 · **1.4M** Views

Source: Twitter / X - https://x.com/mhdksafa/status/1931690967356051743 (sorry)

Fossil-free means lower life-cycle impacts too in total

Fig. 3: LCA was used to evaluate data centre impacts across the life cycle, from cradle to grave.

From: Using life cycle assessment to drive innovation for sustainable cool clouds

Cradle to grave

Material production	Use phase	End of life
• Raw material inputs to data centre • Material manufacturing inputs such as heat, power, water, production of low GWP fluid, servers, racks, tanks and supporting equipment	• Includes data centre infrastructure differences • Use-phase energy • Replacement of components	• Waste treatment of equipment and other inputs, for example, recycling, landfill and incineration

Impacts of all main subcomponents of the data centre were evaluated at each stage. Short descriptions of key aspects of each stage highlight the system boundaries.

Water (l)

		Normalized impacts (%)
Two-phase	100% renewable	8
	0% renewable	52
One-phase	100% renewable	9
	0% renewable	55
Cold plate	100% renewable	22
	0% renewable	69
Air-cooled	100% renewable	45
	0% renewable	100

Legend: Use phase, Building, Server, Rack/tank, Cable, Supporting equipment, Fluid impacts

Source: Using life cycle assessment to drive innovation for sustainable cool clouds (link)

OK, is the internet becoming more fossil-free?

Corporate targets in early 2020's

Google Data Centers

Locations   Innovations   Data and Security   Efficiency   **24/7 Clean Energy**   Gallery   Life@   Podcast   Discover   FAQ

24/7 Carbon-Free Energy by 2030

Over the past decade, Google purchased more renewable energy than any other company, based on cumulative renewable electricity purchased in megawatt-hours from 2012 to 2021. Now, as we enter our third decade of climate action, we're targeting our most ambitious sustainability goal to date: we intend to run on 24/7 carbon-free energy (CFE) – everywhere, at all times.. And we aim to do it by 2030.
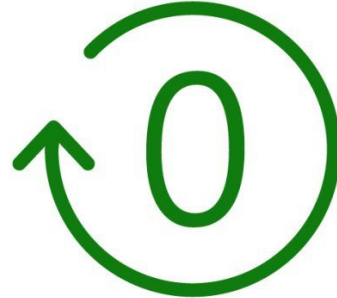
Ambitious corporate targets (cont)

Microsoft's new 100/100/0 commitment by 2030

100% of electricity consumption → 100% of the time → Matched by zero carbon energy purchases

"

Reducing carbon is where the world needs to go, and we recognize that it's what our customers and employees are asking us to pursue. This is a bold bet — a moonshot — for Microsoft. And it will need to become a moonshot for the world

Brad Smith, *Microsoft President, 2020*

Sounds promising, right?

" In 2020, we unveiled what we called our carbon moonshot. That was before the explosion in artificial intelligence......*so in many ways the moon is five times as far away as it was in 2020*, if you just think of our own forecast for the expansion of AI and its electrical needs

Brad Smith, *Microsoft President,* **2024**
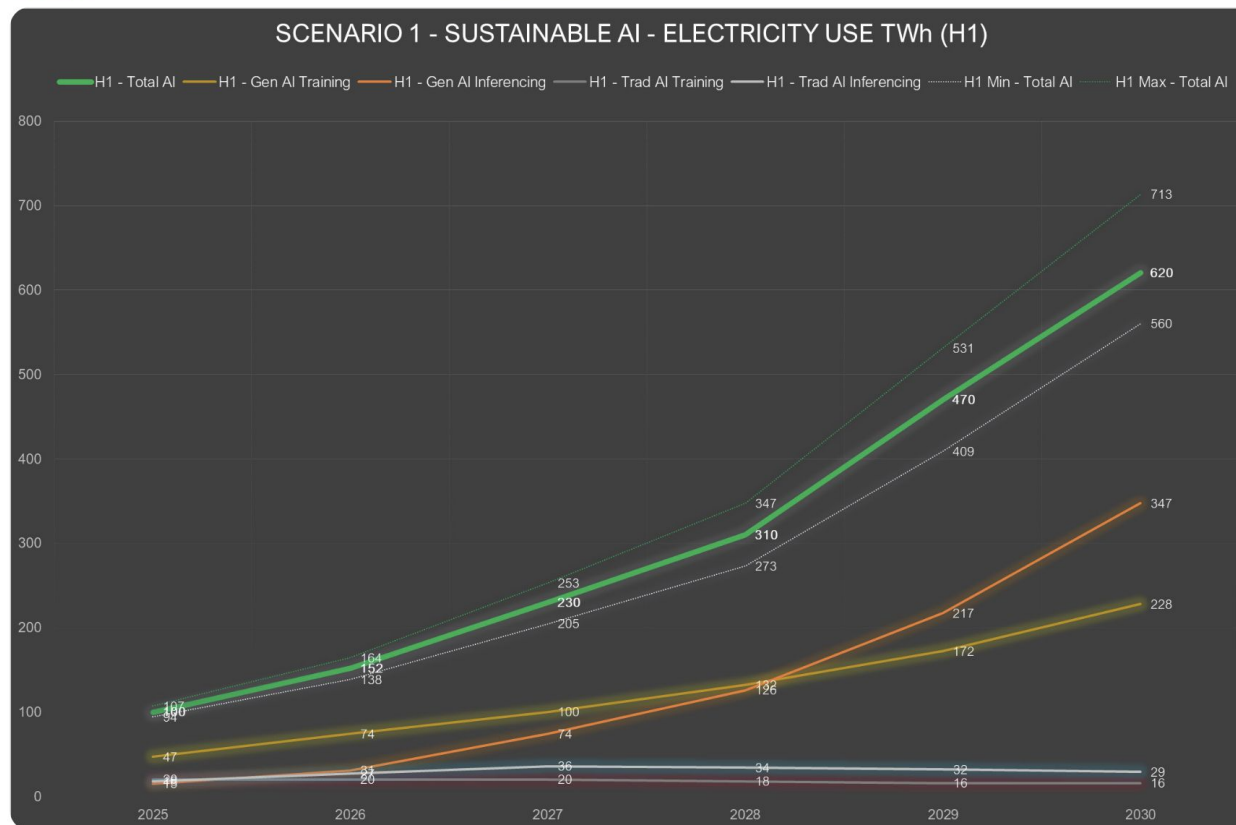
😐

Oh. But we need this AI for sustainability, right?

" I'm so tired of this sales pitch: *"AI is using a lot of energy but it's also helping the climate"*. The AI that helps the climate is generally very different from the AI that uses a lot of energy (e.g. LLMs like ChatGPT). We can have the former without the latter.

David Rolnick, *Climate Change AI cofounder, and Assistant Professor in CS at McGill*

Exhibit 4. Sustainable AI Scenario electricity consumption forecast from 2025 to 2035, in TWh

SCENARIO 1 - SUSTAINABLE AI - ELECTRICITY USE TWh (H1)

Legend: H1 - Total AI · H1 - Gen AI Training · H1 - Gen AI Inferencing · H1 - Trad AI Training · H1 - Trad AI Inferencing · H1 Min - Total AI · H1 Max - Total AI

Getting to a fossil free internet in Europe

New changes in the law are making firms operating in Europe care more about two things:

1. Climate Disclosure: what are my emissions?

2. Climate Response: what is my plan to reduce them?

Driving Climate *Disclosure*

"Show us you track emissions, and share this info with society"

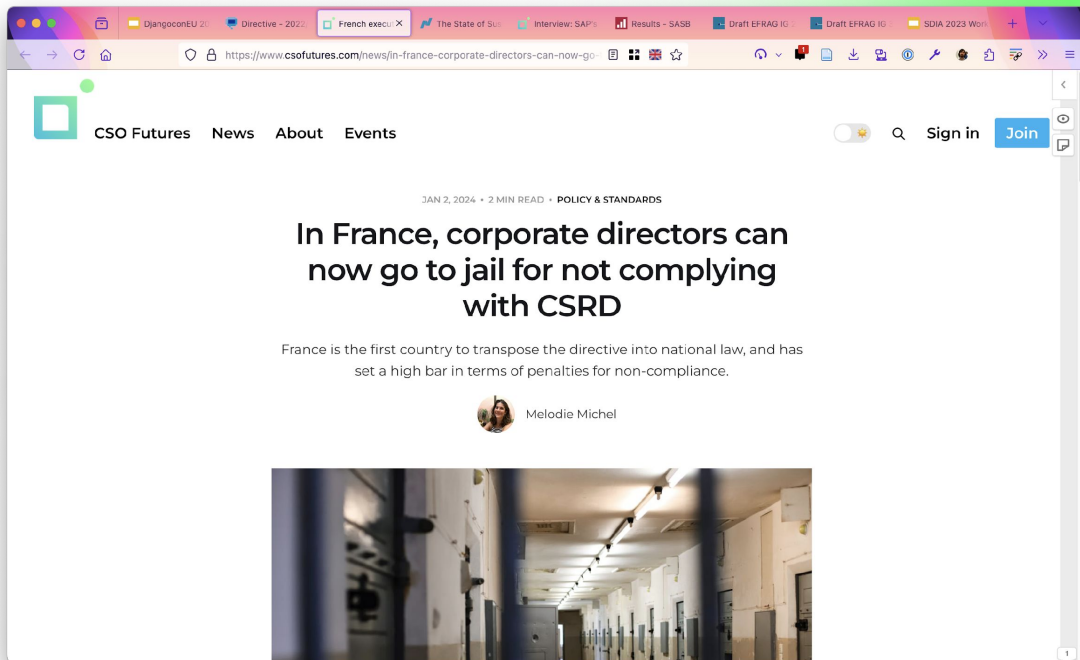Corporate Sustainability Reporting Directive (CSRD)

Wet implementatie richtlijn duurzaamheidsrapportering

(Implementation Act on the Directive for Sustainability Reporting)

Driving Climate *Disclosure*

liberté
egalité
CSRDé
🥁

In France, corporate directors can now go to jail for not complying with CSRD

https://www.csofutures.com/news/in-france-corporate-directors-can-now-go-to-jail-for-not-complying-with-csrd/

New laws: the Energy Efficiency Act (E.E.D)

Article 12(1) on data centres

Owners and operators of data centres on EU territory with an installed IT power demand of at least 500kW to *make publicly available*:

Name of the data centre, owner and operators date of entry into operation and the municipality where the data centre is based

Floor area of data centre, installed power, annual incoming and outgoing data traffic, amount of data stored and processed
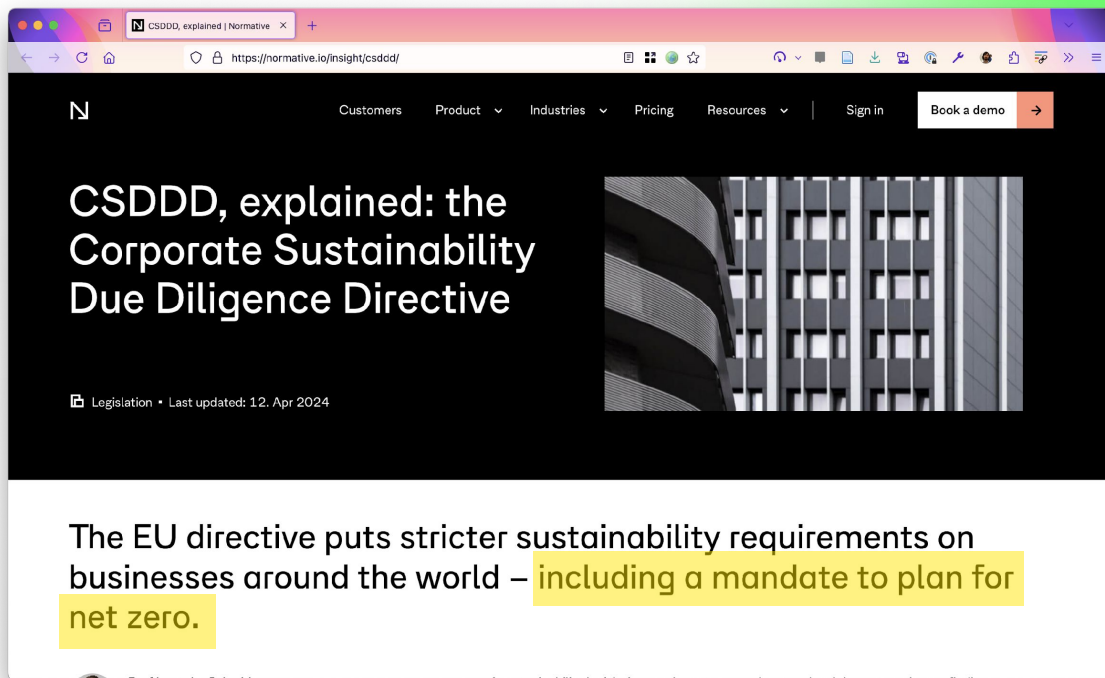
The performance of the data centre during the last full calendar year (energy consumption, power utilisation, temperature set points, waste heat utilisation, water usage and use of renewable energy)

(except information subject to national and EU laws protecting trade and business secrets and confidentiality)

European Commission

Driving Climate *Response*

"Show us you have a plan informed by the science"

The EU directive puts stricter sustainability requirements on businesses around the world – including a mandate to plan for net zero.

"it is also clear that the ICT sector also needs to undergo its own green transformation...

Data centres and telecommunications will need to become more energy efficient, reuse waste energy, and use more renewable energy sources. **They can and should become climate neutral by 2030**

European Commision Strategy Document: *Shaping Europe's digital future for 2019-2014 (link)*

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Fossil-free targets in Europe for 2030

Countries with the largest data centre capacity in Europe (not in order of size)

Netherlands	70% electricity from renewables by 2030
Germany	80% electricity from renewables by 2030. Has 100% renewables target for datacentres by 2030.
UK	95% + fossil-free electricity by 2030 (the energy model is on github!) * *with 5% back-up if it's dark and not windy
France	Already at ~90% fossil-free, aiming to half fossil fuel consumption by 2030

Sounds promising, right?

Actually getting there

Energy Efficiency Act Recommendations

Summary

Based on the reported data and considering the stakeholders' input, both obtained by 24. 04. 2025, we suggest considering the following MPS:

PUE

- Operational PUE < 1.5 for existing DC by 2030
- Design PUE < 1.3 for DC commisioned 2027 and later, operational PUE < 1.4 achieved within 3 years of operation

WUE

- WUE < 0.4 L/kWh (based on potable water) for all DC by 2030
- WUE < 0.4 L/kWh (regardless of origin) for DC commisioned 2027 and after
- Further focus on WUE regardless of water source

REF

- REF = 100% for all DC (regardless of origin) by 2030
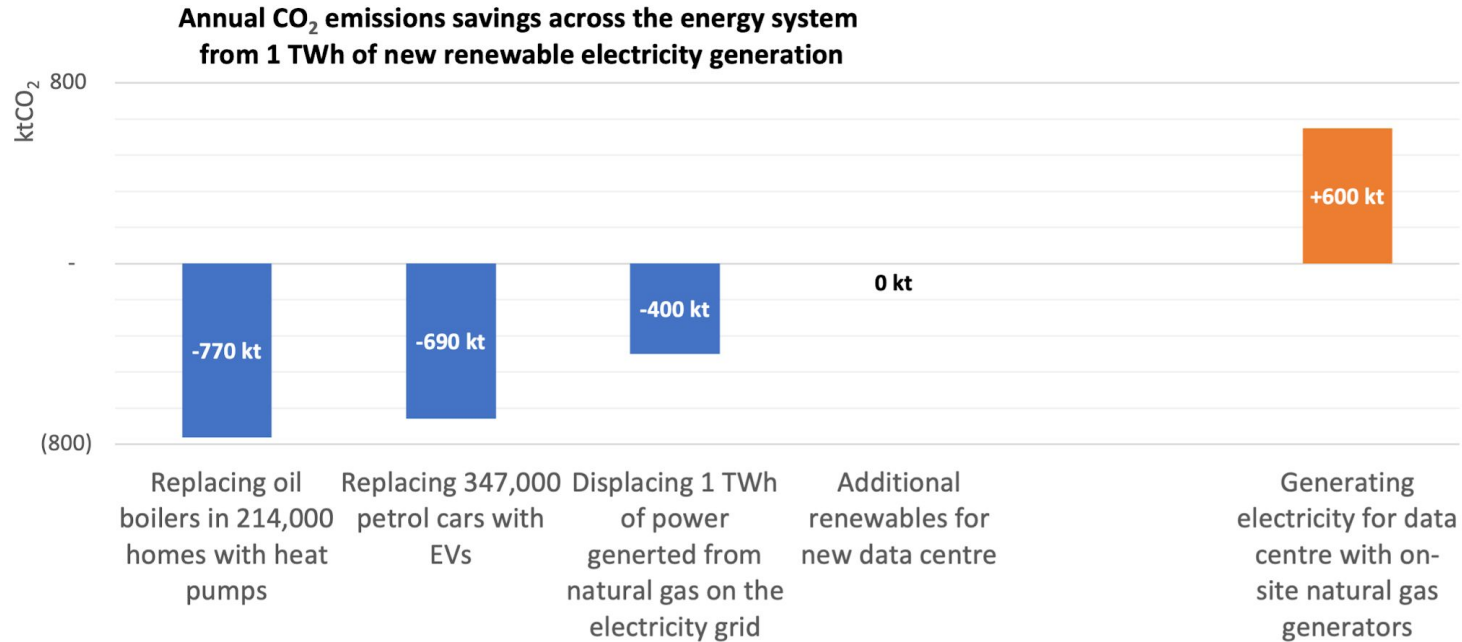- Further focus on the origin of renewable energy
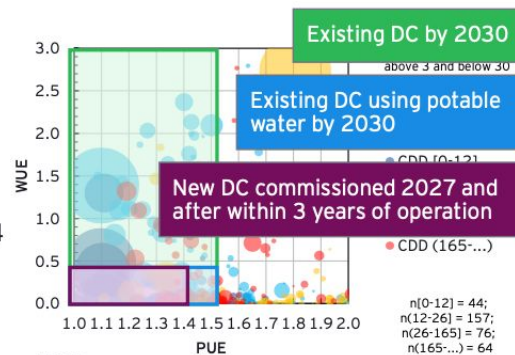
ERF

We do not believe that mandating a EU-wide criterion is feasible – we propose for it to be assessed locally.

For all MPS, we encourage policy makers to introduce stricter regulations on national level where deemed necessary and feasible.

Cleaning up existing supply vs expansion

Annual CO$_2$ emissions savings across the energy system from 1 TWh of new renewable electricity generation

ktCO$_2$

- Replacing oil boilers in 214,000 homes with heat pumps: -770 kt
- Replacing 347,000 petrol cars with EVs: -690 kt
- Displacing 1 TWh of power genreted from natural gas on the electricity grid: -400 kt
- Additional renewables for new data centre: 0 kt
- Generating electricity for data centre with on-site natural gas generators: +600 kt

Assumptions:
- Heat pump with COP of 3 replacing oil boiler emitting 257 gCO$_2$/kWh - would be higher with retrofit measures
- EVs with efficiency 0.16 kWh/km replacing ICE emitting 110 gCO$_2$/km
- Assumed GHG intensity of 400 gCO$_2$/kWh of large-scale CCGT natural gas, and 600 gCO$_2$/kWh for on-site generation

"

For now, arguing that we need more data centres in order to grow renewables is akin to arguing that we need new roads to support the growth of EVs.

Hannah Daly, *Professor in Sustainable Energy Systems, University College Cork, 2025*

> "To stimulate private sector investment in cloud capacity and data centres, the Commission will also propose a Cloud and AI Development Act. The goal is to **at least triple the EU's data centre capacity in the next five to seven years, prioritising highly sustainable data centres**.

European Commision Press Release: *Commission sets course for Europe's AI leadership with an ambitious AI Continent Action Plan (*link*)*

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If money *has* to be spent on new DC infra

Companies create early "lead markets" for advanced technologies the whole system will need soon, like long-duration storage to bridge gaps in wind and solar generation. Just 3% of German companies buying 24/7 (carbon free energy) with iron-air long-duration storage would reduce costs by 25%, so they become cost-competitive in the bulk electricity market.

(paraphrased for space, from existing quotes)

Tom Brown, *TU Berlin - Digital Transformation in Energy Systems , 2025*

A brief recap of what we covered

Why a fossil free internet

The internet is a bit like shipping.
We can use less, sure, but it's more important to clean up the supply.

Fossil-free helps with more than just carbon

Fossil free in Europe

Laws have been on our side, but we have a fight on our hands to keep hard-won wins.

We must make sure laws are not watered down now.

Obligatory AI comment

There are different kinds of AI.

Know which ones help climate, and which ones help companies make their next quarter (and which ones they are lobbying for)

Transition vs expansion

A fossil-free internet is desirable, but we still need to displace fossil fuels outside of tech.

Early investment in new energy tech can help with future transition

Thanks!

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greenweb.org - Green Web Foundation Website

climateAction.tech - a friendly community of climate-minded tech workers

podcast.greensoftware.foundation - I interview experts in this field, 1-2 times per month

branch.climateAction.tech - an online magazine at intersection of tech & climate

Finding a community to help you

Climate Action .tech