Towards a fossil free internet

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thegreenwebfoundation.org/ripe84

RIPE 84 - @mrchrisadams

Hi!

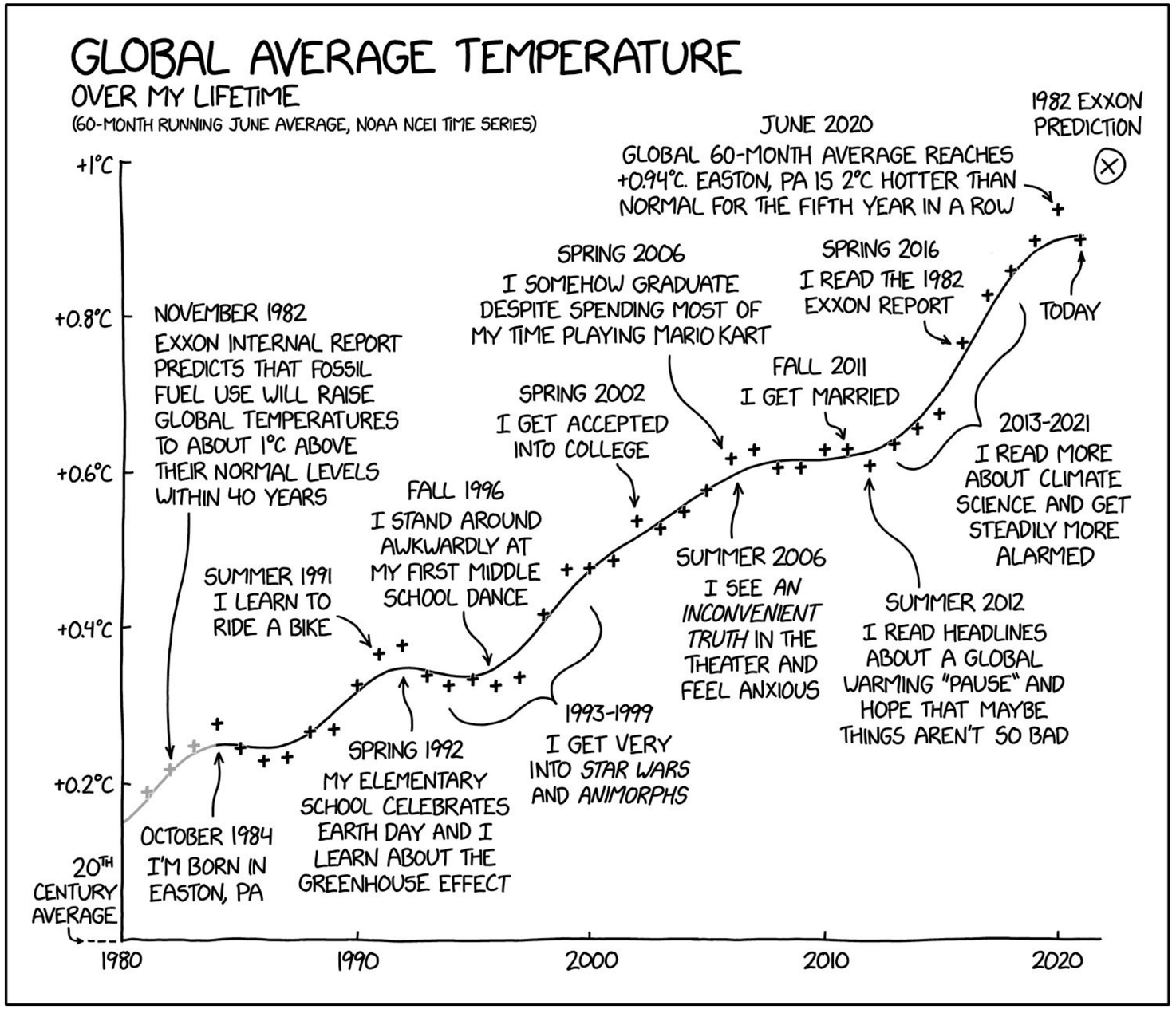
I’m Chris.

Executive director, The Green Web Foundation
Organiser, ClimateAction.tech
Co-Editor, Branch Magazine
Chair, Green Software Foundation Policy Working Group

thegreenwebfoundation.org/ripe84

What we'll cover together…

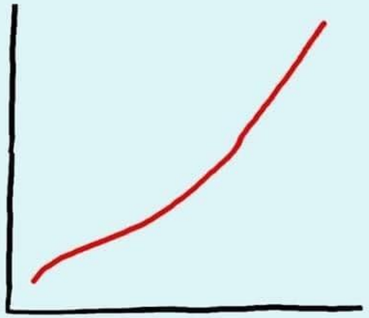
1. Why we need a fossil free internet
2. Qualities of a fossil free internet
3. Making the case for a fossil free internet



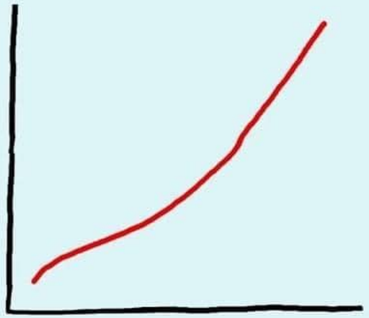
XKCD cartoon: https://xkcd.com/2500/

Spot the Difference

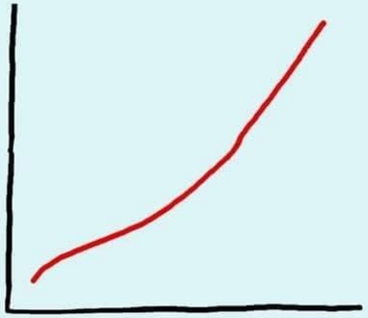
Your Energy Bill



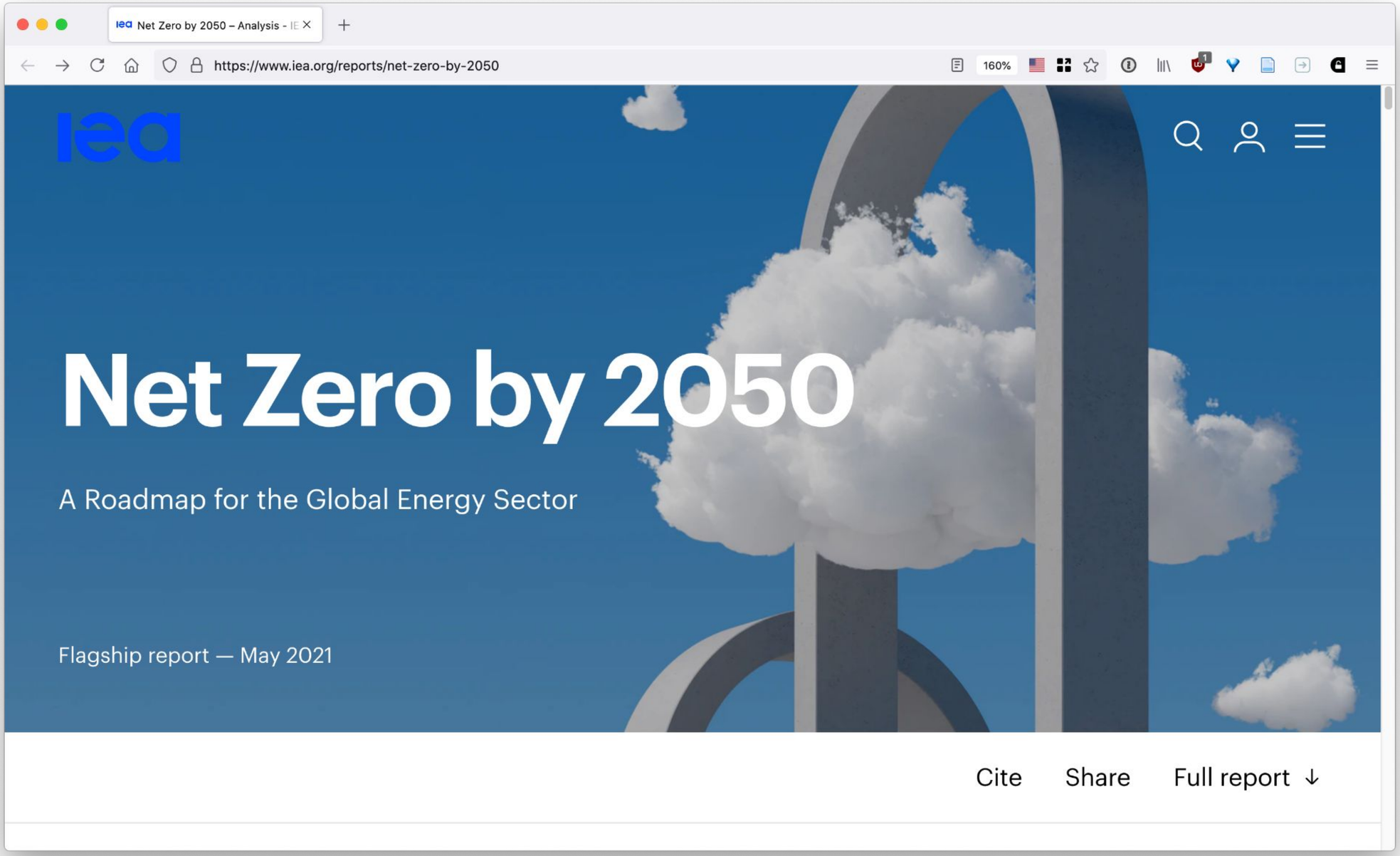
Shell's Profits



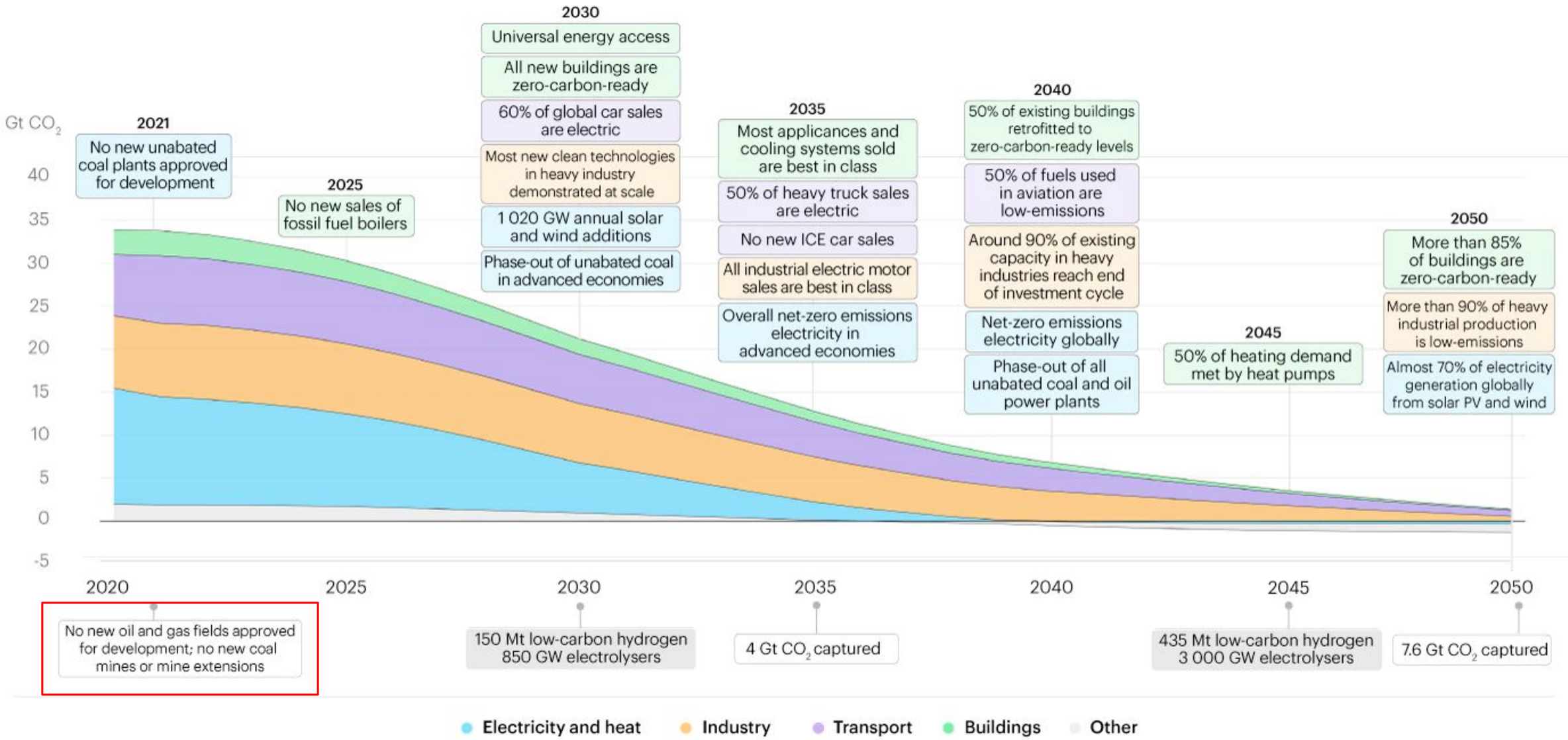
Average Global Temperature



We are in a climate crisis largely because we keep burning fossil fuels, instead of finding a path off them



The International Energy Agency is the leading authority for the energy sector (link)



IEA's Net zero scenario pathway (link)

Why we need a fossil free internet

Save carbon - climate emergency, remember?

Save lives - 5m+ avoidable deaths / year from poor air quality globally, primarily from burning fossil fuels

Save money - fossil fuels are expensive with volatile prices

Improve retention among staff - ppl 💚 greener firms

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What does a fossil free internet look like?

Green

Open

Lean

Distributed

A fossil free internet looks like GOLD

Green
Open
Lean
Distributed

Green energy, and
greener material inputs
For running computers
For making computers

Fossil energy versus green, non-fossil energy

You don't have control over what others feed into the grid.

If you know the mix going into the grid, you can at least account for it.

Climate Impact by Area

Ranked by carbon intensity of electricity consumed (gCO_2eq/kWh)

Search areas

1	El Hierro	Spain
2	Orkney Islands	Great Britain
3	South Island	New Zealand
4	Yukon	Canada
5	Southwest Norway	Norway
6	Ontario	Canada
7	North Norway	Norway
8	El Salvador	
9	Middle Norway	Norway
10	Southeast Norway	Norway
11	Uruguay	
12	Bornholm	Denmark
13	West Norway	Norway
14	Tasmania	Australia

This project is Open Source (see data sources).
Contribute by adding your territory.

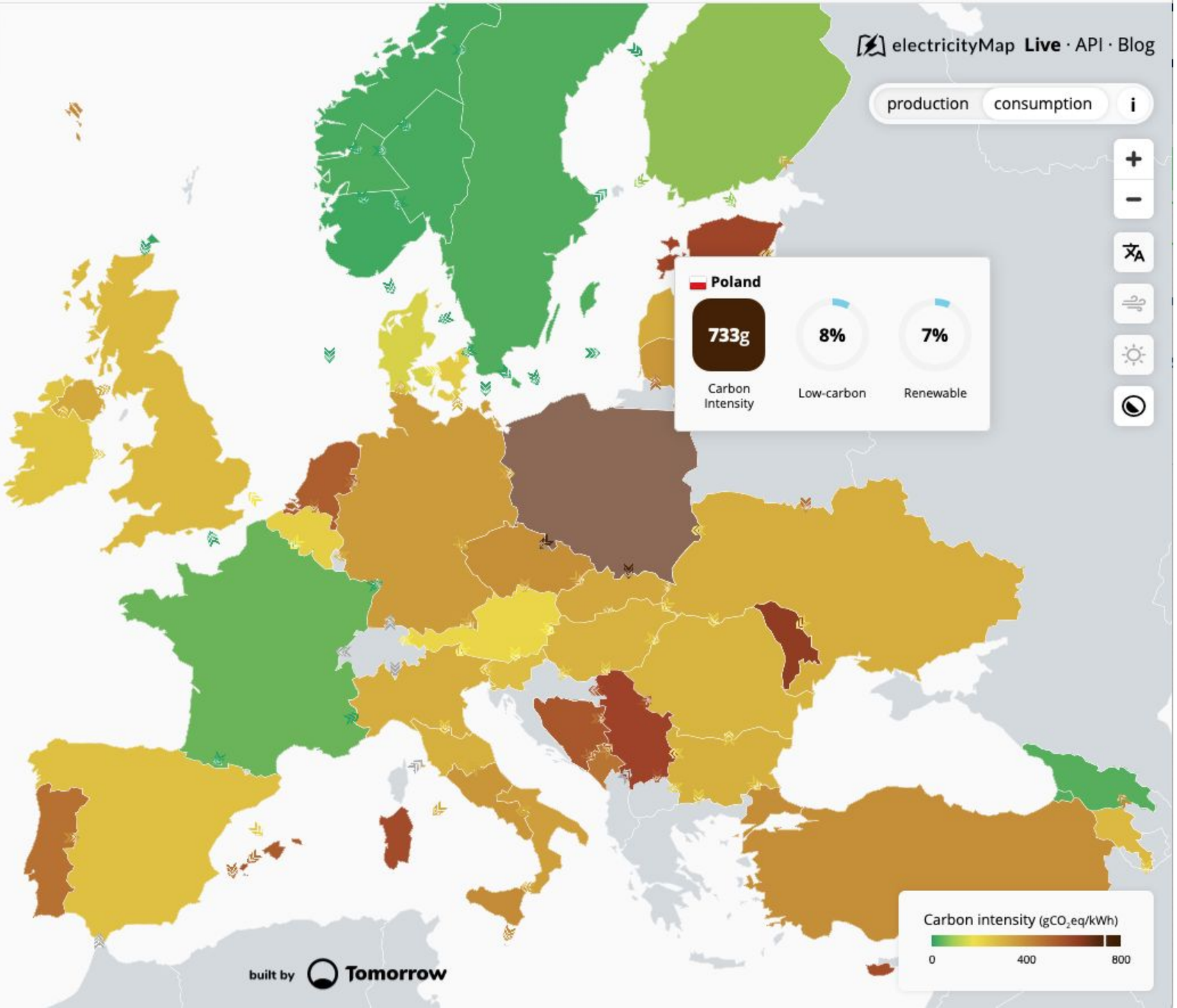
Found bugs or have ideas? Report them here.

Like the visualization? We'd love your feedback!

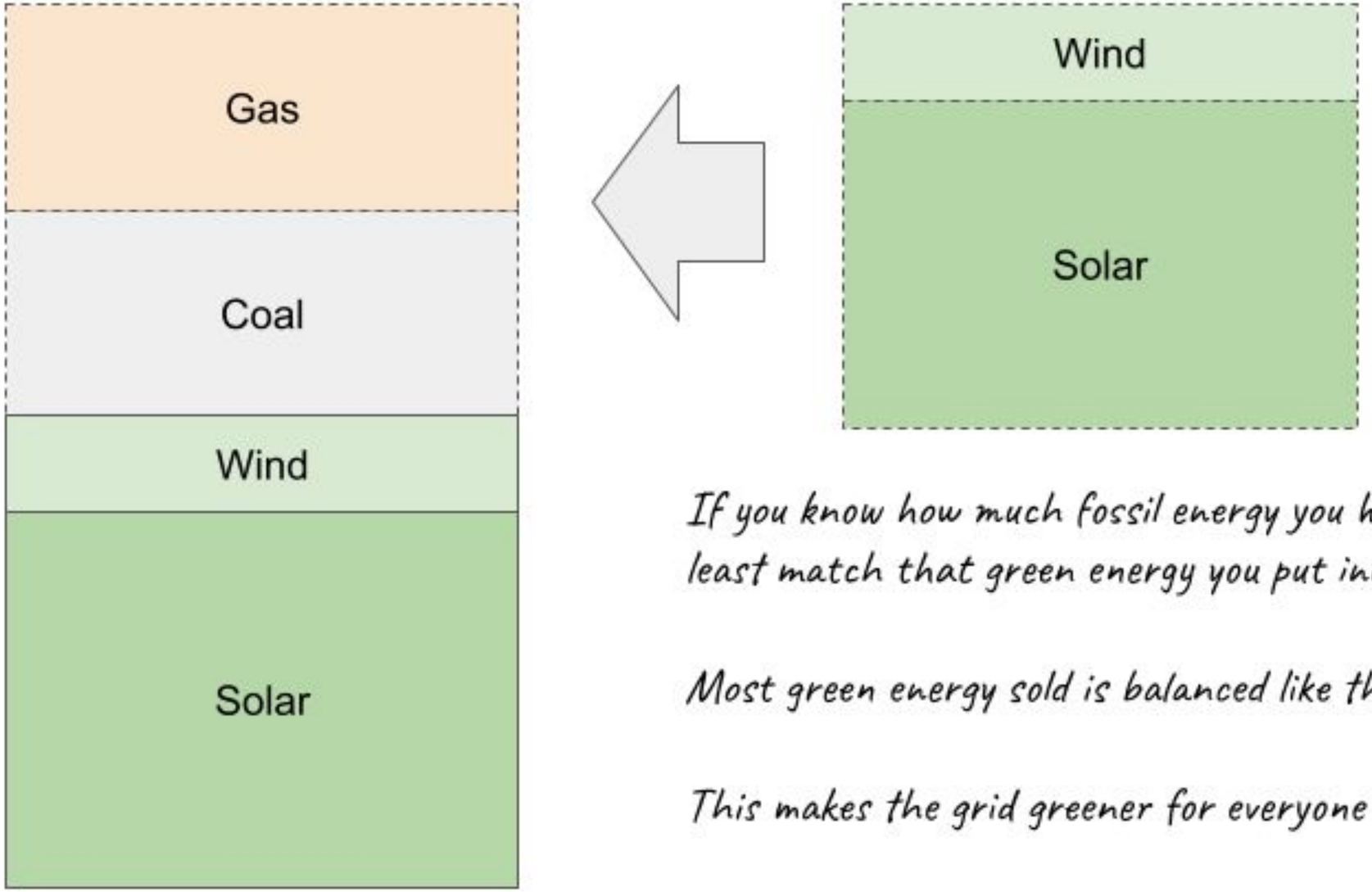
Anything unclear? Check out our frequently asked questions.

color blind mode

Tweet Slack



Accounting for fossil fuel energy



If you know how much fossil energy you have used, you can at least match that green energy you put into the grid.

Most green energy sold is balanced like this a yearly basis.

This makes the grid greener for everyone over time.

Result of the green web check — greengeeks.com is hosted green!

Congratulations! The website is hosted green.

This hoster is using green energy / compensation for its services.

Hosted by: GreenGeeks LLC

Supporting evidence for the hoster's claims

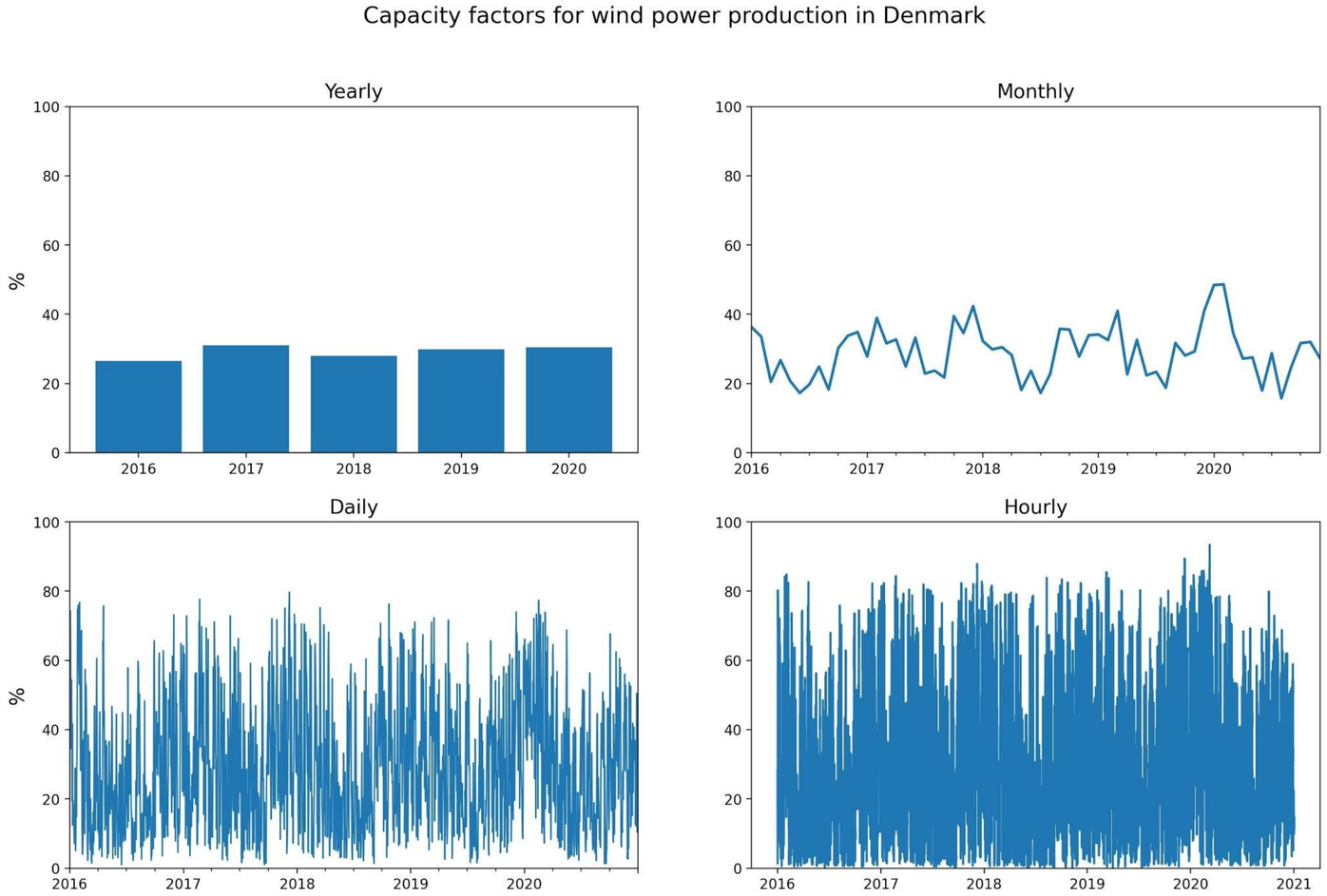
- 2020 Green Energy Certificate - RECs
- 2021 Green Energy Certificate - RECS
- Confirmation from the US EPA of 300% matched power

Is this your website? Implement this badge on your website and show the world you are green.

Save this image or use the code below to implement this badge on your website.

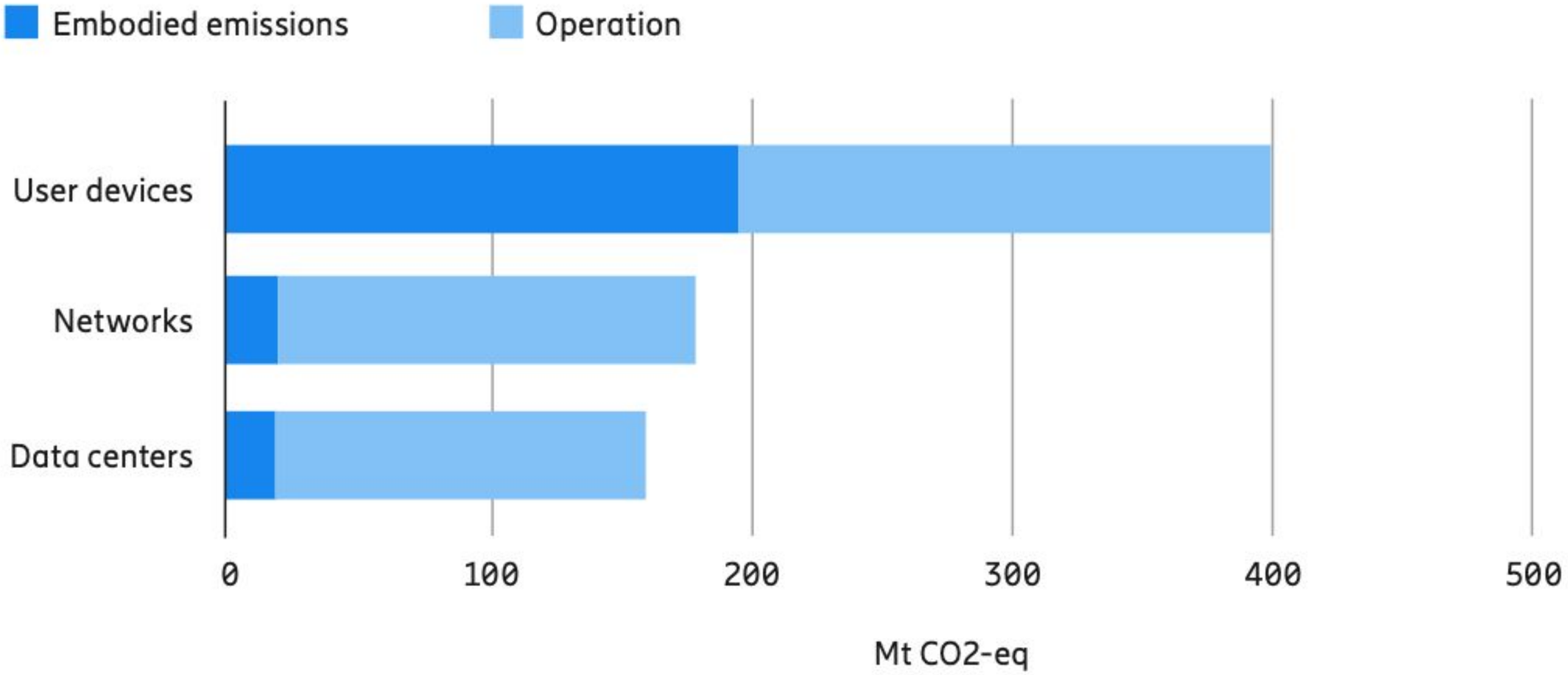
Annual figures vs hourly figures

"An average of ~30 % per year does not mean wind turbines are constantly producing at 30 % capacity every hour of the year."



Charts from Bo Tranberg, Entolabs (link)

Figure 4: Distribution of ICT's carbon footprint (2015)



Ericsson - A quick guide to your digital carbon footprint (link)

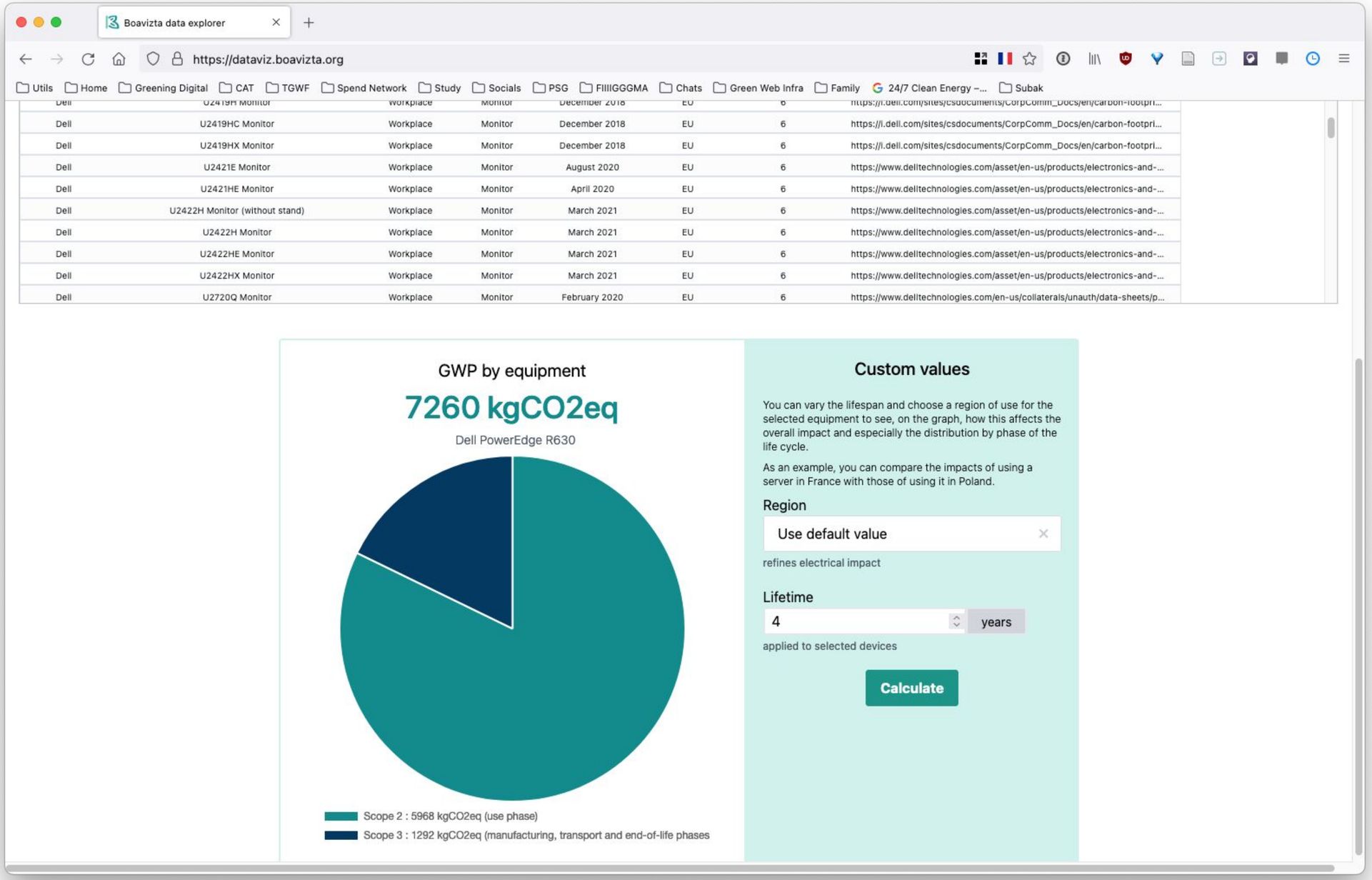
Green

Open

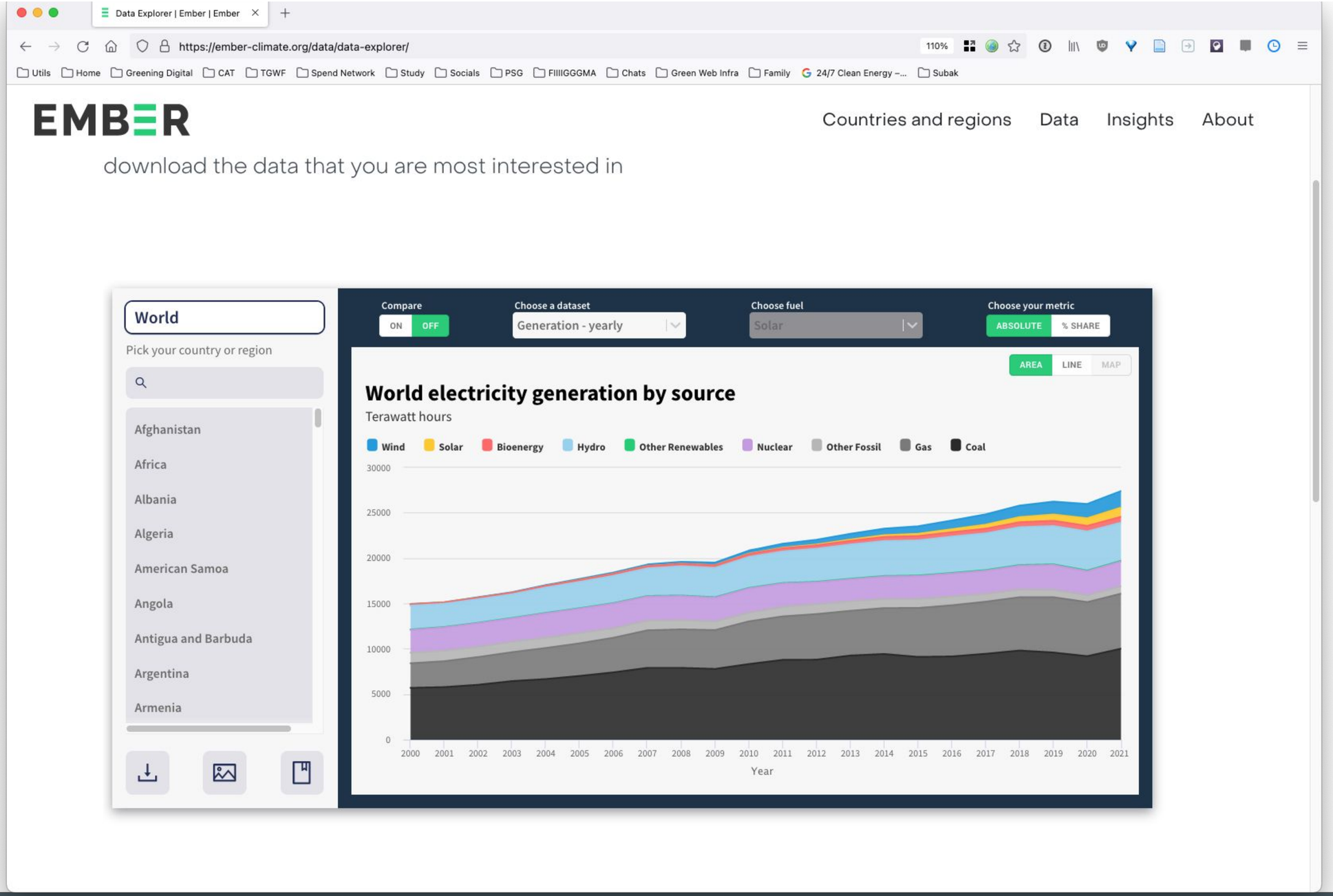
Lean

Distributed

Open data, open source, transparency



Boavista - open data on embedded environmental impact in hardware - dataviz (link)



Boavista - dataviz (link)

if we can annotate IP data with open arbon intensity data...

```
GET api/v3/ip-to-co2intensity/85.17.184.227
```

```
GET api/v3/ip-to-co2intensity/85.17.184.227
```

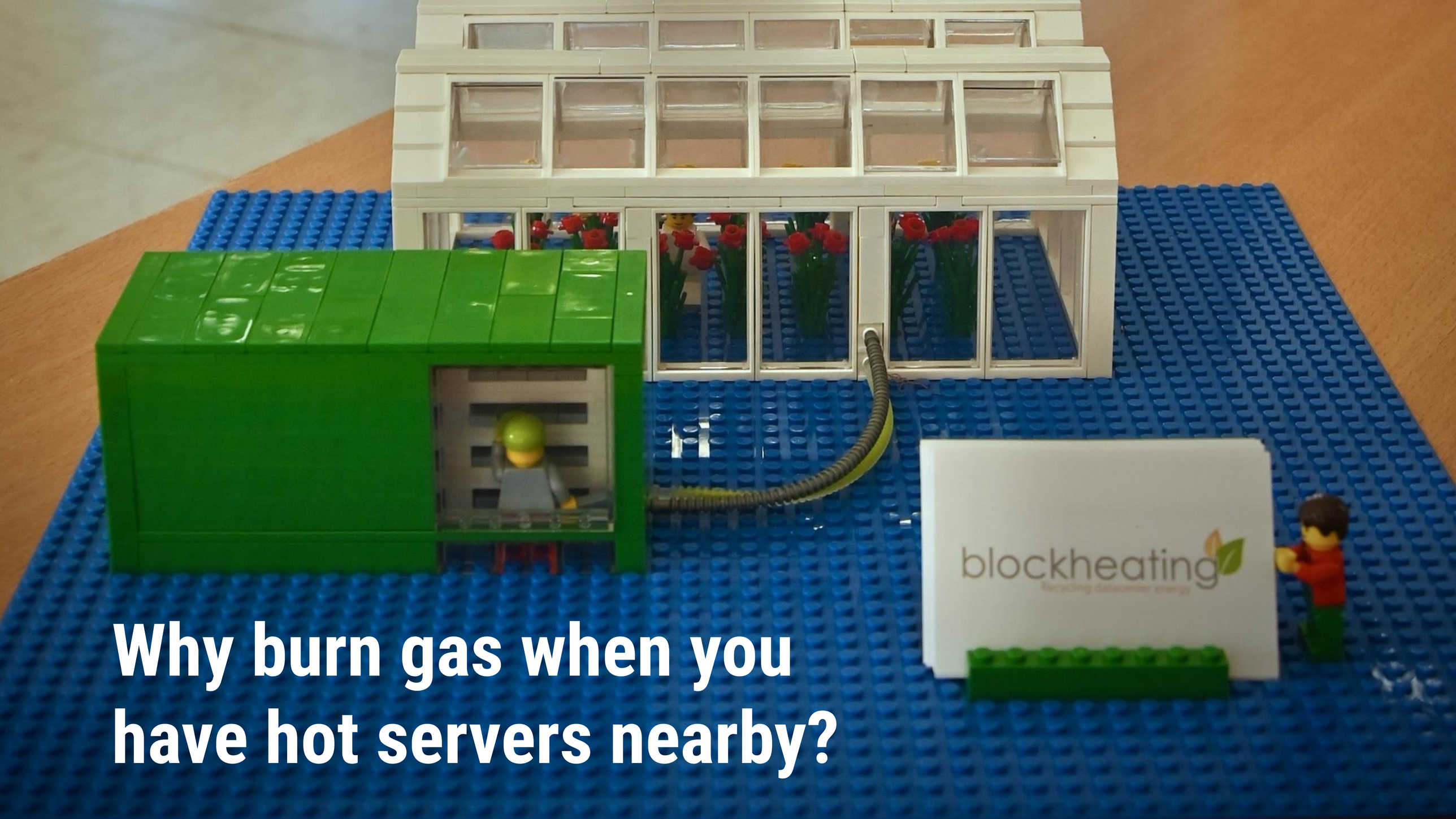
...then we can optimise the internet for carbon too, and build new services


```
{
   "checked_ip": "85.17.184.227",
   "country_name": "Netherlands",
   "country_code_iso_2": "NL",
   "country_code_iso_3": "NLD",
   "carbon_intensity_type": "avg",
   "carbon_intensity_grams_per_kwh": 388.186,
   "generation_from_fossil": 69.84%,
   "year": 2021,
}
```


https://api.thegreenwebfoundation.org/api/v3/ip-to-co2intensity/129.132.114.77

Google's new cloud region picker (link)


This is an open compute datacentre



Why burn gas when you have hot servers nearby?

Green

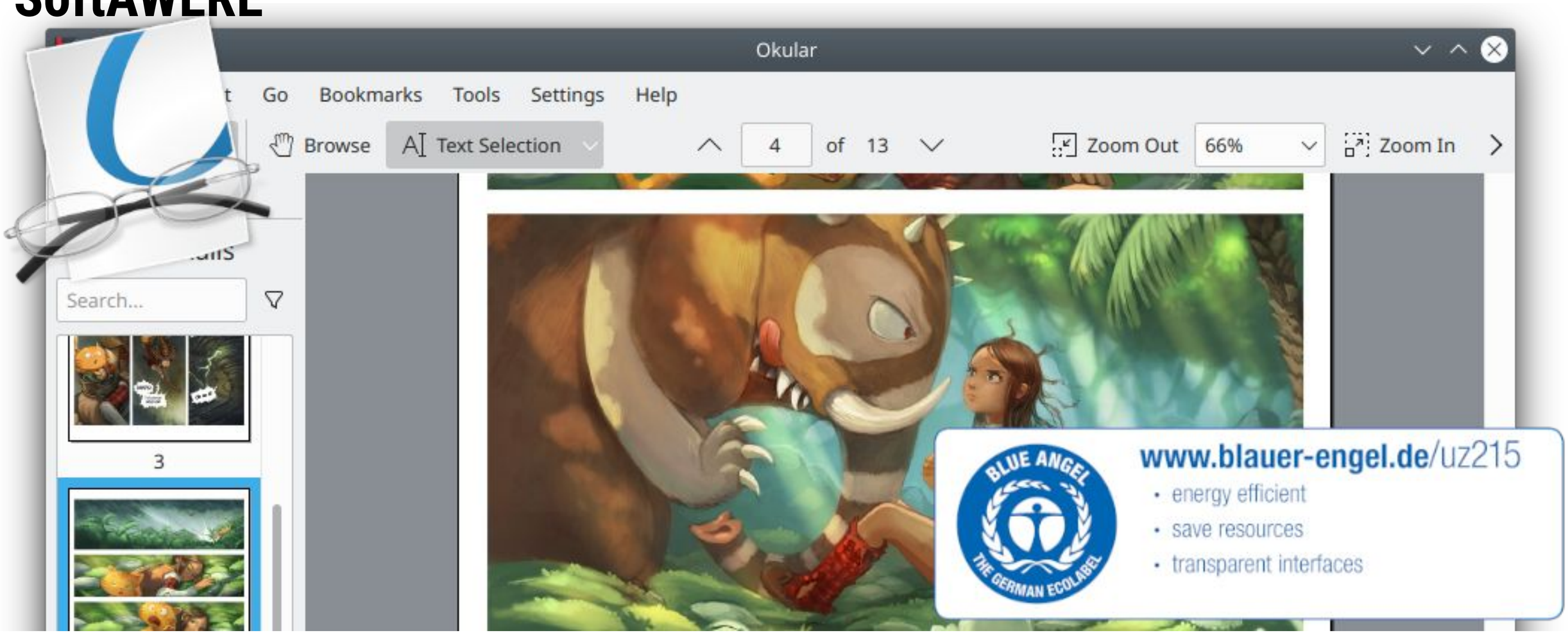
Open

Lean

Distributed

Making power we do use, count

Eco certification for code in Germany with Blue Engel and SoftAWERE



Okular, the first ever eco-certified computer program. Open source, from KDE (link)

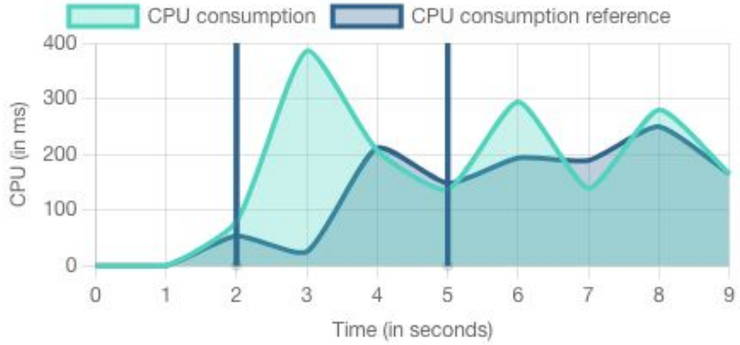
GreenFrame browser

23 mg eq. CO_2 ↑ 14%

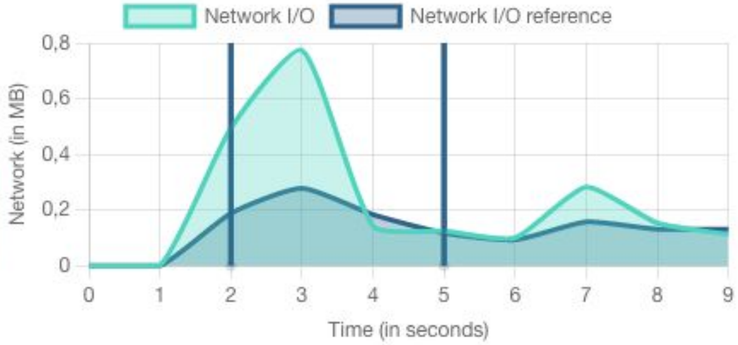
54 mWh

CPU ↑ 6%	NETWORK ↑ 27%	SCREEN ↓ 2%	MEMORY	DISK
6 mWh	**12 mWh**	**36 mWh**	**0 mWh**	**0 mWh**
(0.21 s)	(1.82 MB)	(12.8 s)	(0.73 GB)	0
11%	22%	67%	0%	0%

CPU



Network



Acme API

9 mg eq. CO_2 ↑ 13%

20 mWh

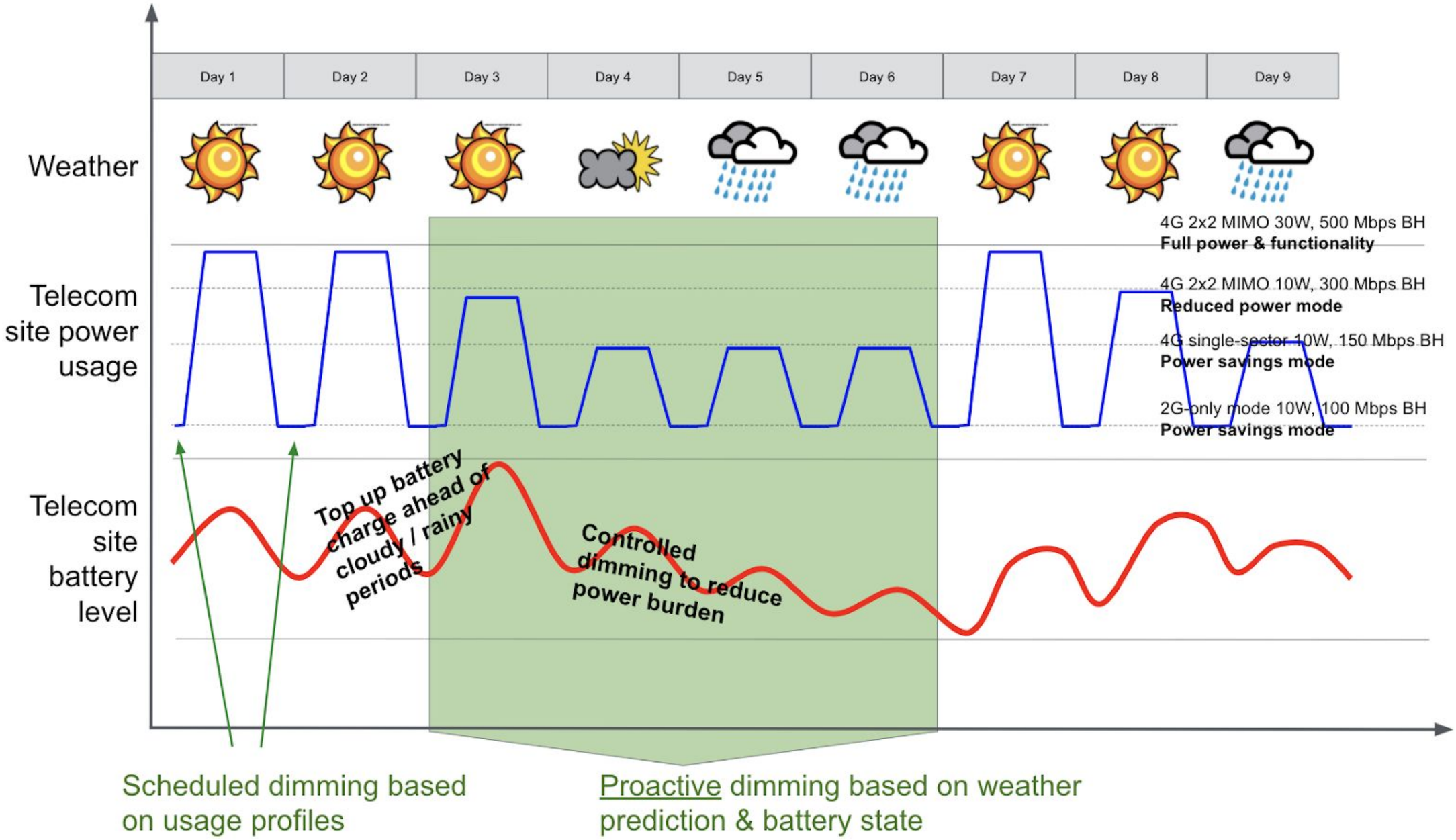
Acme Database

2 mg eq. CO_2 ↑ 4%

4 mWh

Testing an entire system with Greenframe.io (link)

Getting off Diesel with Project SIESMIC in offgrid locations (link)



Project SEISMIC: Smart Energy Infrastructure for Mobile Internet Connectivity (link)

Green

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Lean

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Move work through time and space to avoid carbon emissions

Can baking wait?

We recommend baking when more than a third of Britain's electricity is coming from wind, solar and hydro power – right now, between **15:00 - 15:30**, it's **17%** *

Follow the **forecast on Twitter** or ask - **Alexa**, should I bake?

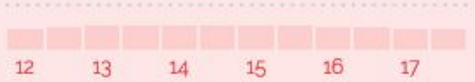
* the UK average in 2019 was 33.0%

The baking forecast

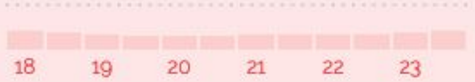
Here's the baking forecast for **29th - 2nd October**

Show only the good times to bake

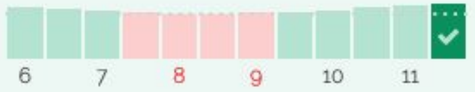
Today
Afternoon



Today
Evening



Wednesday
Morning

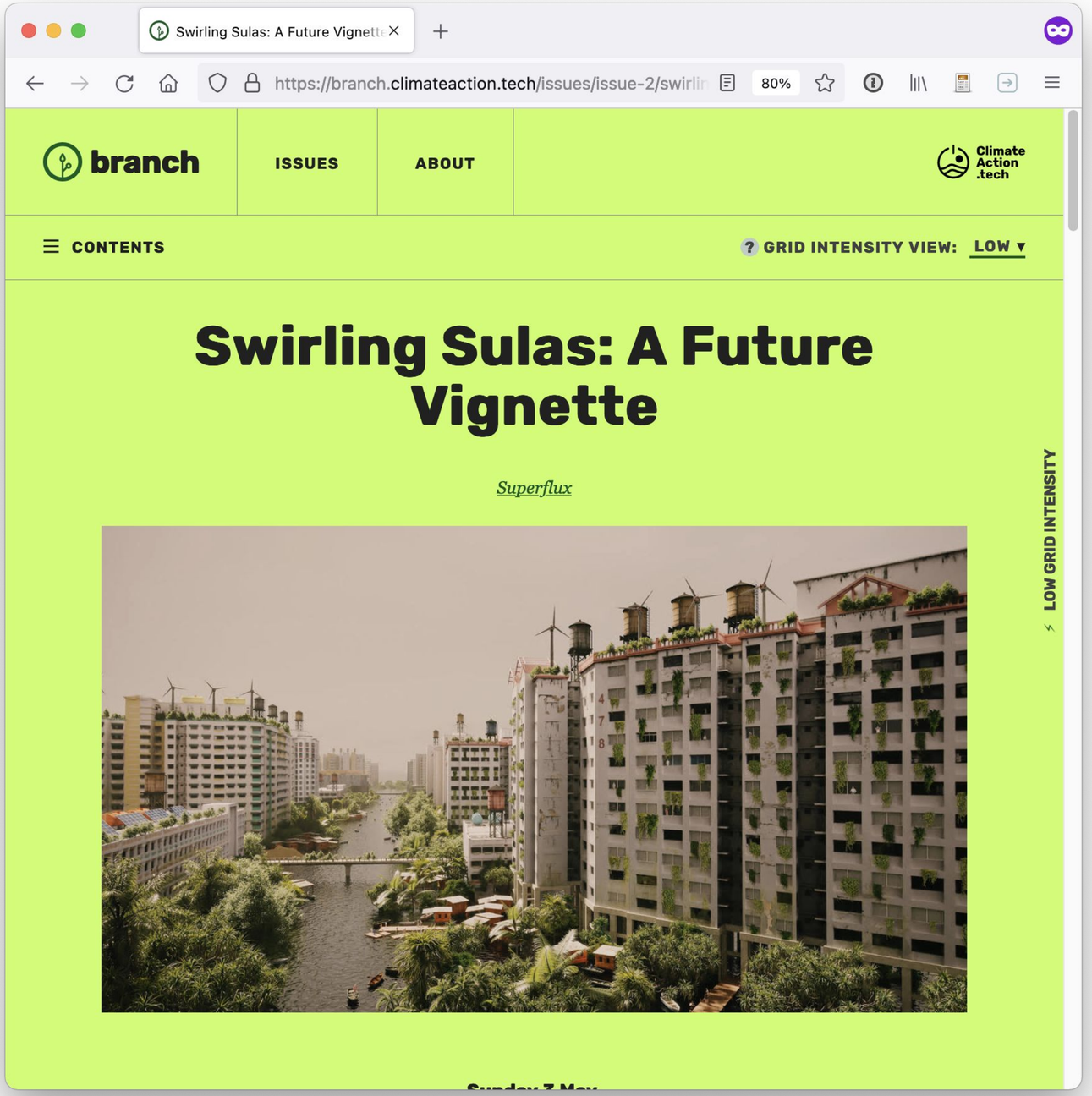


Carbon aware websites

Shifting work through time to use greener energy

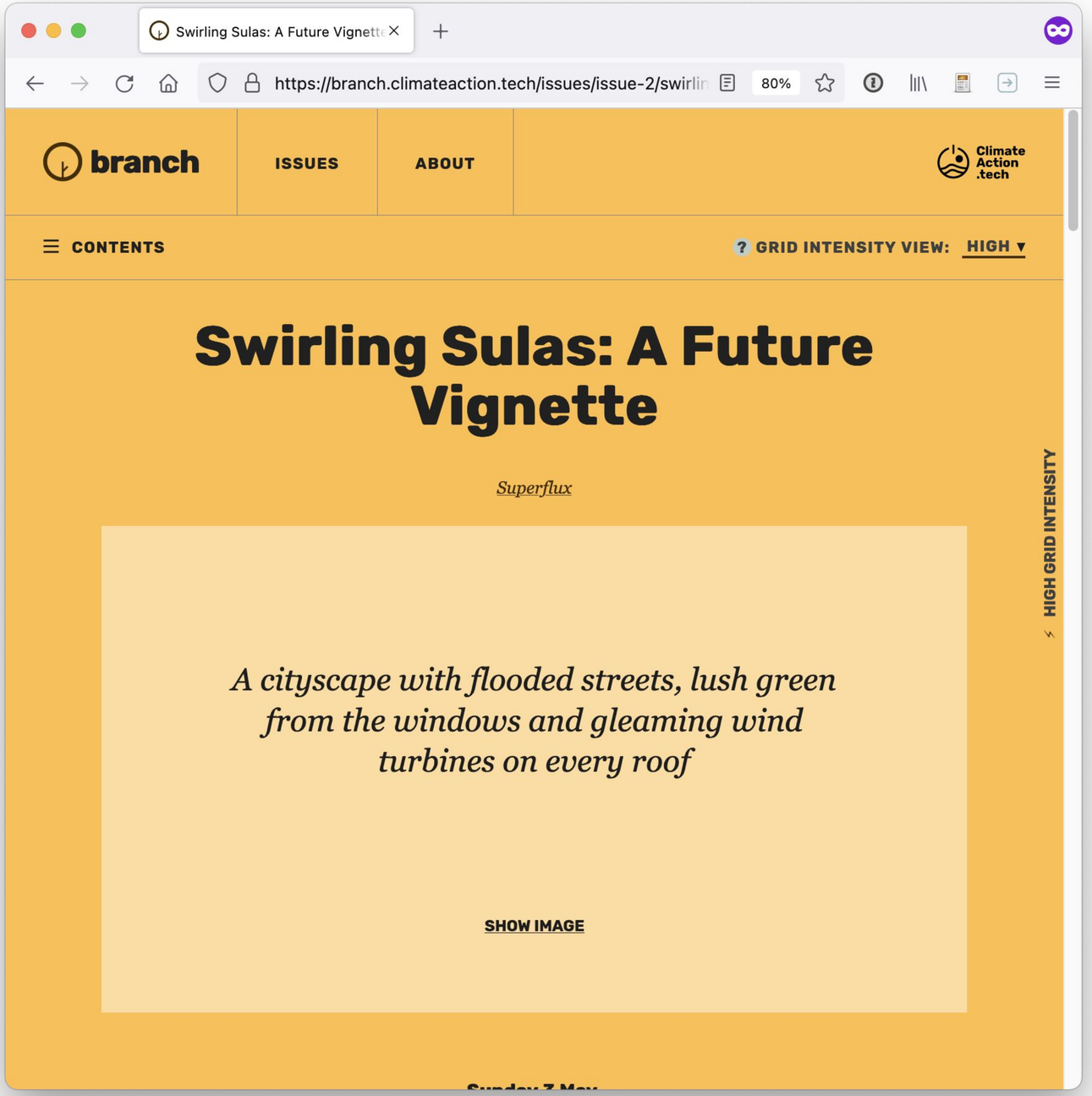
Mostly renewables on the grid:

serve full set of rich images and media elements



Lots of fossil fuels on the grid:

scale back design elements to stay inside carbon budget

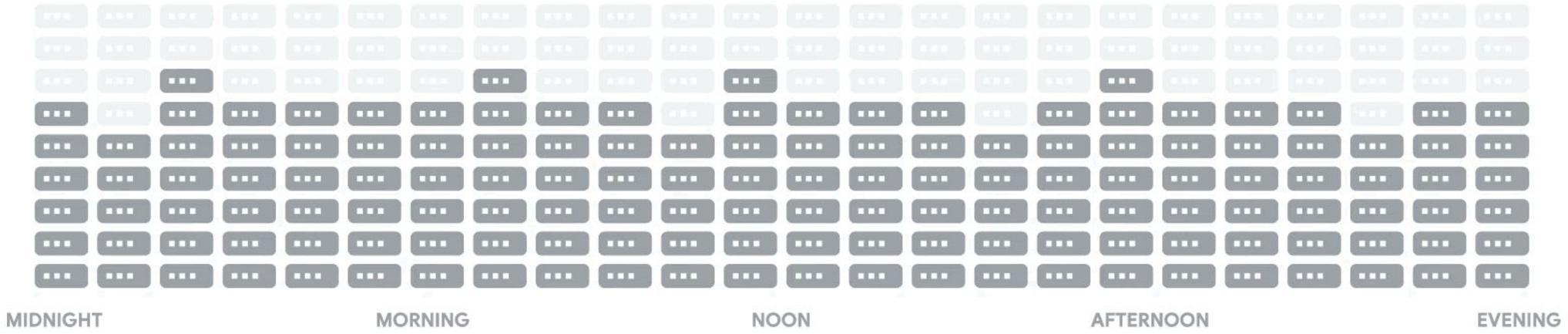


Carbon aware datacentres

Scheduling work to use greener, cheaper energy

Conventional compute load

Execution of compute tasks throughout the day, regardless of carbon impact



How Google move compute loads through ***time*** to when energy is cheap and green (link)

https://twitter.com/shelbywebb/status/1523774146496319488

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Chris Adams
@mrchrisadams

Thread

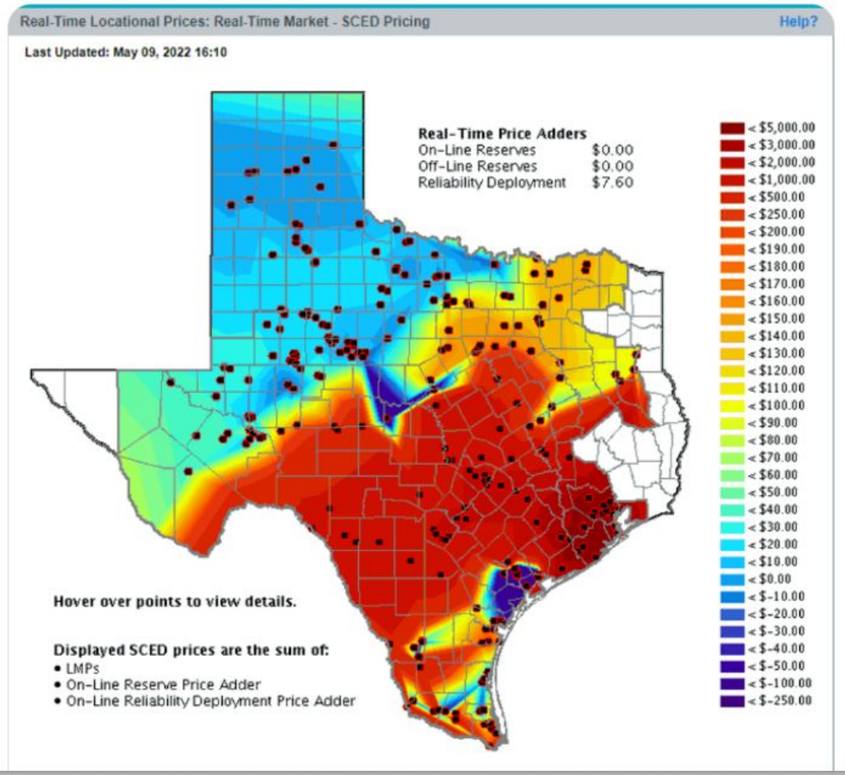
Shelby Webb
@shelbywebb

More

Here are your prices at 4:15 p.m.

North Harris County at $3,429 a megawatt hour

That one spot in Calhoun County is at negative $2,461



Search Twitter

Relevant people

Shelby Webb
@shelbywebb
Follow

Energy tech, renewable energy reporter for @houstonchron. Recovering Florida woman. Got tips or story ideas? Send them to shelby.webb@chron.com.

Trends for you

Trending in Germany
#weltuntergang

Trending in Germany
Hamsterrad

Technology · Trending
Jeff Bezos
28.3K Tweets

Trending in Germany
Messenger-Chats

Trending in Germany
Julian Reichelt
1,567 Tweets

Trending in Germany
Omicron
31.3K Tweets

Trending in Ge
Maske

Messages

the price of energy is increasingly linked to renewable generation and availability of transmission (link)

Carbon aware routing

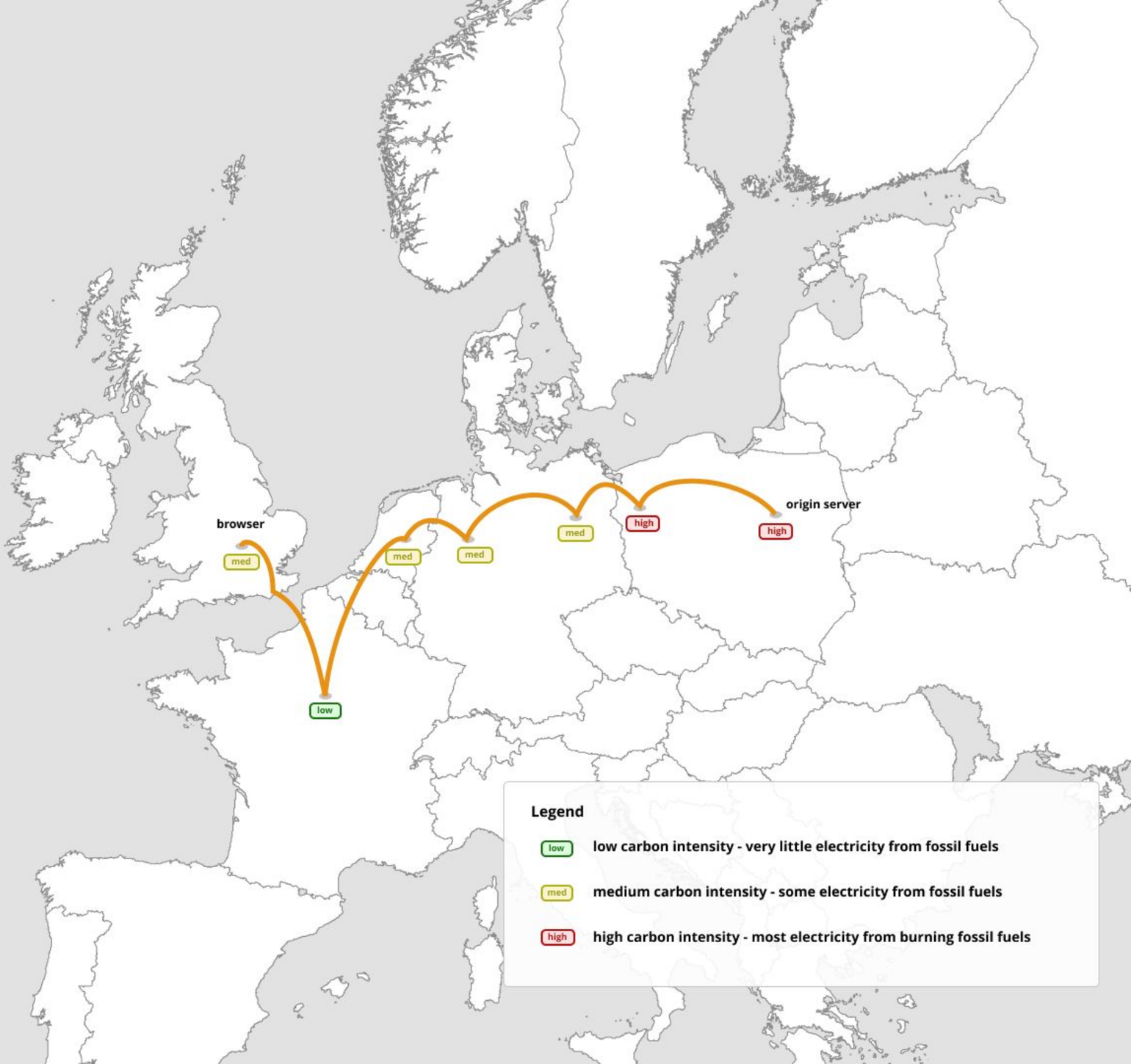
Path preferences for the green routes with SCION

When we fetch data from servers, we rely on routers to route it to the next ‘hop’ along the way, as well as from the origin server.

This adds up - data transfer for the internet uses around 250 TWh of electricity each year - this is more than Spain uses!

Also when routes pass through areas where electricity mainly comes from burning fossil fuels, we have a higher carbon footprint for this transfer.

Because most electricity globally is still generated by burning fossil fuels, these emissions are hard to avoid with the design of the current internet.

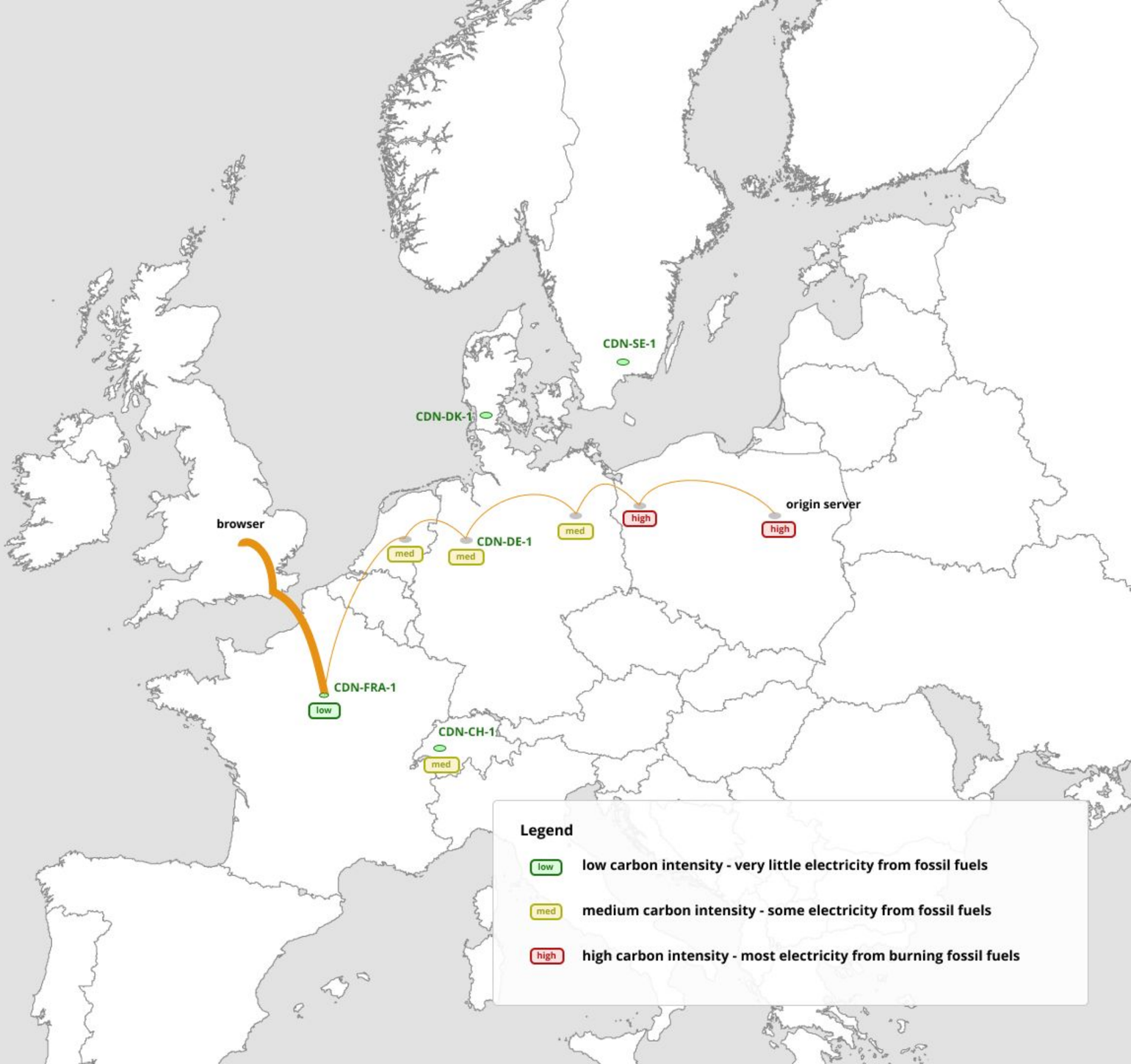


One way to reduce this is to use CDNs to serve the same content from a closer cache instead of fetching it from the origin each time.

This saves hops, and improves the user experience making it feel faster.

If the nodes serving most of the traffic are running where electricity is low carbon, we save carbon here too.

Even if we can't cache everything, we can still serve most of our traffic from greener sources reducing the overall emissions.

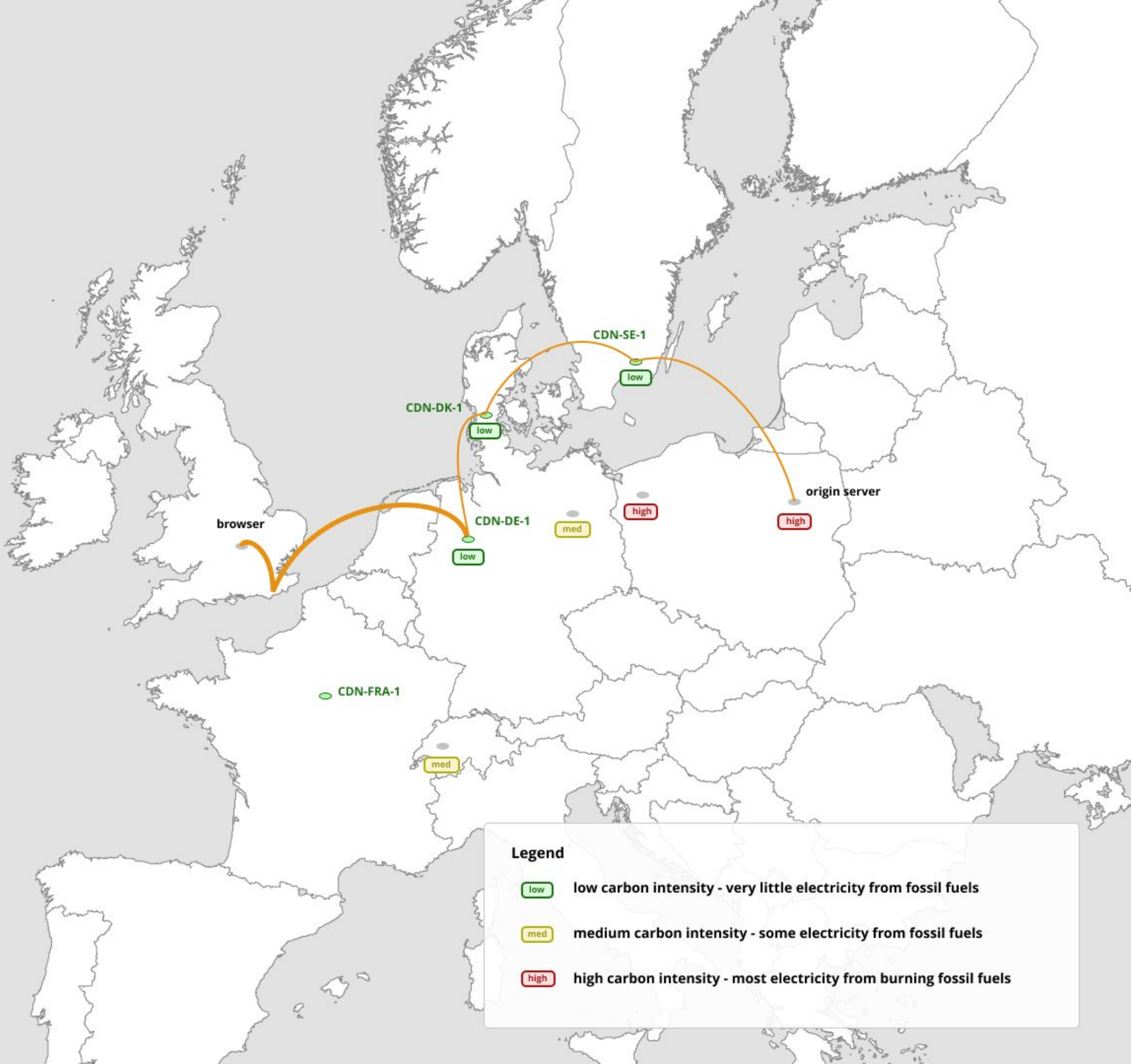


We ***can and should*** go further though.

If we know the carbon intensity of energy on the grid, we can tailor the way we serve traffic to match moments of over-supply on sunny or windy days, when energy is particularly cheap and green.

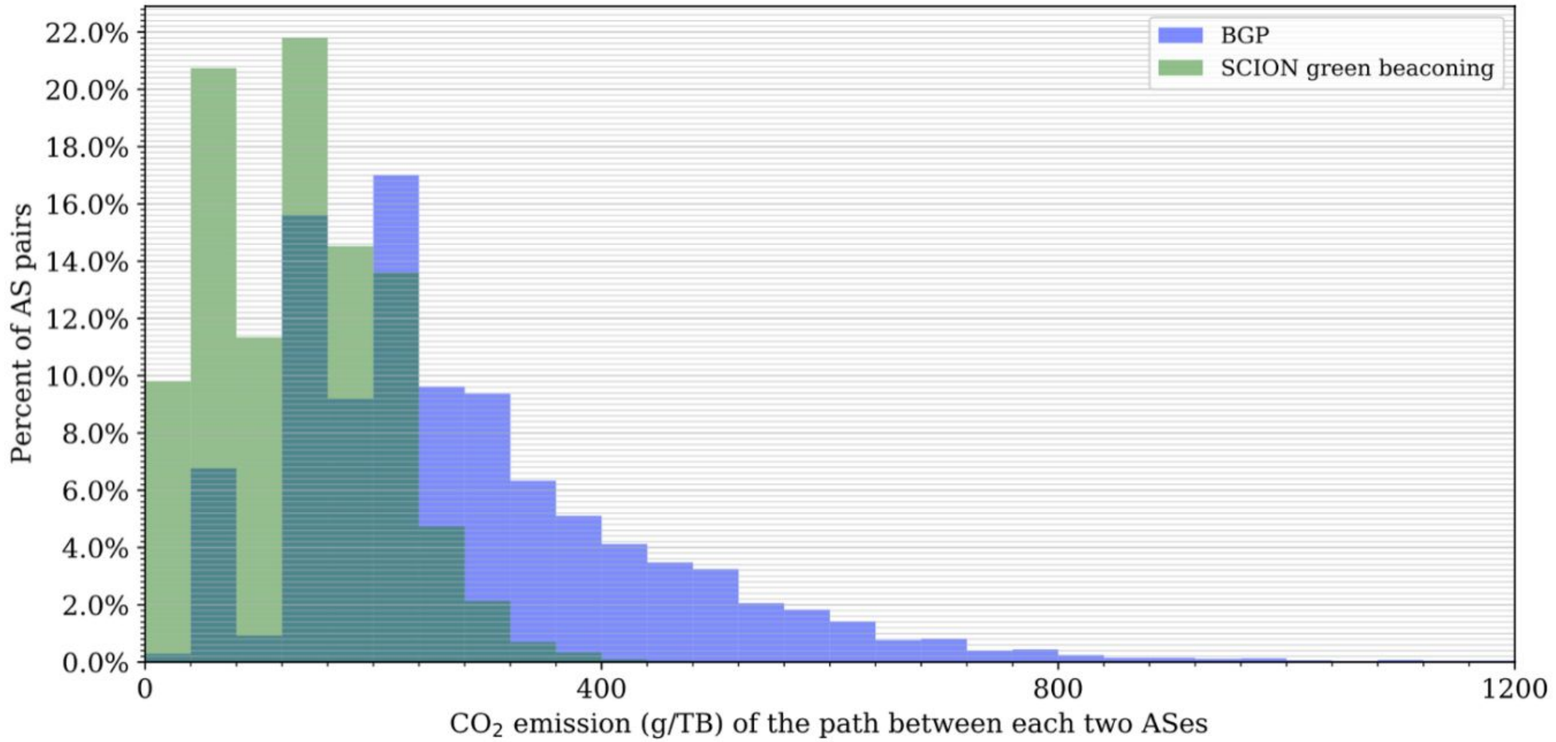
As long as the nodes are close enough, we can still serve quick responses, and save hops reducing the carbon footprint, but we also help actively balance the grid, making it easier to integrate more renewables into our energy system.

Even when some content can’t be cached, we can still optimise for the greenest routes that serves the request in time.



Encouraging: Early Results

- Based on simulations of a real-world Internet topology with the 2000 largest autonomous systems, path selection offers lower CO_2 paths for most end-to-end paths: 50% of autonomous system pairs can reach each other through a path that emits at least 50% less CO_2 than the path in today's Internet



ETH zürich

simulated CO2 savings from using SCION, a suite of path aware networking techologies (link)

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If you want green, think GOLD

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Why you might want a fossil free interet

Save carbon - climate emergency, remember?

Save lives - 5m+ avoidable deaths / year from poor air quality globally, primarily from burning fossil fuels

Save money - fossil fuels are expensive with volatile prices

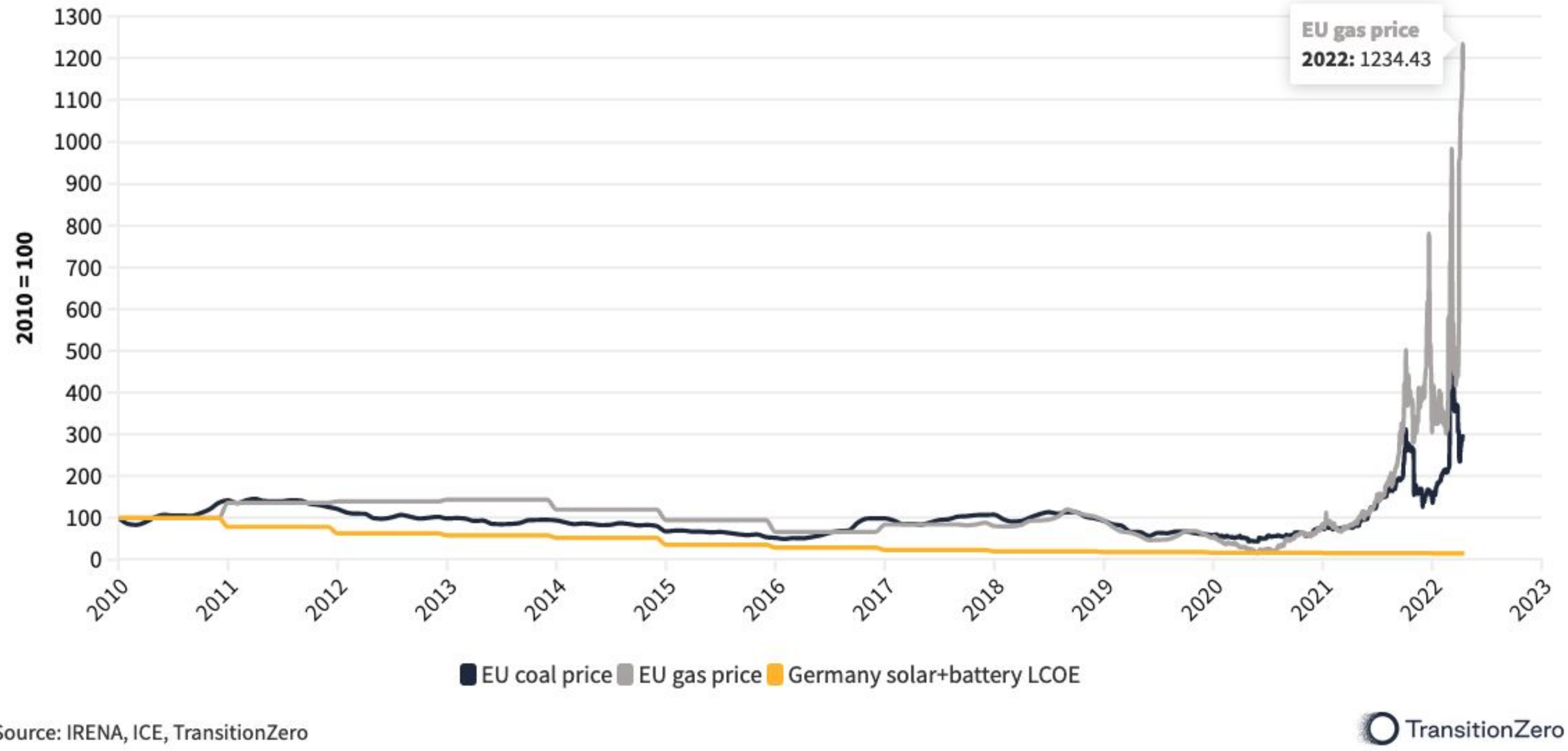
Improve retention among staff - ppl 💚 greener firms

“A recent survey of 1,200 companies across six countries showed that, of those sourcing renewables, 92% are doing so in order to reduce electricity costs.”

Re-Source: Introduction to Corporate Sourcing of Renewable Electricity in Europe, 2020 (link)

Roller coaster ride

EU coal and gas prices versus levelised cost of German solar PV plus batteries

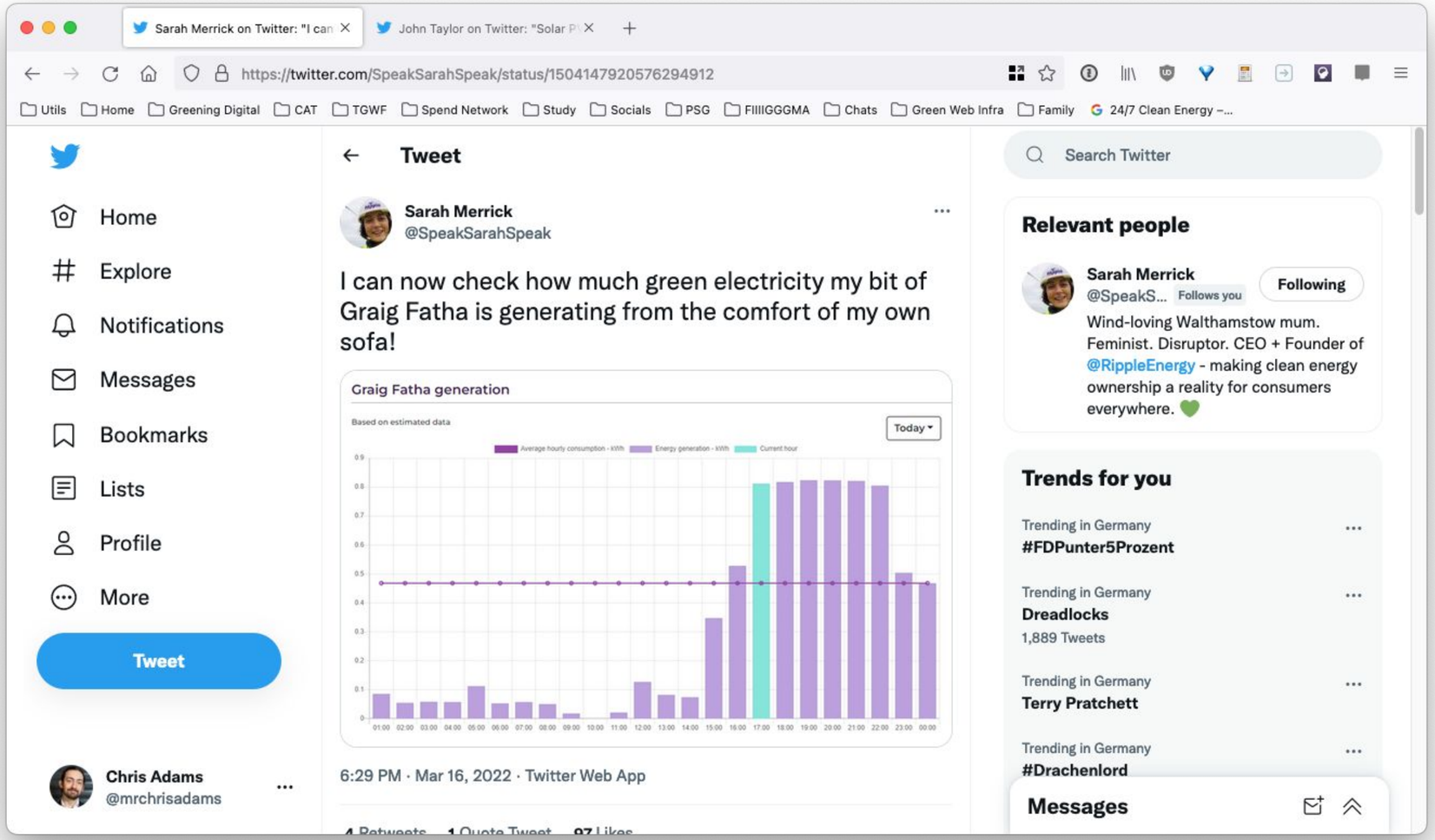


Source: IRENA, ICE, TransitionZero

TransitionZero

Fuel Switching 2.0: Carbon Price Index for Coal-to-Clean Electricity (link)

If groups of individuals can crowdfund wind turbines for lower bills, why can't we?



Buy a share of a wind farm, in exchange for predictable, lower prices, and a nice warm feeling (link)

Thanks!

ClimateAction.tech

This talk with all the links
thegreenwebfoundation.org/ripe84

Get in touch for training, consultancy and registering your green services:
chris@thegreenwebfoundation.org
@mrchrisadams, @greenwebfound

Online community for climate aware technologists - https://climateAction.tech