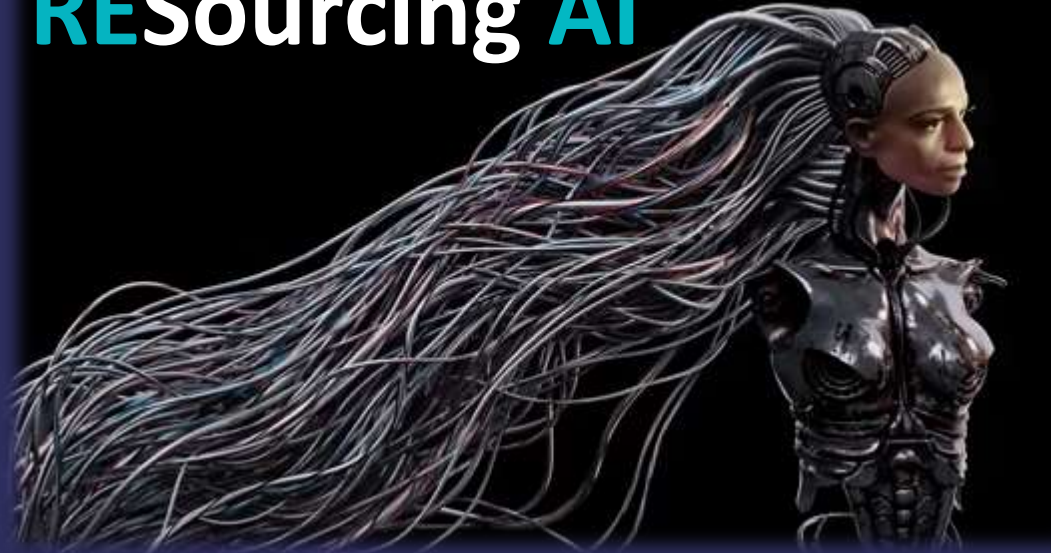


IRENA INNOVATION WEEK ²⁰₂₅

RESourceing AI



Organized in partnership with



12 June 2025 | 13:30-15:00

#IIW2025

Scene Setting



Adrian Gonzalez

Programme Officer
IRENA



IT **energy** consumption, the need for **perspective**:

Average smartphone (2025)
Charging yearly energy
consumption:
5.5 kWh

Efficient fridge (2025)
Yearly energy consumption:
110 kWh

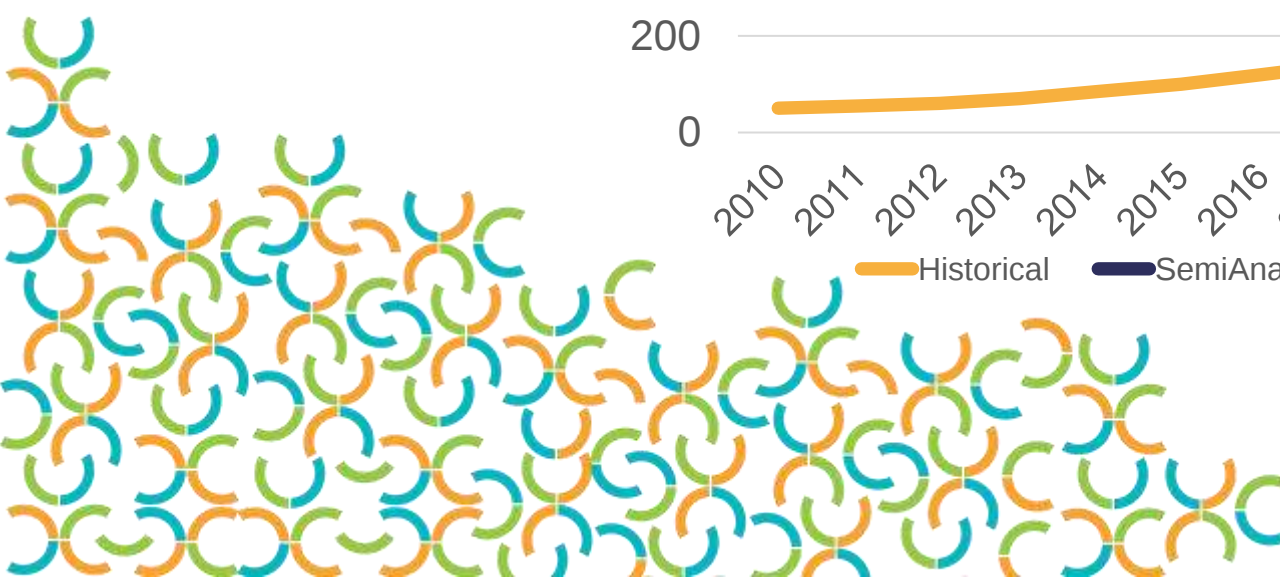
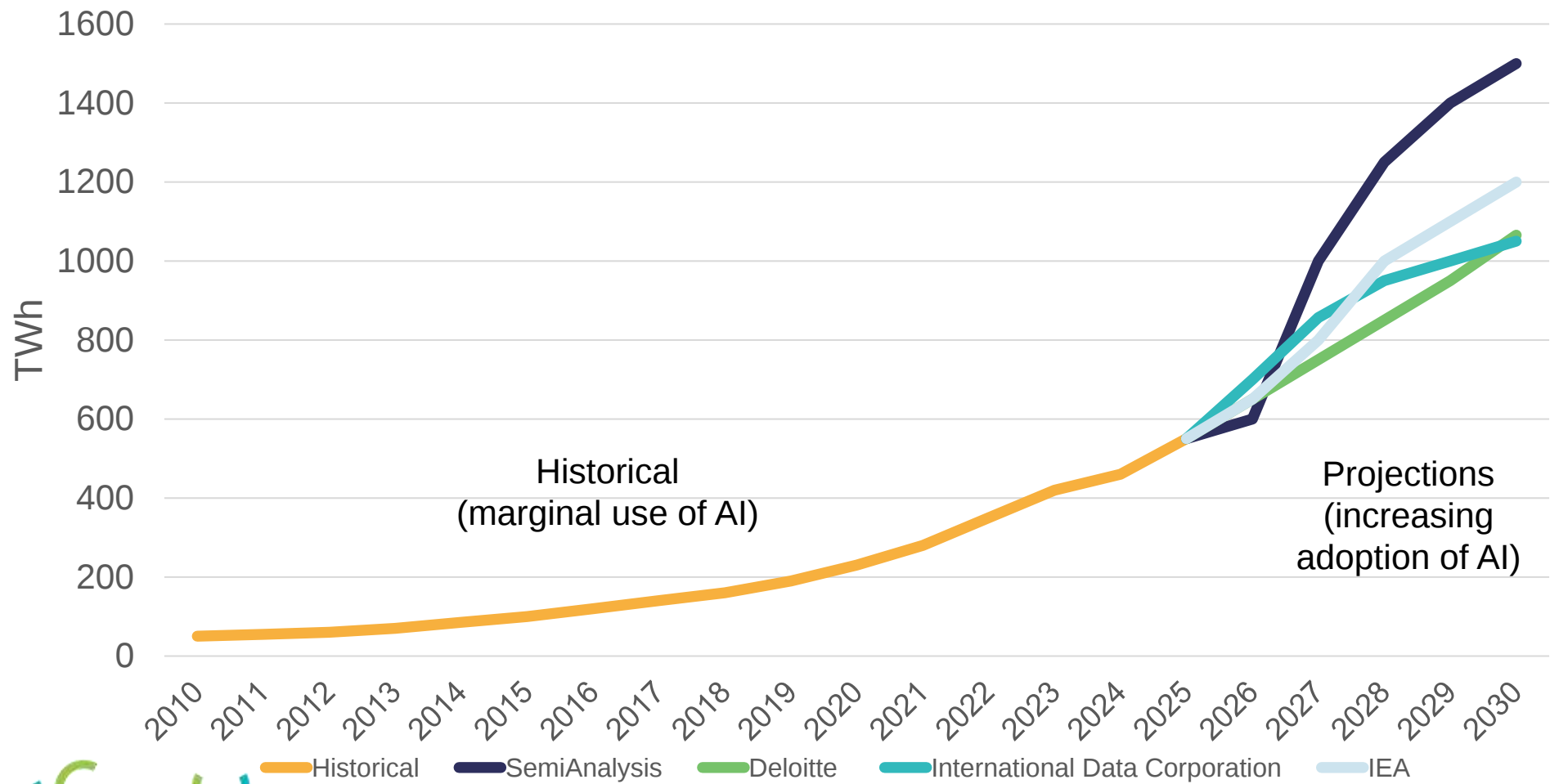
Charging 20 smartphones
=
Using 1 fridge

IT **energy** consumption, the need for **perspective**:

Average smartphone (2025)



Global energy consumption of data centers



AI demand projections, are they accurate?

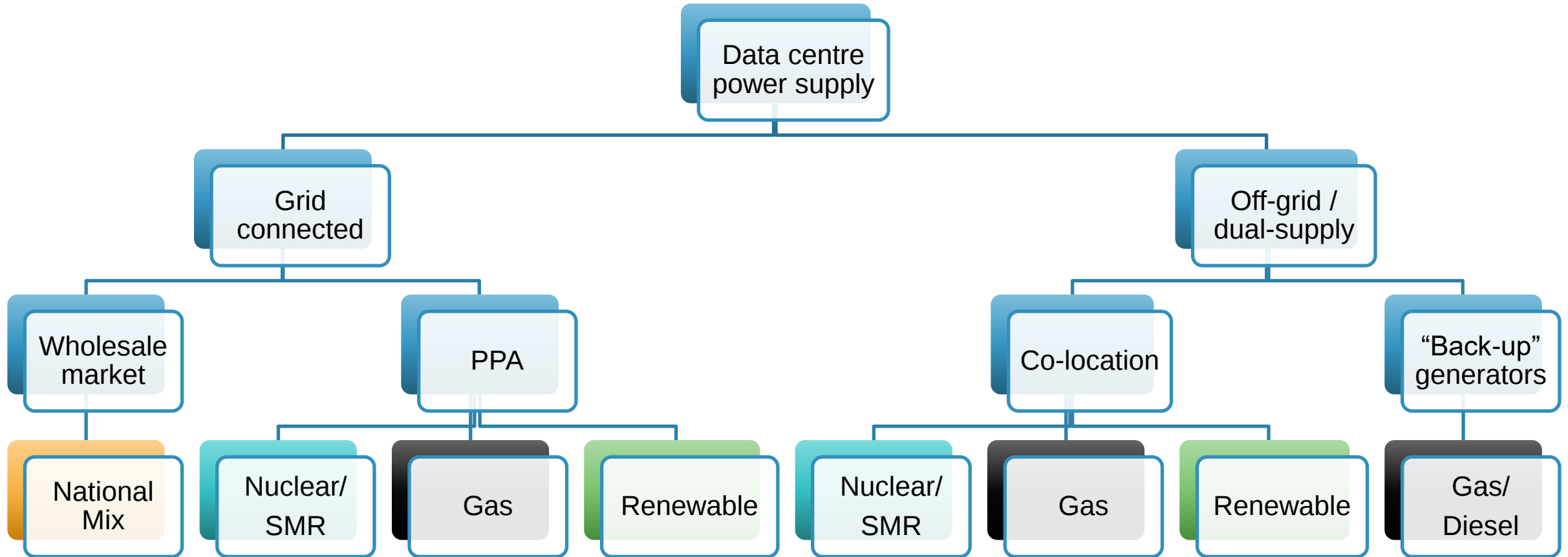
Drivers and uncertainties

- ☐ Scale of AI Adoption
- ☐ Model Complexity
- ☐ Hardware development and efficiency
- ☐ Certification efforts on sustainability
- ☐ Grid availability
- ☐ Policy and Regulation
- ☐ Skills gap and supply-chain constraints
- ☐ Edge computing

 AI Energy Score



The source matters more than the amount



The renewable ways

Power Purchase Agreements (PPAs)

A company enters into a contract with an independent power producer, a utility or a financier and commits to purchasing a specific amount of renewable electricity, or the output from a specific asset, at an agreed price and for an agreed period of time.

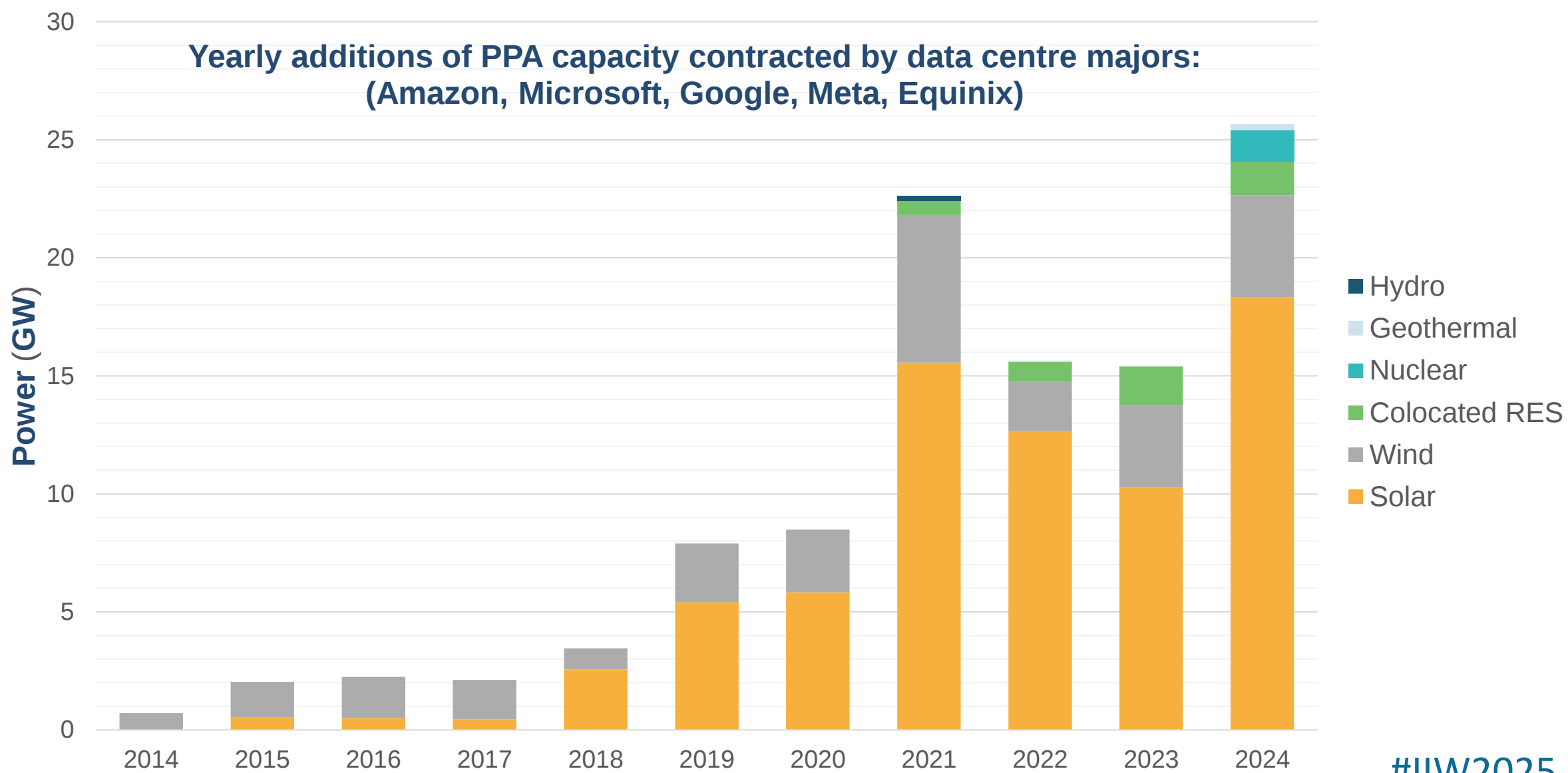


Production for self-consumption

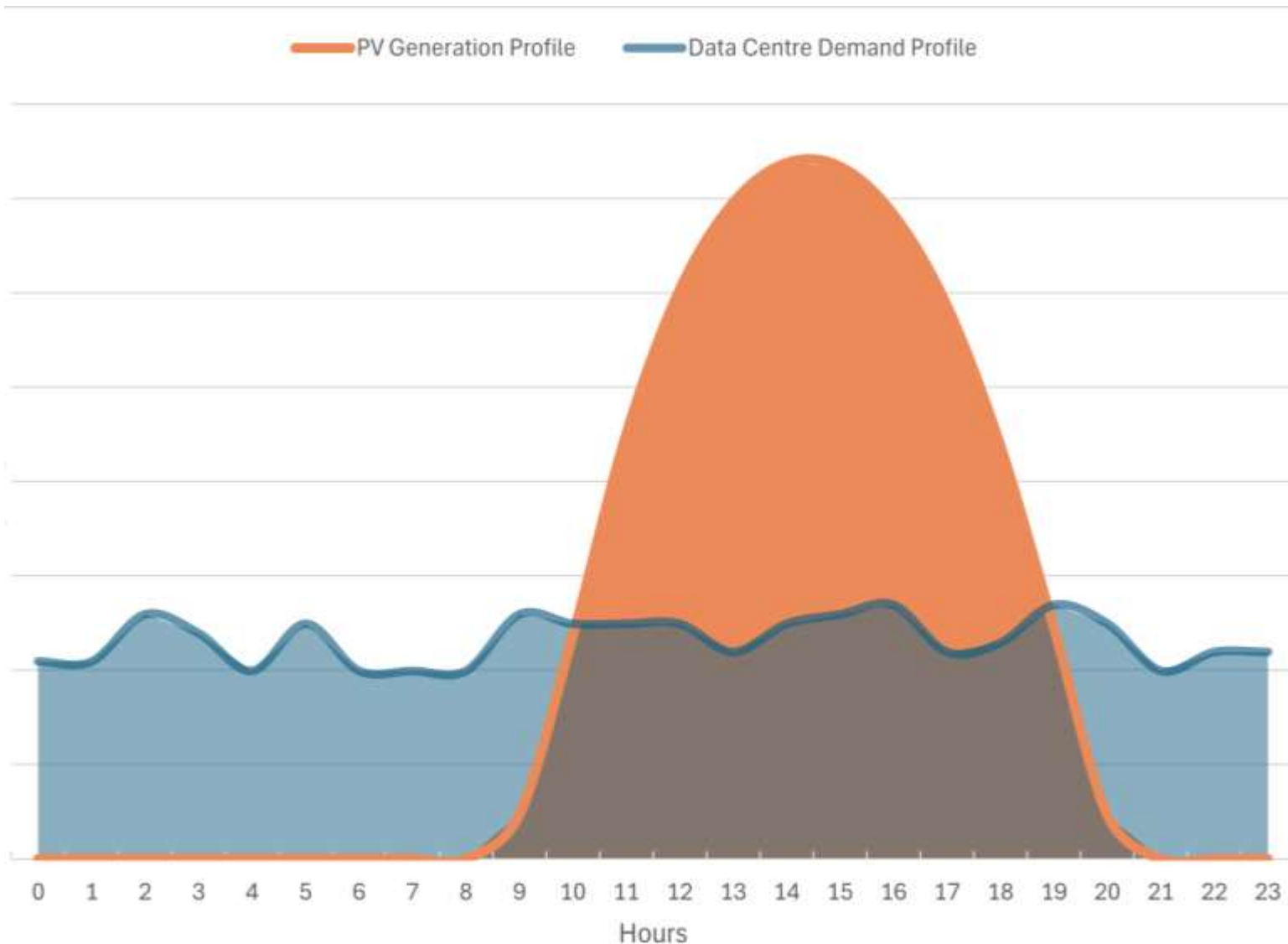
A company invests in its own renewable energy systems, on-site or off-site, to produce electricity primarily for self-consumption.



Industry majors are improving their sourcing. But there is a catch



The catch: Lack of correlation

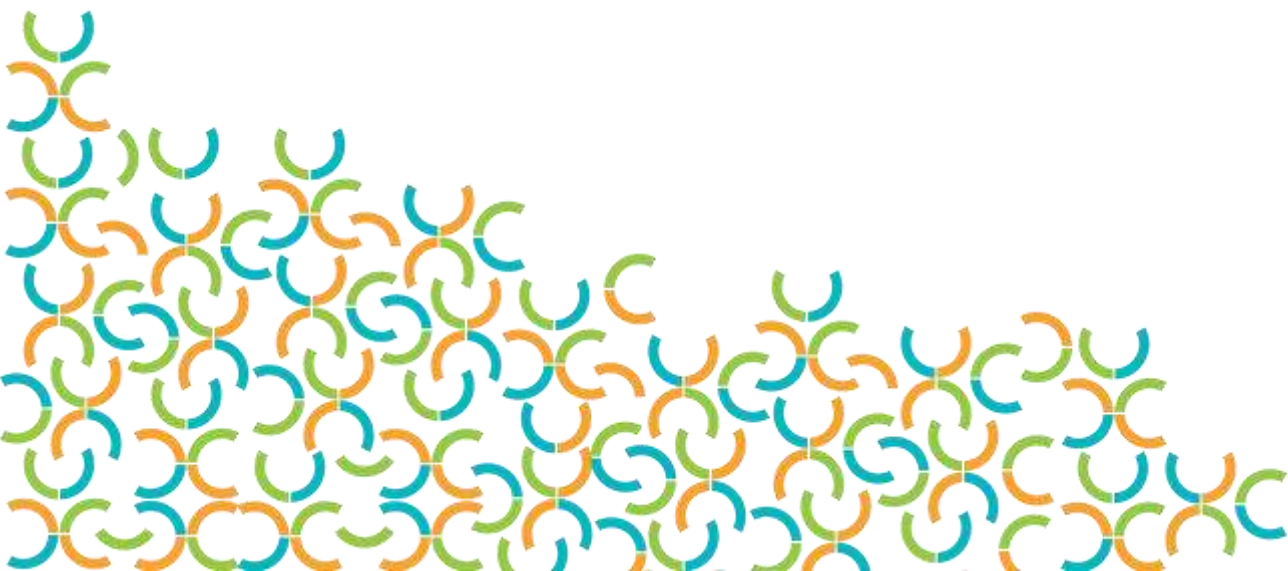


Temporal and geographical mismatch between renewable energy generation (basic PPA) and data centre demand can lead to:

- **Market volatility:**
 - **Higher prices during system peak demand**
 - **Negative prices during solar hours**
- **Increased grid congestions**

Problem solvers: 24/7 renewable hourly matching

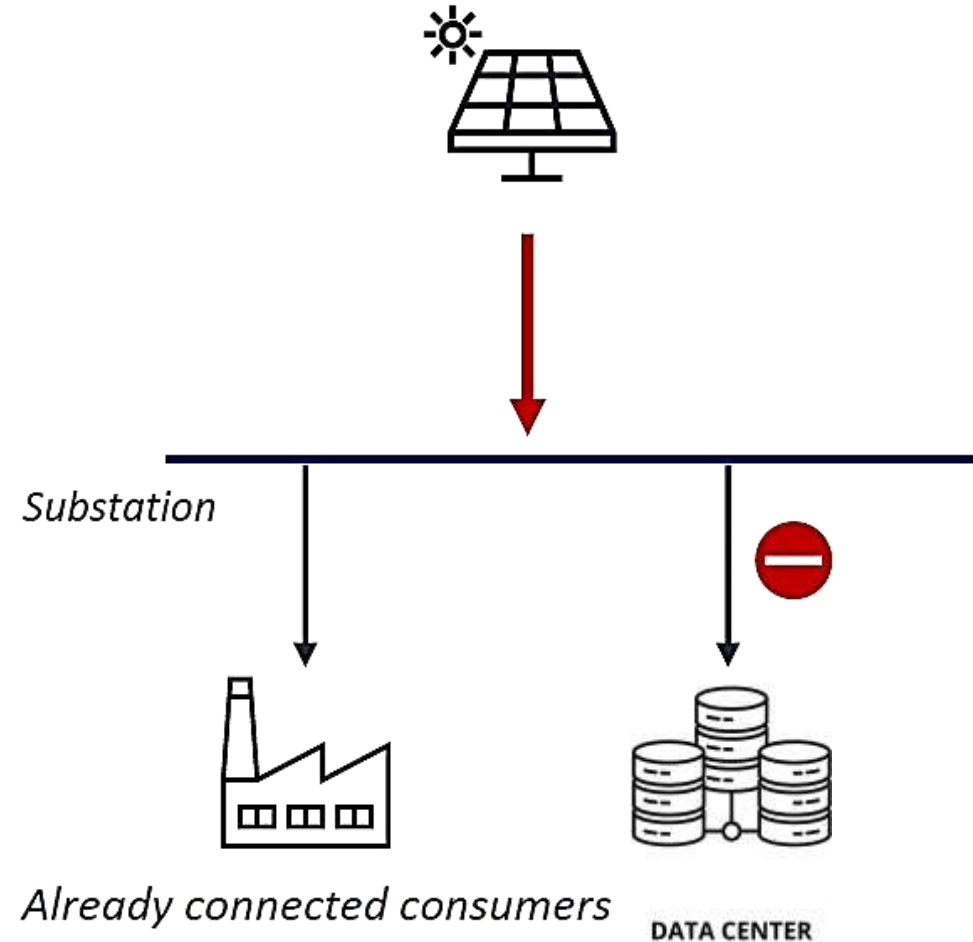
- Diversified portfolio of renewable energy sources
- Storage
- Market-based flexibility solutions
- Co-location



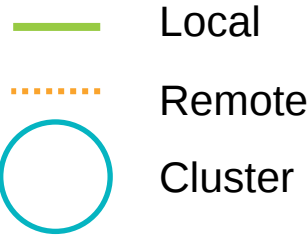
Problem solvers: Flexible Connection Agreements

- Context: Power lines in the area reach their maximum operational capacity at some hours and cannot withstand the additional demand of the data center in those periods.
- ✓ In this case, the data center might only be allowed to connect via a **flexible connection agreement**, so that it will be **limited on consumption** during peak demand hours

Grid congestion and flexible connection agreements:



Archetypes for sustainable data centers



IRENA INNOVATION WEEK **2025**

Renewables and Digitalisation for a Sustainable Energy Future

Thank you!

#IIW2025

Scene Setting



Jill McArdle

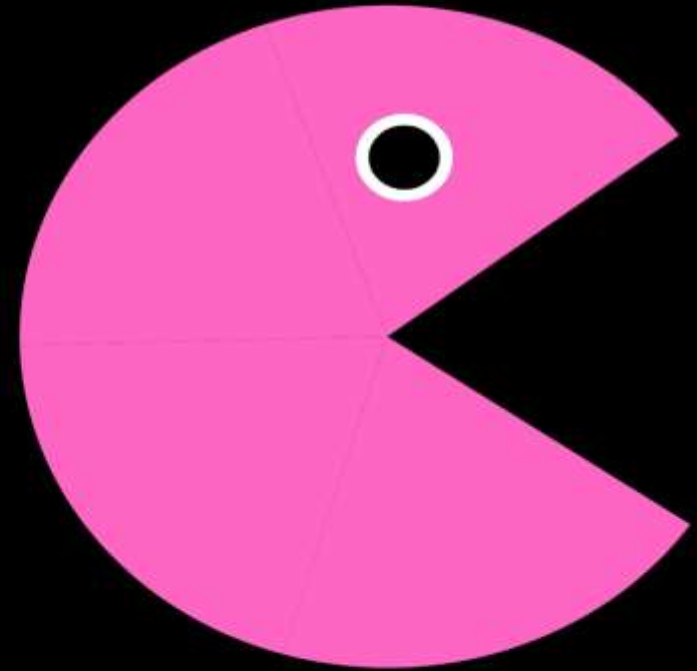
International Corporate Campaigner
Beyond Fossil Fuels



Data centres and the energy transition in Europe

SYSTEM OVERLOAD:

How new data centres could throw
Europe's energy transition off course





BEYOND FOSSIL FUELS



WHO WE ARE

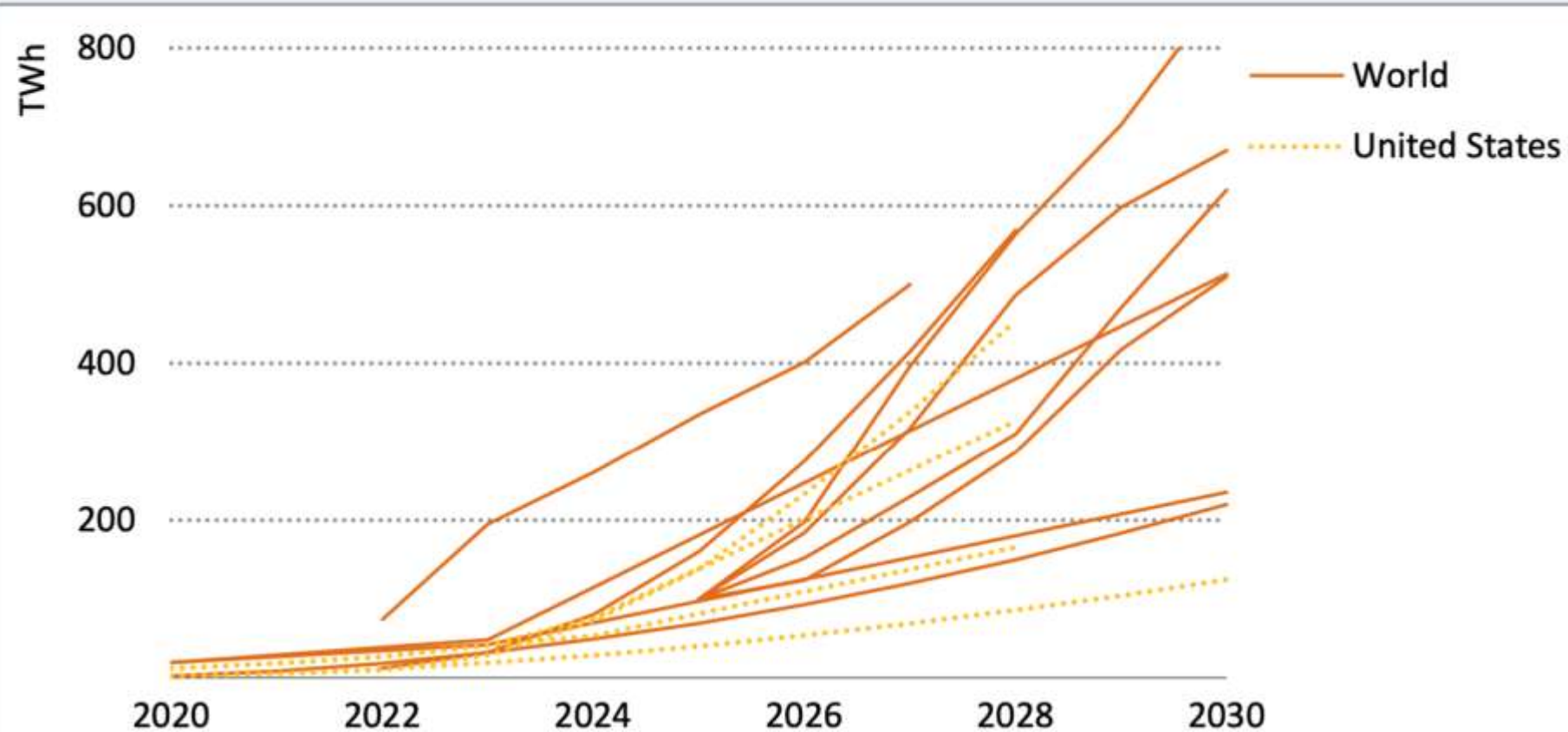
The Beyond Fossil Fuels coalition builds on the remarkable success of moving Europe Beyond Coal and unites 79 civil society organisations and think tanks in a collaborative effort to transform the European power sector. It is supported by a Secretariat with staff spread across Europe.



**OUR AMBITION:
MAKE THE EUROPEAN POWER
SECTOR FOSSIL-FREE AND
RENEWABLES-BASED BY 2035**



Figure 2.5 ▸ Estimated data centre electricity demand due to AI, 2020-2030



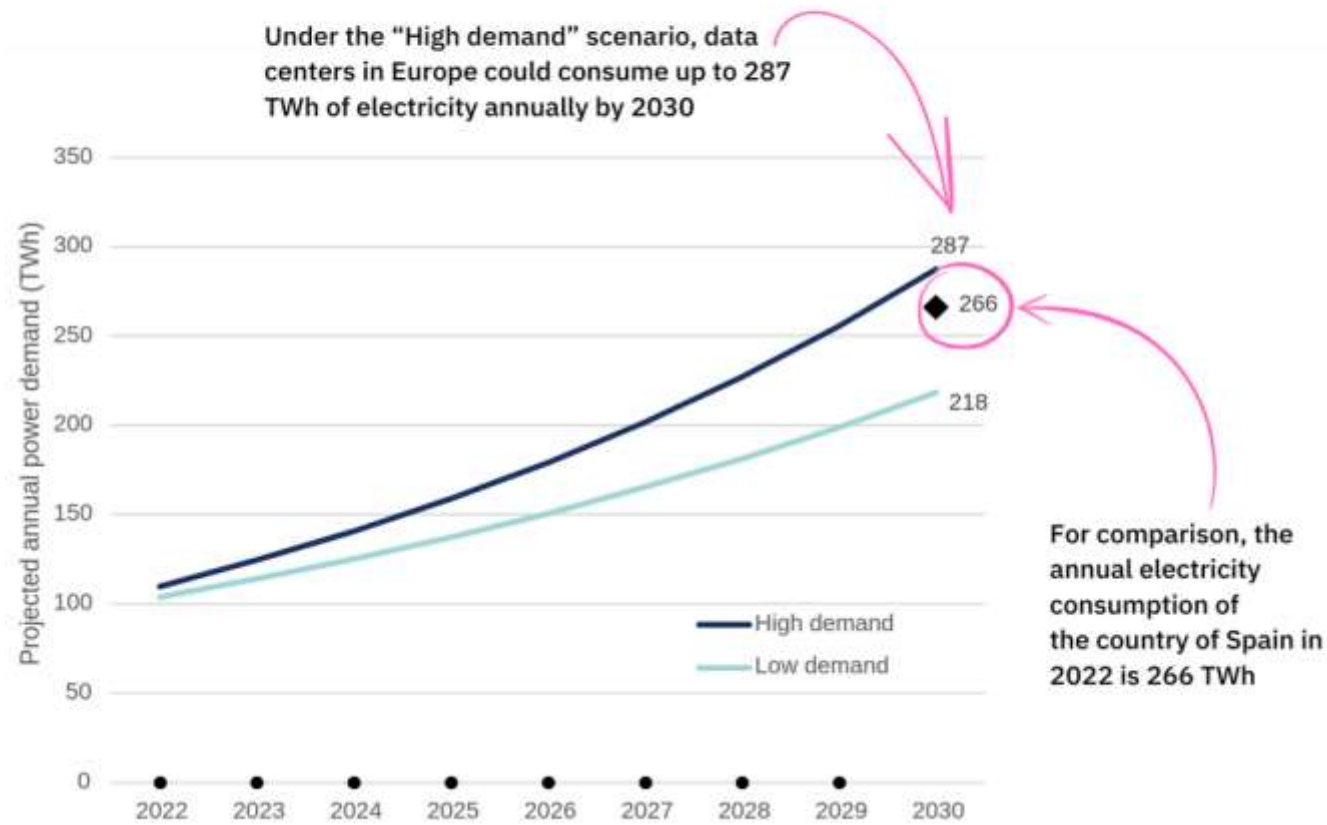
IEA. CC BY 4.0.

*Estimates of the share of AI in total data centre electricity consumption
vary widely and are based at best on imperfect proxies*

Sources: IEA analysis based on data from Deloitte (2024), Gartner (2024), Goldman Sachs (2024), Schneider Electric (2024), SemiAnalysis (2024), and Shehabi, et al., (2024).



Figure 1. Baseline and projected data centre power demand (TWh) in Europe under two demand hypotheses.



EUROPE'S DATA CENTRES
COULD CONSUME AS MUCH
ELECTRICITY AS THE
WHOLE OF SPAIN.

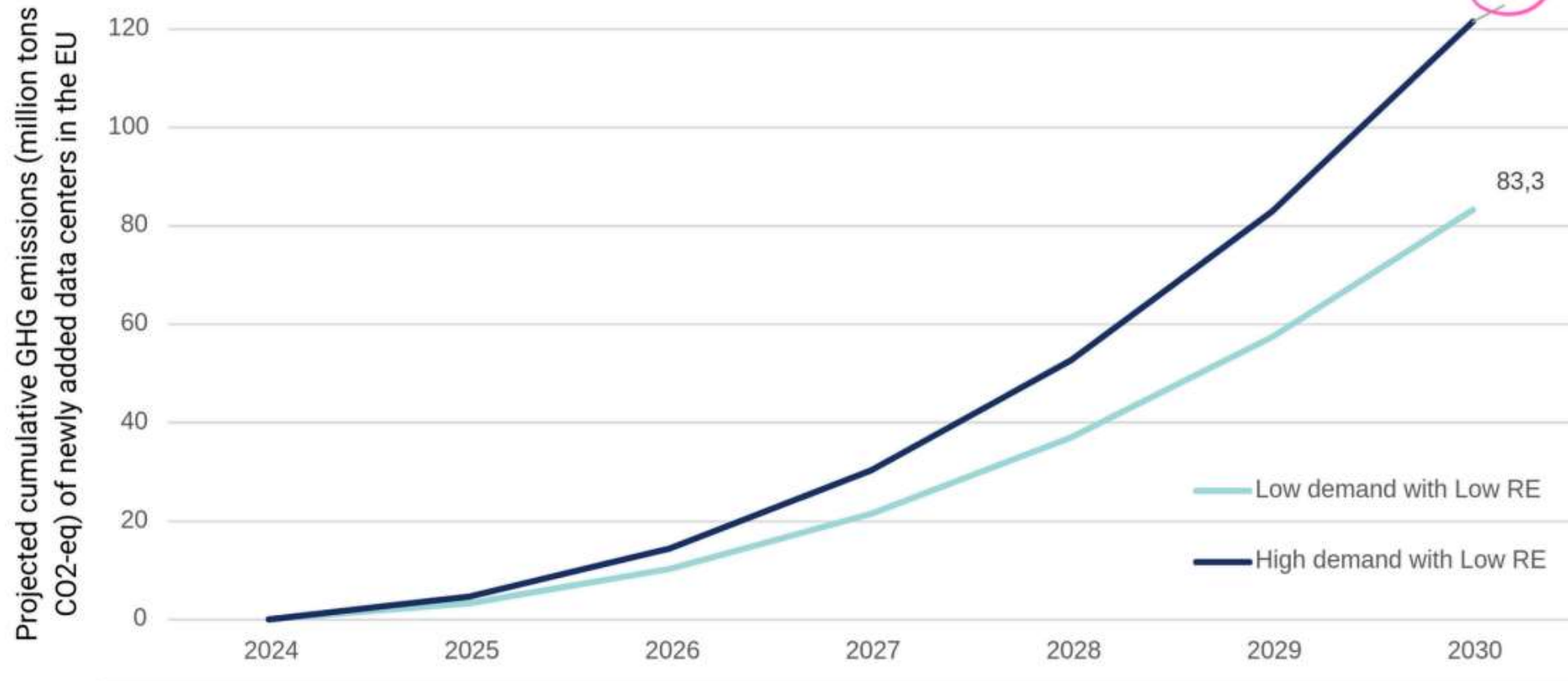


BEYOND
FOSSIL FUELS

Figure 3. Projected cumulative GHG emissions of newly added data centres from 2025 to 2030.



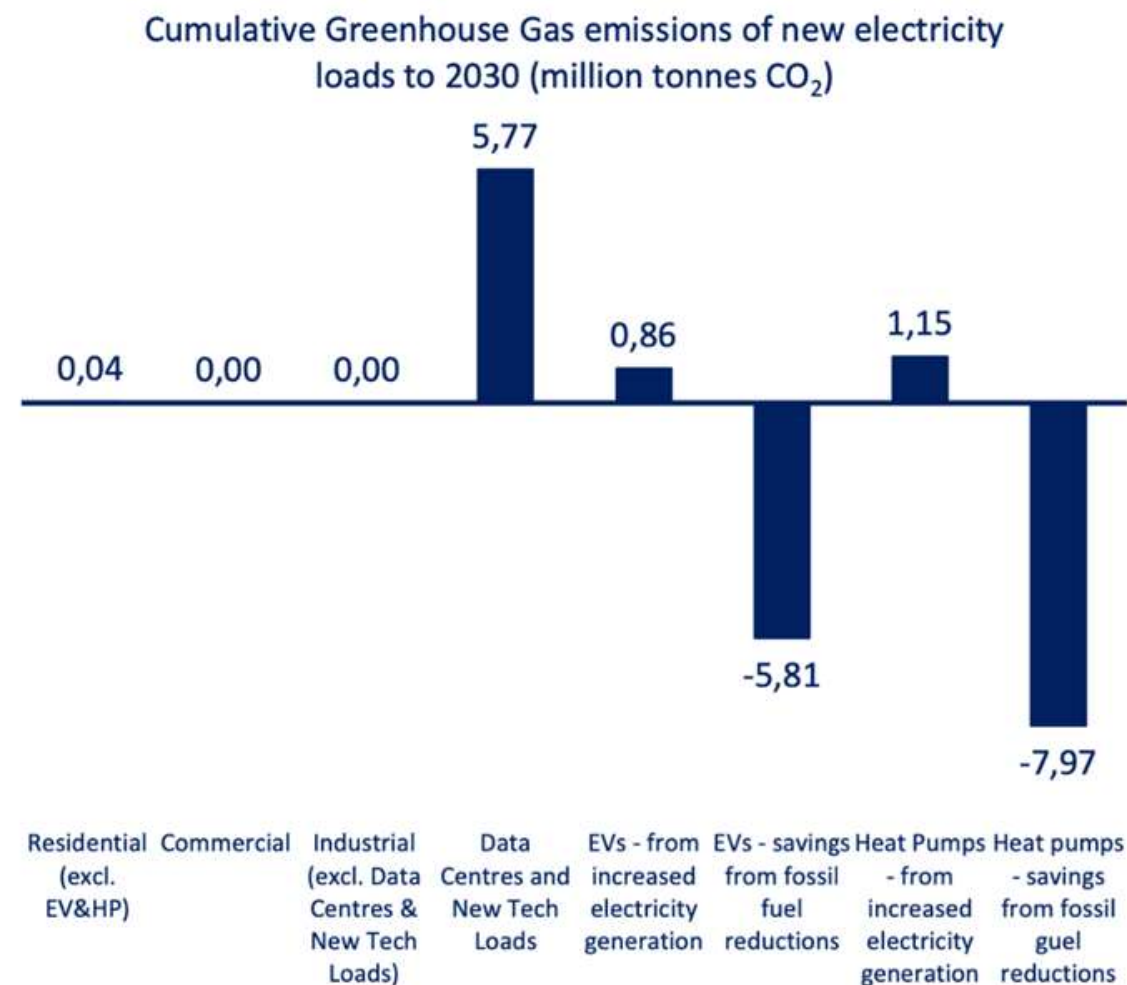
Under the "High demand - Low RE" scenario, newly added data centers in the EU could cumulatively emit about 121 million tons of CO₂ in the next 6 years from 2025 through 2030.



Note: Graph starts at zero in 2024.

Greenhouse gas emissions from data centre *electricity* demand

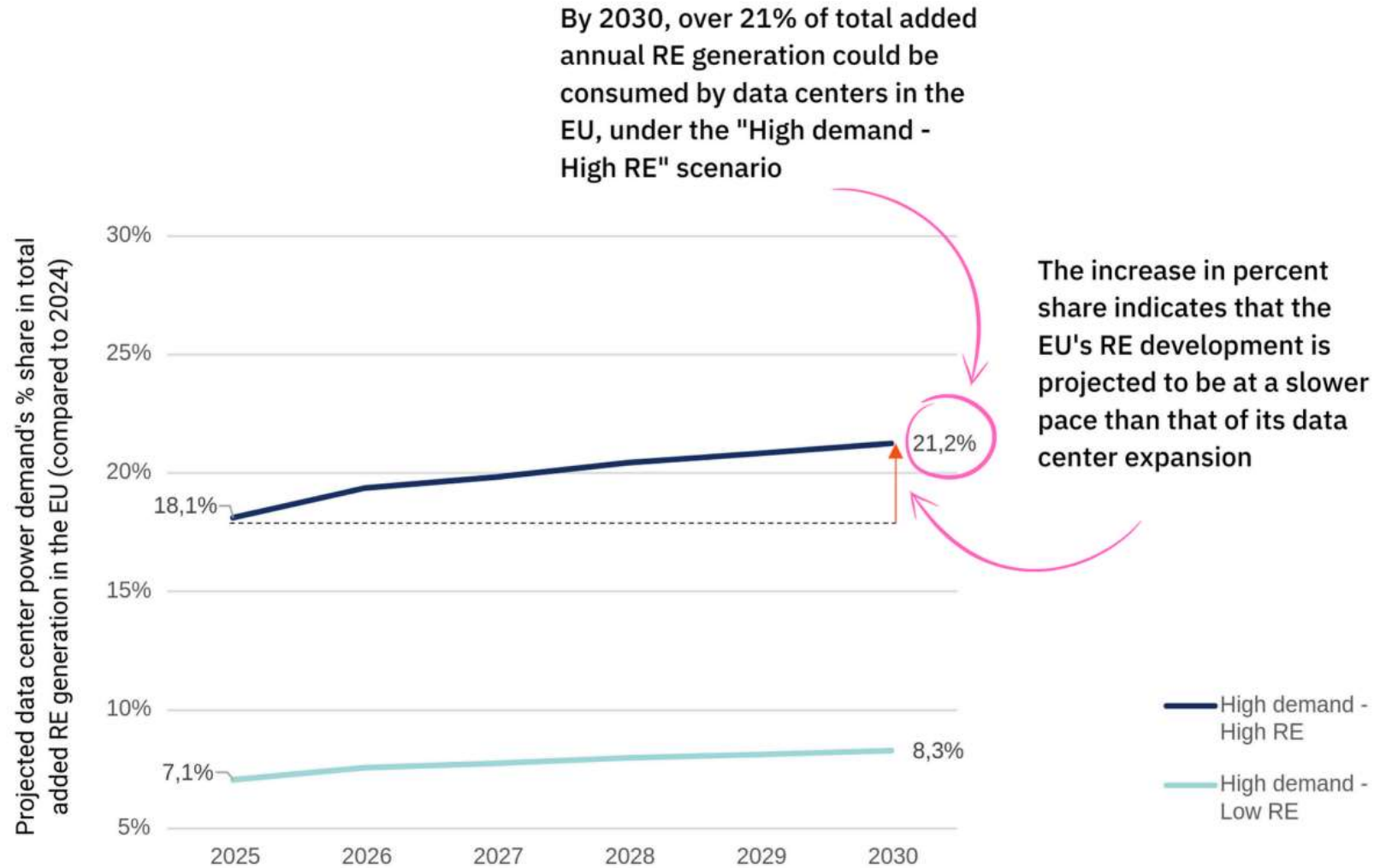
- ❖ **2023 Emissions:** Data centres emitted **1.53 million tonnes of CO₂**, representing **2.5% of Ireland's total GHG emissions** and **4.5% of total CO₂ emissions**.
- ❖ **Projection for 2021–2030:** New data centre electricity demand is projected to cause nearly **6 million tonnes of CO₂** emissions.
- ❖ Whereas additional emissions from electrification of heat pumps and EVs are significantly **outweighed by emissions savings**
- ❖ If only **16% of new data centre demand** is powered by renewables (through CPPAs), the remaining is met with natural gas, increasing cumulative emissions to **14.6 million tonnes** over the decade.
- ❖ This will have a significant material impact on our ability to meet carbon budgets
- ❖ These projections are only for data centres with connection agreements to April 2024: EirGrid is starting to permit more



Source: Own calculations based on Dr. Paul Deane
https://www.esri.ie/sites/default/files/media/file-uploads/2024-06/7.%20Paul%20Deane_ESRI%20Presentation_PDeane%20June2024.pdf



Figure 4. Percentage share of total added (compared to the 2022 baseline) renewable energy generation consumed by new data centres in the EU under two demand hypotheses.

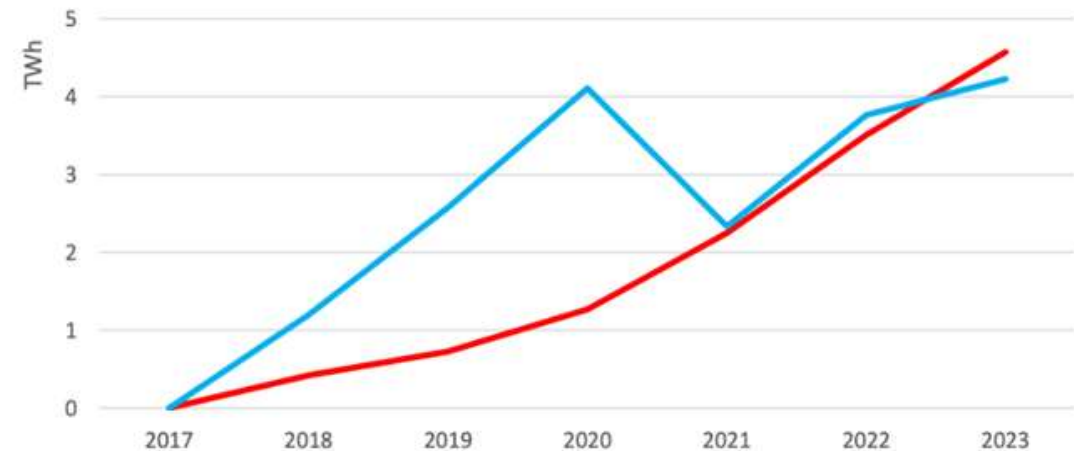


Note: Projected total added renewable energy generation data for the EU are from IEA 2024b.

Data centre demand has outpaced wind energy growth

- ❖ If growing renewables generation is simply met by growing demand, then fossil fuel use won't fall – it will be like walking up a downwards-moving escalator.
- ❖ There is no evidence to suggest that data centres are supporting net renewables growth in this way - additional wind energy generated in Ireland since 2017 has been outpaced by growth in demand from data centres.
- ❖ Absence of detailed data on the role of DC in financing renewables through CPPAs - Estimates suggest that CPPAs only met 16% of the growth in data centre demand from 2020-23

Since 2017, all the additional electricity generation from Irish **wind energy** has been overtaken by the growth in energy demand from **Data Centres**



Data Sources:

- Additional data centre demand: CSO Table MEC02
- Growth in wind energy: SEAI Energy Balances, 2023



Home / Irish News

Power shortages mean we'll have to choose between new homes and data centres, top official warns

Extra capacity on grid for new houses has already been used up by tech sector



“Data centres could increase strain on the energy system and drive up energy prices , **especially considering data centres’ capacity to outbid other energy consumers for access to energy.**”

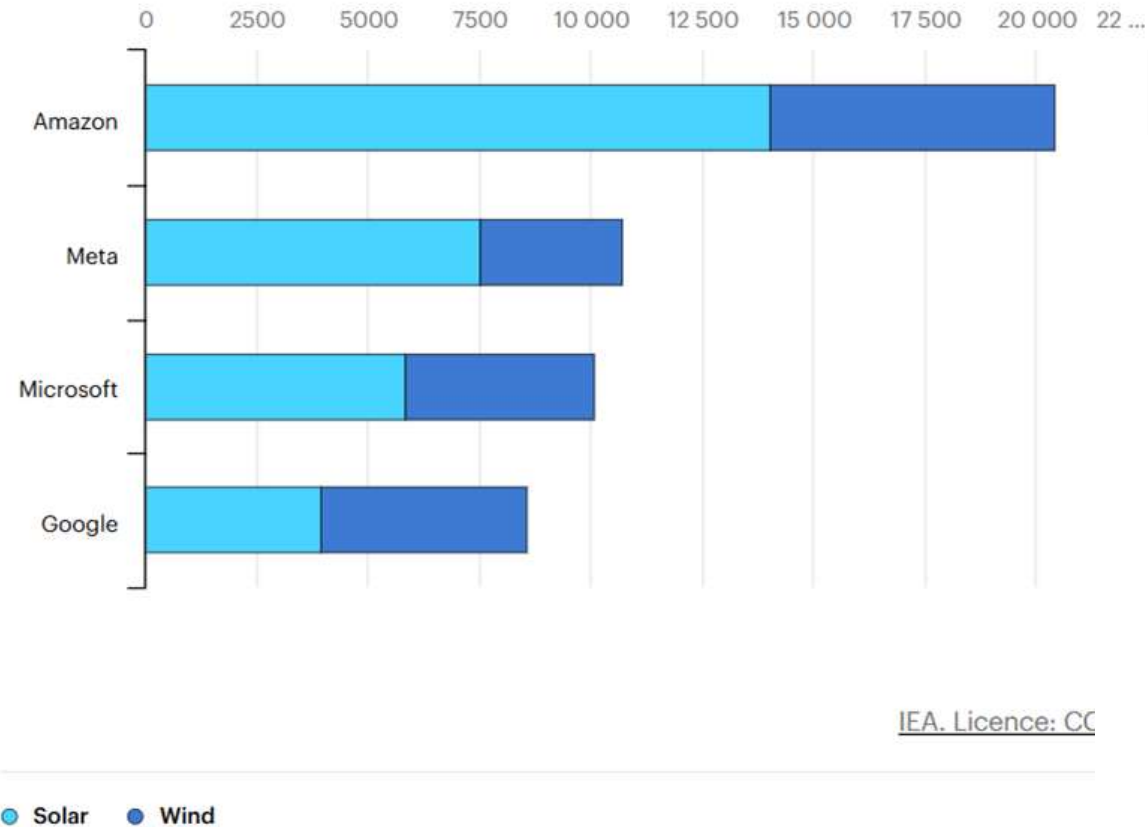
- EU Action Plan for Affordable Energy

Top corporate off-takers of renewable energy power purchase agreements, 2010-2022

[Open ↗](#)

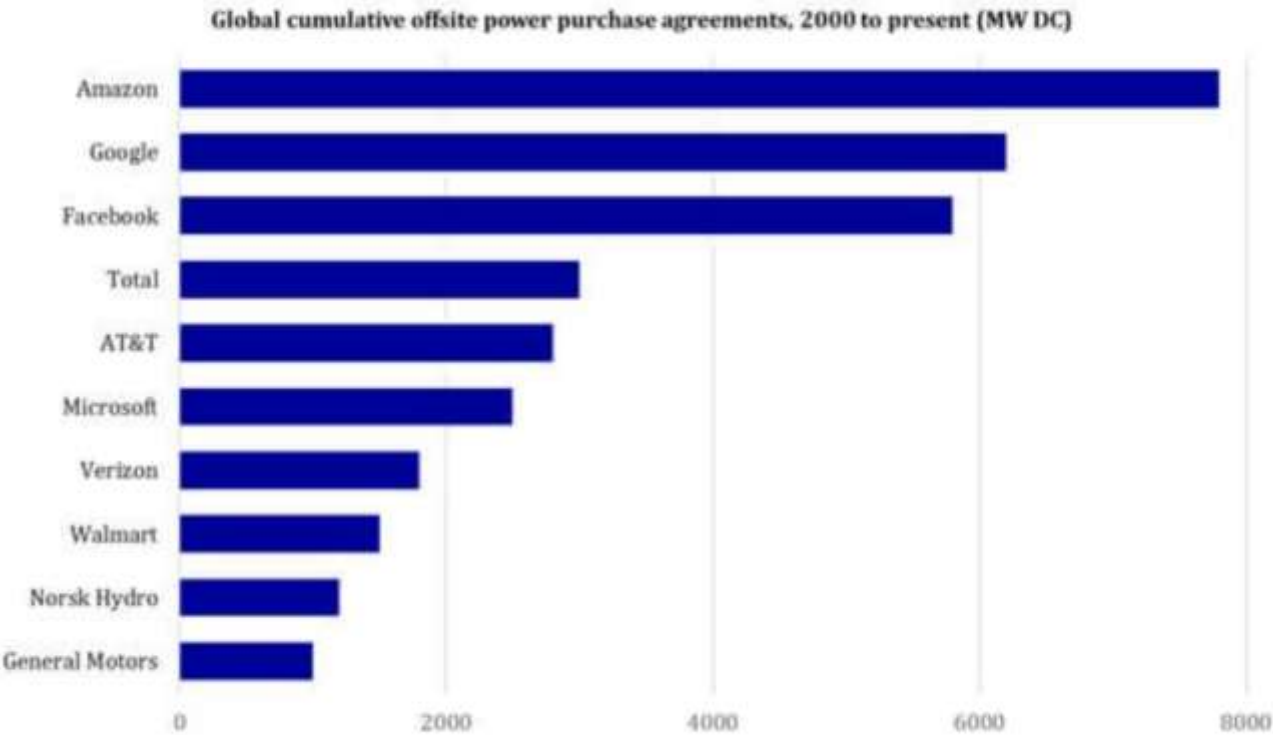


MW



IEA. Licence: CC

Big Tech Tops Corporate Power Purchase Agreements, 2000-2020



Source: Bloomberg NEF



Microsoft's AI Push Imperils Climate Goal as Carbon Emissions Jump 30%

The company's goal to be carbon negative by 2030 is harder to reach, but President Brad Smith says the good AI can do for the world will outweigh its environmental impact.

The Guardian

Google's emissions climb nearly 50% in five years due to AI energy demand

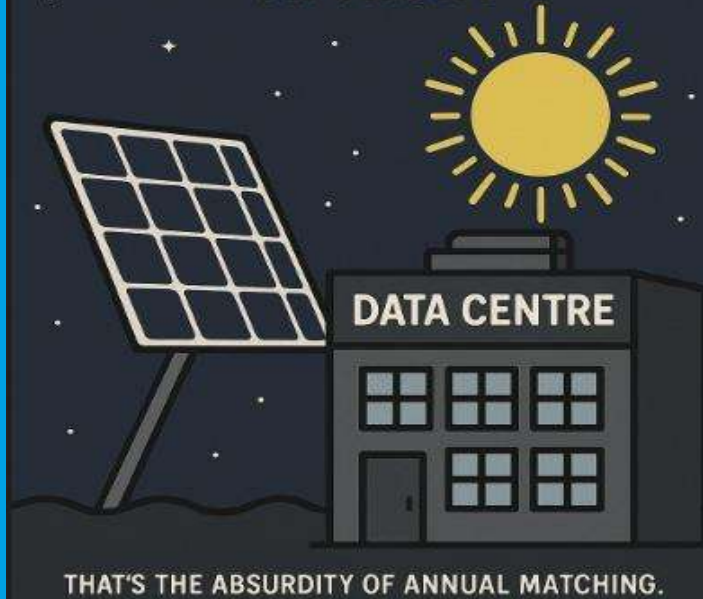
Tech giant's goal of reducing climate footprint at risk as it grows increasingly reliant on energy-hungry data centres

**The Register**

Eric Schmidt: Build more AI datacenters, we aren't going to 'hit climate goals anyway'

Perhaps the power-draining tech is the solution after all, posits former Google CEO

TODAY, A DATA CENTRE
CAN CLAIM TO BE
SOLAR POWERED
AT NIGHT

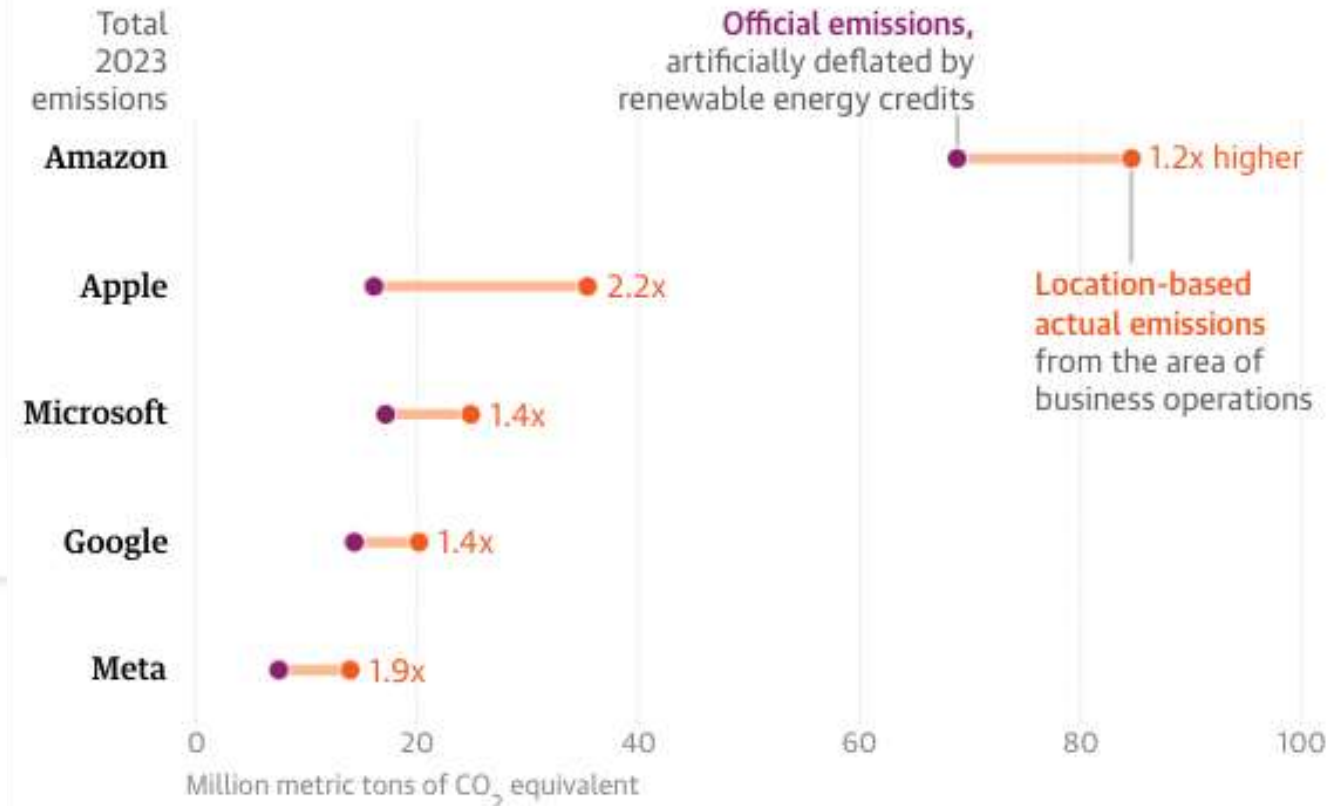


Emissions First
Partnership

Data center emissions probably 662%
higher than big tech claims. Can it keep
up the ruse?

Emissions from in-house data centers of Google, Microsoft,
Meta and Apple may be 7.62 times higher than official tally

The gap between tech companies' official and actual emissions



Guardian graphic. Source: Various company reports. Note: Google and Microsoft do not make their location-based scope 3 figures available — their official numbers were used instead. Apple only provides a partial location-based scope 3 number. All three firms' total emissions are likely understated.



Search Amazon News

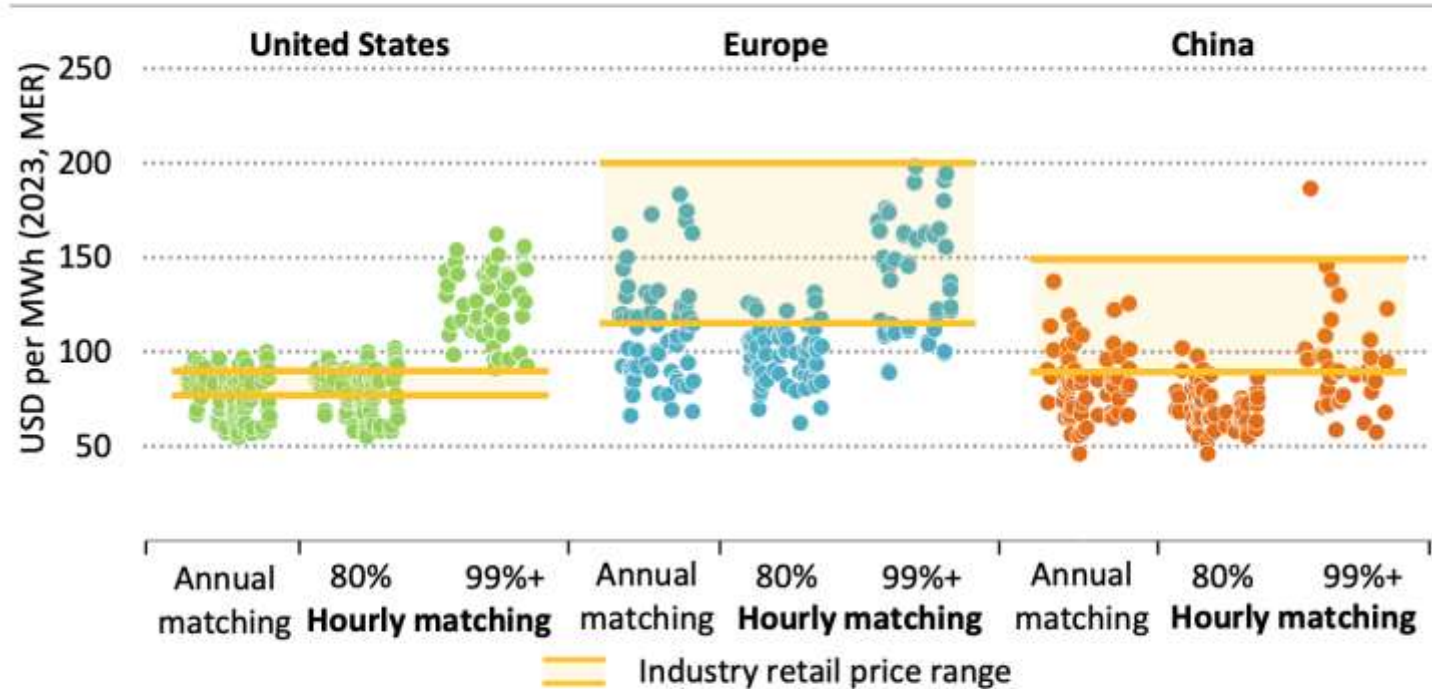


Amazon meets 100% renewable energy goal 7 years early

All of the electricity consumed by Amazon's
operations, including its data centers, was matched
with 100% renewable energy in 2023.



Figure 2.19 ▶ Total cost of electricity per unit consumed for hybrid options of wind, solar PV and battery in the United States, Europe and China



IEA. CC BY 4.0.

Hybrid wind, solar PV and battery portfolios can meet 80% of baseload demand at an average cost competitive with industry retail prices in the United States, Europe and China

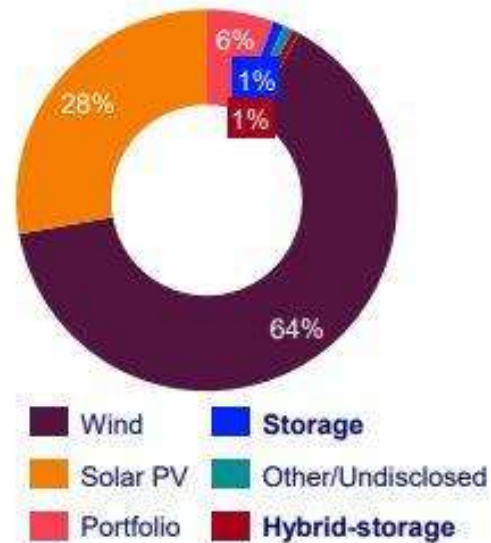
Whereas matching renewable energy on an hourly basis has potential to drive grid decarbonisation, research has shown that **matching renewable electricity on an annual basis has very limited to no effect** (Xu et al. 2023).



Europe storage PPA and tolling contracts form less than 2% of the total signed capacity

This is set to change drastically with more exposure of renewable projects to actual wholesale power price volatility across the region

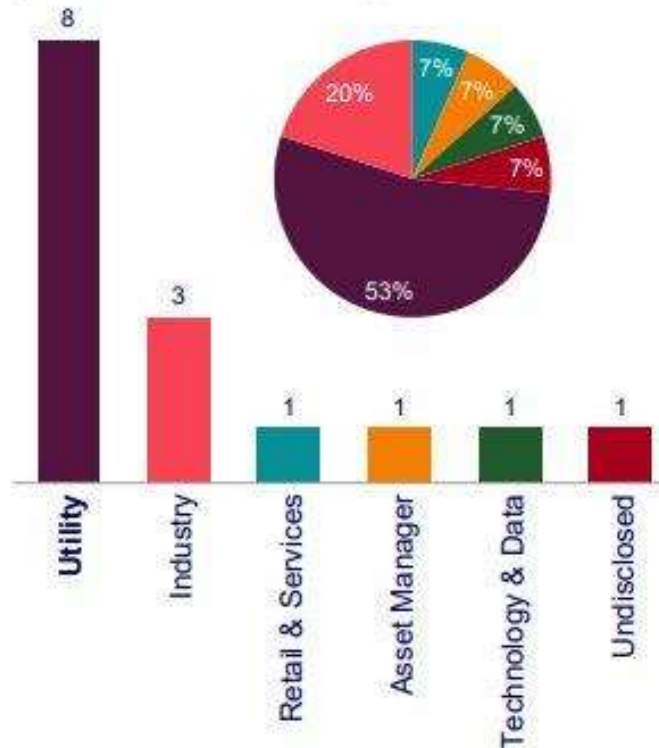
European PPA contracts by technology group (% of GW)



Source: Wood Mackenzie



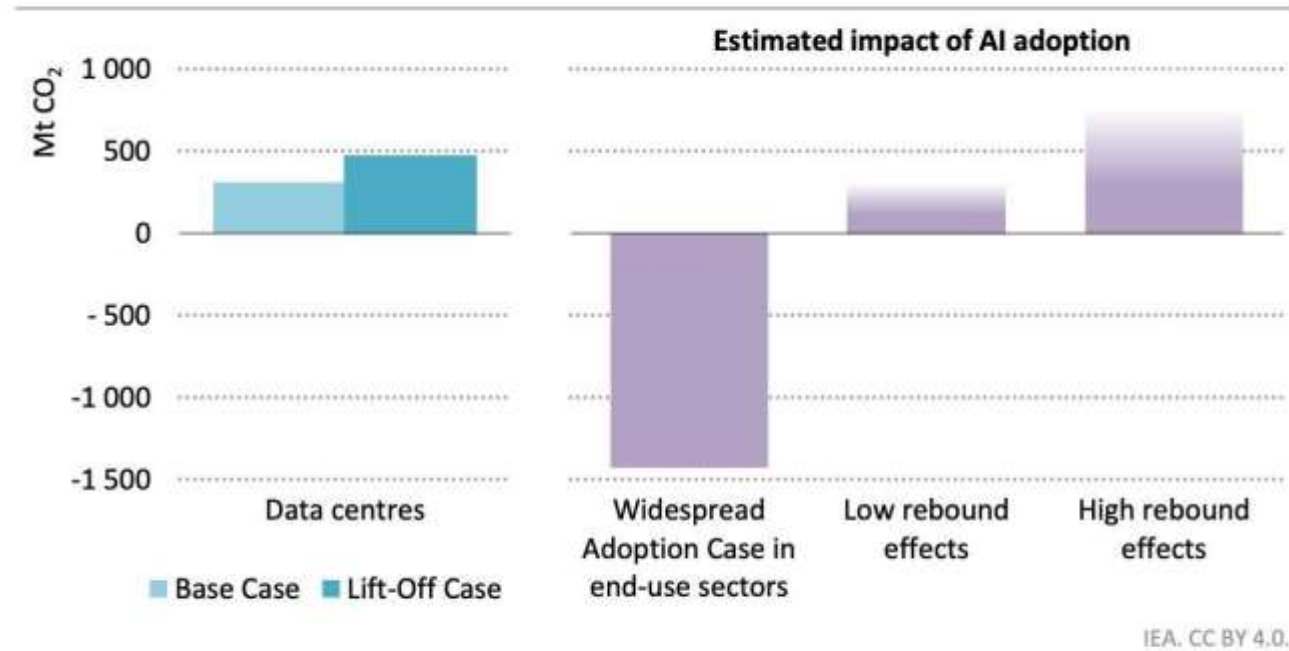
PPA contracts by offtaker type (number of contracts)



PPA and tolling contracts per location and type



Figure 5.31 ▸ Indirect emissions from data centres in selected cases and an exploratory analysis of AI impacts on emissions, 2035



While the widespread adoption of AI leads to emissions savings in excess of data centre emissions, such AI adoption is not guaranteed and could be negated by rebound effects

IEA 'ENERGY & AI' 2025



Former Google CEO Tells Congress That 99 Percent of All Electricity Will Be Used to Power Superintelligent AI

"We need the energy in all forms, renewable, non-renewable, whatever."

Artificial Intelligence / AI / Electricity / Government



Accelerating climate action with AI

AI has the potential to mitigate 5-10% of global greenhouse gas emissions according to our new report with Boston Consulting Group.

The company's goal to be carbon negative by 2030 is harder to reach, but President Brad Smith says the good AI can do for the world will outweigh its environmental impact.

Bloomberg



- ❑ Corporate commitments to phase out fossil fuels
- ❑ Corporate commitments that new data centres are powered by additional, local / deliverable renewable energy that is 90% hourly matched
- ❑ Corporate PPAs that prioritise renewable energy combined with storage and demand flexibility
- ❑ Policies ensuring AI growth within sustainable limits e.g. that prioritises connections for data centres with clean energy
- ❑ Transparency on emissions and energy consumption

Thanks

jill.mcardle@bff.earth



IRENA INNOVATION WEEK ²⁰₂₅

Panel discussion

Moderator



Romain Tranchant

iMasons

Panellists



Trigya Singh

**Global Renewable
Alliance**



Jill McArdle

Beyond Fossil Fuels



Gema del Río

**IDAE
Spanish Government**



Andres Acosta

LevelTen Energy



Sylvie Tarnai

Energy Pool

#IIW2025

IRENA INNOVATION WEEK ²⁰₂₅

Presentation



Michael Barth

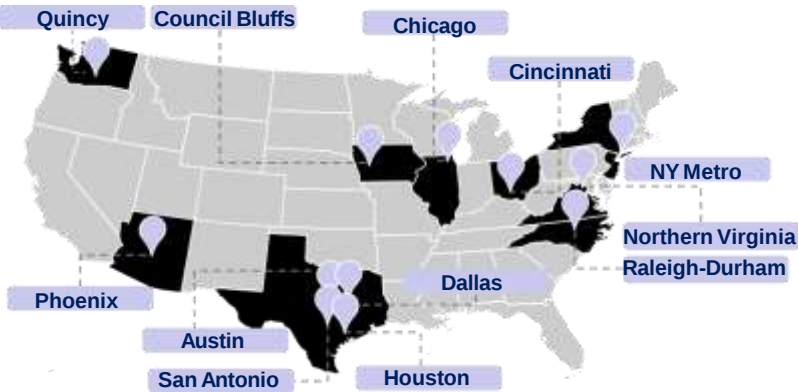
Senior Corporate Counsel Europe
CyrusOne

#IIW2025

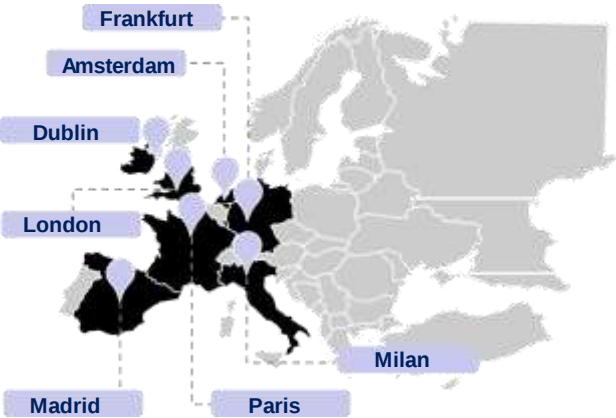
COMPANY AT A GLANCE

CyrusOne is one of the largest data center colocation providers globally with a footprint across key data center regions, a high-quality customer base, ~1.4GW of contracted capacity, and a 20-year track record

UNITED STATES



EMEA



JAPAN¹



55+

operational data centers

20+

Regions

>20 YEARS

Development Track
Record

~1.0GW

In-Service Capacity

~1.4GW

Contracted Capacity²

~\$16.0BN

Enterprise Value³

PROJECT FRA7

FRANKFURT WESTSIDE Industrial park Griesheim



FRANKFURT WESTSIDE

FRANKFURT WESTSIDE



Initiated by BEOS in 2019: WESTSIDE is currently Germany's largest neighborhood development project (73 hectares of former "Industrial Park Griesheim").

CYRUSONE FRA7 DATA CENTRE

An aerial photograph of the CyrusOne FRA7 data centre campus. The image shows a large, modern industrial facility with several tall, dark smokestacks rising from the roof. The building is surrounded by greenery and a parking lot. In the background, a city skyline is visible under a blue sky with scattered white clouds. The CyrusOne logo is visible on the side of the main building.

Jointly implemented by BEOS and CyrusOne since 2023:
Currently the largest waste heat project in Europe, in which
only **one data centre supplies the entire campus
development.**

CyrusOne breathes new life into old industrial parks



- When completed, up to **40 MW** of waste heat deployed to **70 new buildings** with an area of approx. **500,000 m²**
- **DGNB Platinum** for quarterly performance and **BREEAM "Very Good"** for the data centre
- **Design PUE of 1.21** at 75% load (without adiabatic cooling technology!)

HOT & COLD WATER SUPPLY

An aerial architectural rendering of a modern urban development. The scene shows a cluster of buildings with flat roofs, many of which are covered with solar panels. The buildings are arranged in a grid-like pattern with green spaces and trees interspersed. To the left, a river flows through the landscape, bordered by lush greenery. In the background, more urban structures and parking lots are visible under a clear sky.

- 6 km long cold local heating network (28° C) → low-loss transport
- Decentralised heat pumps (redundancy!) are supplied with
- PV electricity from the WESTSIDE (ca. 10 MW peak)
- Buildings can heat and cool independently of each other

Legal aspects of hot & cold water supply

- The interface between the transfer point is the heat exchanger/hydraulic diverter in the BEOS heating centre (= heat transfer station within the meaning of § 11 III No. 3 EnEFG)
- Creation of a redundant infrastructure by BEOS as the local heat network operator for heating and cooling supply
- CyrusOne is a data center operator responsible for waste heat transport to the heating centre: avoid becoming a utilities company



IRENA INNOVATION WEEK **2025**

Renewables and Digitalisation for a Sustainable Energy Future

Thank you!

#IIW2025

Closing Remarks



Romain Tranchant

Chair of Innovation Committee
iMasons Climate Accord

IRENA INNOVATION WEEK **2025**

Renewables and Digitalisation for a Sustainable Energy Future

Thank you!

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IRENA INNOVATION WEEK ²⁰₂₅



Coffee Break



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