Scientists fear surge of poorly written 'slop' puts AI sector's credibility at risk

MELISSA HEIKKILÄ — LONDON

Artificial intelligence researchers are grappling with how to stop so-called "AI slop" from damaging confidence in the industry's scientific work.

AI conferences have rushed to restrict the use of large language models for writing and reviewing papers in recent months after being flooded with a wave of poor AI-written content.

Scientists have warned that the surge risks eroding trust and the integrity of the sector's research by introducing false claims and made-up content.

"There is a little bit of irony to the fact that there's so much enthusiasm for AI shaping other fields when, in reality, our field has gone through this chaotic experience because of the widespread use of AI," said Inioluwa Deborah Raji, an AI researcher at the University of California, Berkeley. Recent studies have highlighted the prevalence of the technology in AI research.

In January AI detection start-up GPTZero found over 100 AI-generated errors across 50 papers last year at the Neural Information Processing Systems conference, seen as the most prestigious place for cutting-edge AI research.

An analysis by start-up Pangram estimated that 21 per cent of reviews at the International Conference on Learning Representations (ICLR) in 2025 were fully AI generated, and more than half included some AI use, such as editing.

Of submitted papers, the company found that 9 per cent had more than half of their content generated by AI.

ICLR updated its AI usage guidelines before the conference, including warning that papers that do not disclose "extensive" usage of LLMs would be rejected. Researchers who used LLMs to create low-quality reviews of papers would also be penalised.

"If you're publishing really low-quality papers that are just wrong, why should society trust us as scientists?" said Hany Farid, a computer science professor at the University of California, Berkeley.

LLMs tend to produce gibberish when their dataset contains too much uncurated AI-generated data.

But detecting AI-generated content is difficult owing to the lack of industry-wide standards or methods to analyse papers reliably. A tell-tale sign is when papers contain hallucinated references in the bibliography, or figures that are wrong, said Thomas G Dietterich, emeritus professor of computer science at Oregon State University.

AI Shift page 12

[FT](#) (1 February 2026)

Hayden has now graduated with a High Distinction. How much of his final year studies did he outsource to AI? "All of it," he says without skipping a beat. "It's completely insane. In my smaller units, AI was covering 100 per cent of my coursework and 100 per cent of my exams. And that's not me outing myself, that's me outing everyone. You've got like, five per cent of students still putting in hours and hours of effort, and 95 per cent of us who are crawling out of bed ten minutes before exams and winging it with AI.

"Lobotomised by AI", *The Australian* (6 Feb 2026)

Chris Bradley • 2nd

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Senior Partner at McKinsey, Dire...

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As someone who for many years has had to make hiring decisions about some of Australia's best young minds, I wonder how that works in a world where academic achievement is a mirage. And don't start me moralising on how cheating could get normalised like this. We will have a group of young people who deep down are not proud of themselves. Ughh

Obvious fix: old fashioned in person written exams, kill group assignments, return to serious marking scales. PLEASE.

LinkedIn (6 Feb 2026)

Sasha de Marigny
@sashadem

Think of these roles as being a Substacker with
to real time data, insider knowledge of what's h
of AI + independence to write about the topics
These roles are for big thinkers and domain exp
marketers.

> **Keir Bradwell** @keirbradwell · 14h
> The Anthropic Editorial team is hiring TWO new writ
> about AI and economics/policy, and someone to wr
>
> This is quite an important time to be thinking and w
> AI. So please apply!

Last edited 8:46 AM · Nov 5, 2025 · **63.2K** Views

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25 September 2024

WSJ: "Big Tech Is Rushing to Find Clean Power to Fuel AI's Insatiable Appetite"

by Jennifer Hill and Amrith Ramkumar

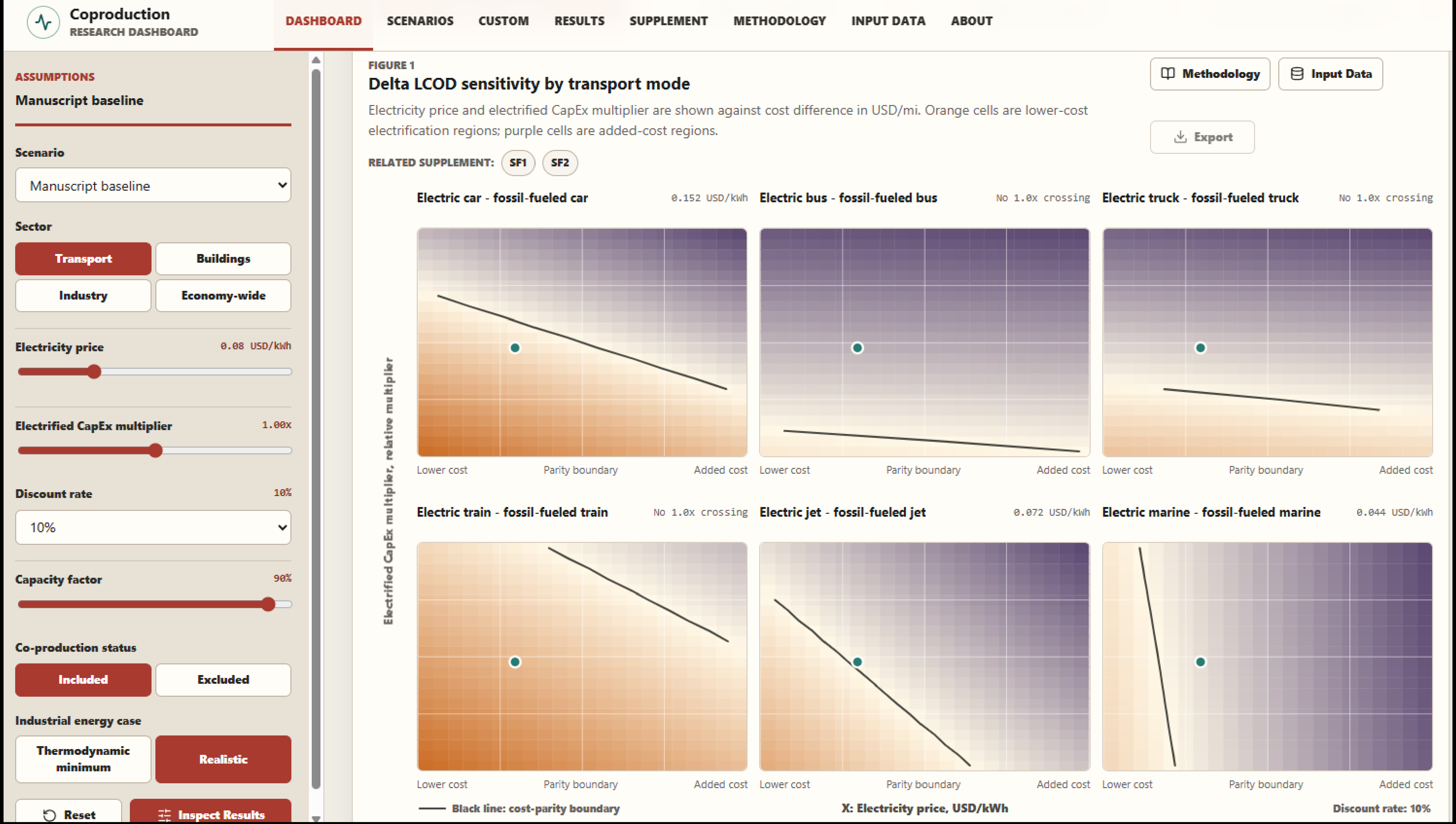
AI News WSJ

> Over time, tech companies say AI could help them limit emissions by, for example, helping utilities more efficiently deploy renewable power. But it isn't clear such benefits would come close to making up for the soaring emissions.
>
> "It's a massive increase that may not be justified by the productivity gains from AI," said Gernot Wagner, a climate economist at Columbia Business School.

WSJ (25 September 2024)

❶ Productivity gain to justify CO_2?

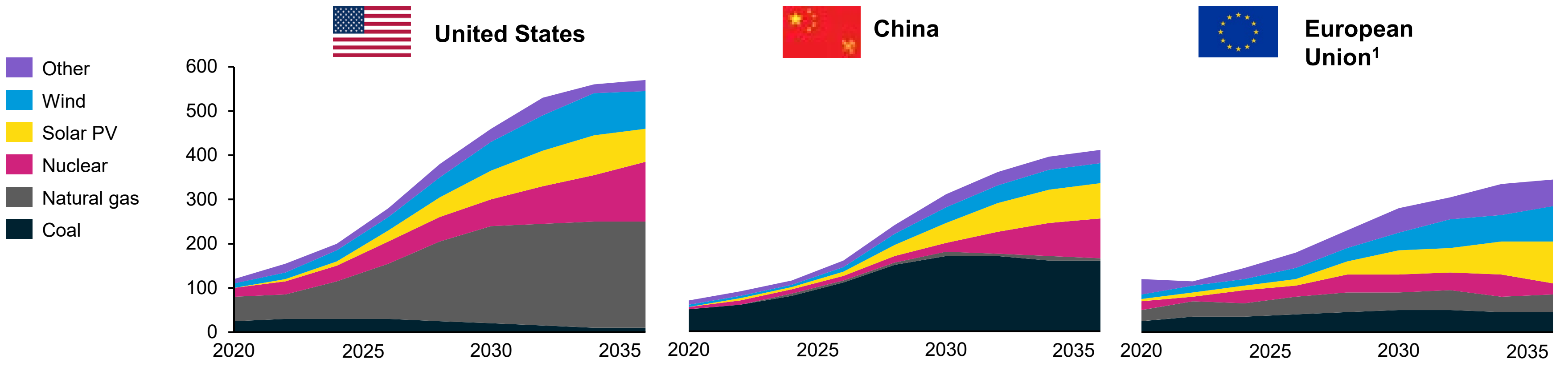
Wagner, "Yes AI, No AI" (Somehow the most popular page on my personal site: my AI policy)



"Co-production as an Economically Feasible Pathway to Economy-Wide Electrification" (*Mimeo*)

1. Productivity gain to justify CO_2?
2. CO_2 emissions are/will be up

Clean energy is expected to grow in share of data center energy mix across geographies, despite different deployment drivers



Deployment	**Market-driven, cluster-based model**	**State-led, decentralized model**	**Market-driven, urban-centered model**
Power demand growth projection	**+130% (~425 TWh by 2030)**	**+170% (~277 TWh by 2030)**	**+~70% (~45 TWh increase by 2030)**
Policy drivers	• CHIPS Act, AI and clean energy orders • Tax breaks, utility deals, DOE grants • Corporate power purchase agreements (PPAs)	• AI 2030 and Eastern Data, Western Computing • High and New Technology Enterprise (HNTE) 15% tax break, bundled permits, and fast approvals • Co-located with renewables	• Green Deal Digital, Digital Decade • Carbon markets, RRF, and CSRD-driven incentives • **France:** Offers tax breaks for green, efficient data centers • **Germany:** RRF funds support digital and energy upgrades
Permitting	**Fragmented** (1-3 years)	**Centralized and fast-tracked**	**Often slow** (5-7 years), local resistance
Grid flexibility required	**Flexibility urgent** industry piloting batteries, workload shifts, and gas backup	**Minimal flexibility** needed; strong central planning enables coordination but is underutilized	**Regulation-led flexibility;** automation and cooling shifts help, but grid limits slow progress

Observations

- U.S. deployment is **market-driven**, fragmented by state permitting and **dependent on corporate PPAs,** raising risk of grid bottlenecks in major data center clusters.
- **China's state-led model** offers speed and scale with centralized permitting, bundled land-power packages, and national mandates (e.g., Eastern Data, Western Computing), enabling rapid build-out.
- **The EU has strong decarbonization goals and regulatory levers** (CSRD, Green Deal Digital), but **slow permitting and public resistance** (e.g., Dublin moratorium) threaten deployment timelines.
- **Permitting bottlenecks** in the U.S. and EU contrast sharply with **China's fast-tracked national build-out**, giving China a decisive edge in infrastructure readiness.
- **A power mix shift** across regions converges toward more renewables and nuclear by 2035 — but China's top-down mandates may make the transition faster, even if its coal reliance remains a near-term emissions challenge.

[1] Projections based on IEA scenarios. EU data calculated by discounting US and China from global data.

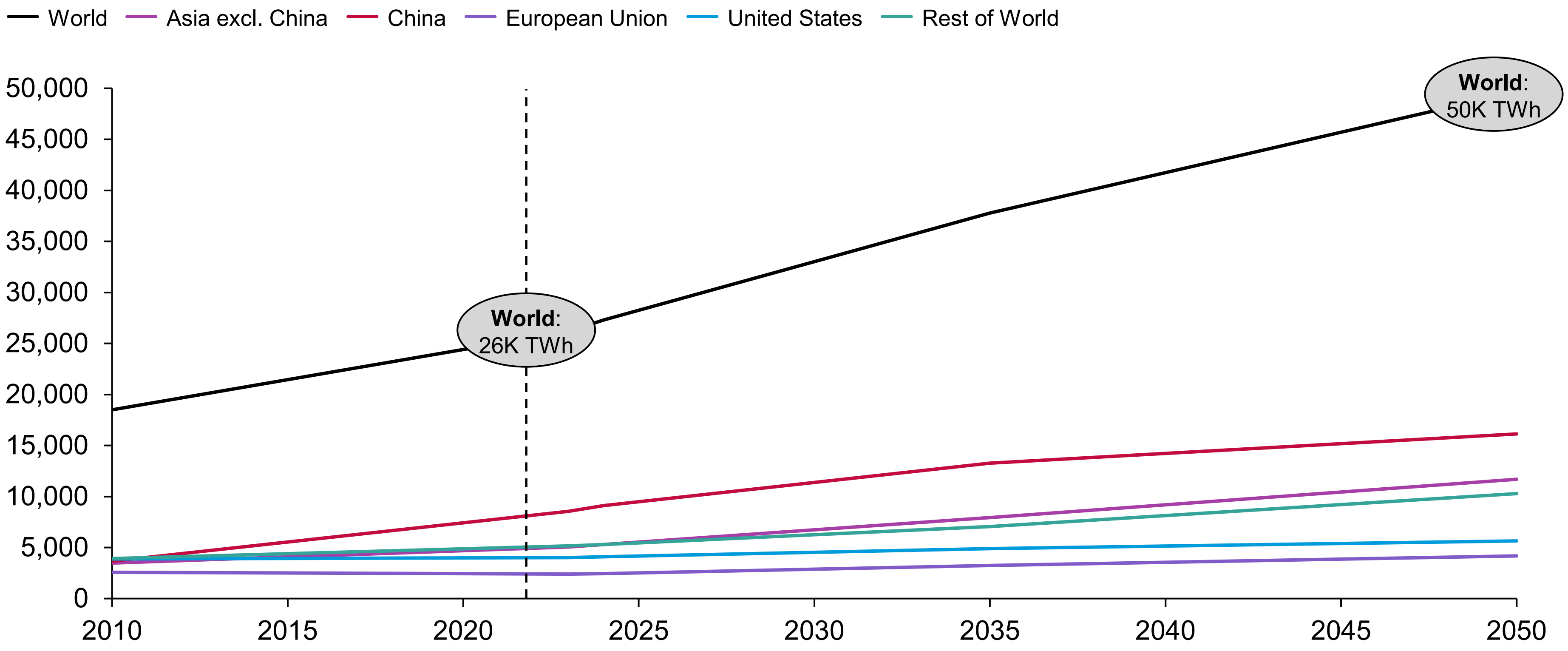
Sources: IEA, Energy and AI (2025); Sinosities, Mapping China's Inland Data Centers (2025); Engineering, The "Eastern Data and Western Computing" Initiative in China Contributes to Its Net-Zero Target (2024); Bruegel, Annual Report (2024); Cushman & Wakefield, Americas Data Center Update (2025).

Credit: Shubhangi Prasad, Ariela Farchi, Isabel Hoyos, Hyae Ryung Kim, and Gernot Wagner. Share with attribution: Kim et al., "Powering Data" (23 January 2026).

Global electricity demand is expected to double by 2050, after being relatively unchanged since 2010 everywhere outside of China

Electricity demand growth has been led by China, and steady or even negative in the rest of the world; the 'age of electricity' is projected to change this trajectory globally

Electricity final demand, 2010-2024 actuals, 2025-2050 forecasted, TWh[1]



Observations

- The trajectory of electricity demand growth in all regions is **a stark contrast to recent decades**
- Pre-2023, electricity demand growth in the U.S. and European Union were negative; **recent growth** from electrification, renewables, and data centers is a major **challenge for decades-old grid systems, requiring massive investment**
- **Many other estimates** forecast electricity growth to exceed that of the IEA's Stated Policies Scenario, **more than doubling by 2050**
- Electricity demand growth is now double that of energy demand

[1] IEA Stated Policies scenario, from IEA World Energy Outlook 2025

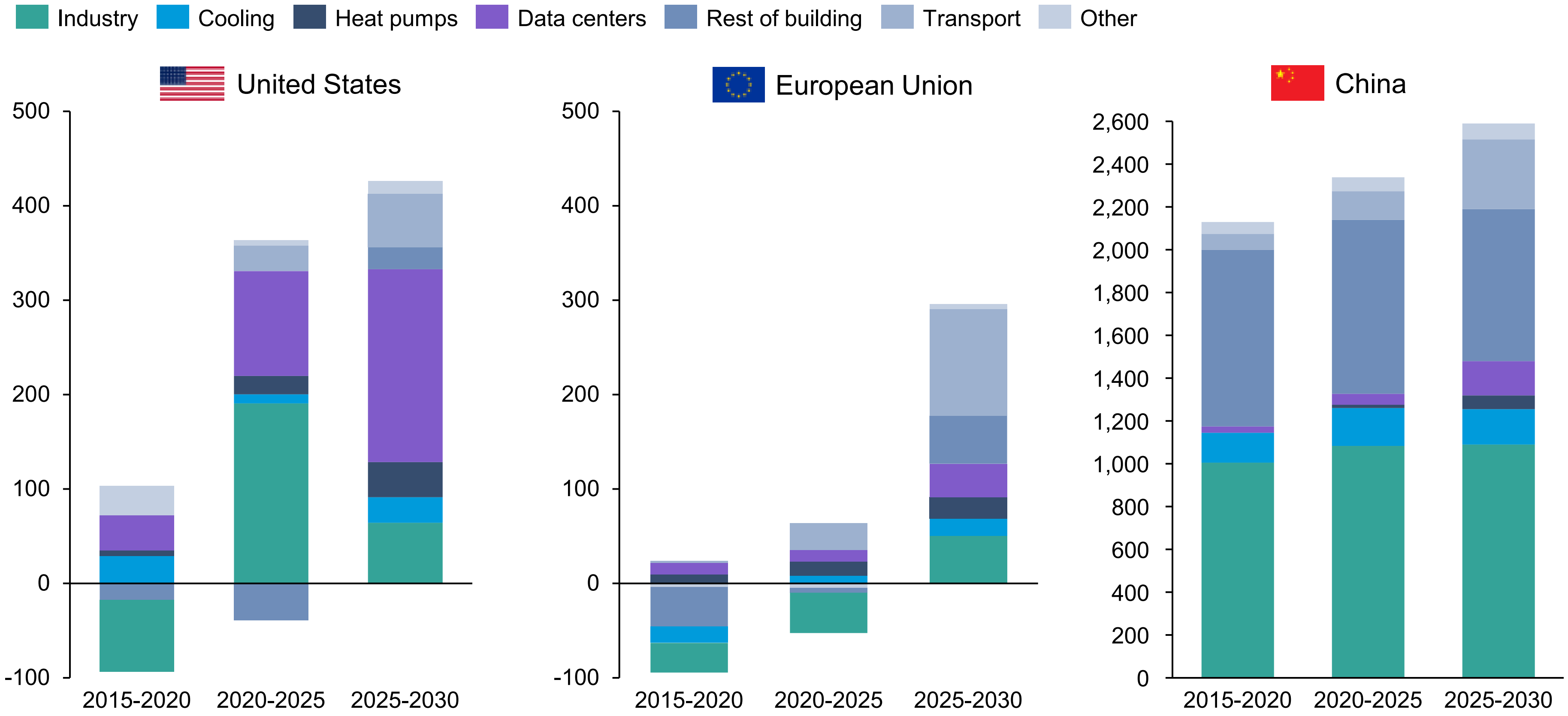
Sources: World Energy Outlook 2025; (IEA, 2025); Electricity 2026 (IEA, 2026); New Energy Outlook (BNEF, 2026); Power generation from renewables set to jump 84% in next five years (BNEF, 2026).

Credit: Dominica Wambold, Ariela Farchi, and Gernot Wagner. Share with attribution: Wagner *et al.*, "Powering Grids".

Electrification and data centers are among primary drivers accelerating electricity demand across the US, EU, and China

By 2030, data centers projected to account for ~50% of U.S. demand growth, building and transport electrification lead in the EU, and industrial electrification in China's

Electricity demand total growth by sector and end-use in the US, EU, and China 2015-2030 TWh



Observations

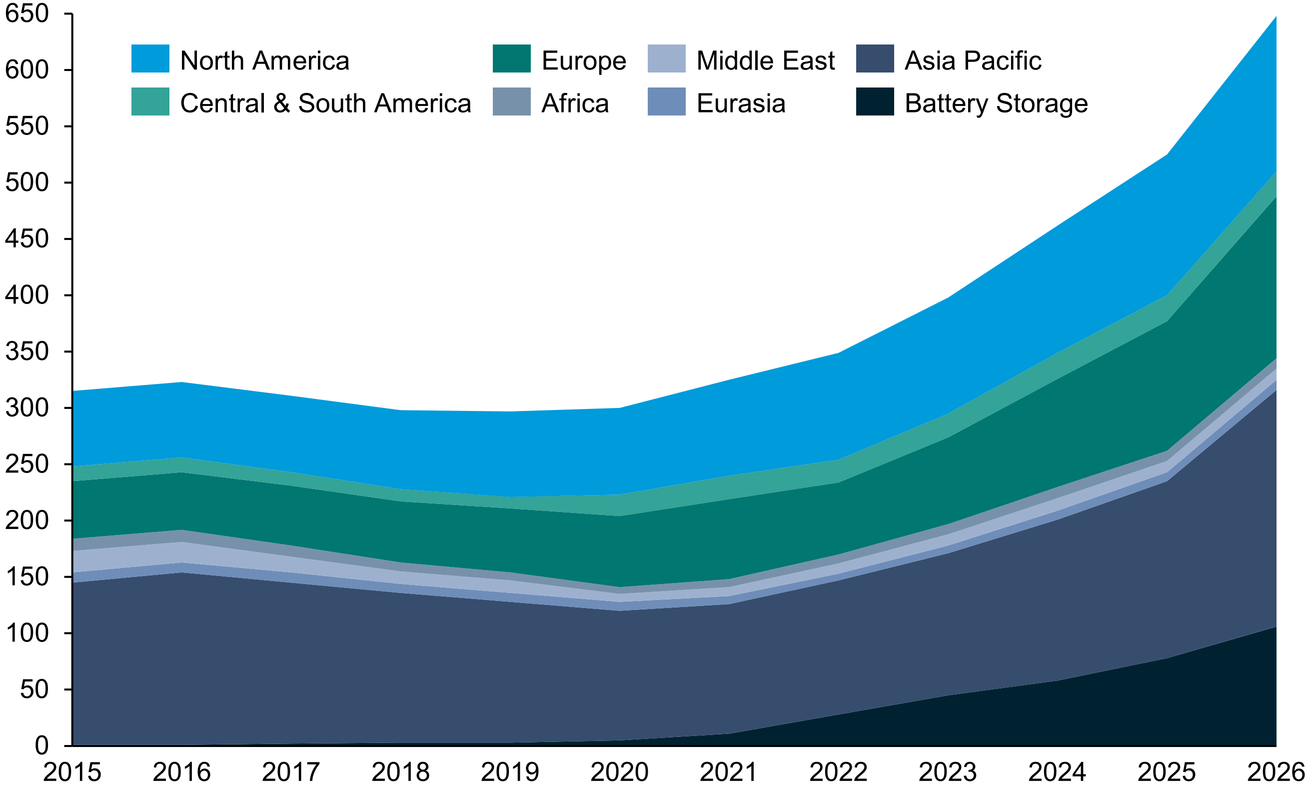
- **Building and transportation electrification, industry, and data centers** are leading to compounding electricity demand growth in the 2020s
- While **data center** electricity demand represents a small portion of all growth, its **average annual growth rate is expected to double again in the years ahead under base scenarios** and is the leading growth driver in the U.S
- Electricity demand characteristics from each of these drivers pose distinct challenges to grids; each **can drive significant increases in peak as well as average demand**, with different levels of predictability and control

Sources: Electricity data, (IEA, 2026).
Credit: Ilayda Tezcan, Dominica Wambold, Ariela Farchi, and Gernot Wagner. Share with attribution: Wagner *et al.*, "Powering Grids".

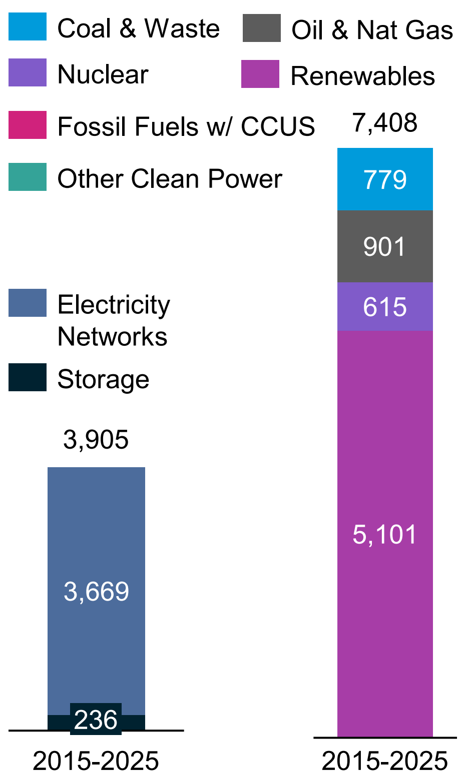
While financing flows into grids are increasing globally, investment has heavily lagged that in generation

Traditional grid investment flows have been growing globally but further financing is required to absorb electrification demand growth for all energy transition scenarios

Grids and utility scale storage investment, $B, 2015-2026[1]



Power investment, $B, 2015-2025



Observations

- Grid financing has lagged load (demand) and generation investment growth
- Generation investment has been nearly double that in grid investment for the last decade
- Investors can play a major role **in financing EMDE grids,** especially as international development financing dries up
- Grid-connected (front-of-meter) **storage is primed for sustained global investment**, tied closely to the deployment of variable renewables
- Substantial grid financing opportunities expand beyond those tracked as 'Power' investments, including digital, end use, and generation associated investments

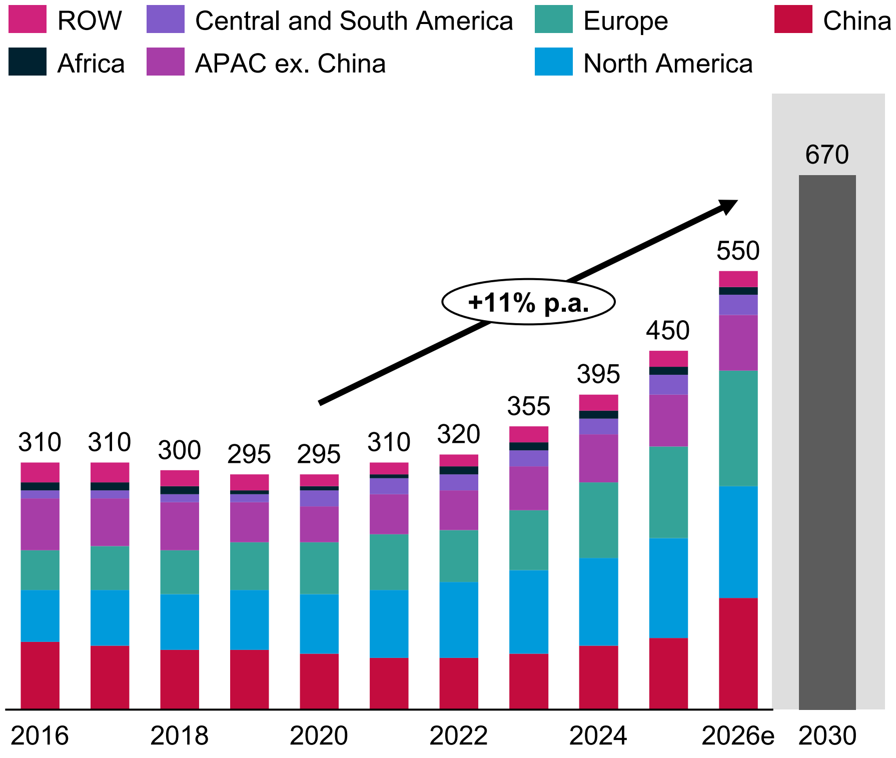
[1] IEA WEI 2026 actuals for 2015-2025 and forecasted for 2026 by region for IEA's Power segment. [2] IEA WEI generation investment by Source, 2015-2025.
Sources: World Energy Investment 2026 (IEA, 2026), World Energy Outlook 2025 (IEA, 2025), Batteries and Secure Energy Transitions (IEA, 2024)
Credit: Dominica Wambold, Ariela Farchi, and Gernot Wagner. Share with attribution: Name of lead author *et al.*, Share with attribution: Wagner *et al.*, "Powering Grids".

Columbia Business School
Climate Knowledge Initiative

Global grid investment is expected to rise to +$500B in 2026 and increase through 2050, driven by infrastructure, materials, and labor

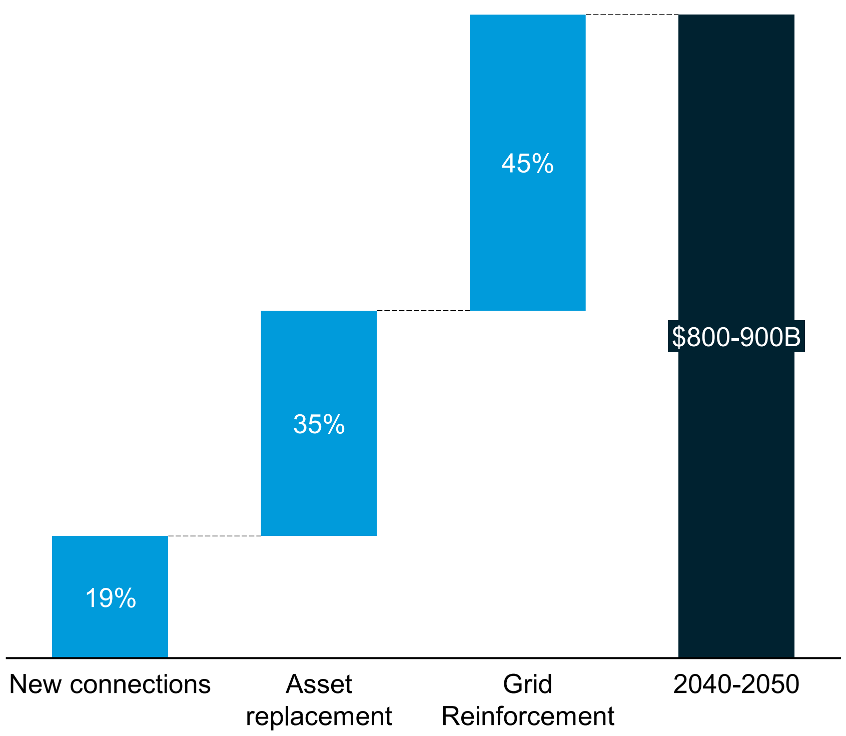
Investment grew ~85% over 5 years, targeted to reach $600B by 2030 in NZE

Investment in power grid infrastructure, 2016-2026e
USD Billions



2040-2050, 80% of investment needs to be used to modernize and 20% to expand

Breakdown of global annual investment required, 2040-2050



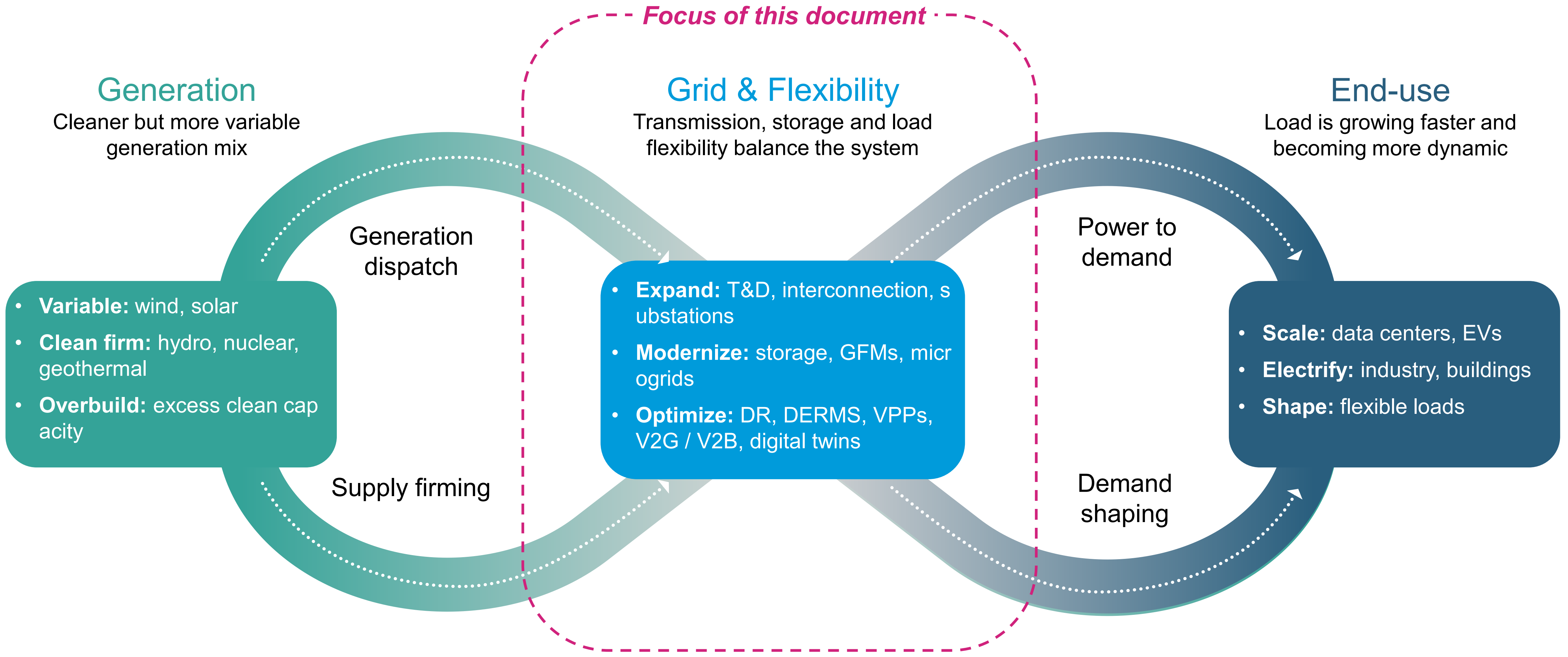
Observations

- Grid investment needs to be spread across **physical grid infrastructure**, and **grid enhancing technologies**
- Investing in **robust supply chains and a prepared work force,** alongside infrastructure and technology, will be critical to achieving global targets
  - Increasing costs of equipment divest grid investments away from potential new infrastructure
- **Venture capital investments** into grids has increased significantly in 10 years
  - Investment in grid **hardware** rose 4x from **~$200M in 2015 to ~$800M in 2025**
  - Investment into **optimisation (reinforcements)** rose from **~$50M to ~$400M**
  - Largest rise was in VPPS and Derms, from **~$50M to ~$650M**

[1] In line with Net Zero by 2050, as per IEA scenarios;
Sources: World energy investment (IEA, 2026); Global landscape of energy finance (IRENA, 2025); Building grids faster: the backbone of energy transmission (ETC, 2024)
Credit: Ariela Farchi, Brenda Rain, and Gernot Wagner. Share with attribution: Wagner *et al.*, “Powering Grids”.

1. Productivity gain to justify CO_2?
2. CO_2 emissions are up(!)
3. AI opportunities to cut CO_2

Grid and flexibility tools work together to match growing demand with a cleaner, more variable power system



Source**:** Clean Firm Power (FCA, 2026)
Credit: Ilayda Tezcan, Ariela Farchi, and Gernot Wagner. Share with attribution: Wagner *et al.*, “Powering Grids”.

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Expanding, modernizing, and optimizing will upgrade insufficient and aging infrastructure into a resilient, intelligent grid ecosystem

	Expand grid networks	Modernize and harden the core	Optimize grid assets
Definition	Structurally extend the grid's network to integrate available and emerging generation	Upgrade and modernize the core with capital efficient physical and technical augmentation	Maximize the value of the grid through digital intelligence and demand management
Physical and Capital Profile[1]	• Net new and upgraded grid transmission • Capital intensive	• Hardware solutions at existing grid nodes • Capital efficient	• Digital intelligence & demand-side solutions • Asset-light
Highlighted Solutions	• Transmission • HVDC	• Grid-Forming Inverters (GFM) • Grid-Scale Battery Storage • Flexible AC Transmission Systems (FACTS) • Advanced Metering Infrastructure (AMI) • Digital Twins	• Load Shifting Technologies • Distributed Energy Resource Management Systems (DERMS) • Virtual Power Plants (VPPs) • Vehicle2Grid (V2G)
Time to Deploy	• 5-15+ years	• 1-4+ years	• 1-2+ years
Investment Opportunity[2]	• Estimated $200B+/yr from 2030-2035	• Estimated $200B-$400B+/yr from 2030-2035	• Estimated $50-$150B+/yr from 2030-2035[1] • Systems savings potential of $150B+ by 2035
Key Policy Levers	• Regional/interregional transmission planning • Permitting and interconnection queue reform	• Smart grid grants and incentive programs • Cap & floor and depreciation schemes	• Performance based regulation reform • DER aggregation reform, NWA incentives

[1] The capital profile indicated is relative (e.g., batteries vs. new transmission) and intended to reflect the grid capital investment e.g., V2G battery costs are substantial, but may not be borne by the grid
[2] Investment opportunity is global and based on projected investments for highlighted solutions as defined in each solution area, supplemented by World Energy Investment 2025-2026 reports aligned to STEPS 2030 and BNEF NZE and ETS scenarios. Grid expansion is driven significantly by net-new transmission; modernize & harden the core includes IEA's Power segment of battery storage; the optimize range includes grid orchestration software and a subset of end-use related charging infrastructure, with savings potential reflecting estimated grid value from demand flexibility.

Sources: Building the future transmission grid (IEA, 2025), World Energy Investment (IEA, 2026); World Energy Investment (IEA, 2025); Electricity 2026 (IEA, 2026); Energy storage enters the 100 gigawatt era (BNEF, 2026); Electric Vehicle Outlook (BNEF, 2026); The Value of Demand Flexibility (IEA, 2025). Building grids faster (Energy Transitions Commission, 2024); Electricity Grids and Secure Electricity Transitions (IEA, 2023).

Credit: Dominica Wambold, Ariela Farchi, and Gernot Wagner. Share with attribution: Wagner *et al.*, "Powering Grids".

Distributed Energy Resource Management Systems orchestrate millions of small assets into a single, dispatchable grid resource

1. **Distributed energy resources**
2. **Metering & telemetry**
3. **Forecasting**
4. **Optimization**
5. **Dispatch & control**
6. **Verify & settle**

How does DERMS for grid systems work?

1. Distributed energy resources (DERs), e.g. **rooftop solar, batteries, EVs and thermostats**, are **connected and registered to the platform**
2. Each asset **continuously reports its output, state of charge and availability**
3. The platform **forecasts load, solar and wind output, prices and grid constraints**
4. It **optimizes a dispatch** that respects **grid limits and market signals**
5. Setpoints go back to the assets: **charge, discharge, curtail or shift load**
6. Delivered response is **verified and participants are paid**, then the loop repeats

Why is it critical for the energy transition?

- **Unlocks flexibility** hidden in millions of behind-the-meter assets, turning **passive load** into a **controllable, grid-supporting resource**
- Lets the distribution grid **absorb far more rooftop solar and EVs without costly wire upgrades**, by actively managing local flows
- By **aggregating DERs into virtual power plants**, it provides **capacity and ancillary services** otherwise met by fossil peakers
- Shifts the grid from centralized, supply-following dispatch to a **distributed, demand-flexible system**

Advantages

- **Defers grid capex** - avoids new wires
- **Fast to deploy** - software-led
- **Unlocks DER value** - idle assets earn
- **Improves reliability** - local flexibility
- **Integrates renewables** - absorbs solar/wind swings

Disadvantages

- **Integration complexity** - many vendors & systems
- **Needs enrollment & rules** - opt-in, standards, FERC 2222
- **Cybersecurity** - millions of endpoints to secure

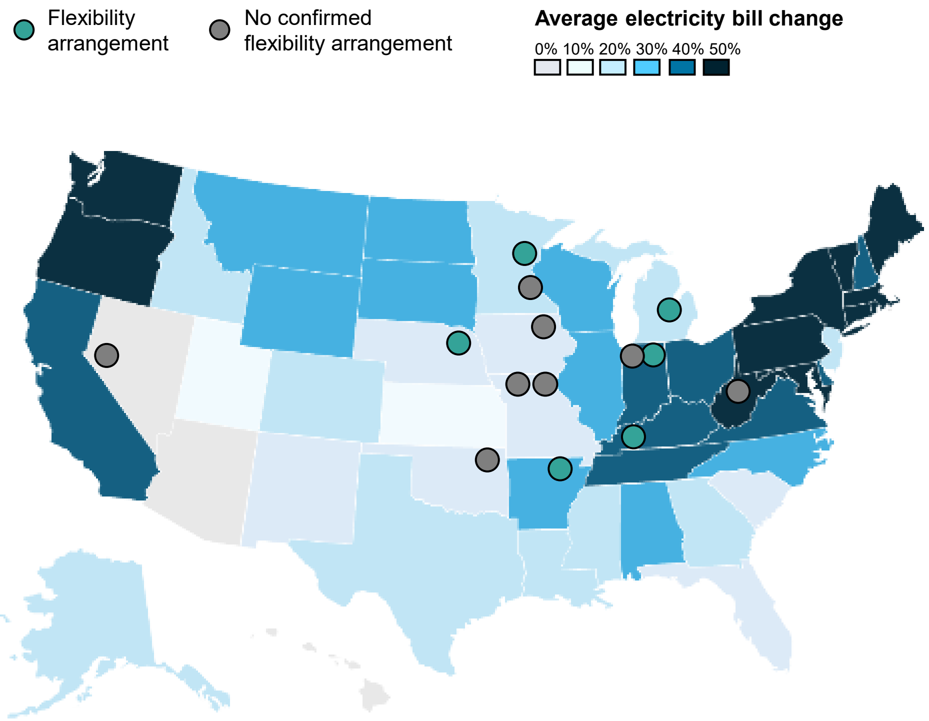
Source: Pathways to Commercial Liftoff: Virtual Power Plants, US DOE (2025); Order No. 2222 Explainer: DERs in Electricity Markets, FERC (2020); GridOS DERMS: Distributed Energy Resource Management System, GE Vernova (2025)

Credit: Sevgi Helin Tilkicioglu, Hasan Alawadhi, Pia Morrow, Vincent Sandow-Straesser and Gernot Wagner. Share with attribution: Wagner *et al.*, "Powering Grids".

Google is working with operators on a range of demand response efforts, seeking to unlock flexible capacity for datacenters

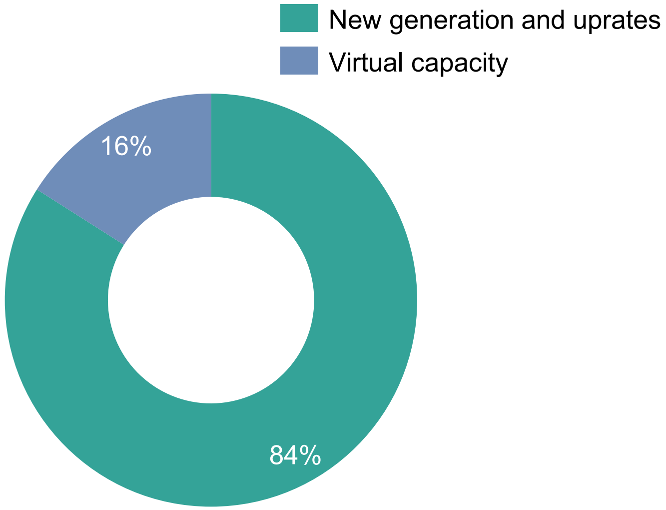
Demand flexibility is in place for DC compute in multiple jurisdictions

Google locations with flexible data center agreements



The Voltus-Google BYOC deal unlocks 100MW of nameplate capacity in PJM

Physical vs. virtual capacity cleared in '28-'29 auction, MW



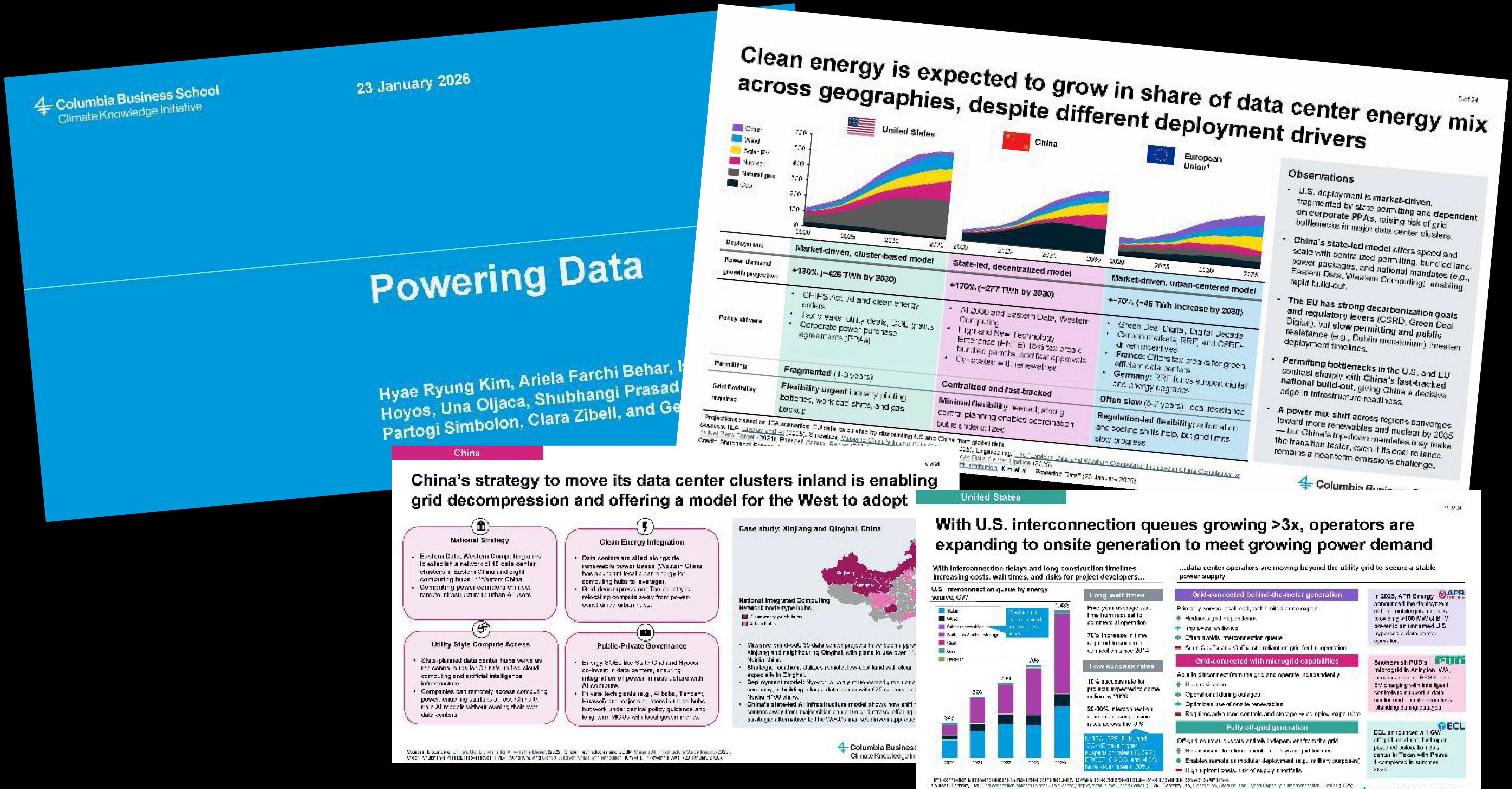
Deal Dynamics

- Google pays Voltus to aggregate 100MW annually of flexibility in a PPA-like structure (300MW in 3 years)
- Represented nearly 19% of all newly cleared capacity, yet reduced regional '28-'29 shortfall by only ~1.5%

Observations

- Data center investments can expedite the flexibility technology learning curve
- BYOC reflects one model for tech participation in grid investments, with Google's role that of a financier
- Effectively engineering DC flexibility commitments may deliver greater consumer benefits than BYOC alone
- Improving grid utilization through demand flexibility could deliver large consumer savings, as much as $110-170B in the U.S. over the next decade

Source: Large Load Customer Projects and Tariffs (2026, EEI); A new framework for DER value in the speed to power era (Brattle, 2026); How we're making data centers more flexible to benefit power grids (Google, 2025); Google and Voltus to deliver grid capacity and local economic benefits through bring your own capacity agreement (Voltus, 2026); PJM Capacity Auction Procures 138,318 MW of Generation Resources as Work Continues To Address Growing Electricity Demand (PJM, 2026).
Credit: Dominica Wambold, Christy Wong Ka Ying, Ariela Farchi, and Gernot Wagner. Share with attribution: Wagner *et al.*, "Powering Grids".



“[Powering Data](#)” (CKI, 23 January 2026)

9 June 2026

The AI Revolution Mirrors the Green Transition

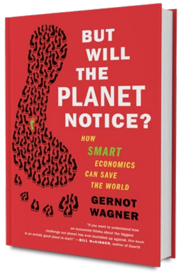
The need for massive upfront investments and the likelihood of significant job displacement imply remarkable parallels between the AI buildout and the green transition. In both cases, the state has an important role to play in guiding market forces on behalf of the public good.

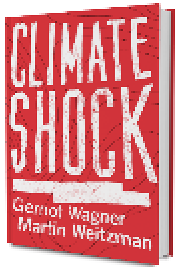
Climate tech | AI | Green Growth | Columns | Project Syndicate

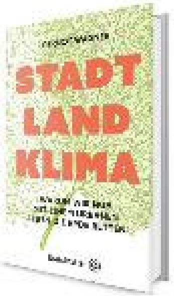
By Adam Michael Bauer and Gernot Wagner

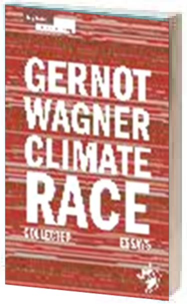
CHICAGO/NEW YORK—The AI race is already generating forces that are transforming the global economy. That makes it surprisingly similar to the green transition, given the potential of both to upend traditional industries, labor markets, and geopolitical balances. Both call for trillions of dollars in upfront investments in exchange for significant benefits over the medium and long term.

gwagner.com/ai-twin









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