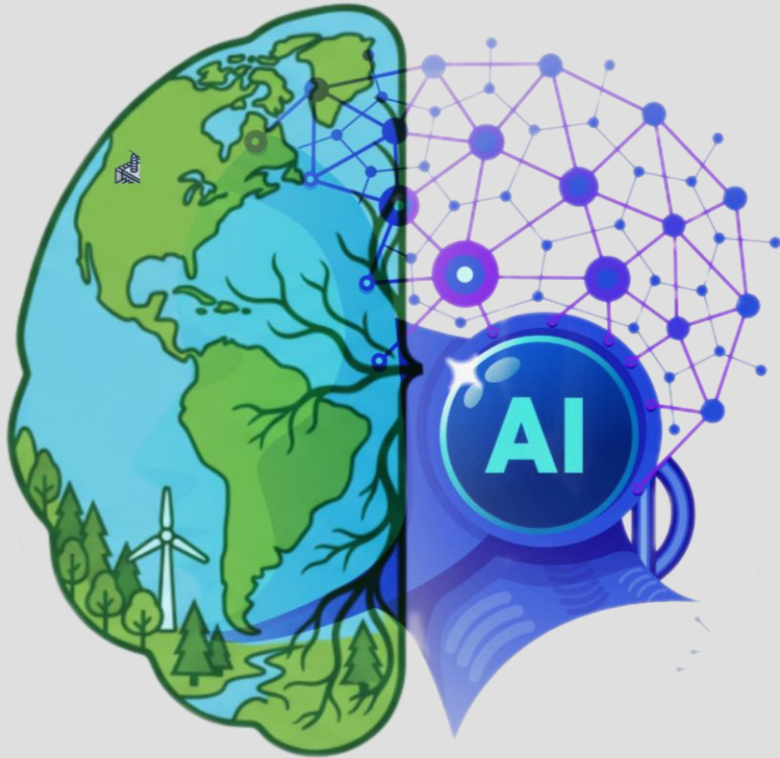




AI and the Atmosphere

Powering Progress Without Polluting the Future

Rosie Barnes Pardalote Consulting | Engineering with Rosie

The story you've heard

"Energy, water use and pollution of AI rival most countries"

"We did the math on AI's energy footprint"

"ChatGPT uses a bottle of water per email"

"Data centre explosion could spark power price hikes"



My audience agrees

Everything useful has a footprint. The Internet. YouTube. This conference.

The real question: is the value worth the resources?

@hughhigley6188 3 months ago

Terrible use of AI imagery.
At 13 seconds the Grandfather clock had both the weights and the pendulum swinging. Roman numerals are seldom represented upside down.
These anachronisms are jarring to your viewers.
It makes me not trust what I am seeing.

@eobanb 8 months ago

The AI slop graphics really detract from this otherwise solid channel. I'm afraid I'll be unsubscribing until this changes.

@bimblinghill 8 months ago

I always enjoy your videos, but please don't use AI-generated diagrams like at 9:50. It's a mess!

@okkomp 4 months ago

1:44 whats going on in this AI footage?

@roidroid 4 months ago

1:40 Not sure what we're looking at here, i suspect it's AI generated fictional slop 🤖.

@CuthbertNibbles last week

9:47 "Air Filter" pointing at the air-tight substrate. AI slop in engineering stands out even more obviously than reporters who don't know the difference between energy and power, and yet, it is still creeping in everywhere.

@TheGeoffable 7 months ago

The AI image of the student holding a gravity defying test tube which has apparently been filed by through-glass diffusion massively detracts from your obvious credibility. Please don't use AI images.

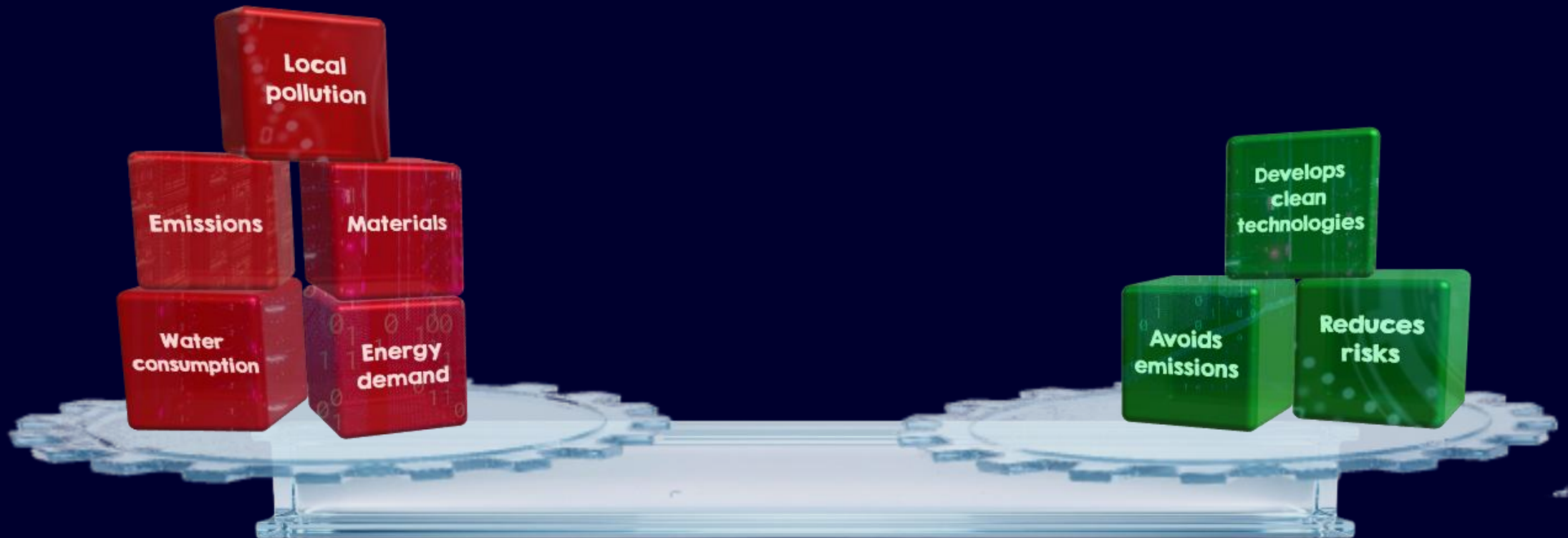
@teresashinkansen9402 8 months ago

Sad to see AI imagery permeating everywhere. Once you lose your job to AI remember you contributed to your own demise.

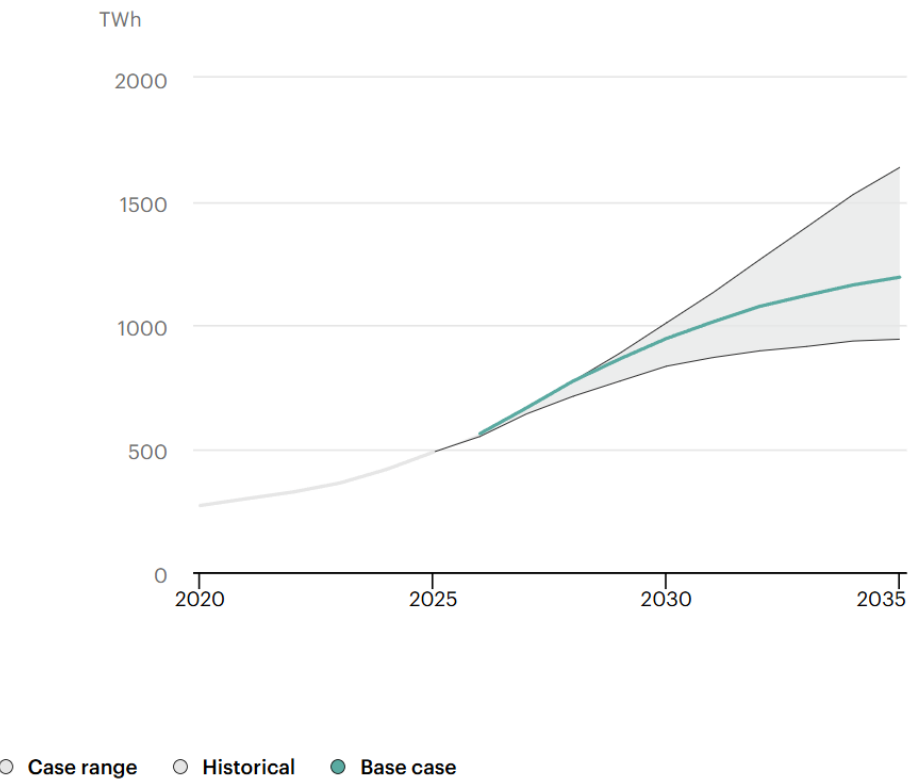
@ashnur 8 months ago

The AI writing creeps into my favorite youtube channels' scripts?

The impact balance



Electricity consumption by data centres, 2020-2035



(IEA, 2024)

How big is it really?

Current Scale

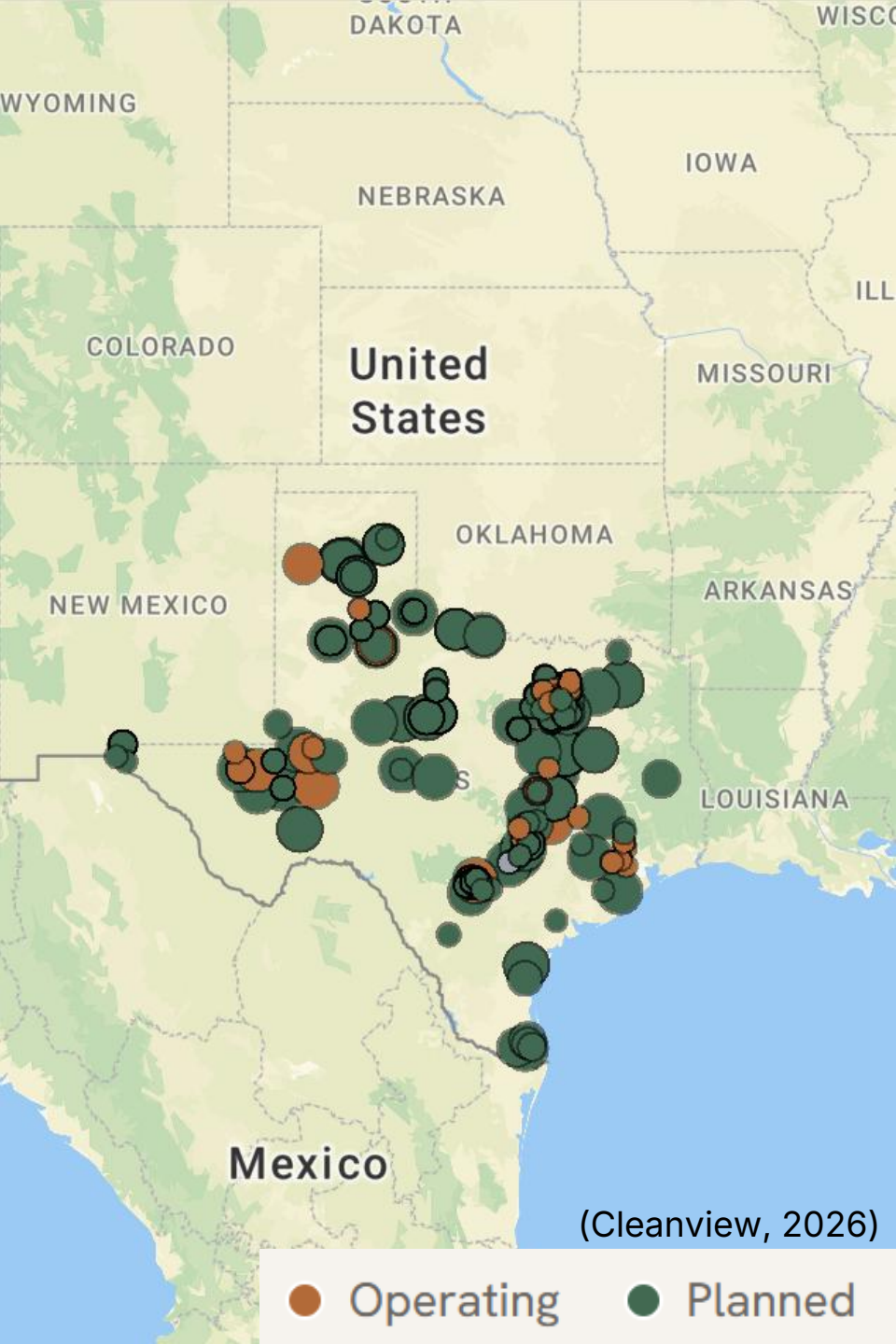
Data centres: ~1.5% of world electricity

AI's share: ~0.5% (the rest of the Internet uses 2x that)

Growth Trajectory

460 TWh (2024) → 1,000+ TWh (2030) (IEA)

Still only ~1/10 of global demand growth. EVs, air conditioning and industry are all growing too.



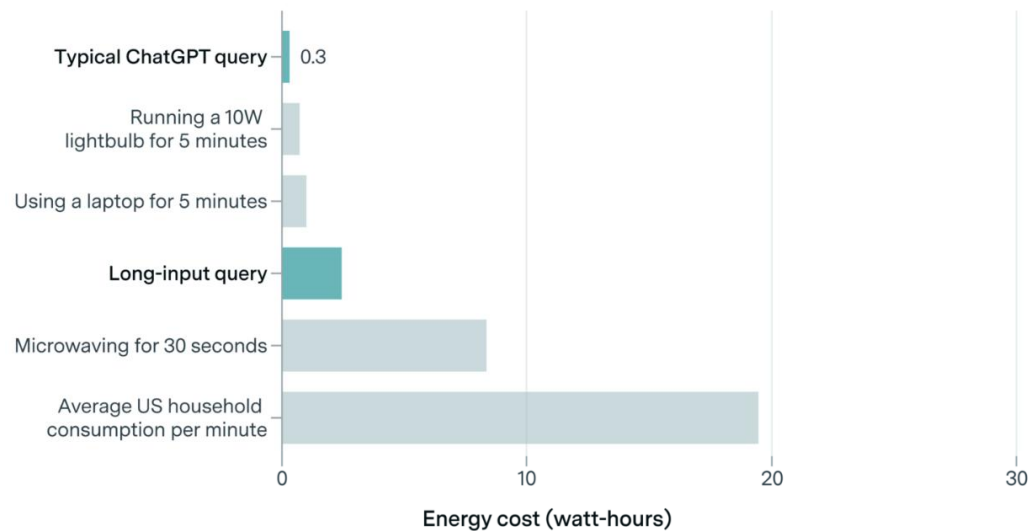
Pipeline $\neq$ buildout

A connection request measures interest, not commitment.
Developers apply at several sites, build at one.

Generation projects that entered US grid queues 2000-2018:
only 19% were ever built (14% of the megawatts).

Announced $\neq$ built. But even a fraction is a lot.

Energy consumption per ChatGPT query is small compared to everyday electricity use



(Epoch.ai, 2026)

Your queries are not the problem

One chatbot question $\approx$ a few watt-hours $\approx$ seconds of a boiling kettle

Individual abstinence is not where the leverage is.

Concentration is the issue

Ireland

>20% of national electricity

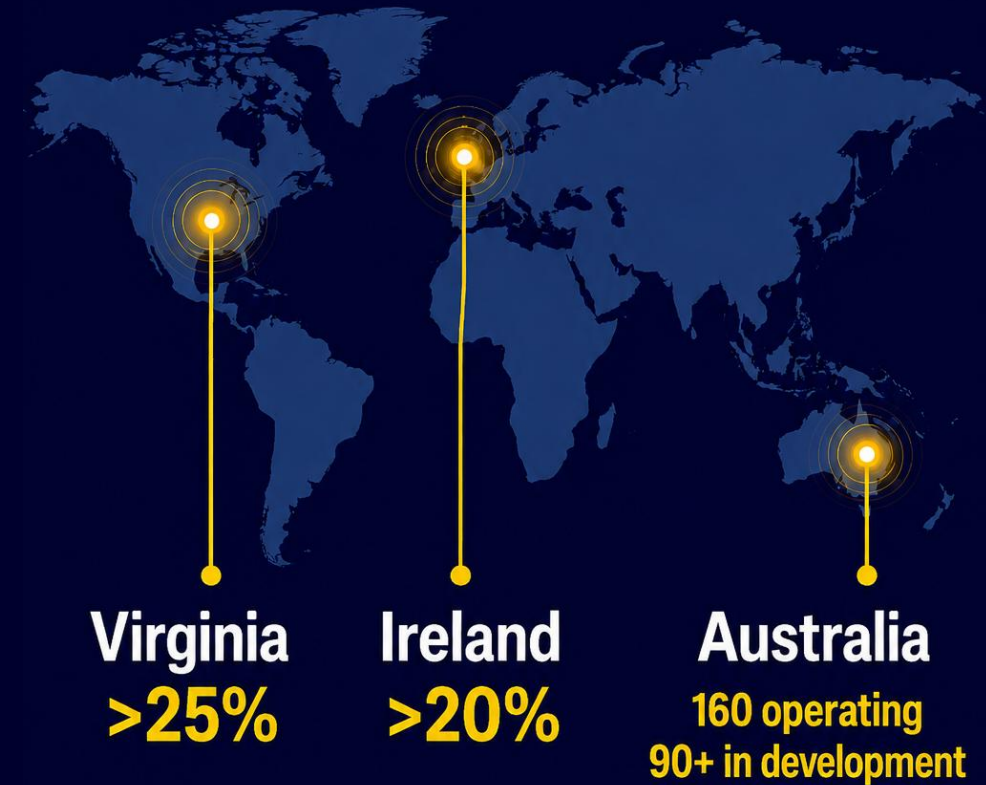
Virginia

>25% of state demand

Australia

~160 data centres operating, 90+ in development

Grids feel data centres locally and suddenly, not globally and gradually.

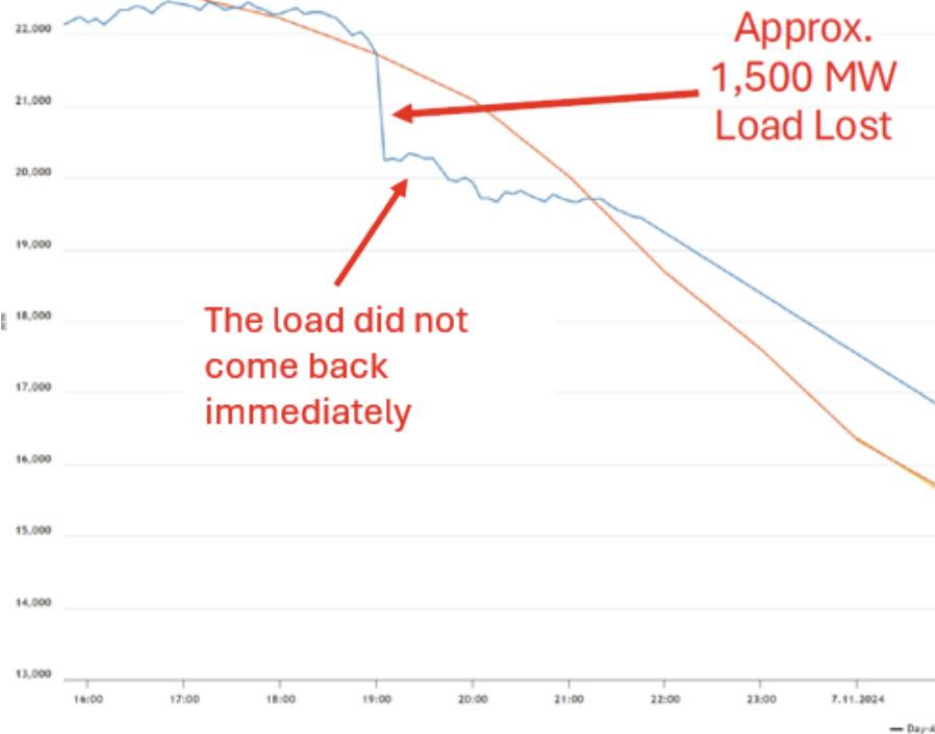


HARM 1: A new kind of grid problem

A Virginia event: 1,500 MW of data centre demand vanished in under a second from 70 data centers.

2025: multiple events over 100 MW. Two over 1,000 MW.

Grids were built for demand that changes gradually. AI demand can swing in seconds.



(NERC, 2025)



Scenario 1
No mitigation



Scenario 2
Additional renewables



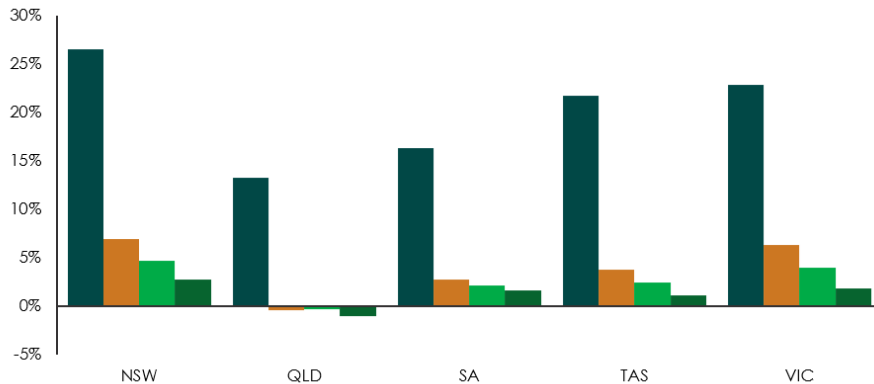
Scenario 3
Additional 3.2 GW
renewables & 0.95 GW
storage



Scenario 4
Additional 3.2 GW
renewables & 1.9 GW
storage

Average load-weighted prices in 2035

Change relative to baseline



CEFC, (2025)

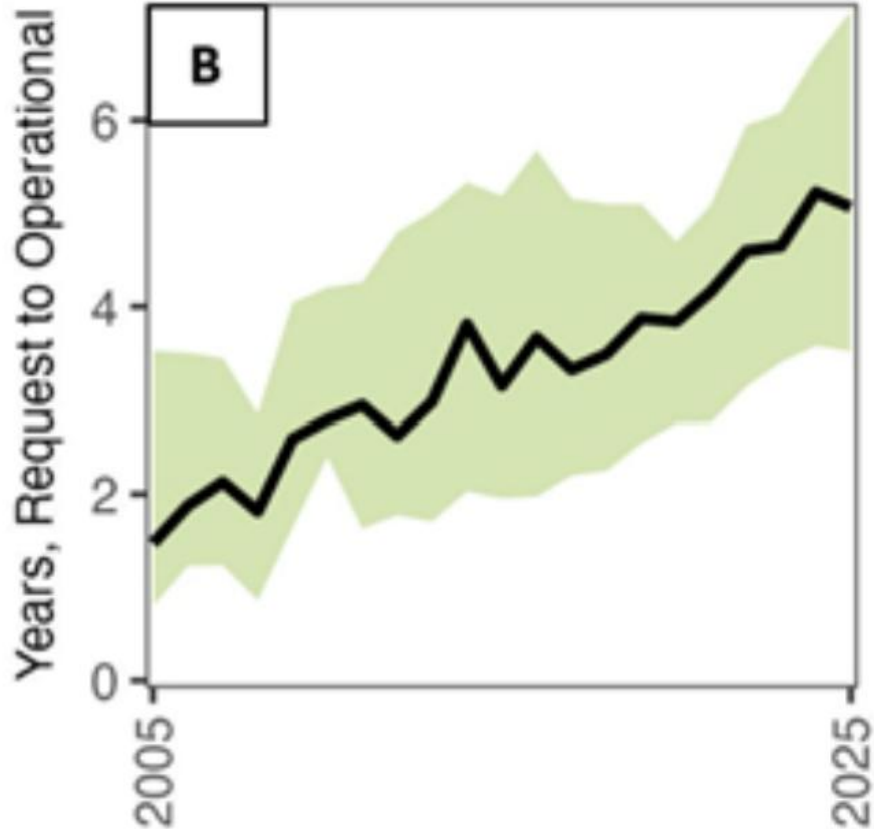
HARM 2: Who pays?

Australian worst case: household bills up to 26% higher, IF new demand is met by gas and extended coal.

"Data centres raised prices 267%" = wholesale capacity prices, not your bill.

Who pays for new substations and lines? Depends where you live.

Same demand, different supply choices: very different bills.



Berkeley Lab, (2026)

HARM 3: Who waits?

Grid access is a finite resource.

Data centres compete for the same substations, lines and engineers as:

- EV charging networks
- industry electrification
- swapping from gas to electric heating
- etc

One large connection can push everything else down the queue.

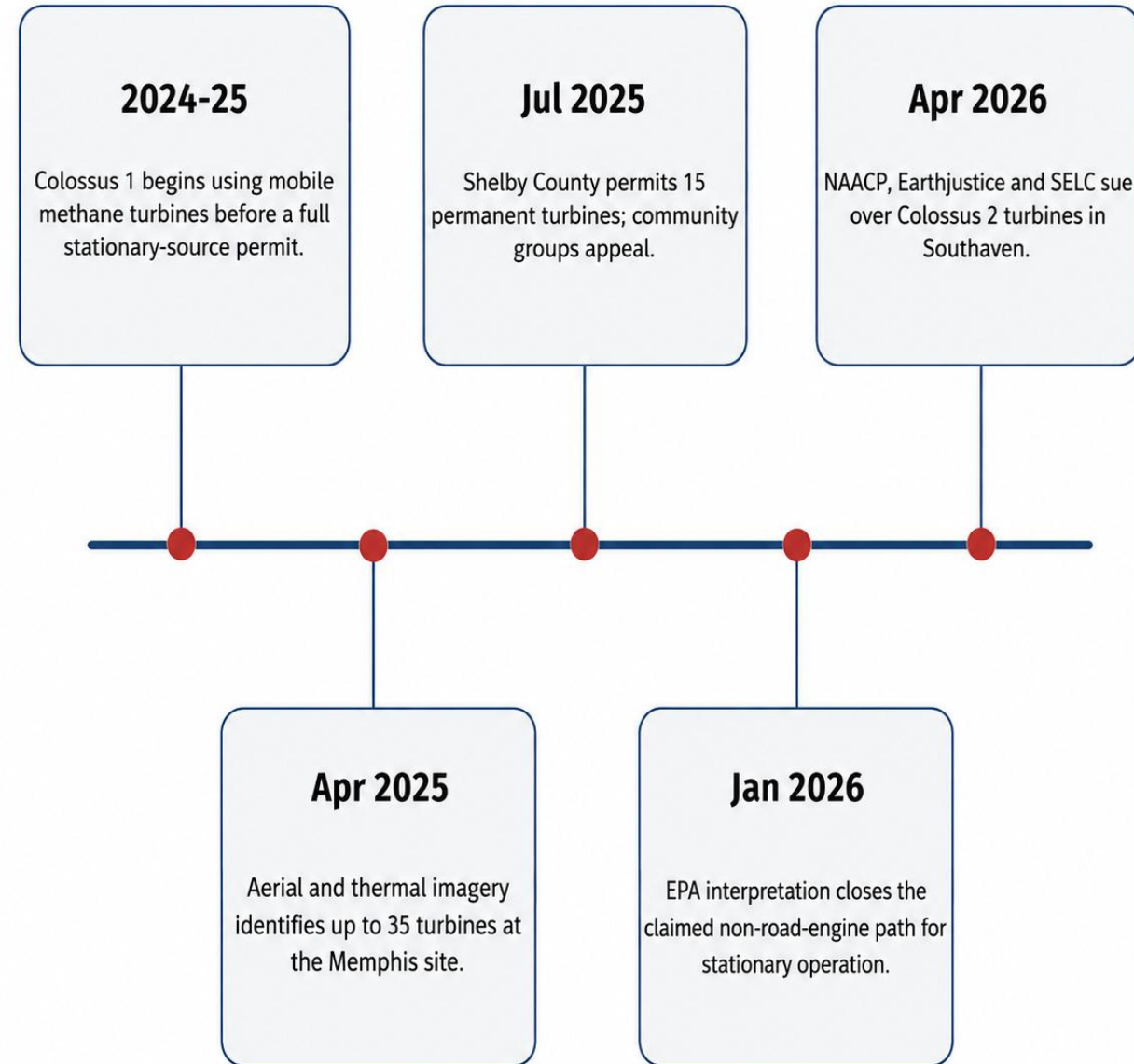
HARM 4: Memphis

2024: xAI installs mobile gas turbines as "temporary" non-road engines. No permits. No public review.

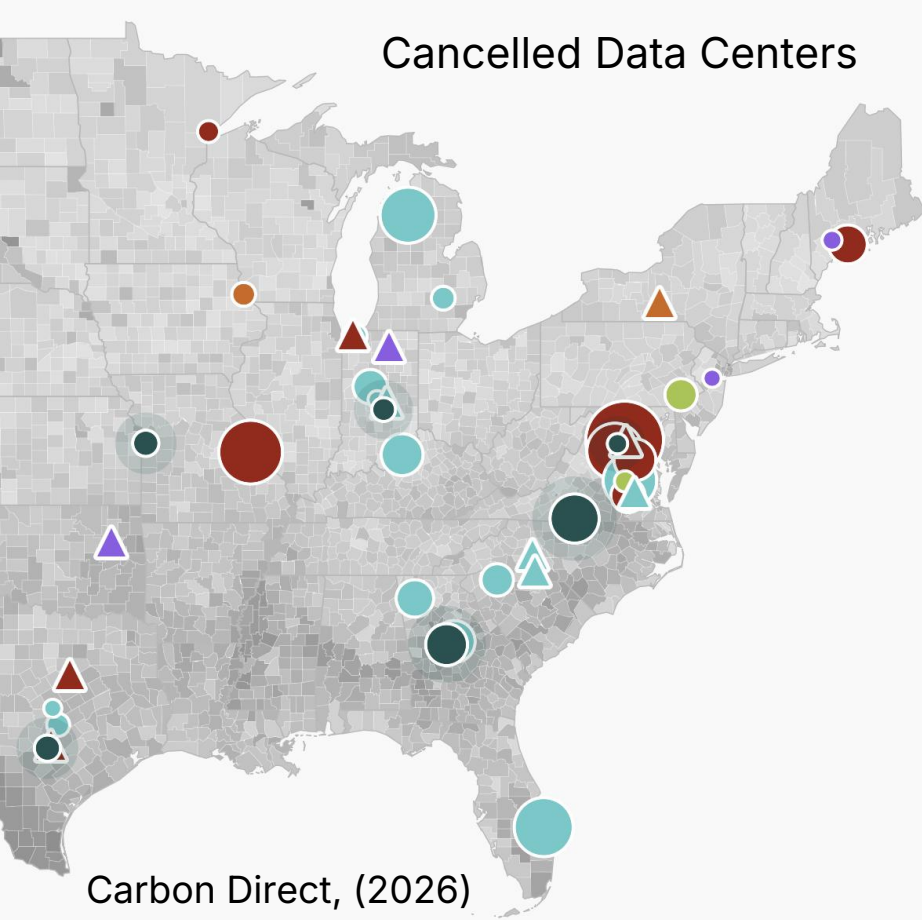
Aerial imagery: up to 35 turbines.
Disclosed: 15.

Second, larger fleet across the state line.

Jan 2026: US EPA closes the loophole.



Cancelled Data Centers



Carbon Direct, (2026)

@jsbrads1 8 months ago

Why can't an AI company buy power from the grid just like anyone else?

@bibihunden 2 months ago

If we didn't have to spend so much energy collecting all our data and handing over our privacy to AI centers, we could save a lot of these cables. We are blindly chasing after limiting our CO₂ emissions from fossil fuels while we are in the process of creating the biggest environmental disaster with "green ...

[Read more](#)

@Alastair510 8 months ago

Have you factored in the increased demands from AI datacentres?



Ae @aenorist2431 2 years ago

@EngineeringwithRosie The correct answer would be "we are not, shut 95% of AI down like the useless garbage it is"



HARM 5: Communities concerns

Since Jan 2024: US\$170+ billion of US projects blocked, withdrawn or stalled.

Opposition groups: 396 → 833 in one year.

The concerns: noise, water, land, power bills. Some real, some overstated. All of them count.

The other side of the balance

Six examples:

Smoke	Contrails
The grid	Minerals
Ships	Planes

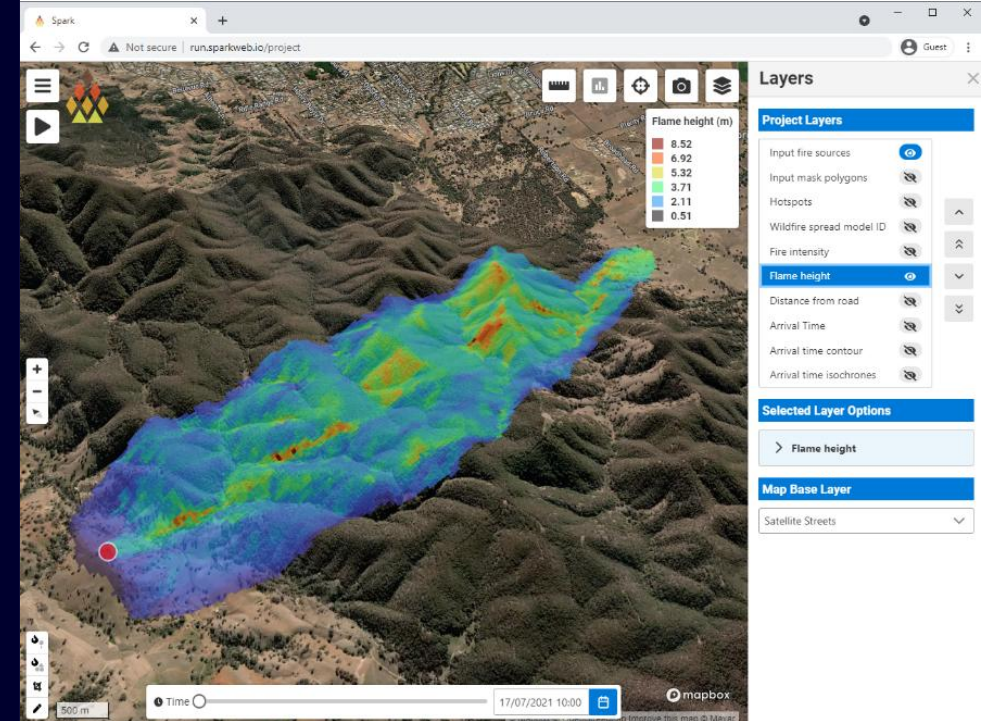
HELP 1: Seeing the smoke coming

Black Summer: ~715 Mt CO₂ released in just 3 months — more than Australia's annual human-caused CO₂ emissions

Black Summer: 33 deaths from fire. 400+ from smoke.

CSIRO's Spark: hours of fire spread simulated in seconds.

Faster prediction = earlier warnings, better smoke-day guidance.

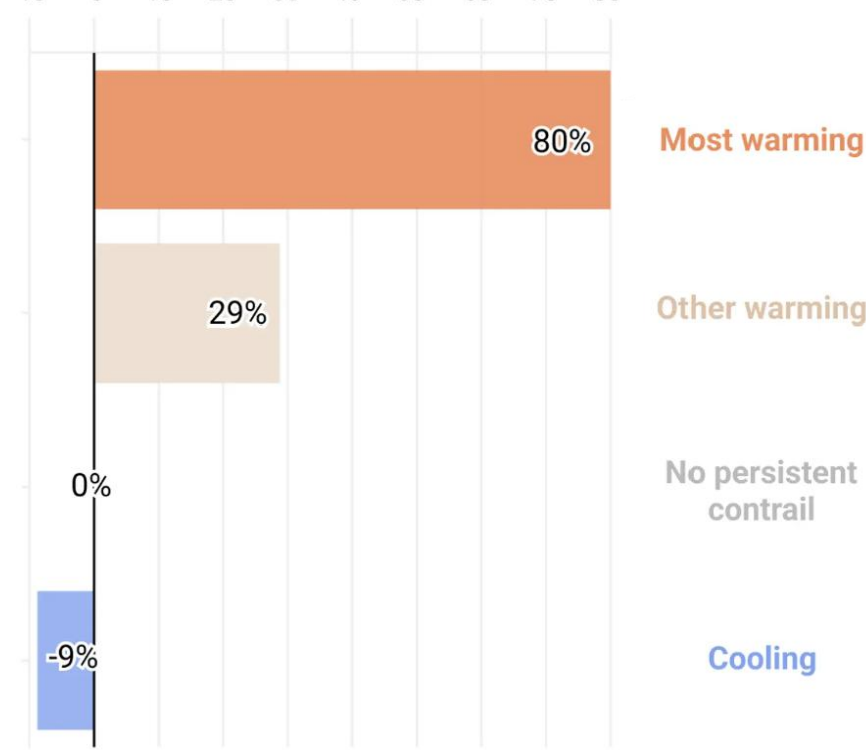


(CSIRO, 2022)

Contrail warming (%)

Cooling ↔ More warming

-10 0 10 20 30 40 50 60 70 80



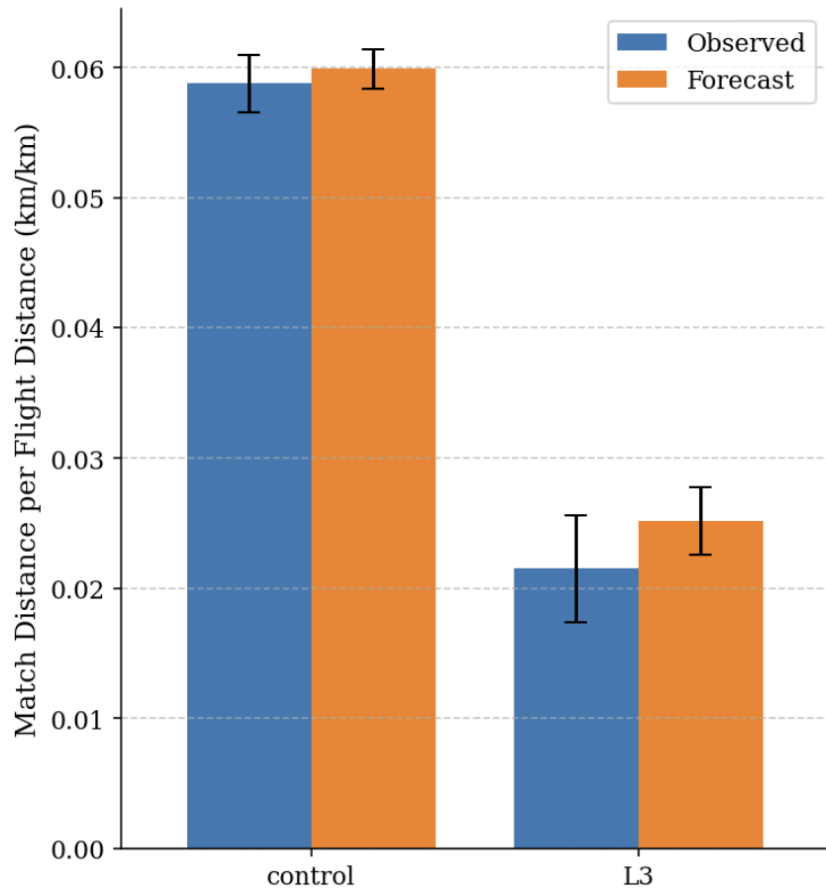
(Transport & Environment, 2024)

HELP 2: Contrails. A huge, concentrated problem

Contrail warming contributes more than 50% of ALL of aviation's global warming effects.

~3% of flights cause ~80% of it.

Find those flights, shift altitude slightly, skip the warming.



L3 - Flights that were released as contrail-optimized plans and flown as planned

(Transport & Environment, 2024)

HELP 2: Contrails trials

2023: 70 flights → 54% fewer contrails

2025: 2,400 transatlantic flights, forecasts in standard flight planning. 1,200 offered new routes. 112 flew them. Those 112: 62% fewer contrails.

Extra fuel: ~0.3% fleetwide. Benefit ≈ 20x the cost.

The AI is in the weather model, not the cockpit.

HELP 3: The grid problem becomes the grid asset

Not all computing is urgent.

Chatbots and safety systems: protected.

Training, batch jobs, backups: can wait hours.

Software orchestrates it like air traffic control: the grid asks, flexible workloads step aside, critical work never stops.



HELP 3: It's already been demonstrated

Phoenix

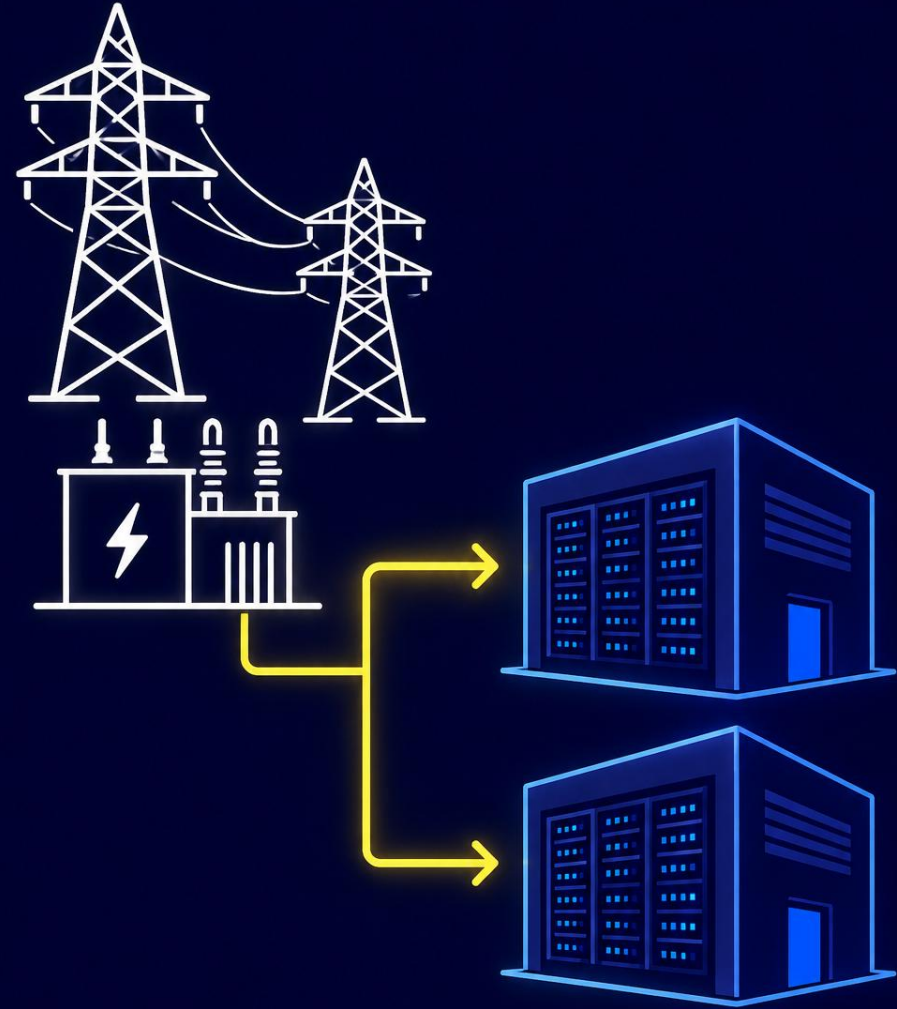
Live AI cluster cut power 25% for 3 hours during a real peak. Every job met its deadline.

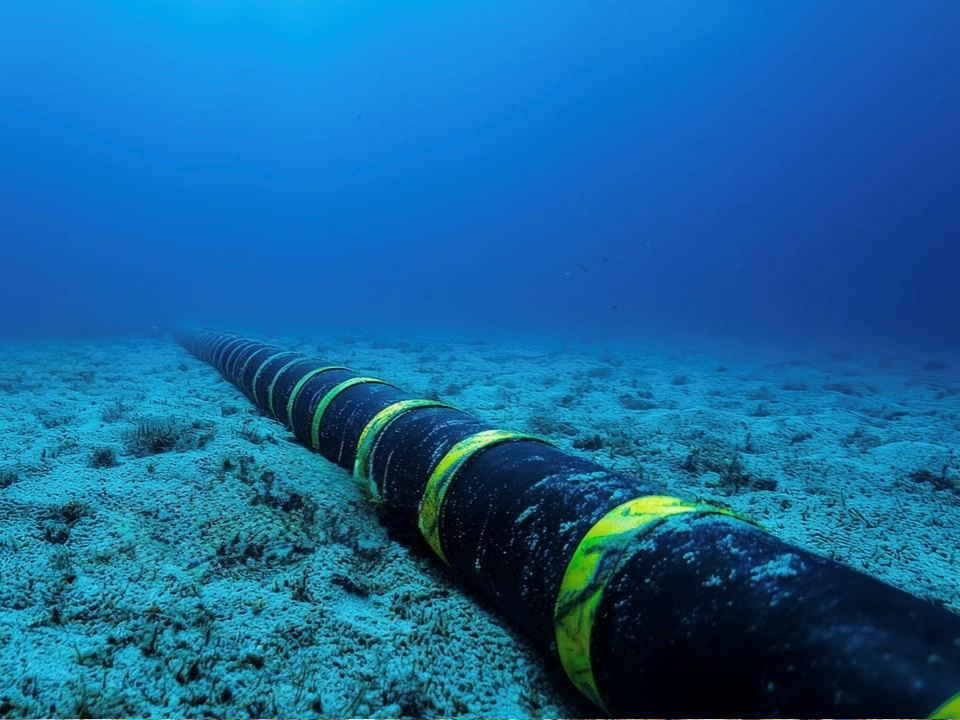
UK

1/3 of load shed in under a minute.

Duke University

Flex just 22 hours a year → the existing US grid could host ~76 GW of new data centres. Roughly this decade's growth.





HELP 4: Finding the transition's materials

The transition runs on copper, lithium, nickel, cobalt. Discovery rates have fallen for decades.

KoBold Metals: AI picks the most informative next drill hole.

Fleet Space (Australia): AI + ambient noise tomography. A copper prospectivity model for Australia.

Fewer dry holes. Faster finds.



HELP 5, 6, 7: Percentage points everywhere

Ships: arrive just-in-time instead of idling at anchor. 6.5-7.5% fuel saved in trials.

Qantas AI flight planning: ~2% fuel across the fleet.

Lighter AI-designed parts: 20 aircraft parts become 1.

Small percentages x enormous systems = big numbers.



Meanwhile, on the other side...

Oil and gas is already using AI. Aggressively.

- Seismic interpretation
- Reservoir modelling
- Predictive maintenance

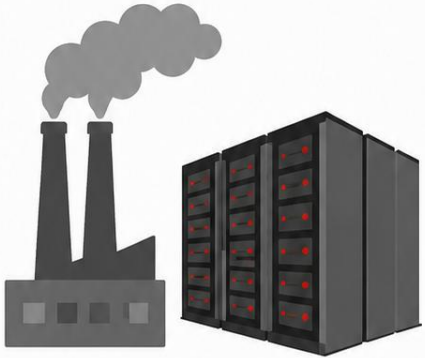
Nobody there is debating whether it's ethical to use.

AI has no climate values. It amplifies the goals of whoever wields it.



BAD OUTCOME

**DIRTY POWER
+ RIGID DEMAND**



HIGHER PRICES



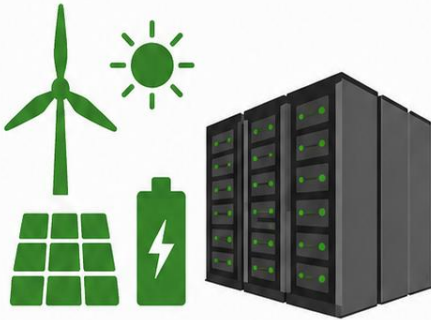
HIGHER EMISSIONS



MORE GRID STRESS

GOOD OUTCOME

**CLEAN POWER
+ FLEXIBLE DEMAND**



LOWER PRICES



LOWER EMISSIONS



LESS GRID STRESS

What tips the balance

1 What powers it

Gas + extended coal → the 26% scenario

Matched new renewables → the boom funds the transition

2 How it behaves

Memphis vs flexible, engaged operators

Same chips. Same racks. Opposite outcome.



The lesson wind learned the hard way

Social licence is an engineering constraint. Design for it from day one.

What good looks like:

- Engage before announcing
- Design noise out at the source
- Plantings, biodiversity, shared land use
- Share the benefit: one London scheme heats 25,000 homes with waste heat

An unpopular opinion

Questions?

Rosie Barnes Pardalote Consulting | Engineering with Rosie

Good afternoon,
CASANZ

How can I help you today?



ChatGPT >



What can I help with CASANZ?

Ask anything



GPT-5 ▾

