



Energy and Artificial Intelligence

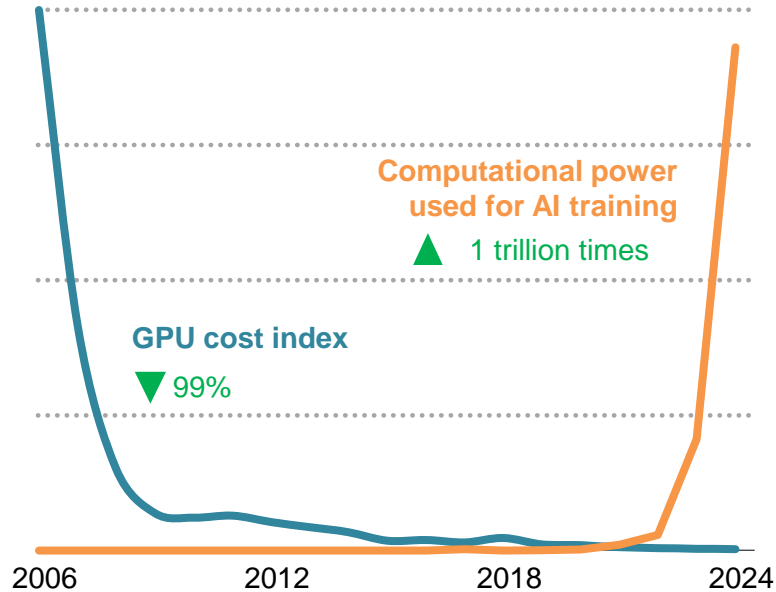
Thomas Spencer and Siddharth Singh

19 May 2025

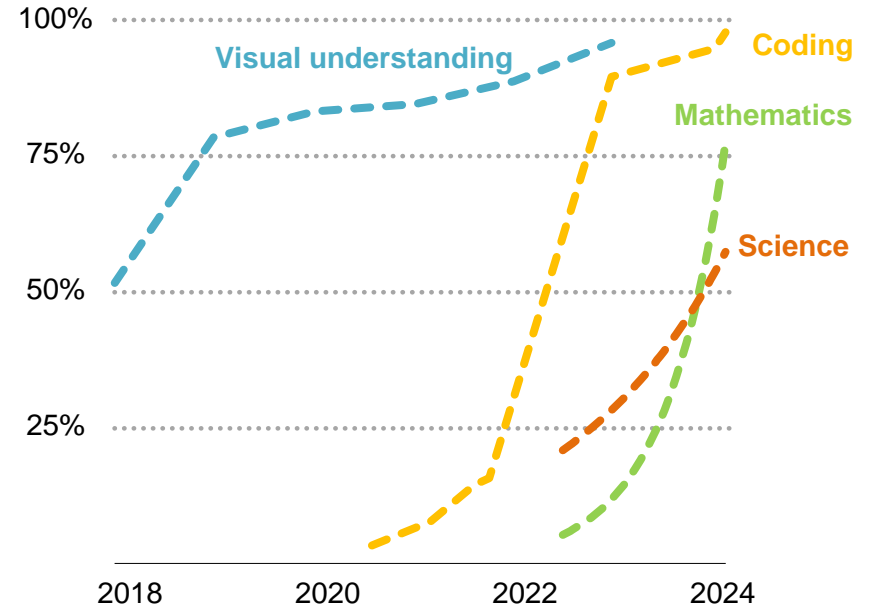
IEEJ

The rise of artificial intelligence

Graphics processing unit (GPU) cost index and AI model training size index



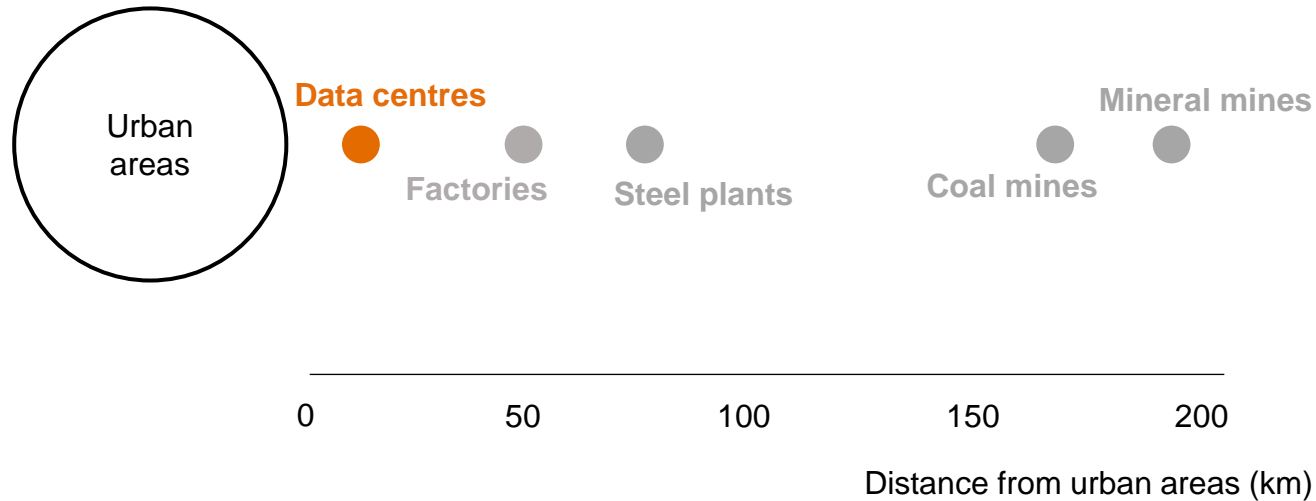
AI model performance on select benchmarks



Cheap and abundant computing, more data, and technical breakthroughs have ushered in a new age of AI. This has led to a sharp improvement in capabilities, which in turn has fuelled market cap growth for AI companies.

Data centres cluster together

Proximity of selected infrastructure to urban areas



Data centres are both power intensive and tend to cluster together, creating challenges for local grids.

Data centres cluster together

Proximity of selected energy consumers to urban areas and spatial concentration



Data centres are both power intensive and tend to cluster together, creating challenges for local grids.

Data centres cluster around each other – and are growing in size

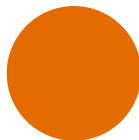
Household equivalents of data centre electricity consumption

Hyperscaler
today



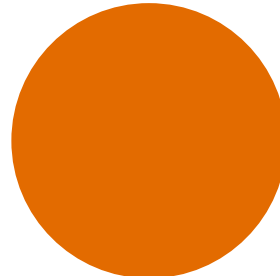
100 000
households

Largest under
construction



2 million
households

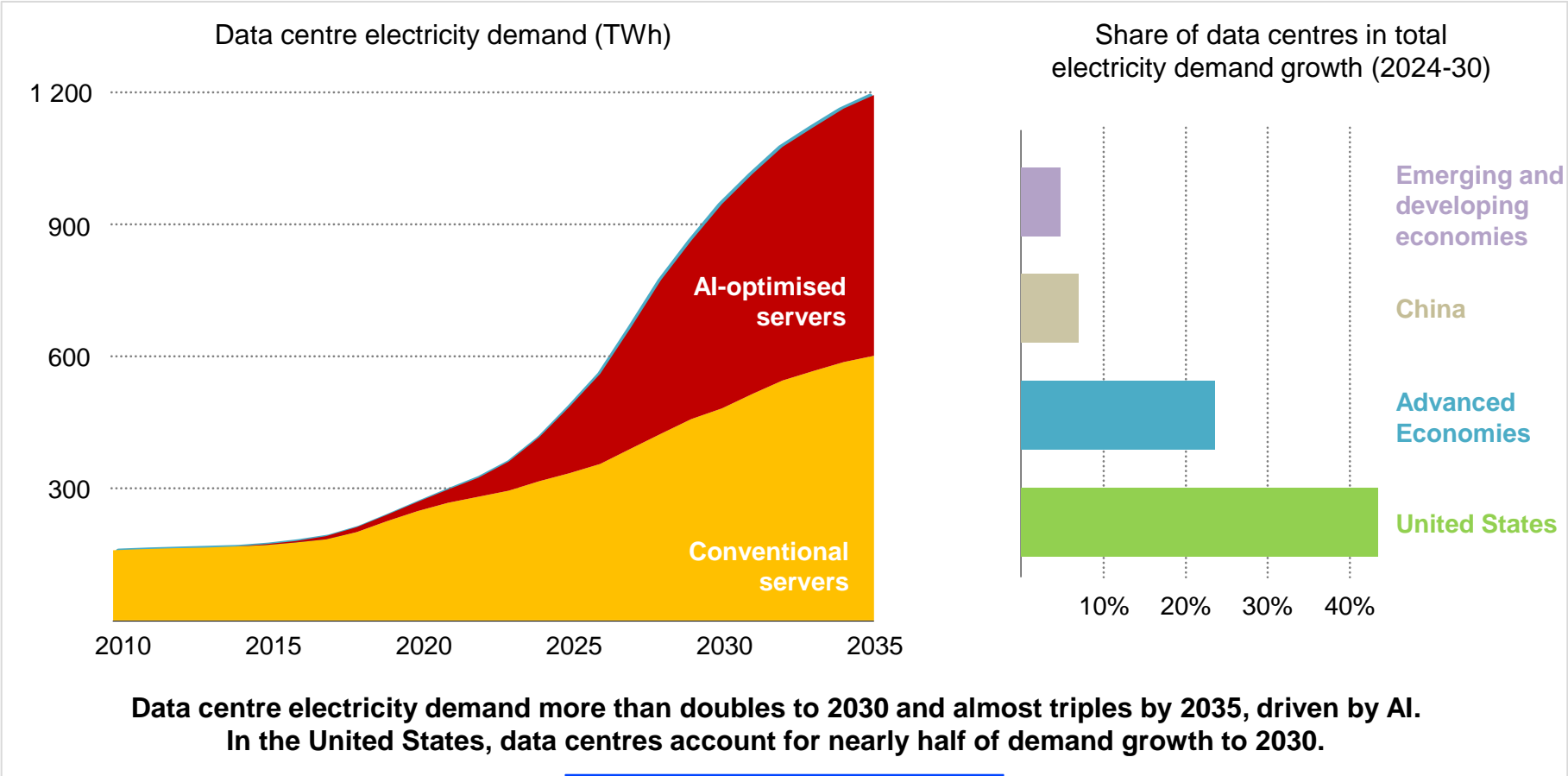
Largest
announced



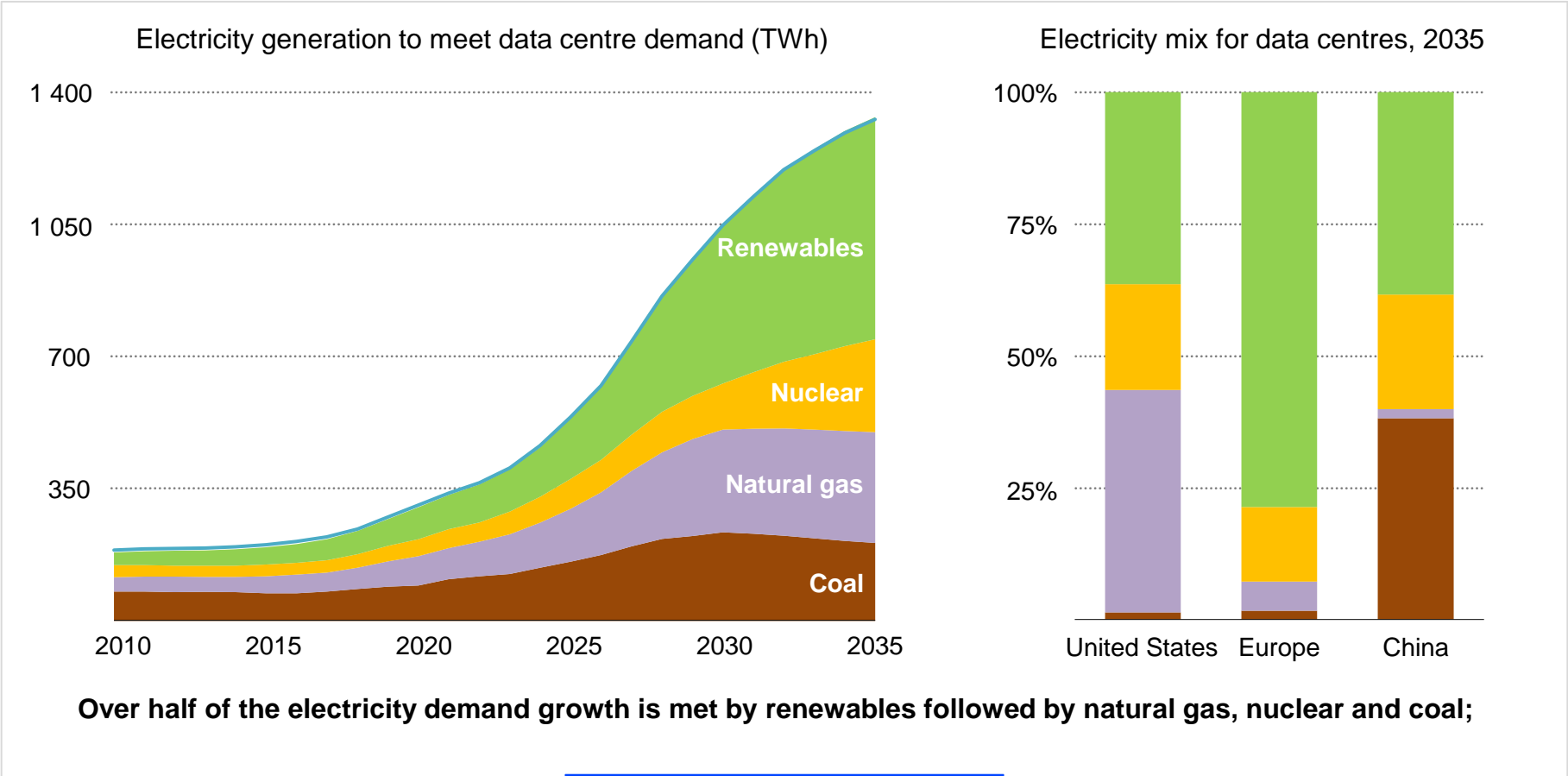
5 million
households

Data centres are both power intensive and tend to cluster together, creating challenges for local grids. They are also increasing in size, with the largest under construction 20 times larger than a typical hyperscaler today

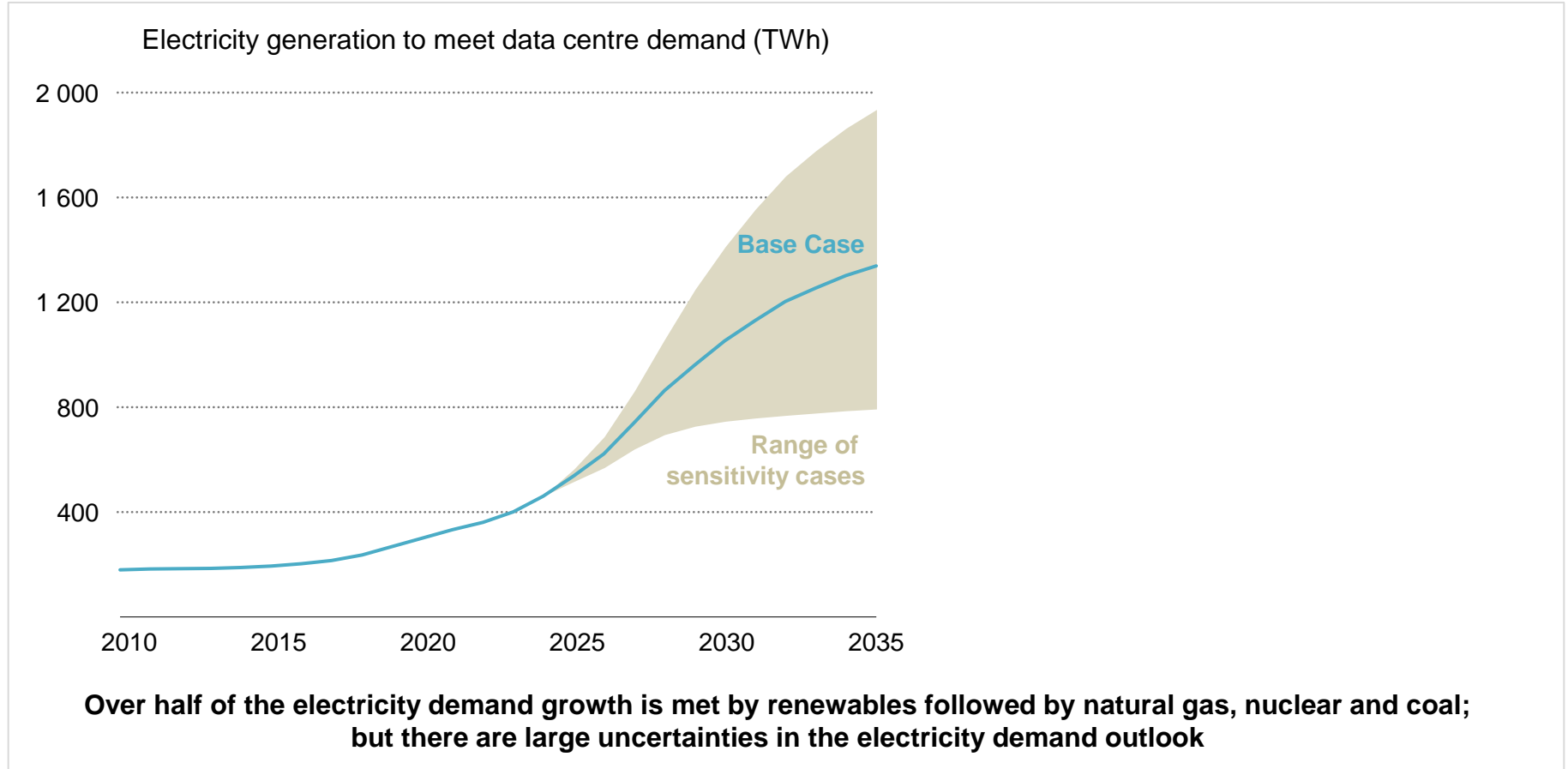
Data centre electricity demand surges



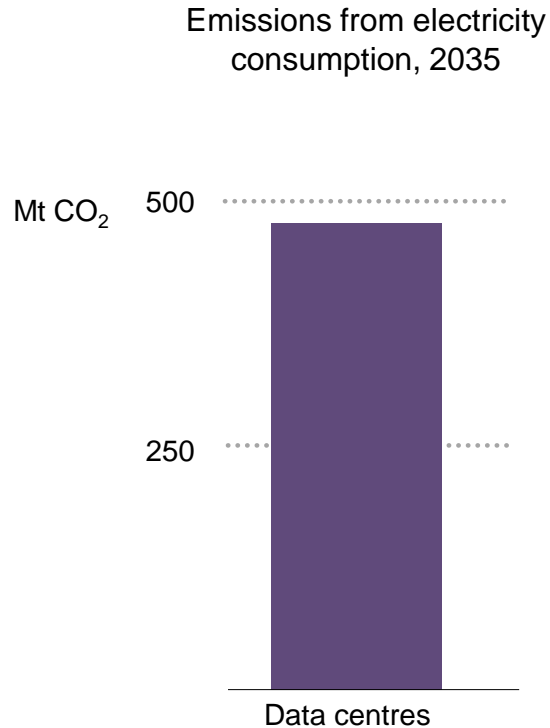
A diverse range of sources will be needed to meet demand



A diverse range of sources will be needed to meet demand

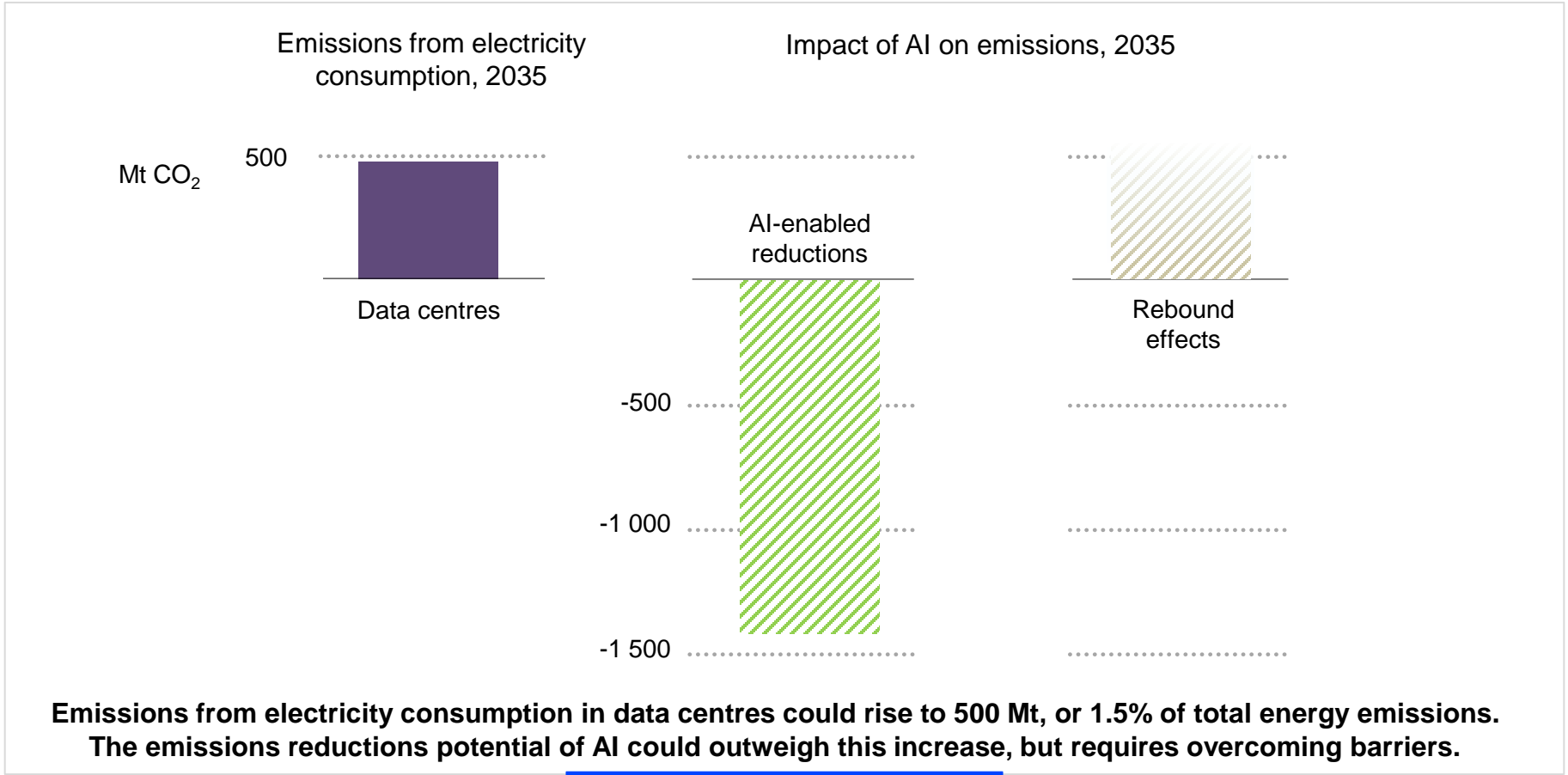


The impact on emissions depends on the uptake of AI in energy



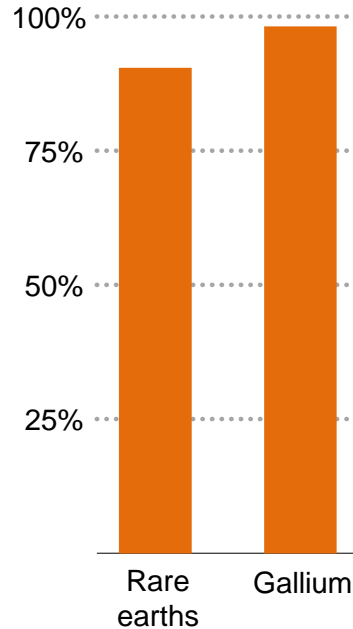
Emissions from electricity consumption in data centres could rise to 500 Mt, or 1.5% of total energy emissions.

The impact on emissions depends on the uptake of AI in energy

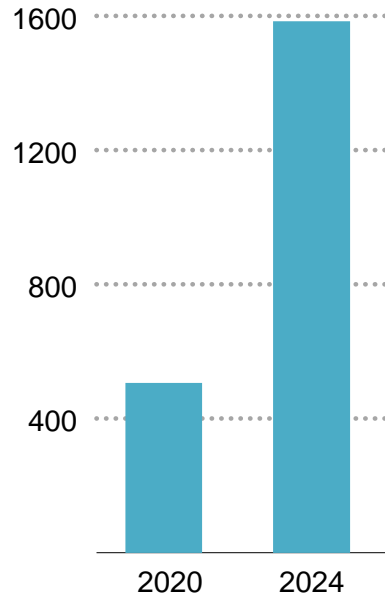


AI could sharpen some energy security concerns & help address others

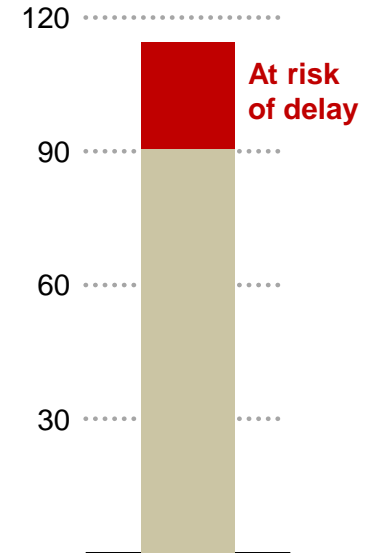
Share of largest country
in refined supply



Weekly cyberattacks
on energy utilities



Capacity additions of data centres
from 2025-30 (GW)



The rise of AI sharpens the focus on supply chain and cyber security, but AI can also address security concerns; unless the electricity sector steps up, around 20% of planned data centre capacity could be at risk of delays.

