The Impacts of Energy on AI

IENE Webinar on “AI & Energy Transition” - 20.05.2025

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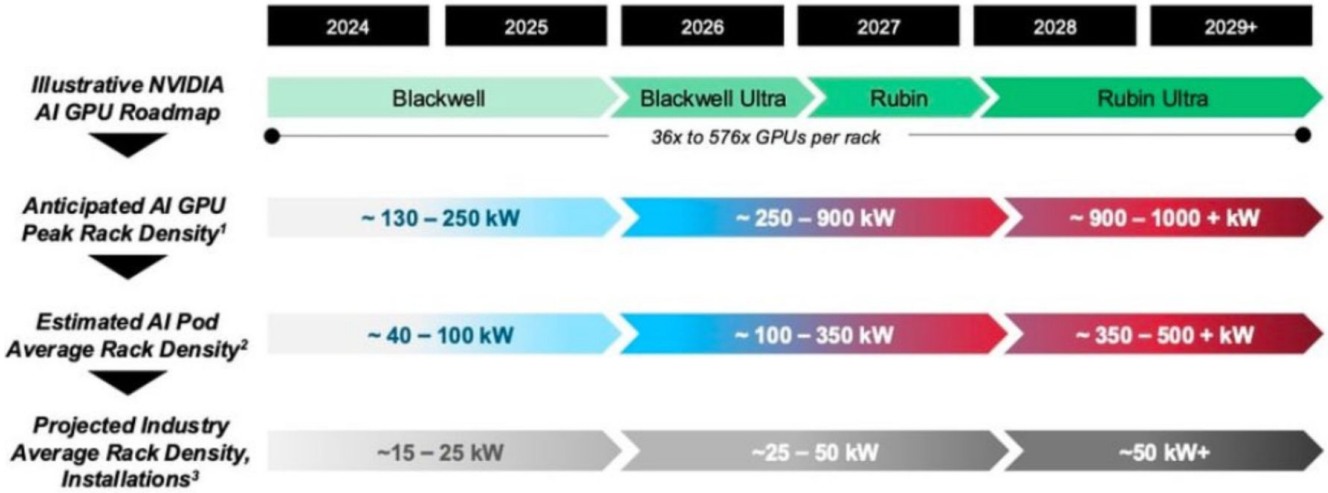
Source: https://www.technetbooks.com/2024/11/ai-server-rack-density-to-reach-1000-kw.html from Vertiv

Exponential AI Computer Power

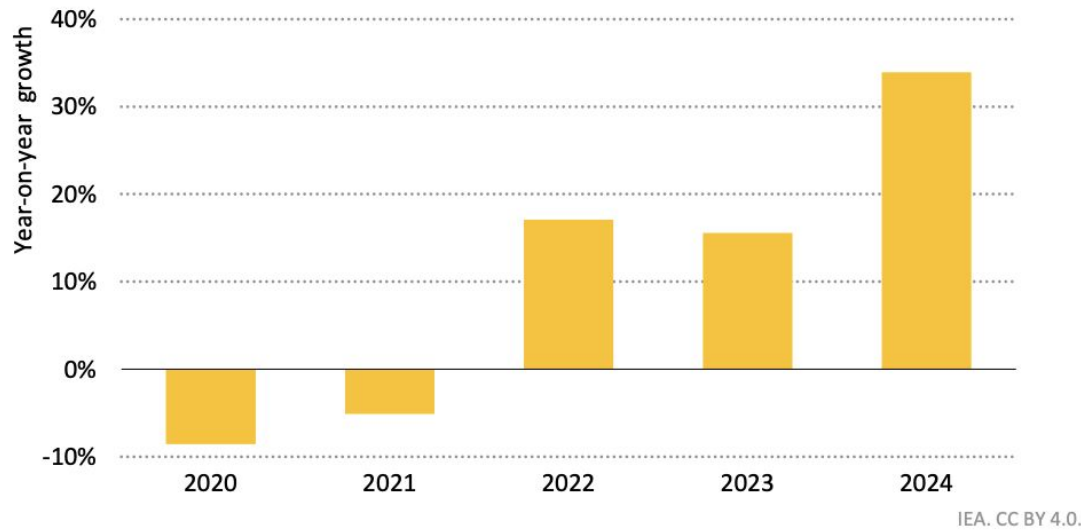


Average DC size of 50-100 MW with Gigafactories in development

Source: IEA “Energy and AI” Report, April 2025

Energy and Grid has Become the Biggest Bottleneck

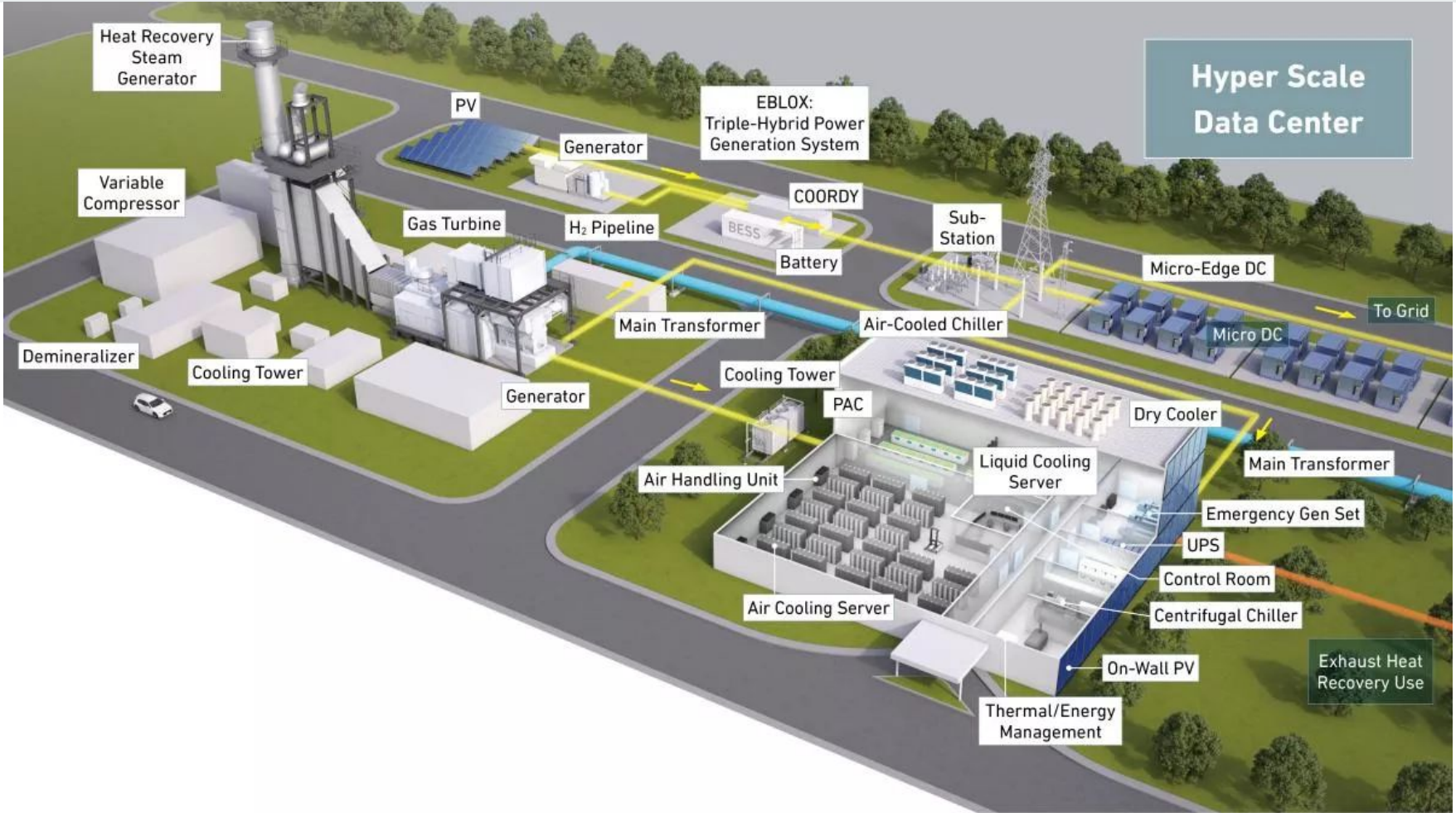
Figure 5.2 ▷ **Increase in power transformer order backlog in selected manufacturing companies, 2020-2024**



The backlog of power transformer orders has been increasing in recent years

Note: Based on order backlogs of Hitachi Energy, Schneider Electric, Siemens Energy, GE Vernova.

Source: https://www.mhi.com/products/infrastructure/data_center



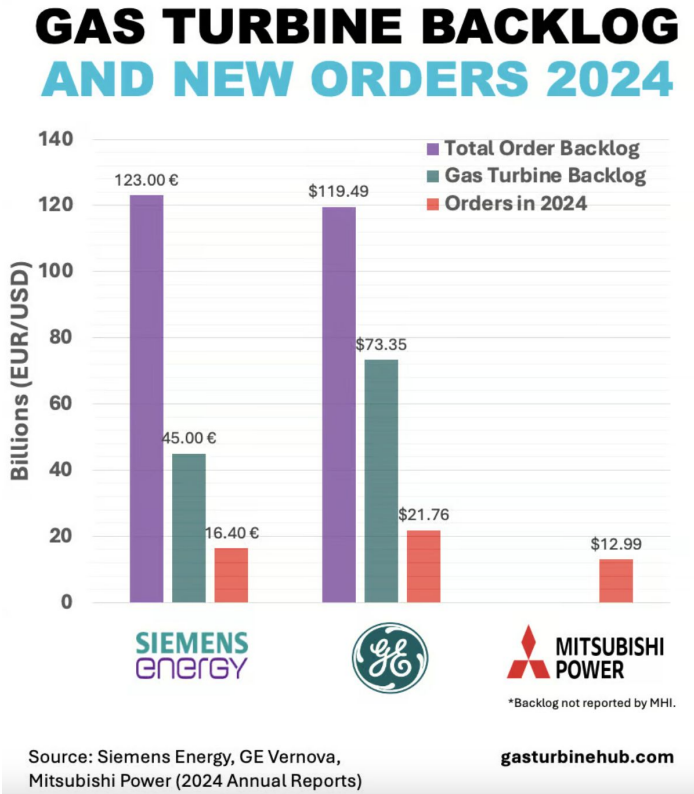
1. https://openai.com/index/announcing-the-stargate-project/
2. https://blogs.microsoft.com/on-the-issues/2025/01/03/the-golden-opportunity-for-american-ai/
3. https://www.datacenterdynamics.com/en/news/google-expects-2025-capex-to-surge-to-75bn-on-ai-data-center-buildout/

Substantial Capital Invested in Data Centers

- “The Stargate Project is a new company which intends to invest $500 billion over the next four years building new AI infrastructure.”
- “In FY 2025, Microsoft is on track to invest approximately $80 billion to build out AI-enabled datacenters.”
- “Google expects capital expenditure to hit $75 billion this year, with the majority going to data centers, servers, and networking.”

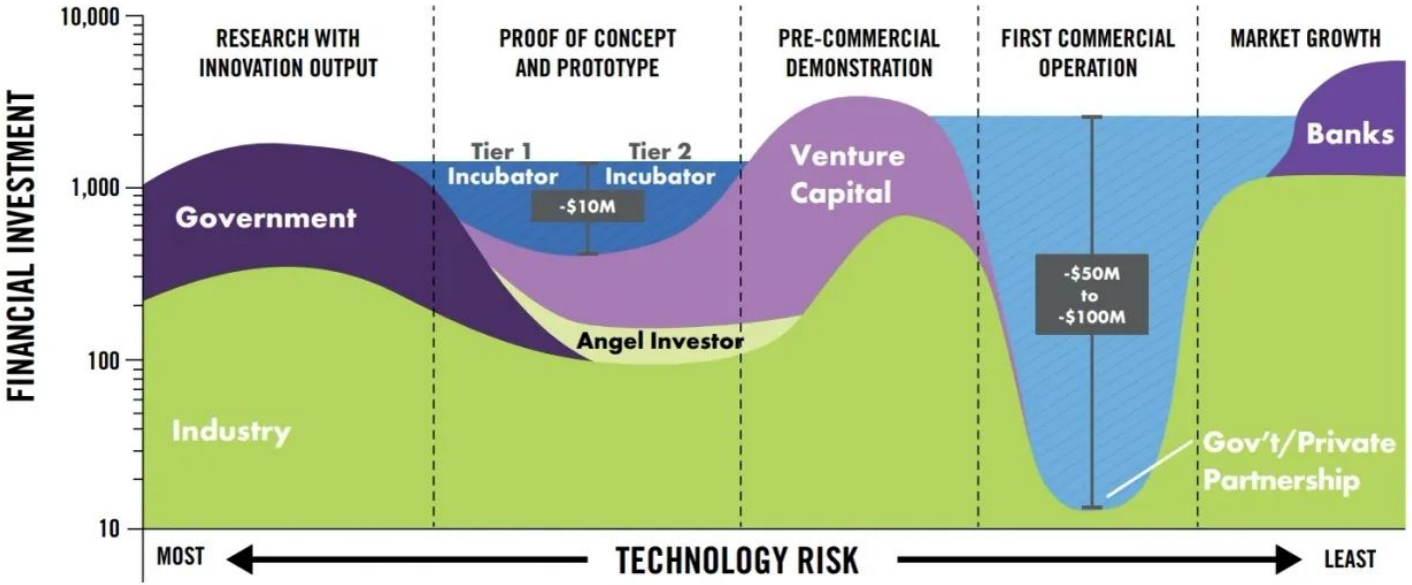
Where Will the Power Come From?

- Data Centers require 24/7 firm power.
- Behind the meter vs. Front of the meter?
- Grid connected or off-grid islands?
- PPAs, Clean Transition Tariffs, and other financing methods.
- CCGT backlog.
- Green premiums for new technologies?



https://mdeia.org/blog/f/two-more-valleys-of-death-for-hard-science-tech?blogcategory=News

Opportunity in the fray? Filling the Valley of Death



1. https://fervoenergy.com/fervo-energy-secures-additional-255-million-funding/
2. https://www.marketwatch.com/investing/stock/oklo
3. https://www.canarymedia.com/articles/long-duration-energy-storage/form-energy-raises-405m-for-its-100-hour-iron-air-batteries
4. https://www.reuters.com/business/energy/x-energy-raises-700-million-development-small-modular-reactors-2025-02-06/

Opportunity in the fray? Filling the Valley of Death

- Fervo Energy (Enhanced Geothermal Systems) raised $500M
- Oklo (Small Modular Reactor commercial by 2030) has a market cap of $5B
- Form Energy (Iron-Air Batteries) raised $1.2B
- X Energy (Small Modular Reactor) raise over $1.5B

Opportunity in the fray? New Models and Policy

- What new market designs and signals can be tested?
  - Lond Duration Storage (load following 10-100+)
  - Seasonal Storage
  - Multiple PPAs vs CTTs vs new models?
  - Flexibility?
- What policies can governments adopt?
  - Heat re-use?
  - Data Centers pay extra for grids (NYC skyscraper model)

Can AI save itself?

- AI models are constantly more efficient
- New Materials
- More efficient buildings
- Hyperlocal flexibility
- More efficient grids (DLR, ADMS, Digital Twins)
- More efficient balancing markets
- More efficient interconnections

Thank you for your time!

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