# Tekoälyn energiankulutuksen jalanjälki

## Green ICT Ekosysteemitapaaminen
## 18.9.2025

Aavista Oy
Merja Kajava

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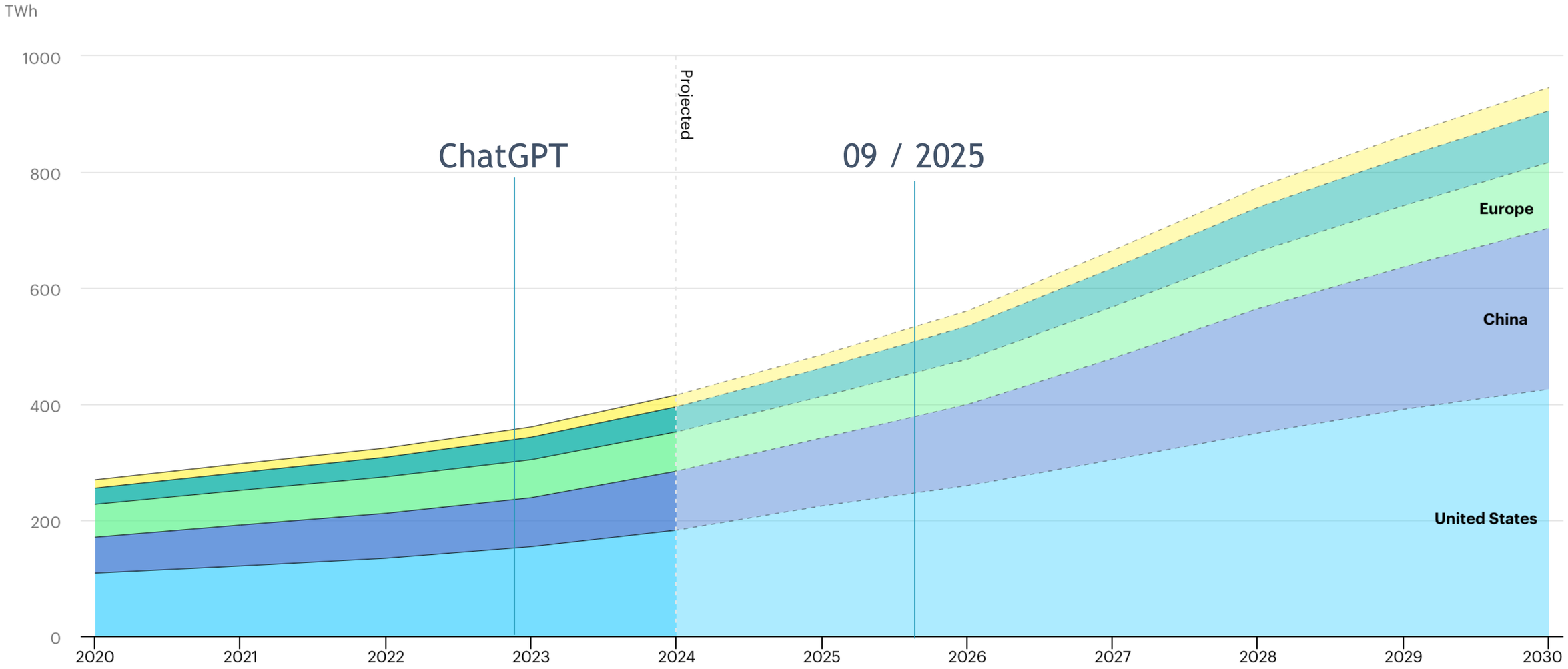
# Data center energy consumption increases worldwide

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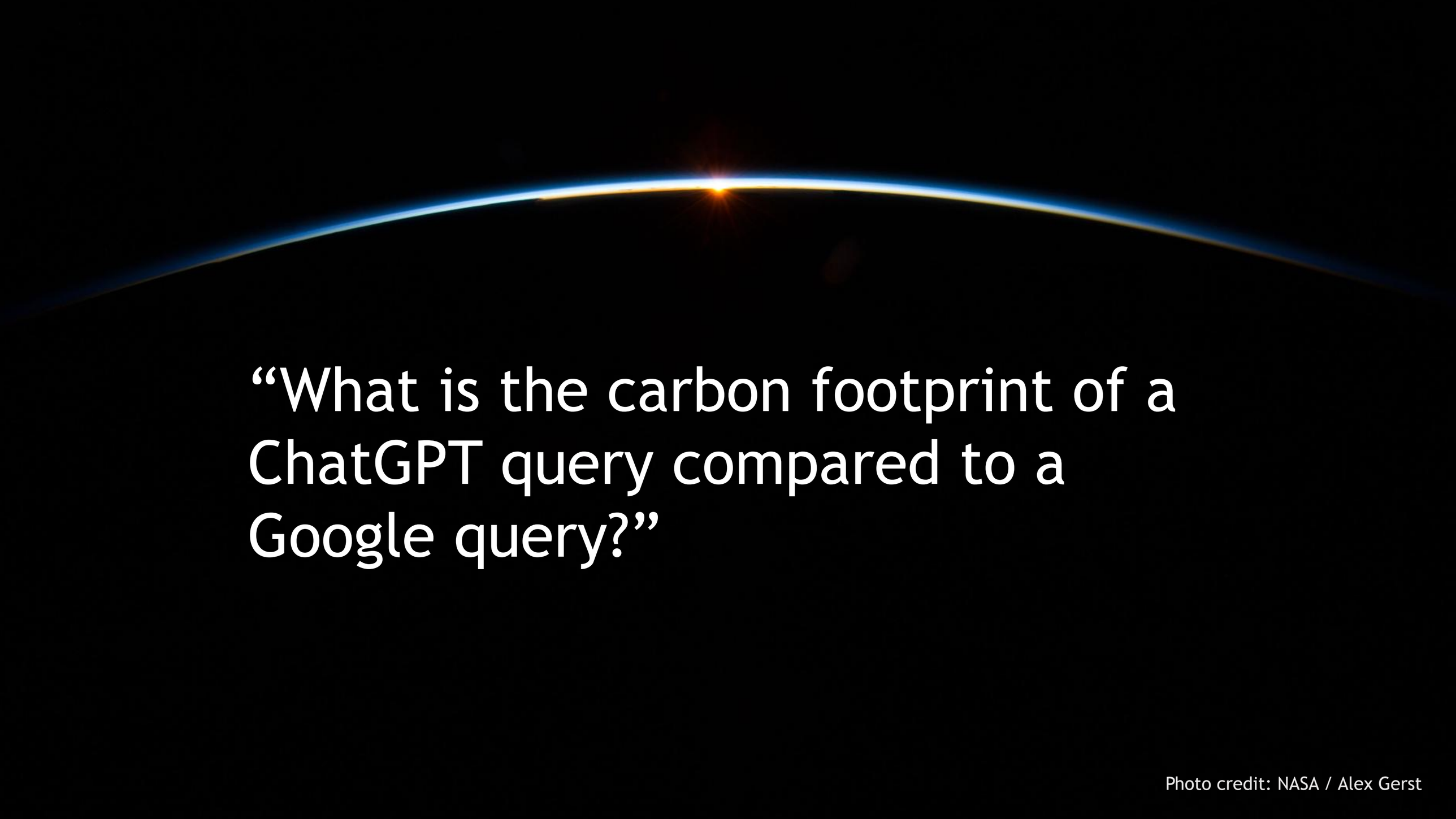
Source: IEA (2025), Data centre electricity consumption by region, Base Case, 2020-2030, IEA, Paris
https://www.iea.org/data-and-statistics/charts/data-centre-electricity-consumption-by-region-base-case-2020-2030


“What is the carbon footprint of a ChatGPT query compared to a Google query?”
Photo credit: NASA / Alex Gerst

Vanderbauwhede (2024):

“AI-generated answers to conventional search queries dramatically increase the energy consumption.

By our estimates, energy demand increase by 60-70 times.”

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Vanderbauwhede, W. (2024). Estimating the Increase in Emissions caused by AI-augmented Search. https://doi.org/10.48550/ARXIV.2407.16894

# 480,000,000,000,000

**480 trillion** tokens processed by Alphabet a month (May 2025)

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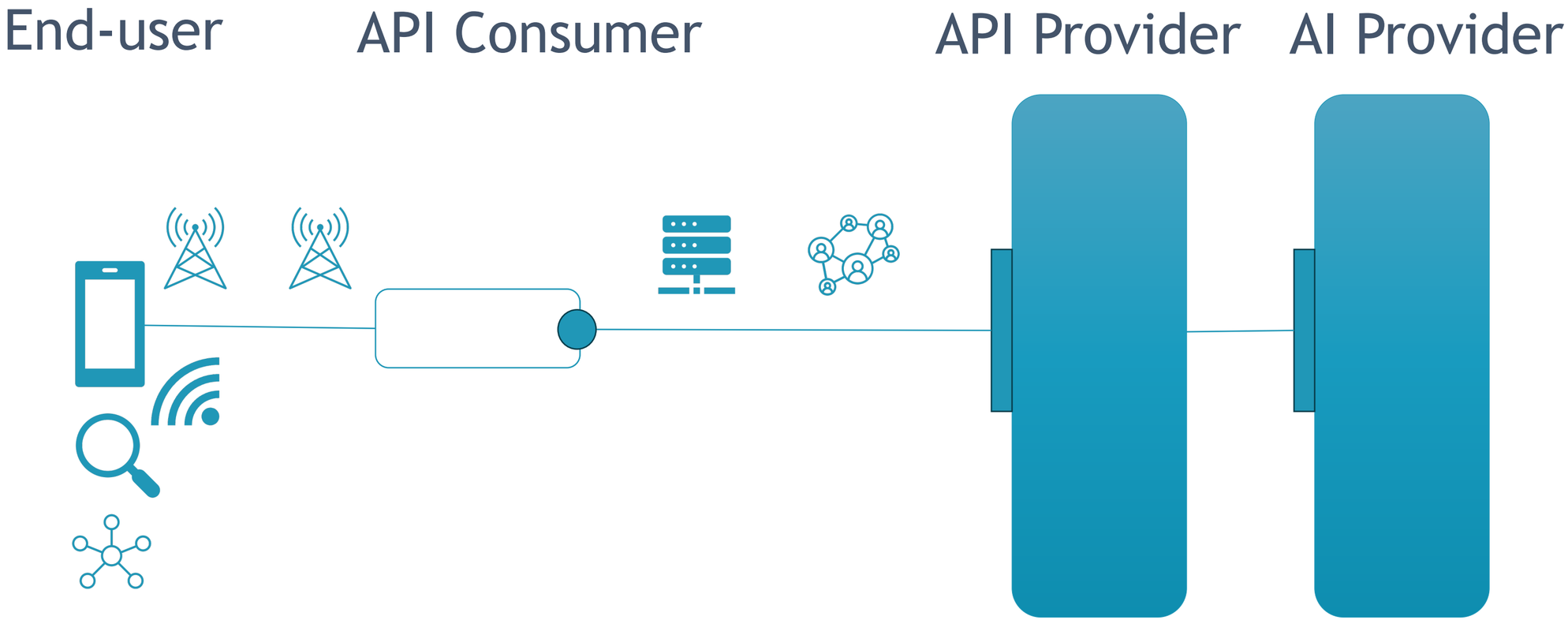
Source: Google I/O 2025

# The Network End-to-End

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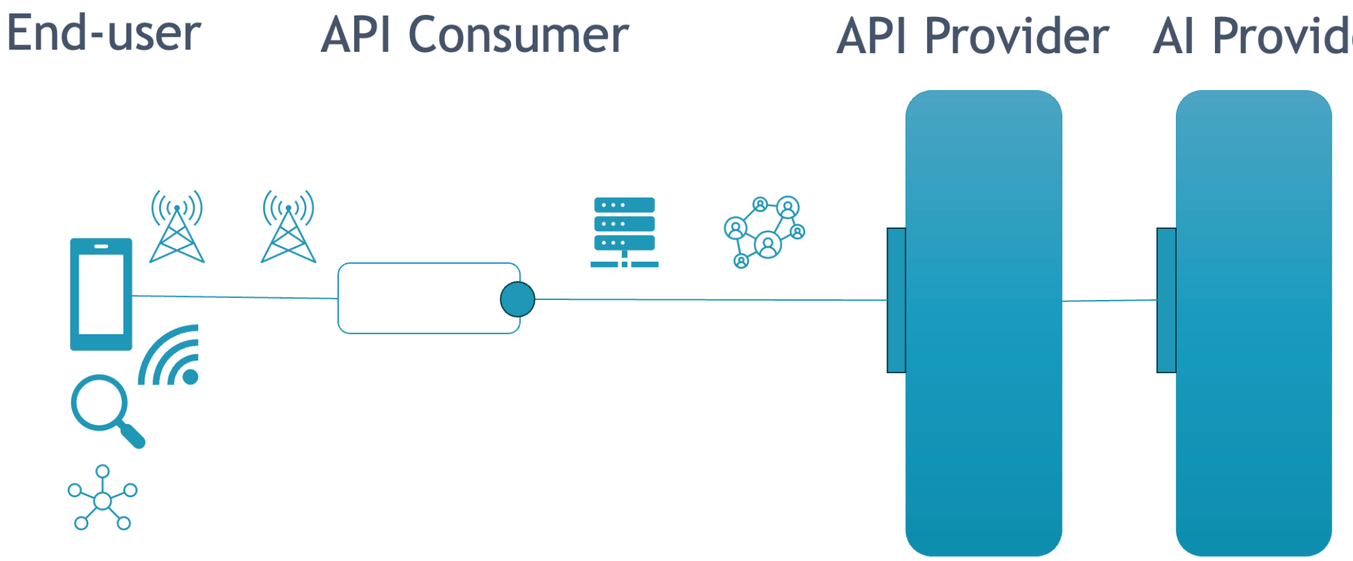
AI governance Security and privacy




Data quality Testing

Performance Cost Sustainability

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Carbon footprint ~ Cost

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Nothing exists until it is measured
Niels Bohr
AAVISTA

# Calculate the carbon footprint

## Cloud providers

AWS
Google Cloud
Microsoft
Multi-cloud

## Data centers

Applications

## Service providers

IPaaS
API
SaaS
AI

Carbon footprint calculators by cloud providers

Multi-cloud calculators

Open-source calculators, for example Code Carbon

Commercial calculators, for example from Dynatrace and Splunk

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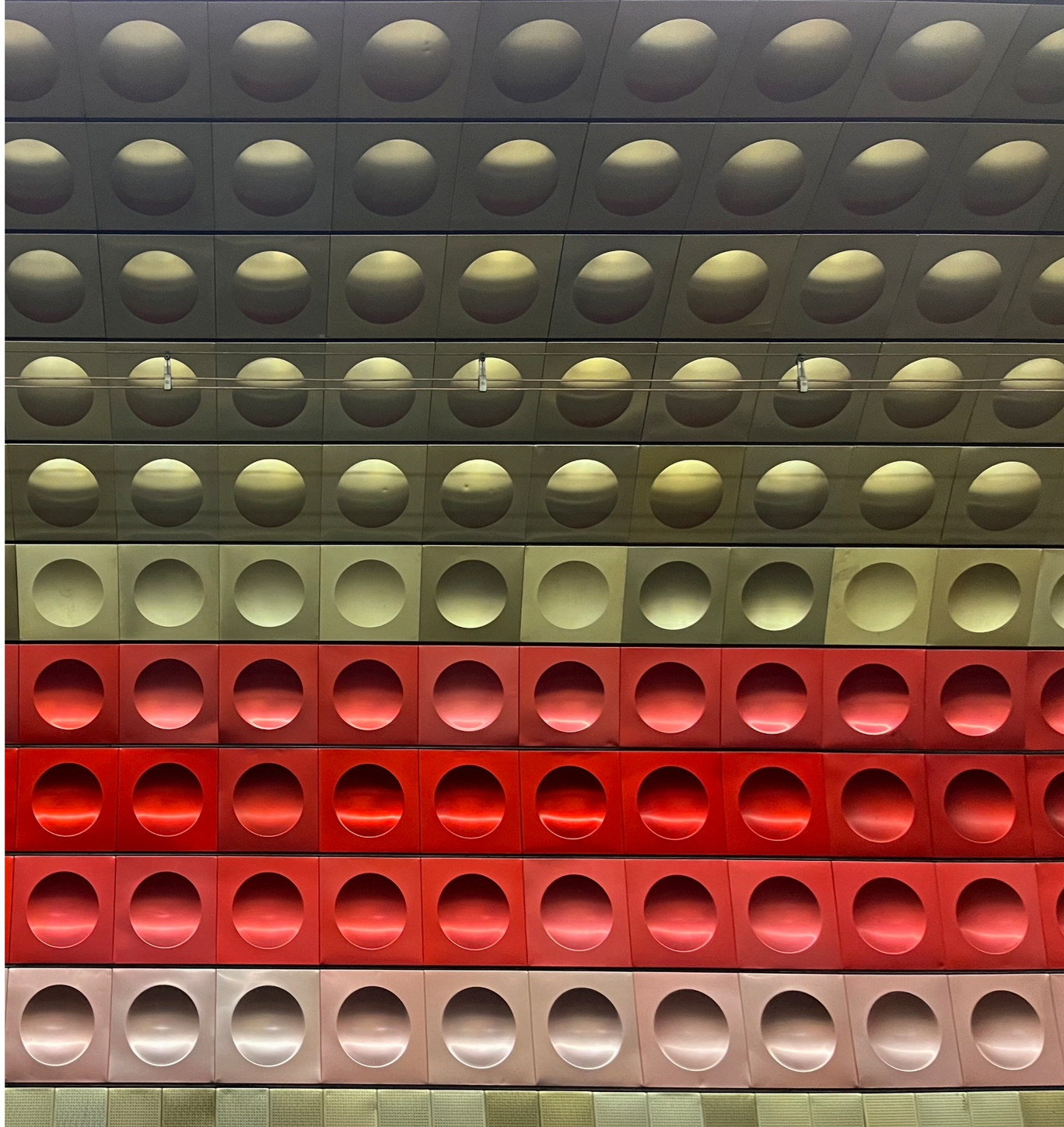
# Choose your models carefully



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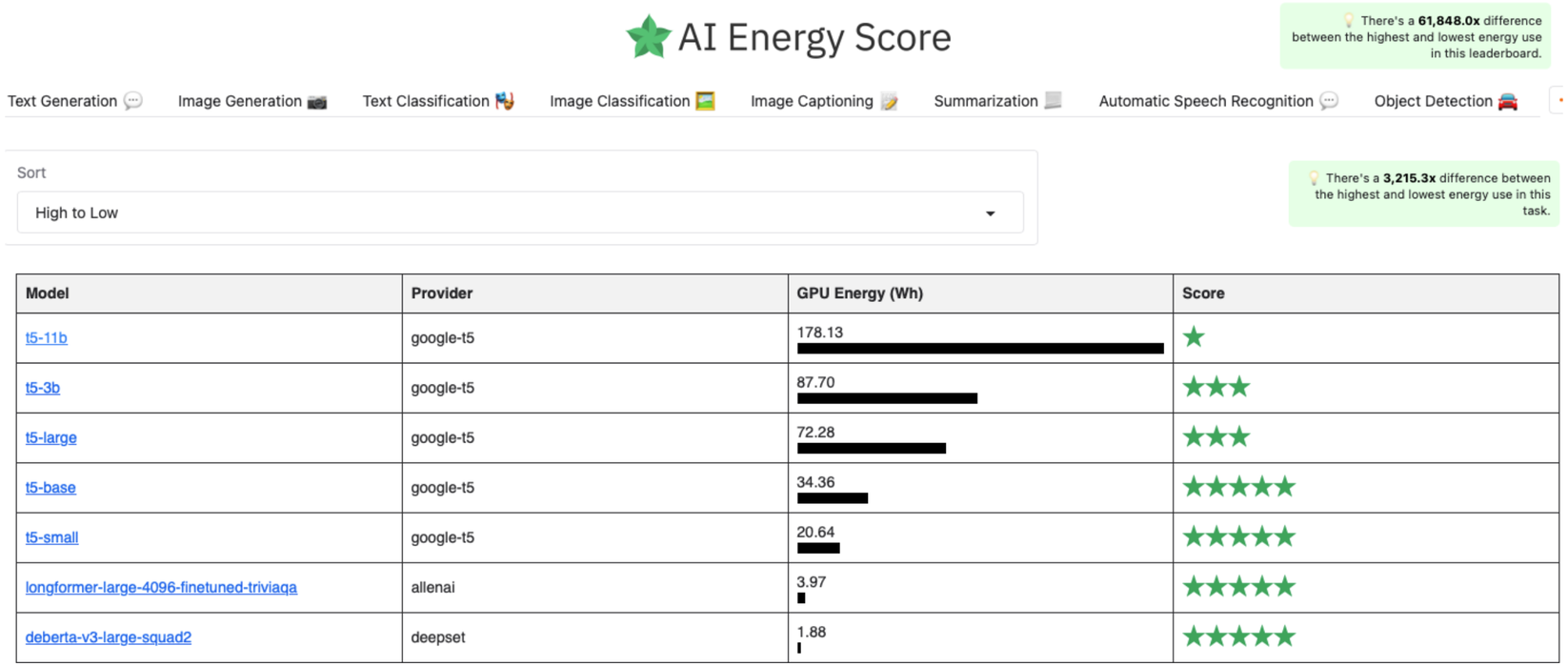
# Each Gen AI model is different

Luccione et al. (2024):

"Multi-purpose models are more energy-intensive."

## AI Energy Score - Extractive Q & A
by Huggingface




| Model | Provider | GPU Energy (Wh) | Score |
|---|---|---|---|
| t5-11b | google-t5 | 178.13 | ★ |
| t5-3b | google-t5 | 87.70 | ★★★ |
| t5-large | google-t5 | 72.28 | ★★★ |
| t5-base | google-t5 | 34.36 | ★★★★★ |
| t5-small | google-t5 | 20.64 | ★★★★★ |
| longformer-large-4096-finetuned-triviaqa | allenai | 3.97 | ★★★★★ |
| deberta-v3-large-squad2 | deepset | 1.88 | ★★★★★ |

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Luccioni, S., Jernite, Y., & Strubell, E. (2024). Power Hungry Processing: Watts Driving the Cost of AI Deployment? The 2024 ACM Conference on Fairness, Accountability, and Transparency, 85-99. https://doi.org/10.1145/3630106.3658542

Luccioni, S., Gamazaychikov, B., Strubell, E., Hooker, S., Jernite, Y., Wu, C., Mitchell, M. (2025). AI Energy Score Leaderboard - February 2025. https://huggingface.co/spaces/AIEnergyScore/Leaderboard

# Multimodal AI brings new challenges

Multimodal streaming

“Agent architecture with bi-directional event streaming running 24/7”

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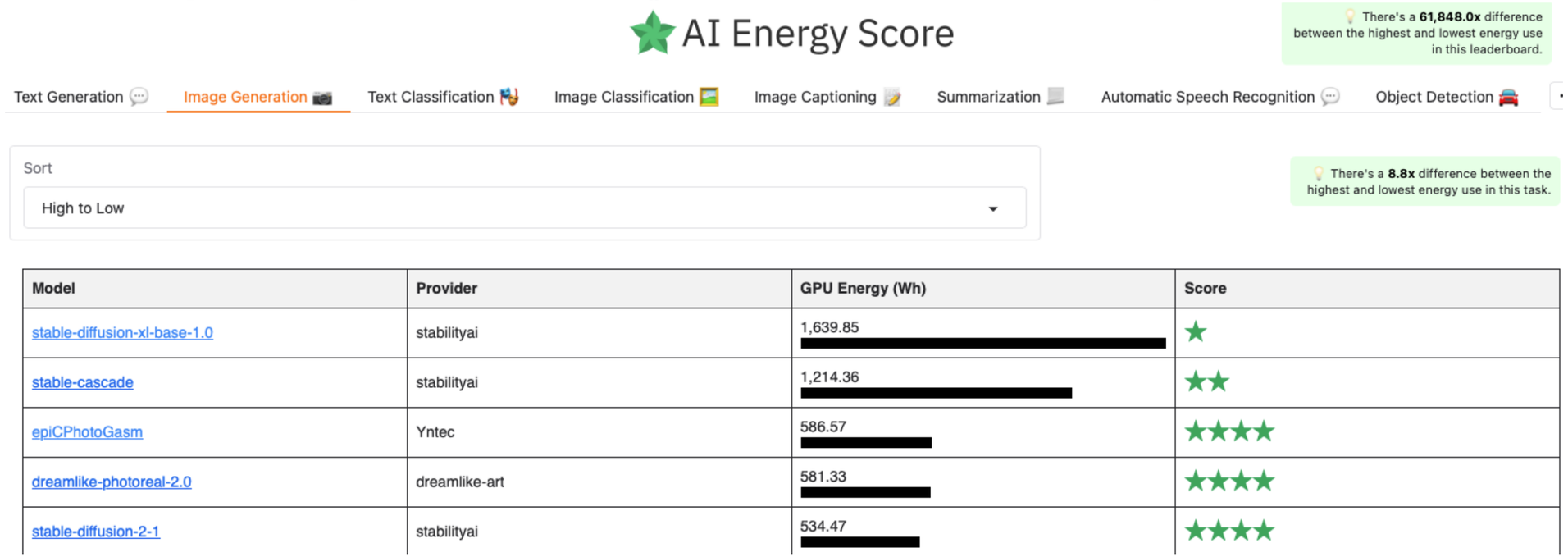
# Multimodal AI
# From text prompt to images,videos and speech




"Tasks involving images are more energy- and carbon-intensive compared to those involving text alone."


Luccioni, S., Jernite, Y., & Strubell, E. (2024). Power Hungry Processing: Watts Driving the Cost of AI Deployment? The 2024 ACM Conference on Fairness, Accountability, and Transparency, 85-99. https://doi.org/10.1145/3630106.3658542

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# In search of standardized AI energy certificate

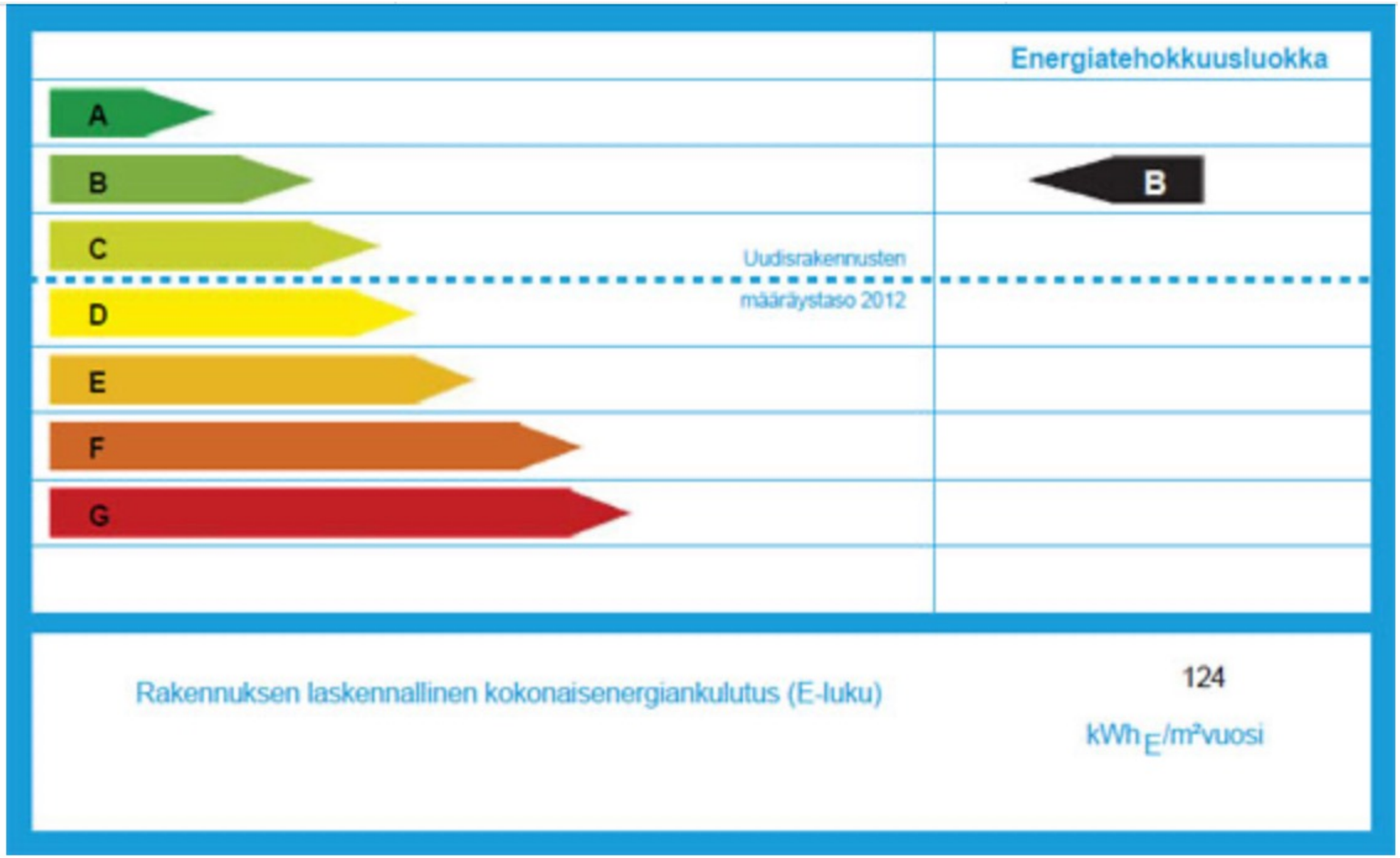


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Photo credit: Energiakartoitus Oy

# Key takeaways

Choose the minimal solution - YAGNI

Estimate and follow up the costs

Measure the carbon footprint

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## The Data Refinery Company

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