

C12



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Computing more, consuming less: how carbon nanotubes redefine quantum at scale

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The digital economy is not immaterial

AI compute is an exponential energy problem, and we are not building power plants fast enough.

DATA CENTERS TODAY

415 TWh

~1.5% of global electricity (2024)

PROJECTION BY 2030

945 TWh

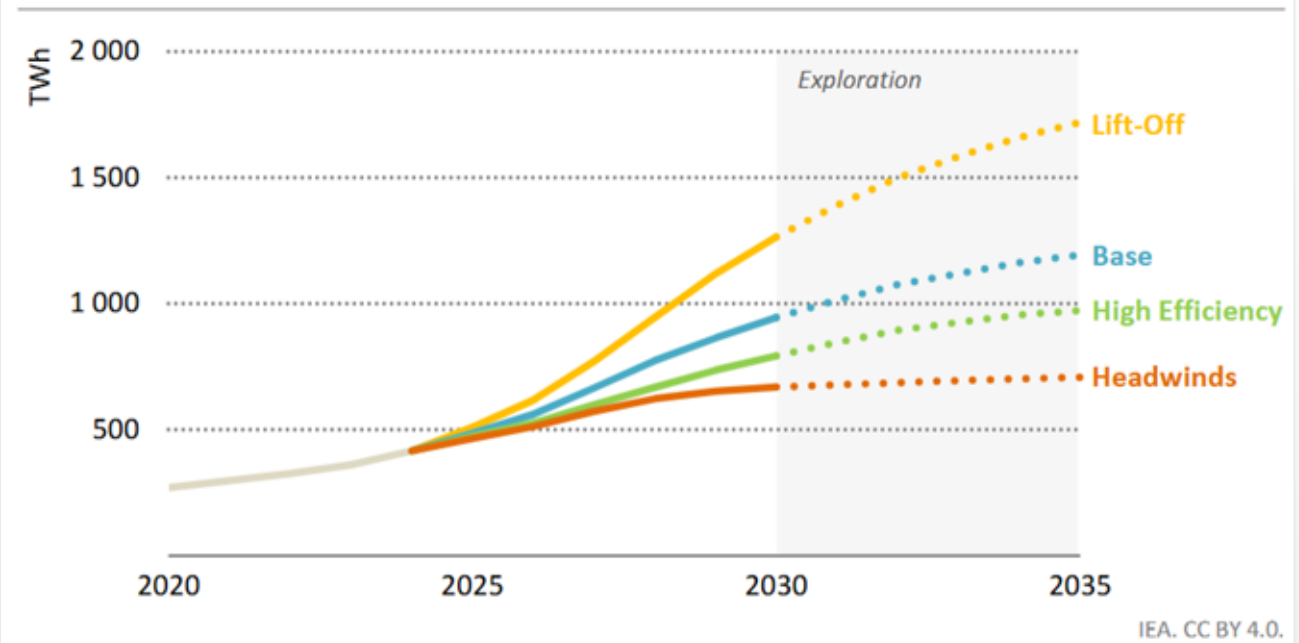
+15%/year - fastest growing sector

A SINGLE AI RACK

180-220 kW

NVIDIA Vera Rubin NVL72 rack power – keeps climbing each generation

Figure 2.14 ▶ Global data centre electricity consumption by sensitivity case, 2020-2035



Problems classical computers can't solve, but **quantum can**, unlocking a 1 trillion \$ market

Domain	Chemistry	Multi-physics	Optimization	Artificial Intelligence	Cryptography
Description	Simulates nature with precision out of reach for classical computers		Absolutely optimal solutions found faster for NP-hard problems	Quality training data for classical AI and a vast expansion of AI's inquiry capabilities	Decrypt RSA public key infrastructure
Market Value by 2040*	\$ 175-330 bn		\$ 110-210 bn	\$ 95-250 bn	\$ 40-80 bn
Use Cases	Batteries, fertilizers, catalysts, new drugs	Aircraft wings Climate modeling Thermal management	Finance Logistics Energy networks	Faster training Reduced energy consumption Natural language processing	Breaking today's public-key cryptography

A new class of computation, without a new energy crisis

Quantum tackles problems classical computers can't at any energy budget. But only if the materials are right.

SUPERCONDUCTING (IBM STARLING, 2029)



~1500 kW

~200 logical qubits. Each refrigerator at ~15 mK

SPIN QUBIT (C12 PANOPEIA, 2033)



~50 kW total

792+ logical qubits. One refrigerator. 17m² of data center space.

~1 kW of external power to generate 1 μ W of cooling at 20 mK. Like burning a washing machine's worth of electricity to keep a single snowflake from melting.

Carbon nanotubes change the equation

Carbon-12

No rare earths, cobalt or gallium dependency

Zero geopolitical supply risk

Near-1D structure

Isolates the electron spin from noise and defects

Integrated directly into a standard semiconductor circuit

Quantum bus

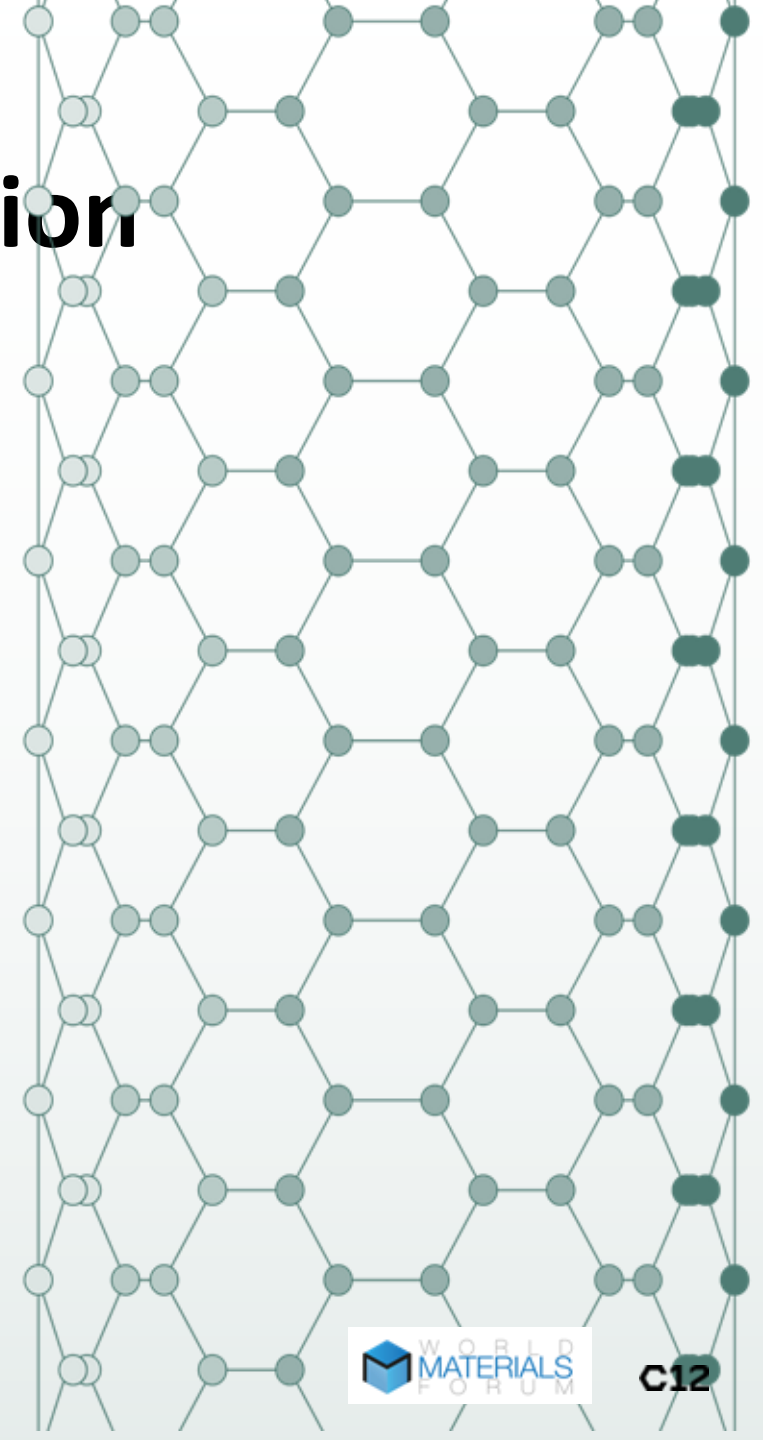
Connects non-neighboring qubits

Most competitors limited to nearest-neighbor only

In-house fabrication

Controls the nanotube growth process in the Paris quantum fab

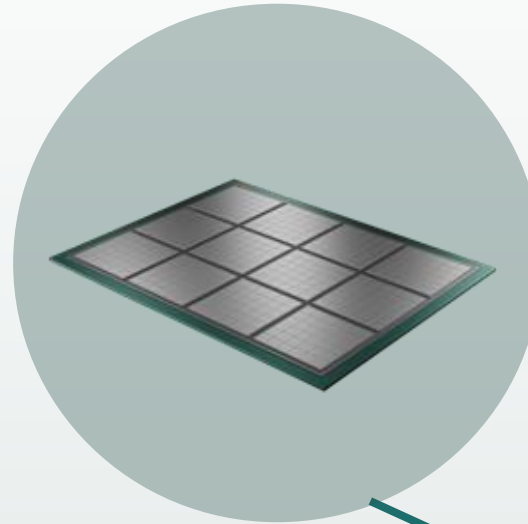
Enables reproducible, scalable production using standard semiconductor infrastructure



A clear path to energy-efficient quantum at industrial scale

The future is hybrid: AI + HPC + quantum

- **~50 kW** total system at Panopeia scale (target) vs. competitors at hundreds of MW
- **100,000 qubits** → **792+ logical qubits**, first universal processor by 2033, 17m² of datacenter space



Aïdos 2027

16 physical qubits

Zélos 2030

236 physical qubits

Styx 2032

8500 physical qubits

Panopeia 2033

100000 physical qubits