EUROPE'S NEXT COMPUTING FRONTIER

Bringing quantum, HPC and AI together

Hybrid infrastructure • Industrial innovation • European competitiveness

QUANTUM EUROPE STRATEGY

Oscar Diez | DG CONNECT, European Commission

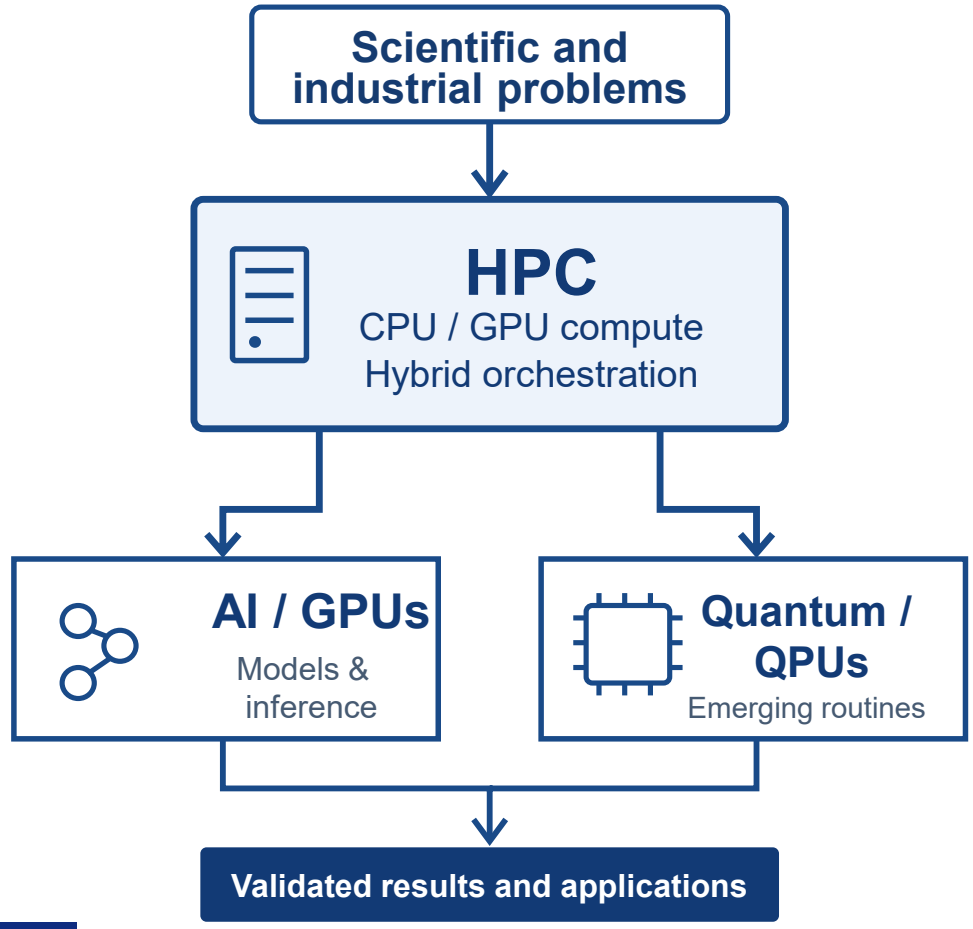
Forum Teratec | 21 October 2026 | Paris

European Commission

Combining HPC, AI and quantum computing

Three complementary computing capabilities within a shared European ecosystem

HPC provides the foundation for large-scale simulations, data processing and complex calculations.
AI complements HPC through data-driven models, prediction and optimisation.
Quantum computing offers emerging capabilities for selected simulation and optimisation problems, integrated into hybrid workflows.

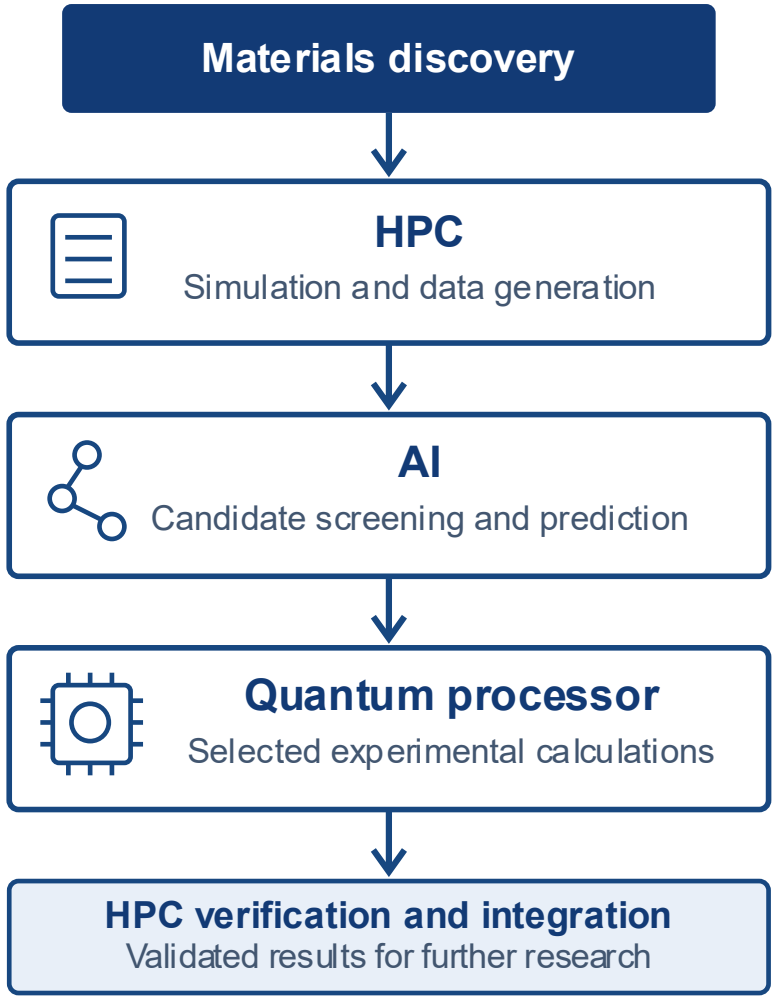


Combining complementary computing capabilities to strengthen Europe's research and industrial competitiveness.

From simulation to discovery with HPC, AI and quantum

An illustrative hybrid workflow for accelerating materials research

- **HPC generates and processes simulation data**, modelling material properties and providing the basis for further analysis.
- **AI identifies promising candidates**, learning from simulation data to predict properties and narrow the search.
- **Quantum processors explore selected problems**, investigating quantum-mechanical properties through experimental algorithms.
- **HPC validates and integrates the results**, comparing computational approaches and supporting further research.



Combining specialized computing capabilities to accelerate scientific discovery and innovation.

Complementary roles of HPC, AI and quantum computing

Different computing approaches contribute to different stages of complex scientific and industrial problems.

HPC

Classical compute backbone

- **Simulation**
  Physics-based, large-scale models
- **Data processing**
  Reliable preprocessing and validation
- **Numerical solvers**
  High-performance parallel routines

AI

Data-intensive methods

- **Surrogate models**
  Approximate expensive simulations
- **Accelerated discovery**
  Learn patterns and guide experiments
- **Operations**
  Automation, model support and prediction

Quantum

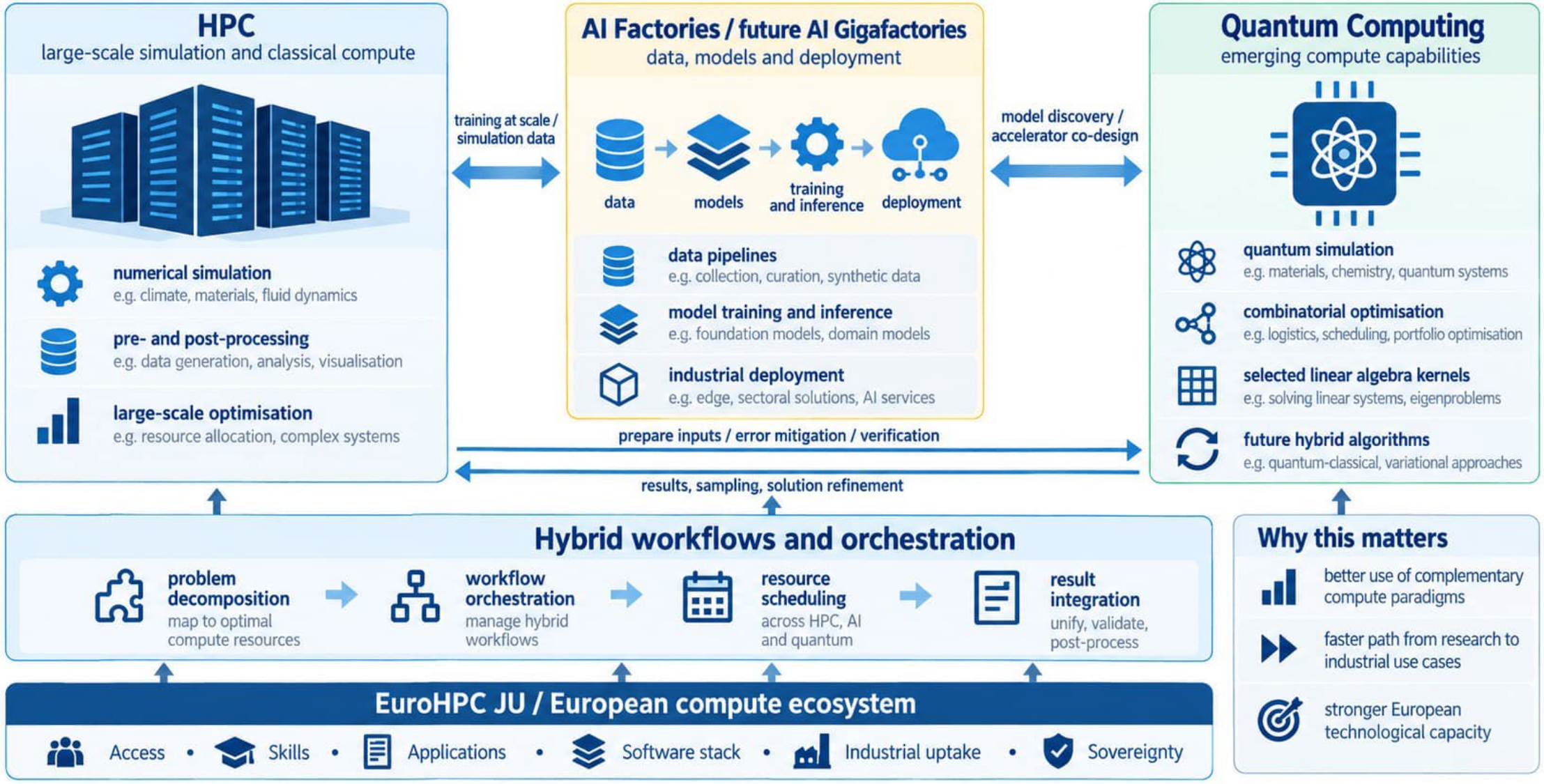
Emerging specialisation

- **Quantum simulation**
  Molecular and material Hamiltonians
- **Sampling and optimisation**
  Selected experimental algorithms
- **Hybrid methods**
  Quantum subroutines plus classical control

Combining complementary computing capabilities to strengthen Europe's research and industrial competitiveness.

How Quantum Computing complements HPC and AI (Giga)Factories

A hybrid European compute ecosystem for advanced research, industrial innovation and deployment



How AI and quantum computing can reinforce each other

AI is already advancing quantum technologies, while quantum-enhanced AI remains an emerging research

AI FOR QUANTUM | TODAY

- **Calibration and control**
  Automating device tuning, pulse optimisation and experiments.
- **Error decoding and mitigation**
  Identifying error patterns and improving decoding strategies.
- **Compilers and scheduling**
  Optimising circuits, qubit mapping and execution workflows.
- **Materials and device design**
  Supporting the discovery and optimisation of quantum components.

QUANTUM FOR AI | RESEARCH

- **Quantum kernels and sampling**
  Exploring new methods for selected learning tasks.
- **Quantum optimisation**
  Investigating specialised algorithms and hybrid approaches.
- **Learning from quantum data**
  Exploring applications involving inherently quantum systems.

Practical advantages for general-purpose AI training remain unproven.

AI is already accelerating quantum development. Quantum computing for AI remains a longer-term opportunity.

From quantum hardware to European user access

EuroHPC is making diverse quantum computing technologies accessible to researchers, industry and public institutions.

- **A growing European quantum infrastructure** with different technologies, including superconducting, photonic and trapped-ion systems.
- **European access launched in June 2026**, enabling researchers, companies and public institutions to experiment with quantum computers.
- **Integration with European supercomputers** to develop hybrid applications, software tools and common user services.
- From **experimentation to practical use**, supporting benchmarking, application development and industrial uptake.



Turning European quantum investments into shared capabilities for research, innovation and industry.

QCS Quantum Infrastructures

Quantum Computing and Simulation - EuroHPC

Quantum Simulators & Hosting Entities Overview

2 Quantum Simulators (100+ Qubits)

- **Jülich: JUWELS – PASQAL QS** *(Germany)*
- **GENCI: Joliot-Curie – PASQAL QS** *(France)*

➤ Both fully operational in **2025**

6 Selected Hosting "Entities" (1st CFEI)

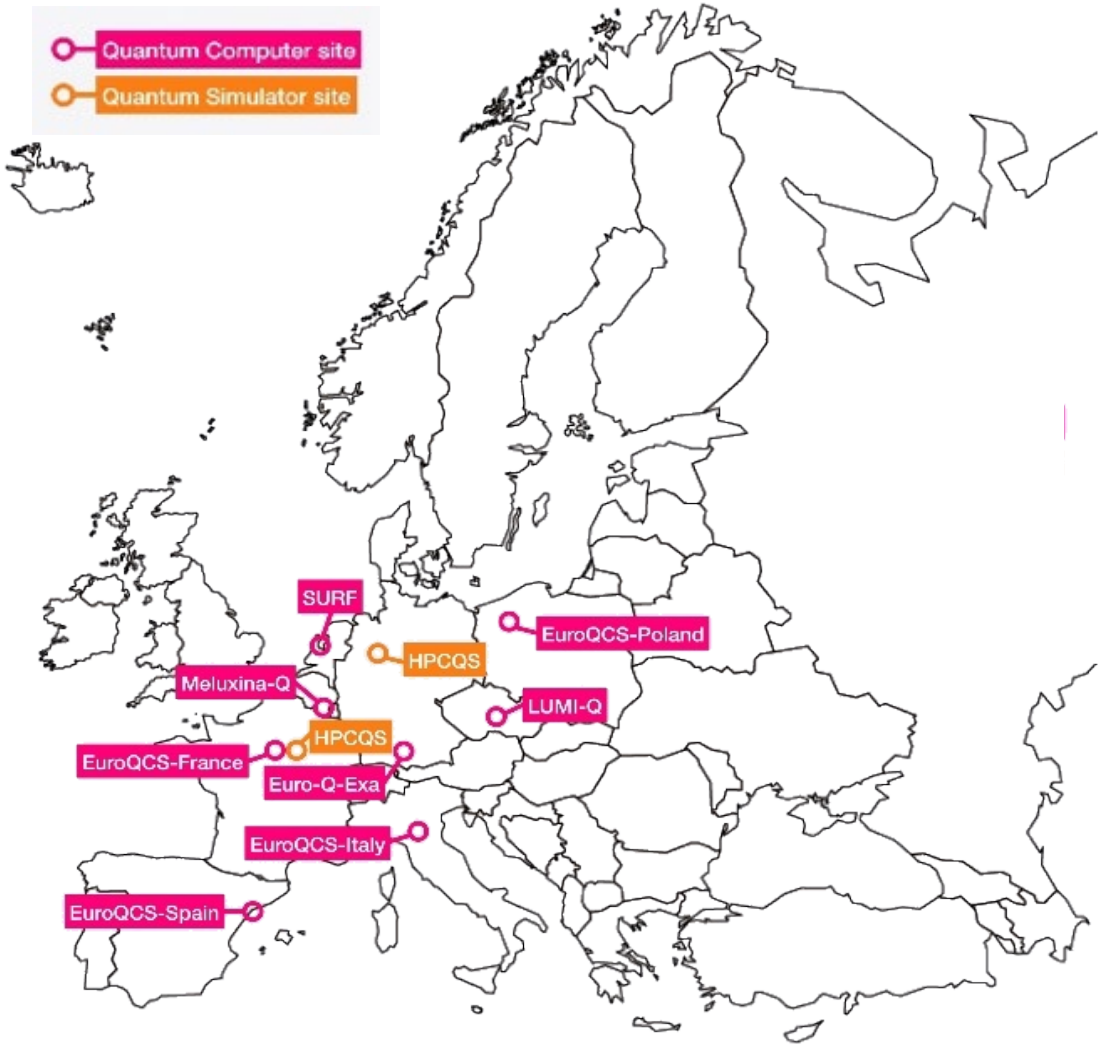
Consortia of 30 participating countries

- **Euro-Q-Exa** – *Superconducting Qubits (DE)*
- **LUMI-Q** – *Superconducting Qubits (CZ)*
- **EuroQCS-Spain** – *Superconducting Qubits (ES)*
- **EuroQCS-Italy** – *Neutral Atom Qubits (IT)*
- **EuroQCS-Poland** – *Trapped Ion Qubits (PL)*
- **EuroQCS-France** – *Photonic Qubits (FR)*

2 Additional Hosting "Entities" (2nd CFEI)

- **EuroSSQ-HPC** – *Semiconductor Spin-Qubits (NL)*
- **MeluXina-Q** – *Semiconductor Spin-Qubits (LU)*

➤ First systems operational since **Q1 2026**



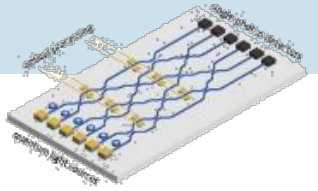
Quantum Computing and simulation Infrastructure

Quantum Diversity in Technology

EuroQCS-France [GENCI]

QUANDELA

Photonic Qubits (digital)



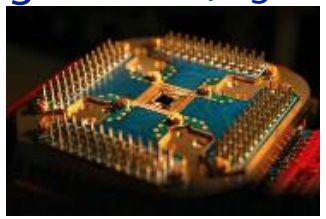


Joliot-Curie

Euro-Q-Exa (Germany) [LRZ]

IQM

Superconducting Qubits (digital)



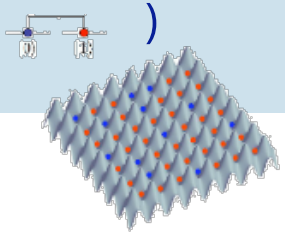


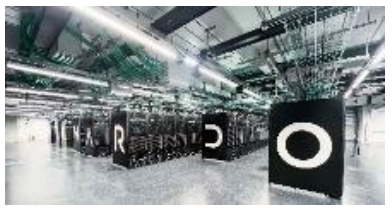
SuperMUC-NG

EuroQCS-Italy [CINECA]

Pasqal

Neutral atom Qubits (analogue/digital)



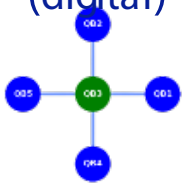


Leonardo

Lumi-Q (Czechia) [IT4I]

IQM

Superconducting Qubits with a star-shaped topology (digital)



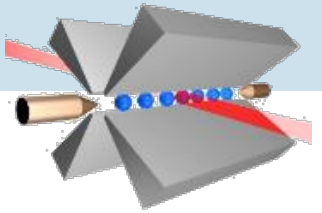


Karolina

EuroQCS-Poland [PSNC]

AQT

Trapped ion Qubits (digital)



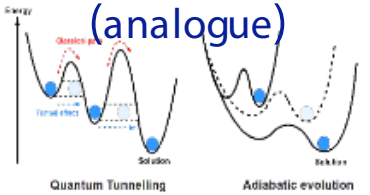


Altair

EuroQCS-Spain [BSC]

QILIMANJARO
We do quantum computing

Superconducting Flux Qubits – Annealer Mode (analogue)





Mare Nostrum-5

EuroHPC Quantum Access Pilot Call is open

Free access to quantum processors for testing, development and skills

ACCESS FOR RESEARCH AND INNOVATION

- **Eligible users** include academia, industry and public authorities in the EU and associated countries.
- **Applications** cover benchmarking, technical feasibility, algorithms, workflows and training.
- **QPU allocations** are available for 3- or 6-month projects, subject to system quotas.
- **Fast evaluation** with resource access targeted within two weeks after the cut-off.

INITIAL SYSTEMS OFFERED

DE	**Euro-Q-Exa**	Superconducting
FR	**Lucy**	Photonic
PL	**Piast-Q**	Trapped ions
CZ	**VLQ**	Superconducting

NEXT CUT-OFF **1 November 2026 | 10:00 CET**

Following cut-off 1 December 2026 | 10:00 CET

Systems and QPU-hour quotas may vary by cut-off.

APPLY FREE OF CHARGE access.eurohpc-ju.europa.eu

AI Factories, future AI Gigafactories and quantum

EuroHPC JU provides a common European framework, with distinct purposes for each infrastructure

HPC infrastructure	Scientific simulation and compute-intensive applications	**PRODUCTION COMPUTE**
AI Factories	AI-optimised computing, services, skills and access	**AI ECOSYSTEM**
Future AI Gigafactories	Larger-scale capacity for frontier AI development and inference	**FUTURE CAPACITY**
Quantum systems	Experimental and developing special-purpose compute	**EMERGING CAPABILITY**

Shared governance and access can reinforce complementarity, without implying identical technology maturity.

Scaling quantum requires the whole technology stack

The industrial challenge extends far beyond physical qubit counts



Why scaling is a system challenge

- **Hardware alone is not enough**
  More qubits only create value if device quality, yield and reproducibility also improve.
- **Control and software are critical**
  Electronics, calibration, compilers and runtimes determine whether systems can be used efficiently.
- **Integration creates practical utility**
  Networks, scheduling, interfaces and access mechanisms are needed to connect quantum resources to real workflows.
- **Users and benchmarks drive maturity**
  Real applications, independent validation and performance metrics are essential to guide progress and investment.

Three priorities for Europe's next computing frontier

From complementary technologies to usable European capabilities

1

Integrate the infrastructures

Make HPC, AI and quantum resources accessible through interoperable workflows.

2

Industrialise the entire stack

Support fabrication, controls, software, skills and resilient supply chains.

3

Measure value for real users

Benchmark end-to-end applications and develop a sustainable demand base.

European capability is created by integration, industrial depth and adoption.

EUROPEAN QUANTUM TECHNOLOGIES CONFERENCE
Advancing Quantum
Dublin 2026



Brand-new Quantum Vertical Exchanges (QVX) for technology providers, use-case developers, buyers & validators, and investors. To help demand creation

[HOME | EQTC](#)

QUANTUM EUROPE STRATEGY

QUANTUM ACT

Many thanks

More info at http://qt.eu

QUANTUM FLAGSHIP

Additional material

Reference slides for discussion and follow-up

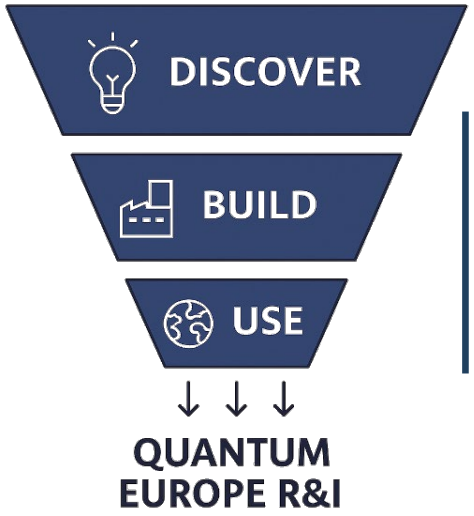
BACKUP SLIDES

Strategy context • European funding chain • Scientific strengths

Quantum Europe Strategy
One lifecycle, five strategic areas



FROM LAB TO MARKET



SCALING QUANTUM CAPABILITIES



Quantum computers in 10+ EU countries

EuroHPC

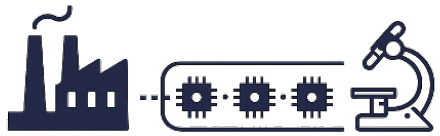
EuroQCI secure quantum communication

Quantum sensors gravimeters, MRI inertial navigation

Pilot lines for production and testing

Interoperability & hybrid systems

GROWING EUROPE'S QUANTUM ECONOMY



- 6 industrial pilot lines
- EU Design Facilitiy + cloud-based tools
- Public procurement to stimulate demand
- QU-TEST: EU-wide certification + benchmarking
- IP strategy + resilience for EU supply chain

STRATEGIC AUTONOMY IN SPACE, SECURITY & DEFENCE

Quantum sensors for GNSS-free navigation

Quantum communication in IRIS² satellites



Roadmaps: PQC, dual-use applications, ESA cooperation

CIVIL

DEFENCE

Quantum in EU defence and NATO strategy

Quantum in EU defence and NATO strategy



A QUANTUM WORKFORCE FOR THE FUTURE

110,000+ graduates/year in related fields

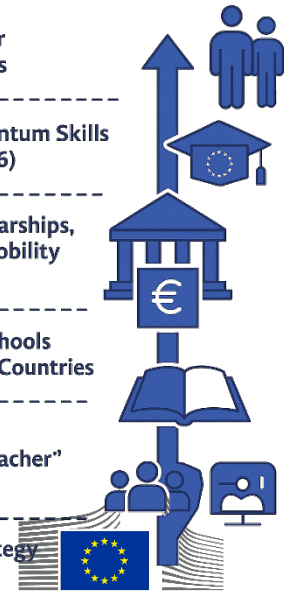
European Quantum Skills Academy (2026)

Training, scholarships, internships, mobility schemes

Qutreach to schools and Widening Countries

Talent portal + 'Teach the Teacher" modules

Robust IP strategy



Europe starts from strength, but faces a conversion gap

Scientific leadership does not automatically become industrial leadership

- **#1 Global position in quantum scientific publications**
- **~1/3 of quantum companies worldwide are based in the EU**
- **>€11 bn EU + Member State public investment over five years**

But Europe still faces:

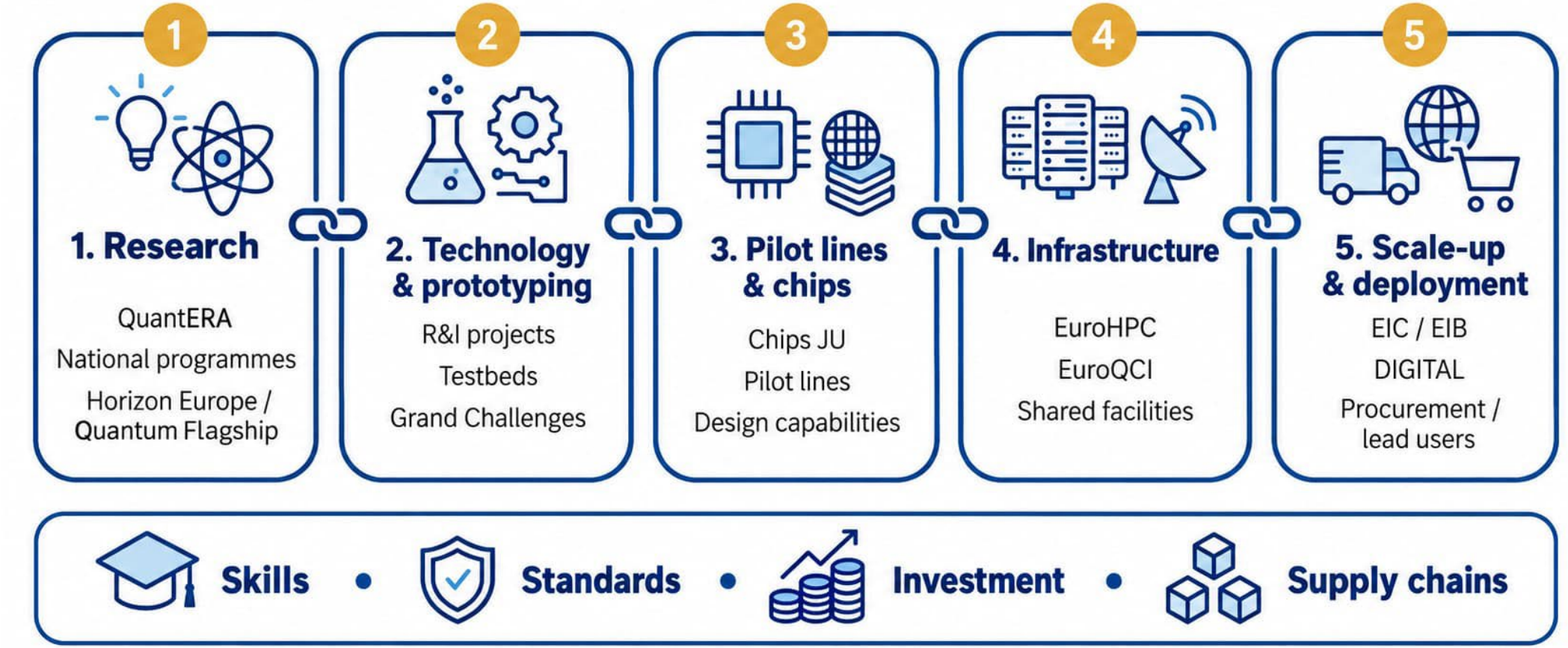
- Fragmentation
- Scale-up challenges
- Limited private investment
- Insufficient early demand
- Technology and supply-chain dependencies



The challenge: Science → Technology → Industry → Market

Europe’s funding and innovation chain

Connecting national and European efforts from research to industrial deployment



European added value: connecting national strengths, shared infrastructures and industrial scale-up