IC59 - QUANTUM COMPUTING

Decision 31872

THE ITALIAN COMPETITION AUTHORITY

AT ITS MEETING of 10 March 2026;

HAVING HEARD the Rapporteur Professor Elisabetta Iossa;

HAVING REGARD TO Law No. 287 of 10 October 1990;

HAVING REGARD TO Article 12, paragraph 2, of Law No. 287 of 10 October 1990, pursuant to which the Authority may conduct general fact-finding investigations in economic sectors where the evolution of trade, price behavior or other circumstances suggest that competition is being prevented, restricted or distorted;

HAVING REGARD TO Decree-Law No. 104 of 10 August 2023, converted with amendments by Law No. 136 of 9 October 2023, containing urgent provisions for the protection of users in the field of economic and financial activities and strategic investments;

HAVING REGARD TO Presidential Decree No. 217 of 30 April 1998, as amended and supplemented;

HAVING REGARD TO the Communication on the application of Article 1, paragraph 5, of Decree-Law No. 104 of 10 August 2023, converted with amendments by Law No. 136 of 9 October 2023, adopted by the Authority on 7 May 2024;

CONSIDERING the following elements:

1. Quantum Computing (hereinafter also referred to as “QC”) is an innovative computing system based on the laws of quantum physics and mechanics, which has been under development since the 1980s but has undergone significant technological acceleration since the mid-2010s, with the potential to revolutionize the management and solution of complex problems compared to current computational standards. Applications

are already in place in areas such as cybersecurity, biotechnology, materials design, production process optimization and fin-tech.

2. QC differs from traditional computers in that it uses qubits rather than bits as the basis for calculation,[1] created using different means and techniques, which are currently competing with each other to achieve a sort of technological stability. Based on the Authority's current knowledge, the most widespread solutions appear to be those based on superconductors, trapped ions, photons or atomic spins.

3. QC allows computing capabilities to be achieved that are exponentially superior to those of traditional computers (known as quantum supremacy). For this reason, QC is included among the so-called enabling technologies (sometimes referred to by the acronym "KETs", from "Key Enabling Technologies"), with potentially disruptive effects on computationally intensive sectors and activities. QC is also referred to as Deep Tech, as it is a technology based on profound scientific or engineering advances with slower maturation cycles, which is associated with a potentially transformative impact.

4. The current state of QC technology is defined as "NISQ" (from "Noisy Intermediate-Scale Quantum"): the quantum computers available are still noisy, i.e. prone to frequent errors and loss of coherence. As a result, QC is already being used for complex experiments and demonstrations, but calculations must be short and limited, as errors accumulate quickly. Managing this operational fragility is currently the main technological challenge for QC, which is transitioning towards systems that are more tolerant to faults and errors (known as "FTQC", from "Fault-Tolerant Quantum Computing").

5. The market for quantum technologies related to QC is undergoing a phase of rapid expansion, with significant growth expectations: according to recent estimates, the global revenue from QC activities already exceeds 1 billion dollars, with a projected total value of over 100 billion dollars by 2040.[2]

6. However, it is currently difficult to provide a clear definition of related markets, given that the commercial and production boundaries between hardware and software are much less clear-cut than is the case for traditional computers. In fact, with competition still ongoing to establish a technological standard of reference, those who develop and manufacture the hardware components are usually also involved in defining the software components, from noise reduction algorithms to application libraries.

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[1] In a nutshell, in traditional computers, bits are binary pieces of information stored as stable physical states of electronic components, usually made of silicon, and can only correspond to 0 or 1: their generation and reading are simple and reliable, because the bit always collapses into a defined state. Qubits, on the other hand, exploit the properties of quantum physics, in particular superposition and entanglement, to exist in many states simultaneously, i.e. 0, 1, or both at the same time, and to 'intertwine' in their respective state changes, even at a distance.

[2] McKinsey Digital, *Quantum Technology Monitor*, June 2025; see also Bain & Co., *Technology Report 2025. AI Leaders are Extending Their Edge*, October 2025.

7. Among the current protagonists in the "race" for QC are the main hyperscalers: these are technology operators that manage cloud and data center infrastructures designed for massive scalability and rapid growth, with highly automated architectures and distributed globally to support the delivery of services to users on a global scale, which are therefore usually associated with the acronym "IaaS" (from "Infrastructure as a Service"). In addition to the small circle of hyperscalers corresponding to the major players in global hi-tech, there are a number of more specialized companies, sometimes still at the start-up stage, often focused on the development of sector-specific QC applications.

8. The very nature of the technology in question, which requires massive investment in research and development and unique physical infrastructure, making it particularly prone to barriers to entry, favors the emergence of a few dominant players. Given that the acquisition of market power is not in itself a negative factor, observation – as far as possible – of the strategies of the main generalist operators nevertheless leads to hypothesize a critical gatekeeping role for these players, based on the characteristics of current technological services as a whole, and above all on the methods of supply.

9. Specifically, there is a tendency for hyperscalers to act as privileged intermediaries for access to quantum computing power by interested parties, providing it as a service from their respective cloud services. In short, the preferred horizon for these operators seems to be that of "Quantum-as-a-Service", where dominant positions in the field of IaaS could be easily replicated for the various services provided from time to time, including, as far as we are concerned here, QC.

10. While, on the one hand, this process could in theory facilitate the spread of the new technology, lowering access costs for average users freed from the need to develop proprietary infrastructure for the use of QC, on the other hand, there are clear risks of both technological and contractual lock-in, particularly in a vendor lock-in situation where a few globally active service providers, leveraging their respective dominance in the cloud, could capture potentially very large audiences of users, both consumers and businesses.

11. Specifically, in the second case, the potential risk cannot be overlooked that companies developing software on proprietary platforms may be unable to migrate their algorithms to different hardware due to the lack of standardized programming interfaces and qubit control languages.

12. To reinforce the above point, it should be noted that QC-related patent registrations are experiencing unprecedented growth, far exceeding the average for other technologies.[3] This trend seems to indicate a sort of global tech preemption, which could have detrimental consequences for the maintenance of contestable markets.

[3] EPO-OECD, *Mapping the Global Quantum Ecosystem. A Comprehensive Analysis Based on Innovation, Firm, Investment, Skills, Trade and Policy Data*, December 2025.

13. Furthermore, it is worth mentioning at least the possibility of early acquisitions for strategic growth/consolidation, which seem worthy of further investigation. Given the significant growth, including in Italy, of start-ups dedicated to QC, this is certainly a critical area for competitive analysis.

14. Finally, from a broader perspective it is necessary to consider that QC is the subject of significant strategic public investments in the world's major jurisdictions, in light of the high expectations associated with an enabling technology with potential dual-use applications. With specific reference to Italy, it should be noted that a dedicated national strategy has recently been adopted,[4] to which substantial infrastructure investments currently underway in various parts of the country can be traced, in line with the objectives of the Quantum Europe Strategy defined by the European Commission.[5]

CONSIDERING, therefore, that it is necessary to launch a sector inquiry into the quantum computing sector, with particular reference to the issues mentioned above.

All this being said and considered:

RESOLVES

a) the launch of a sector inquiry pursuant to Article 12, paragraph 2, of Law No. 287 of 10 October 1990, and Article 1, paragraph 5, of Decree-Law No. 104 of 10 August 2023, converted with amendments by Law No. 136 of 9 October 2023, on Quantum Computing;

b) that the person responsible for the proceedings is Dr. Luca Arnaudo;

c) that the deadline for closing the investigation is set for 31 December 2026;

d) as part of the investigation, by 30 April 2026, any interested party may submit contributions on the topics referred to in the previous paragraphs, in Italian or English. In particular, contributions are requested, including separately, on

(i) existing and expected market structures (e.g. with regard to the distinction/interrelation between quantum hardware and software, cloud services and "Quantum-as-a-Service", vertical applications);

(ii) existing and expected competitive dynamics (e.g. with regard to technological leadership and first-mover advantage, risks of Quantum Computing being absorbed as a complementary module in large, already dominant cloud ecosystems);

(iii) existing and expected importance of intellectual property rights;

[4] See the document *Italian Strategy for Quantum Technologies*, approved by the Interministerial Committee for the Digital Transition on 9 July 2025, and presented for information to the Council of Ministers on 30 July 2025.

[5] Communication from the Commission to the European Parliament and the Council, *Quantum Europe Strategy: Quantum Europe in a Changing World*, 2 July 2025, COM(2025) 363 final.

(iv) already observable acquisition and consolidation strategies, with particular reference to the absorption of start-ups, as well as the current and expected role of development supported by venture capital actions;

(v) strategic dependency profiles (e.g. with regard to access to critical quantum hardware and services, technological-commercial lock-in and proprietary standards, effects on security, resilience and tech sovereignty).

Contributions should be sent in editable format exclusively to the e-mail address IC59@agcm.it, with the subject line "IC59. Call for Input" and the sender's name.

If interested parties believe that their communications contain sensitive data, they must provide both a confidential and a public version; if no confidential version is provided, the entire content received may be published. Attached to this provision is the information notice on the processing of personal data that will be transmitted as part of the aforementioned public consultation, pursuant to Article 13 of Regulation (EU) 2016/679.

This provision will be published in the Bulletin and on the website of the Italian Competition Authority.

THE SECRETARY GENERAL — *Guido Stazi*

THE CHAIRMAN — *Roberto Rustichelli*

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