

KIMI Research

Quantum Technology

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Quantum technology sector deep dive: order validation replaces the R&D narrative — repricing the complex after a 50–75% drawdown

Report date: 2026-10-09 | Coverage: IONQ / RGTI / QuantumCTek | Current prices (2026-10-08): US\$39.45 / US\$14.14 / ¥314.96

Investment summary:

Quantum computing is switching from a "government-funded R&D narrative" to an "order-validated engineering race": over 2024–2026, leading players have largely delivered technical milestones on schedule, but the paying customer remains predominantly government budgets (government revenue is 90.2% of RGTI's total³⁰). The sector has pulled back 50–75%¹ since peaking with Quantinuum's listing in June 2026; the scarcity premium has migrated from IONQ to QNT, leaving IONQ as the sector's value stock (its P/S TTM of 64.9x is the lowest of the five names, 2026-10-08²⁹⁰)¹. We rate IONQ Neutral, RGTI Neutral (speculative) and QuantumCTek Overweight (cautious); the back end of the narrow advantage window (2028–2030) will determine share, and the pace of decline in the error-correction overhead ratio is the number-one tracking variable.

Key messages:

- Profit follows pricing power only:** revenue lands upstream in environmental hardware and midstream systems; within the same dilution-refrigeration niche, OI's quantum line earned ~1.7%¹¹, Bluefors ~17.5%¹⁵ and China's Liangxi 33.8%.
- The upstream pricing-power niche is the only proven profit pool:** with OI exiting, Bluefors' position deepens (2025 revenue €217M, 1,700+ cryogenic systems delivered cumulatively¹⁴); Liangxi Technology ranked first in China with a 30.77% share in 2024.
- Technology delivers, valuation runs ahead:** the logical-qubit record stands at 96 on the broad basis (QuEra, academic demo) and 48 commercial fully error-corrected (Quantinuum Helios), still 10–21x below the fault-tolerant threshold of ~1,000^{61 62}
- Full-spectrum exposure:** the three names cover the trapped-ion full stack (IONQ, FY2025A revenue \$130.0M³², 80.8% of the five pure plays' TTM revenue⁸⁹), the superconducting pure play (RGTI) and QKD plus domestic substitution (QuantumCTek), diversifying single-modality falsification risk
- Two policy engines are in place:** US CHIPS LOIs to nine quantum companies total \$2.013bn²⁸ and EO 14412 sets 2030/2031 PQC migration deadlines⁸³; China's cumulative announced public investment of ~\$15bn is the world's highest^{78 79 80}

INITIATING COVERAGE

IONQ	Neutral / TP US\$34–63
RGTI	Neutral (speculative) / TP US\$18–22
QuantumCTek	Overweight (cautious) / TP ¥350–470
Current price (2026-10-08)	US\$39.45 / US\$14.14 / ¥314.96

Agent Research Team

Guanlan · Head of Research
guanlan@example.com
Jianshan · Global Sector Analyst
jianshan@example.com
Ruwei · Analyst
ruwei@example.com
Zhusuan · Analyst, Financial Verification
zhusuan@example.com
Wenfeng · Analyst, Strategy & Flows
wenfeng@example.com
Bingbi · Analyst, Lead Writer
bingbi@example.com
Danqing · Associate, Charts
danqing@example.com
Zhichi · Analyst, Review
zhichi@example.com
Zhizhi · Associate
zhizhi@example.com
Virtual research team, produced by an AI agent swarm.

KIMI Research | Analyst
research@kimi.com

Valuation and target prices:

- **IONQ Neutral, 12M valuation corridor US\$34–63:** current price US\$39.45, +23% to the range midpoint; P/S TTM of 64.9x is the lowest of the five (2026-10-08²⁹⁰)¹
- **RGTI Neutral (speculative), 12M target range US\$18–22: current price US\$14.14,** +41% to the range midpoint (2026-10-08²⁹⁰)¹
- **QuantumCTek Overweight (cautious), 12M target range ¥350–470:** current price ¥314.96, +30% to the range midpoint; the range implies +11% to +49% (2026-10-08²⁹⁰)¹

Catalysts and decision points

- **[Decision point A (IONQ)]** FY2026 organic revenue (Q4 earnings in 2027-02): ≥\$280M holds Neutral and confirms the upgrade path to Overweight; <\$260M triggers a downgrade to Underweight^{33 90}
- **[Decision point B (RGTI)]** 2QG fidelity back to 99.5% on a 100+-qubit system by end-2026: delivery holds Neutral (speculative) and confirms the upgrade path; a miss with no new committed timeline triggers a downgrade⁹⁰
- **[Decision point C (QuantumCTek)]** 2026Q4 tender season: full-year revenue reaching the ¥366M effective consensus, non-related-party quantum-computing revenue above ¥50M and at least one system accepted outside the shareholder system hold Overweight; revenue below ¥360M or an ex-non-recurring loss above ¥100M triggers a downgrade to Neutral⁹⁰

Key risks

- **Commercialization handoff unproven: no market-wide disclosure of pilot-to-production conversion; D-Wave QCaaS 3Q25 revenue -13.4% YoY (2Q26 back to +50%)²⁶, no Rigetti Novera revenue recognized in 2025 (two POs of ~\$5.7M booked in 2025, delivering 2026)³⁰**
- **Milestone slippage triggers multiple-level drawdowns:** sector P/S TTM of 64.9x–477.9x^{1 290} has already priced in the 2028–2030 narrow advantage window; slippage implies multiple compression, not a percentage pullback
- **Policy timing:** NQI 2.0 has passed both committees but is not yet law⁴⁷; QuantumCTek's revenue recognition concentrates in Q4⁵⁸
- **Supply-side pressure:** the QNT lock-up expires around 2026-12⁴²; IONQ's warrant liability of \$3.05B exceeds pro forma cash of \$1.9–2.0B^{35 33}; the SPAC legacy public warrants (1.07M at \$11.50) expired on 2026-09-30 and are scheduled to be delisted on 10-12²⁷⁵, under 2% of total warrants, while the main overhang (Heights private placement of 79.05M warrants, expiring 2032) is unchanged³⁵
- **Asymmetric export-control escalation:** ECCN 4A906 imposes global licensing from 34 physical qubits⁵⁰; QuantumCTek is on the Entity List²²

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1. Executive summary: after a 50–75% drawdown, order validation replaces the R&D narrative as the pricing mainline

Key points

- Pricing now turns on who pays, order quality and cash runway rather than on qubit counts, and the sector has given back 50–75% from its June 2026 top.
- Three arguments: real profit sits only with upstream "picks and shovels" sellers that have pricing power; an upswing in the technology cycle meets valuations at a cycle high; and the scarcity premium is migrating to Quantinuum, not disappearing.
- 12-month target ranges: IONQ \$34–63 (Neutral), RGTI \$18–22 (Neutral, speculative) and QuantumCTek ¥350–470 (Overweight, cautious), with the top of each range tied to milestone delivery and the bottom to multiple compression or falsification.
- Three decision points drive the ratings: IONQ's FY2026 organic revenue, RGTI's return to 99.5% 2QG fidelity on a 100+-qubit system by end-2026, and QuantumCTek's related-party orders and quantum-communication growth in the 2026Q4 tender season.

We believe quantum computing is moving from a government-funded R&D narrative to an order-validated engineering race. Public milestones from IBM, Google, Quantinuum and D-Wave were largely delivered on time in 2024–2026, but the pricing mainline has shifted from qubit counts and roadmaps to who pays, order quality and cash runway.^{6 69}

- **Deep sector pullback: since peaking with Quantinuum's conventional IPO in June 2026, the sector has pulled back deeply**, with IONQ, RGTI and QuantumCTek -52.0%, -74.9% and -58.2% respectively from their 2-year highs (2026-10-08²⁹⁰)¹.
- **Sell-side "blue-sky" and "next great tech revolution" narratives have clearly diverged from price action^{2 73 5}**, and this report does not follow narrative temperature. As of the 2026-10-08 close, the sector has extended its pullback since late September: IONQ -3.2% (\$39.45) has been relatively resilient, while RGTI/QBTS/QUBT/QNT fell -14%~19% over the same period²⁹⁰; the whole sector averaged -23% in Q3 (Cantor quarterly report²⁸⁰), versus the S&P +2% over the same period
- **We rate IONQ Neutral, RGTI Neutral (speculative) and QuantumCTek Overweight (cautious):** at the industry level, the upstream pricing-power niche is the only entry point with proven profits today.

1.1 The business in one sentence: an engineering race funded by governments and giants, with profits at the picks-and-shovels layer, not the QPU

1.1.1 Revenue is government- and customer-concentrated, but profit sits upstream, not at the QPU

Quantum computing revenue today is mainly government contracts, R&D milestones and early system sales. The profit pool does not sit at the QPU: midstream system makers are loss-making across the board, with IonQ posting a net loss of \$510M in 2025⁴, and the only niche with profits at scale is upstream environmental engineering hardware, where profits stratify by individual pricing power rather than by segment label.^{11 15}

- **RGTI's government revenue share is 90.2% (FY2025A)³⁰**
- **QuantumCTek's related-party sales share is 43.44% on the top-five-customer basis (FY2025A)⁵⁶.**
- **IONQ's top three customers account for 53% of revenue (FY2025A)³².**

1.1.2 Three layers of judgment form the body of this report

- **The first is the value chain** (Section 2): upstream (dilution refrigeration, measurement & control and chip components) is ~40% of the 2024 total market, with midstream (systems and software) at ~46% and downstream (applications) at ~14%³; revenue lands in upstream environmental hardware and midstream system delivery, while profit concentrates in pure players with pricing power.
- **The second is technology modalities and maturity** (Section 3): superconducting, trapped ion, neutral atom and photonic are in an engineering race within the same paradigm, and all four crossed their respective milestones in 2024–2026 with no

elimination signal⁶. Error-correction feasibility is the meta-variable that simultaneously decides the modality verdict, supply-chain demand and the timeline. The logical-qubit record stands at 96 on the broad basis and 48 on the commercial fully error-corrected basis, still 10–21x below the FTQC-scale threshold.^{61 62 89}

- **The third is the competitive landscape and demand validation** (Section 4): revenue is converging at the top — CR1 of independently listed pure plays is ~73% on 2026E revenue, on the sp_data consensus combined basis effective 2026-09-10⁸⁹ — while market value disperses across modalities. The market, in other words, prices modality options, not revenue. Demand validation rates as "partially validated": government demand validated, commercial demand partially validated, and gate-model scale applications still at the narrative stage.

1.2 Core arguments: pricing power, dislocation and migration

1.2.1 Within refrigeration, profit stratifies by pure-play status, substitution premium and cost structure

Argument 1: the chain's real profit sits with the "picks and shovels" sellers, but only those with pricing power make money. Upstream environmental engineering hardware is the only niche with revenue at scale and aggregate profitability — Bluefors posted 2025 revenue of €217M with operating profit above €38M (~17.5%).^{14 15}

- **The "upstream captures all the profit" narrative is falsified by the OI case:** Oxford Instruments' quantum refrigeration business NanoScience generated ~£59M of FY25 revenue and only ~£1M of adjusted operating profit (~1.7%), and the parent divested it to Quantum Design for £60M, or ~1.0x P/S, with the stated motive of focusing on higher-margin businesses.¹¹
- **A domestic substitute in the same niche is profitable:** within the same niche, the Chinese domestic substitute Liangxi Technology earned a 33.8% net margin in 2025.
- **Refrigeration, in other words, is not a thin-margin niche per se:** profit stratifies within it according to whether a player is a pure play, whether it enjoys the domestic-substitution premium, and its cost structure. This stratification directly orders the investment entry points (Section 2).

1.2.2 Valuations already pre-pay the 2028–2030 narrow-advantage window, even as milestone delivery has improved

Argument 2: the dislocation between an upswing in the technology cycle and a high in the valuation cycle is the sector's biggest source of tension.

- **Milestone delivery by headline players in 2024–2026 was markedly better than in the 2021–2023 SPAC era:** Google Willow crossed the error-correction breakeven (2024-12), Quantinuum's Helios launched commercially supporting 48 fully error-corrected logical qubits (2025-11), IonQ set a 99.99% 2QG fidelity record (2025-10), and D-Wave's Advantage2 reached GA (2025-05).^{6 63 69}
- **Valuations have already priced in the 2028–2030 narrow advantage window:** on valuation, IONQ, RGTI and QuantumCTek trade at P/S TTM of 64.9x, 353.5x and 103.6x respectively (2026-10-08²⁹⁰)¹, all having priced in the 2028–2030 narrow advantage window (the back end of the 2026–2030 technology window in Section 3).
- **Technology delivery must accelerate to digest these valuations:** any slip on a key milestone — 256-qubit delivery, the Starling module, error-correction code engineering — produces multiple-level, not percentage-level, drawdowns.
- **Crowded positioning has partially unwound: on the other side,** after the 50–75% sector pullback, crowded positioning has partially unwound, and IONQ's forward P/S (35.2x, FY2026E merged-basis consensus, 2026-10-08²⁹⁰)⁸⁹ has fallen back to a discussable range.

1.2.3 The scarcity premium has moved to Quantinuum's pedigree, and in our view IONQ is now the sector's value leg

Argument 3: demand is "partially validated," and the scarcity premium is migrating, not disappearing. The two hardest facts on demand sit at opposite ends of the spectrum.

- **In annealing and hybrid optimization, one case has entered production:** Ford Otosan's scheduling has entered production, with solve times cut from 30 minutes to under 5, while the NTT DOCOMO solve (27 hours to 40 seconds) remains a near-production pilot — "planned," in Jefferies' wording.²⁶
- **Gate-model finance, meanwhile, has produced its first near-production pilot**, with HSBC and IBM reporting a 34% improvement in quote-fill probability prediction.²⁹

- **Self-driven growth in pay-per-use QCaaS is unproven** – D-Wave's QCaaS revenue fell 13.4% YoY in 3Q25 (2Q26 back to +50%)²⁶ – and customers are choosing to buy capacity outright rather than pay per use.
- **On structure, the scarcity premium is migrating: Quantinuum completed the industry's first conventional IPO (delivered) on 2026-06-04, priced at \$60.00 and raising \$1.68bn⁴⁰. QNT trades at about 478x P/S TTM (2026-10-08²⁹⁰) on revenue of only about 1/11 of IONQ's¹. The sector's scarcity premium has migrated from IONQ to QNT's pedigree premium of "low float + Honeywell control + conventional IPO scrutiny"⁴². Accordingly, we judge IONQ has shifted from "the only investable large-cap pure quantum name" to "the value stock within the sector": the market-cap ceiling of the scarcity narrative has been permanently lowered, but the relative valuation floor now has an intra-sector reference for the first time.**

1.3 Rating stance and target ranges: upside anchored to consensus delivery, downside to falsification paths

1.3.1 Both ends of each target range carry an anchor

Our rating stances and 12-month target ranges for the three names are summarized in Exhibit 1. The top of the range corresponds to the milestone-delivery, multiple-hold path, and the bottom to multiple compression or falsification. These are not path-agnostic compromise values; the triggers sit in the decision points (Section 1.4) and in Section 9–10.

Exhibit 1: Ratings and 12-month target ranges for the three names

Name	Rating	12M target range	Current price (2026-10-08 close ²⁹⁰)	Upside (to range midpoint)
IONQ	Neutral	\$34–63	\$39.45 ^{1 290}	+23%
RGTI	Neutral (speculative)	\$18–22	\$14.14 ^{1 290}	+41%
QuantumCTek	Overweight (cautious)	¥350–470	¥314.96 ^{1 290}	+30%

Source: yahoo_finance¹, KIMI scenario assumptions⁹⁰ Note: IONQ's low end of \$34 = the low end of MS's base range at 12x FY27 (the "organic growth holds but the multiple converges toward AI semis" path); the high end of \$63 = 24x FY27 (the "Superior 256 deployed on schedule + sequentially positive remaining performance obligations (RPO)" path); the falsification case corresponds to a cash floor of \$6–12 (Section 6). RGTI's low end of \$18 = the Jefferies Base "niche survival" path; the high end of \$22 corresponds to the "99.5% fidelity delivered by end-2026 + C-DAC confirmation" path; the falsification case = the Jefferies downside scenario of \$7, and the extreme case = net cash of about \$1.6/share (Section 7). QuantumCTek's range = effective consensus 2026E revenue of ¥366M⁹⁷ × a 98–132x P/S multiple path (the current price corresponds to 89x 2026E PS (2026-10-08²⁹⁰); derivation in Section 8); the falsification high end = "China Telecom procurement beats + orders outside the system land" (Overweight can be maintained); the downside trigger = full-year revenue below 360M or an ex-non-recurring loss above 100M (Section 8 decision point). Scenario probabilities and derivations are below and in Section 10.

1.3.2 The gap between IONQ's two guidance bases is SkyWater

Two bases of IONQ's guidance must be distinguished: an organic basis of \$280–290M (as of 2026-08-05)³³ and a combined basis of \$450–460M (as of 2026-09-08)³⁴.

The bridge between them is SkyWater's ~\$240M contribution in August–December 2026, less ~\$70M of intercompany eliminations.³⁷ Bernstein characterizes the raise as "acquisition-driven rather than an upgrade to the underlying IonQ outlook."⁹³ H1 2026 revenue of \$144.7M excludes the SkyWater consolidation (which closed only on 2026-07-31) but includes contributions from the acquisitions since 2025 — it is not a purely organic basis.^{35 36}

1.3.3 In our probabilities, RGTI's falsification risk exceeds IONQ's, and QuantumCTek's is the lowest of the three

We assign subjective outcome probabilities for the three names, with no single item above the 50% discipline line (derivations in Section 10).

- For IONQ, we assign 42% to "survives but stays mediocre," 30% to platform-leader delivery, 20% to roadmap falsification and 8% to an acquisition.
- For RGTI, we assign 45% to niche survival, 25% to roadmap delivery, 25% to technology falsification and 5% to a premium M&A exit.
- For QuantumCTek, we assign 30% to national-team platformization, 40% to dual-engine delivery, 25% to platformization stalls and 5% to falsification.⁹⁰

The attribution runs as follows.

- **IONQ's combined-basis certainty exceeds its organic-basis certainty** because SkyWater is consolidated³⁵, so "survives but mediocre" is the largest item.
- **RGTI's falsification probability (25%) exceeds IONQ's (20%)** because its revenue elasticity has been proven negative by the NQI lapse.³⁰
- **QuantumCTek's falsification probability is the lowest of the three (5%)** because of its budget-line certainty as a "15th Five-Year Plan" future industry^{53 54}, though the

25% "platformization stalls" item reflects the administrative rhythm of shareholder procurement.

Exhibit 2: Key financials for the three names over the last three years

Name	Item	FY2023A	FY2024A	FY2025A	FY2026E
IONQ	Revenue (\$M)	22.0 ³²	43.1 ³²	130.0 ³²	455.1 (consensus, combined basis) ³⁹
IONQ	Net income (\$M, GAAP)	—	—	-510 ⁴	—
IONQ	Valuation basis	—	—	P/S TTM 64.9x(2026-10-08 ²⁹⁰) ¹	Forward P/S 35.2x ⁸⁹
RGTI	Revenue (\$M)	—	10.79 ³⁰	7.09 ³⁰	23.3 (sp_data consensus, eff 2026-10-08 ²⁸⁸) ³⁹
RGTI	Adj. EPS (\$)	—	—	—	-0.16 (consensus cited by Bernstein) ⁸
RGTI	Valuation basis	—	—	P/S TTM 353.5x(2026-10-08 ²⁹⁰) ¹	—
QuantumCTek	Revenue (¥100M)	—	2.53 ⁵⁹	3.10 ⁵⁶	3.66 (cleaned consensus) ⁵⁷
QuantumCTek	Net income (¥10k)	—	—	539 ⁵⁶	—
QuantumCTek	Valuation basis	—	—	P/S TTM 103.6x(2026-10-08 ²⁹⁰) ¹	—

Source: IonQ 10-K³², Caitong Securities⁴, Rigetti 10-K³⁰, Bernstein⁸, Guotai Haitong⁵⁹, QuantumCTek annual report⁵⁶, Southwest Securities⁵⁷, yahoo_finance¹, sp_data³⁹, KIMI estimates⁸⁹. Note: all three names are loss-making or marginally profitable; the primary valuation basis is P/S, marked TTM/forward; QuantumCTek's P/E TTM of ~5,400x (distorted by marginal profitability)¹ is not used as a valuation basis. IONQ FY2026E is the sp_data sell-side consensus (consolidated basis, eff 2026-10-08²⁸⁸)³⁹; QuantumCTek FY2026E is the cleaned valid consensus (Southwest Securities)⁵⁷.

1.4 Decision-point playbook: three data points, three thresholds, three actions

1.4.1 Decision point A (IONQ): ≥\$280M organic revenue holds Neutral, <\$260M triggers a downgrade to Underweight

FY2026 organic revenue (Q4 earnings in 2027-02; historical anchor: FY2025A actual \$130.0M beat that year's guidance³² 4) is the two-way decision point for the Neutral rating.

- **Organic revenue ≥\$280M (the bottom of current organic guidance³³) validates endogenous growth beyond the combined basis:** hold Neutral and confirm the upgrade path to Overweight (contingent on the Superior 256 decision point in Section 6).
- **<\$260M (below the bottom of the old May guidance) invalidates the endogenous narrative:** downgrade to Underweight and switch to cash-floor pricing, corresponding to the falsification range of \$6–12 (Section 6)⁹⁰.

1.4.2 Decision point B (RGTI): delivery holds Neutral (speculative), while a miss without a new timeline triggers a downgrade

2QG fidelity returning to 99.5% on a 100+ qubit system by end-2026 (historical anchor: Ankaa-3 launch-release 99.5% vs the 108Q system's 99.1% regression) is the dividing line for the technology narrative.

- **On delivery, hold Neutral (speculative) and confirm the upgrade path** (to the balancing upper bound \$22 or even Jefferies Upside \$44, Section 7): the chiplet path is validated, government contracts repair (CHIPS \$100M five-year³¹) and system sales resonate.
- **If missed and management stops committing to a new timeline, downgrade and switch to falsification pricing:** Jefferies Downside \$7, with the extreme case reverting to net cash of ~\$1.6/share (Section 7); a break of the 52-week low of \$12.53¹ with the sector breaking down in sympathy is the stop-loss trigger⁹⁰.

1.4.3 Decision point C (QuantumCTek): passing all three delivery tests holds Overweight (cautious), while a revenue or loss miss means a downgrade to Neutral

Related-party orders and quantum-communication revenue growth in the 2026Q4 tender season (historical anchor: quantum-communication FY2025A revenue -4.10%⁵⁶, metro networks stalled at 40+ cities for two consecutive periods⁵⁷) is the two-way decision point for the Overweight (cautious) rating.

- **Hold Overweight and switch valuation to the ¥470 upper-bound path** (Section 8) if full-year revenue reaches the ¥366M effective consensus, non-related-party

quantum-computing revenue exceeds ¥50M, and at least one system is accepted outside the shareholder system.

- **Downgrade to Neutral and switch to a PS 40–60x framework** (¥126–194, Section 8)⁹⁰ if full-year revenue falls below ¥360M or the ex-non-recurring loss exceeds ¥100M (the Section 8 decision point).

2. Value chain and profit pool: revenue lands in upstream environmental hardware, profit follows pricing power only (1.7% vs 33.8% within the same niche)

Key points

- Revenue lands in upstream environmental hardware and midstream system delivery, but profit follows intra-segment stratification by pricing power, not the "upstream takes everything" label.
- Within the same dilution-refrigeration niche, the quantum line inside a diversified major (OI NanoScience) earned an adjusted operating margin of ~1.7% and was divested at 1.0x P/S¹¹, the pure-play leader Bluefors earned ~17.5%¹⁵, and the Chinese domestic substitute Liangxi Technology earned a 33.8% net margin. • Upstream accounts for ~40% of the 2024 total market³, and all three BOM anchors — a dilution refrigerator at ~\$1M/unit, superconducting measurement & control at ~\$25k/qubit, and QPU cost in the tens of millions of dollars on lagging process nodes — have been re-confirmed against the latest sources.⁵
- The strongest chokepoints are dilution refrigeration and He-3 supply in the superconducting chain, and the niches where bargaining power is rising — refrigeration > decoding electronics > measurement & control > lasers/photonics — also form the investment entry-point ranking.

The quantum-computing value chain's revenue today lands in upstream environmental engineering hardware and midstream system delivery, but the profit distribution is not the segment-level label "upstream takes everything"; it is intra-segment stratification by pricing power.

- **Within the same dilution-refrigeration niche, margins stratify sharply:** the quantum line inside a diversified major (OI NanoScience) earned an adjusted operating margin of ~1.7% and was divested at 1.0x P/S¹¹, the pure-play leader Bluefors earned ~17.5%¹⁵, and the Chinese domestic substitute Liangxi Technology earned a 33.8% net margin. •
- **Upstream accounts for ~40% of the 2024 total market**³, and all three BOM anchors — a dilution refrigerator at ~\$1M/unit, superconducting measurement & control at ~\$25k/qubit, and QPU cost in the tens of millions of dollars on lagging process nodes — have been re-confirmed against the latest sources.⁵
- **The strongest chokepoints are dilution refrigeration and He-3 supply** in the superconducting chain.
- **The niches where bargaining power is rising** — refrigeration > decoding electronics > measurement & control > lasers/photonics — also form the investment entry-point ranking.

2.1 The three-way split: upstream takes 40%, but today's revenue and profit landing points have nothing to do with the endgame structure

2.1.1 The upstream market series is a single-lineage scenario, not comparable with vendor-revenue bases

The three-way split holds, with quantified structure. Upstream (qubit environment, measurement & control systems and chips) is ~40% of the 2024 global quantum-computing market, with midstream (systems and software) at ~46% and downstream (applications) at ~14%.³ The upstream market was ~\$2.04bn in 2024 and is projected to reach ~\$72.57bn by 2030E³ (Exhibit 4).

- **The basis needs flagging:** This series belongs to the same single-lineage, full-value-chain scenario from Photon Box/ICV as "total market \$5.04bn in 2024 → \$807.75bn in 2035"⁴ and "\$811.7bn in 2035"², two cited values that differ by ~0.5%. This report standardizes on the \$811.7bn figure.²
- **Against vendor-revenue bases, the gap is one of statistical boundary rather than forecast:** McKinsey's >\$1bn of QC company revenue in 2025 (2028E \$4.4bn)⁹ versus BofA's ~\$300M of pure QC vendor revenue in 2024⁷ puts the base-year difference at ~5–17x.
- **We therefore do not chart or discuss this series alongside vendor-basis figures:** the four-layer TAM vote is in Section 5.

Exhibit 3: Three-way split of the quantum-computing value chain — upstream takes scale, midstream takes narrative, downstream takes expectations

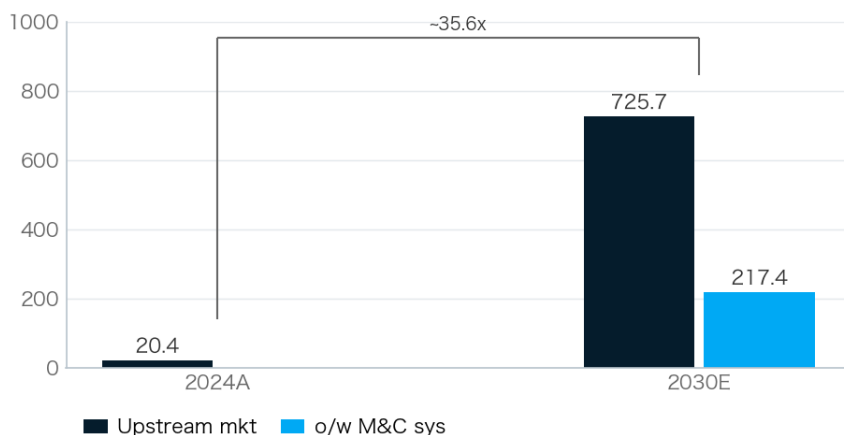
Segment	Outputs	Representative companies (listed/private/China)	Gross margin and profitability	Scale
Upstream: environment (dilution refrigeration/vacuum/cryogenic cabling/He-3)	10mK ultra-low temperature and ultra-high vacuum	Listed: Oxford Instruments (quantum business divested), FormFactor, ULVAC, VAT; private: Bluefors, Leiden Cryogenics; China: Liangxi Technology, CETC 16th Institute, Hefei Zhileng, QuantumCTek (ez-Q series) ³	Sharply stratified: OI quantum line AOP margin ~1.7% ¹¹ , Bluefors operating margin ~17.5% ¹⁵ , Liangxi net margin 33.8%.	2024 global upstream ~\$2.04bn ³ ; of which China's dilution-refrigerator market was ~\$58M, 16.3% of the ~\$360M global market ³
Upstream: measurement & control	Qubit drive/readout/error-correction electronics	Listed: Keysight, Rohde & Schwarz (Zurich Instruments), ADI; private: Quantum Machines, Qblox; China: QuantumCTek (1,000-qubit class), Origin Quantum (500+ qubits) ³	No public quantum-specific margin split (evidence gap); QuantumCTek's quantum-computing segment gross margin of 38.07% ⁵⁶ as a China reference	2030E global ~\$21.74bn ³
Upstream: QPU/chip components	Quantum chips (transmon/trapped-ion/photonic)	Listed: IBM, Google, IonQ (Oxford Ionics consolidated), Rigetti (own Fab-1); private: Quantinuum, PsiQuantum, Origin Quantum ^{3 5}	Not separately disclosed; manufactured on lagging nodes (e-beam/200nm class) ⁵	QPU cost in the tens of millions of dollars ⁵
Midstream: systems/QCaaS/software stack	Complete systems, cloud access, compilers/OS	Listed: IBM, IonQ, Rigetti, D-Wave, QuantumCTek; private: Quantinuum, IQM, Pasqal, QuEra; cloud platforms: AWS Braket/Azure/IBM Quantum/China Telecom "Tianyan" ³	Loss-making across the board: IonQ 2025 net loss \$510M ⁴ ; D-Wave 2025 gross margin 82.6% (revenue only \$24.6M) ⁴	Listed pure-play system makers' combined annual revenue <\$200M ^{4 5}
Downstream: applications	Finance/pharma/chemicals/logistics/energy/cryptography	Mostly POC/pilots (Section 4 ledger)	Essentially no revenue at scale	2035E application mix forecast: finance 51.9%, pharma 20.5%, chemicals 14.2% ²

Source: Sinolink Securities³, Guosen Securities², UBS⁵, Caitong Securities⁴, Oxford Instruments¹¹, Bluefors^{14 15}, Hexin Instrument¹⁶, QuantumCTek⁵⁶ Note: the upstream/midstream/downstream size structure and the upstream market series are Photon Box/ICV single-lineage full-value-chain scenarios and cannot be compared in the same paragraph as vendor-revenue bases; the "representative companies" column is not an exhaustive directory.

2.1.2 Two facts in the three-way structure are frequently misread and deserve separate treatment

- **Midstream's current revenue landing point is tiny:** first, the 46% "scale" of midstream systems and cloud platforms is mostly a forward-basis distribution — listed pure-play system makers generated combined 2025 revenue below the \$200M mark (IonQ at \$130M, Rigetti at \$7.1M and D-Wave at \$24.6M^{4 5}). IBM's cumulative quantum revenue basis of nearly \$1bn over Q1'17–Q4'24 mixes revenue, bookings and IP and cannot be compared with pure-play annual revenue.⁵
- **Downstream's share maps a forecast, not today's revenue:** second, the 14% downstream application share is a discounted mapping of the 2035 forecast structure. Downstream has essentially no revenue at scale today, and procurement by the three expected mainstays — finance, pharma and chemicals, 86.6% combined² — still sits in innovation-lab budget lines (Section 4).

Exhibit 4: Global quantum-computing upstream market size (USD 100M, 2024–2030E)



2.2 BOM quantification: all three BOM anchors confirmed; China's system price is ~0.6–0.9x overseas

2.2.1 All three vintage anchors for where the money goes in a quantum computer have been re-verified against the latest sources

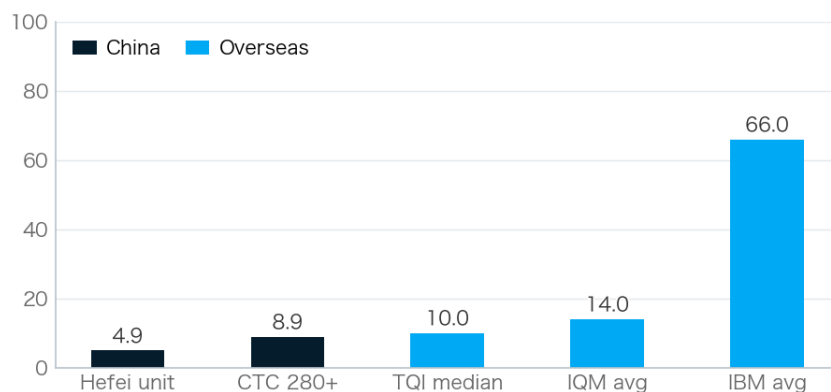
- The dilution refrigerator runs ~\$1M per large unit, rising with qubit count⁵.
- Control electronics cost ~\$25k/qubit for superconducting systems⁵; Rigetti claims its own control system costs \$10k/qubit against an industry \$35k/qubit⁵ — a company claim, unverified by third parties, but one that, if true, would directly weaken third-party suppliers' bargaining power as system makers bring control in-house.
- The QPU itself costs in the tens of millions of dollars and is manufactured on lagging process nodes (e-beam/200nm-class mature equipment); trapped-ion chips are fabricated by Infineon on mature analog lines⁵.
- A supplementary anchor is ultra-high-vacuum systems at ~\$100k⁵.
- The value share of lasers, vacuum and photonic interconnects in the trapped-ion system BOM is an evidence gap market-wide; UBS gives only component-level qualitative structure (QPU + UHV + lasers/optics + control electronics)⁵.

2.2.2 In our view, the only first-hand Chinese sample is a related-party negotiated price, so market price discovery has not yet happened

At the system level, a quantifiable price gap has opened between China and overseas (Exhibit 5).

- The only first-hand Chinese data point is QuantumCTek's sale of a 280+-qubit superconducting quantum-computing project to its controlling shareholder China Telecom Quantum Group, at an estimated contract value of ¥63.0540M including tax (~\$8.9M) and covering a four-piece hardware set of chip, measurement & control, dilution refrigerator, signal transmission and cryogenic components. The procurement drew only one supplier response and was converted to direct procurement, so the price is a related-party single-source negotiated one, not a competitive bid.¹⁹
- On the overseas side, The Quantum Insider's sales dataset counts 204 public deals since 2013, with a median of ~\$10M; IQM's average is ~\$14M and IBM's ~\$66M, including multi-year access bundles.¹⁷
- On total price, the Chinese system is ~0.9x the overseas on-prem median, 0.63x the IQM average and 0.13x the IBM average; on unit price per qubit, China is ~\$31.8k/qubit, roughly 1/8–1/12 of overseas.⁸⁹
- In our view, the popular "China = 1/3–1/2 of overseas" formulation is directionally right but quantitatively imprecise. A more accurate statement is that total price runs at ~0.6–0.9x of overseas and unit price per qubit at ~1/10, that the only first-hand data point is a related-party negotiated price, and that market price discovery has not yet happened.
- Emerging-market orders could shift toward Chinese systems: if the Chinese price band is confirmed by more first-hand samples, export controls could push orders from emerging markets (Middle East, Southeast Asia and Latin America) toward Chinese systems — a variable that foreign sector reports completely ignore.

Exhibit 5: QC system price bands, China vs overseas (USD M/unit, bases per note)



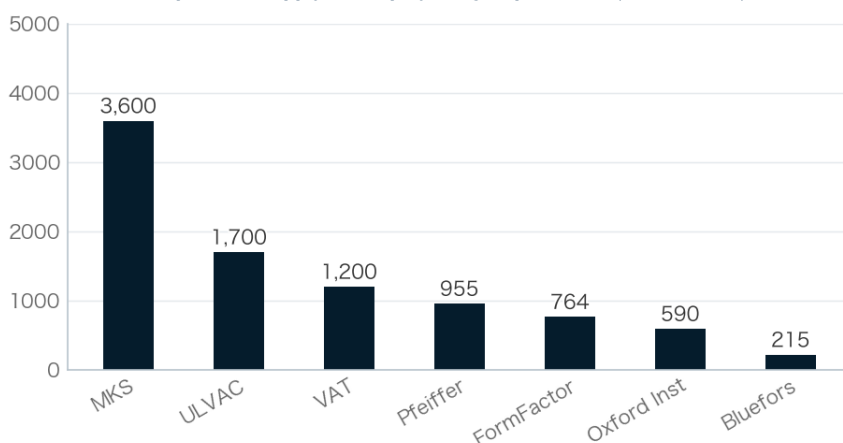
Source: Guodun announcement¹⁸, China Telecom procurement¹⁹, TQI¹⁷, KIMI estimates⁸⁹

2.3 Profit-pool test: revenue lands upstream, margins stratify by individual pricing power

2.3.1 The proposition that "upstream picks-and-shovels sellers capture all the profit at scale" needs a second-order correction now that the OI case is confirmed

- **What holds is upstream's aggregate profitability:** upstream environmental engineering hardware is the only niche with revenue at scale and aggregate profitability: Bluefors posted 2025 revenue of €217M, with 1,700+ cryogenic measurement systems and 15,000+ refrigerators delivered cumulatively¹⁴, 2025 operating profit above €38M (operating margin ~17.5%), and a valuation above €1bn (>4.6x P/S).¹⁵
- **What does not hold is the generalization:** Oxford Instruments' NanoScience, one of the two global dilution-refrigeration oligopolists, generated ~£59M of FY25 revenue and only ~£1M of adjusted operating profit (~1.7%), and was sold to Quantum Design for £60M in total cash consideration — including up to £3M of contingent consideration, or ~1.0x P/S — completing on 2026-01-02.^{11 13}
 - The £1M AOP, moreover, is after allocated group costs: ~£4M of allocated costs flowed back to the group after the sale, and even adding it back yields only ~8.5%, still far below Bluefors and Liangxi.¹¹
 - The seller stated the divestiture motive as focusing on higher-margin businesses and medium-term margin targets¹¹ — the major itself admitting that quantum refrigeration is a thin-margin asset under its cost structure.
- **For reference, the OI group as a whole posted FY25 revenue of £500.6M and adjusted operating profit of £82.2M (16.4% margin)¹²**; the quantum line is indeed a margin valley inside its portfolio.

Exhibit 6: Quantum upstream supply-chain players, group revenue (USDm, 2024)



Source: UBS⁵, as_of 2024-12-31

2.3.2 Profit quality is decided by three variables: pure-play focus, the domestic-substitution premium and cost structure

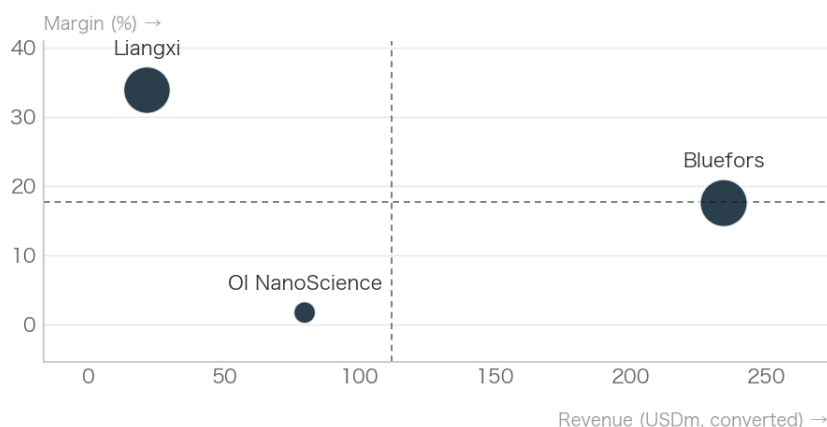
The accurate profit-pool statement, in our view, is that the revenue-lands-upstream claim holds, but margin distribution is intra-segment stratification by individual pricing power, not inter-segment layering (Exhibits 7 and 8).

- The three variables are whether the player is a pure play (Bluefors focused versus OI's diversified cost allocation), whether it enjoys the domestic-substitution

premium (Liangxi ranked first in China with a 30.77% share in 2024, an embargo beneficiary)◦, and cost structure (Liangxi gross margin 56.03%, 61.26% in 2024)◦.

- **Capital markets are already pricing individual profit quality rather than segment labels:** OI's quantum line sold at 1.0x P/S, Bluefors is valued at >4.6x P/S, and the Liangxi 56% stake deal implies 4.5x P/S and 13.3x 2025 P/E for the whole company.^{11 15}◦
- **Quantum-specific margins in measurement & control and lasers are not publicly broken out anywhere**, an evidence gap — and can only be inferred as high-margin but tiny from group gross-margin structures.
- **The China reference is QuantumCTek's quantum-computing segment (measurement & control, systems and components), with an FY2025A gross margin of 38.07%**, well below its quantum-communication segment's 66.27%⁵⁶ — evidence that Chinese measurement & control/systems is currently closer to a price-for-volume niche.

Exhibit 7: Dilution refrigeration: three cases on revenue, margin and P/S (2025–26, mixed vintages)



Source: Oxford Instruments¹¹, Bluefors¹⁴, HS Visio¹⁵, Hexin¹⁶, KIMI estimates⁸⁹, as of 2026-09-22

Exhibit 8: Upstream margin matrix — individual stratification, not segment labels

Niche	Entity	Revenue (latest)	Profit basis	Margin	Valuation/deal multiple
Dilution refrigeration	OI NanoScience (UK, divested)	~£59M (FY25) ¹¹	Adjusted operating profit ~£1M ¹¹	~1.7%	£60M = 1.0x P/S ¹¹
Dilution refrigeration	Bluefors (Finland, private)	€217M (2025) ¹⁴	Operating profit >€38M ¹⁵	~17.5%	Valuation >€1bn =>4.6x P/S ¹⁵
Dilution refrigeration	Liangxi Technology (Shanghai, to be merged into *ST Hexin)	¥152.68M (2025, +110%)◦	Net profit ¥51.56M◦	33.8%	Whole-company ¥687M = 4.5x P/S, 13.3x P/E◦
Measurement & control	Zurich Instruments/Keysight et al.	Quantum lines not broken out	Evidence gap	Evidence gap	—
M&C + systems (China)	QuantumCTek quantum-computing segment	—	Segment gross margin	38.07% ⁵⁶	—
Lasers/optics	TOPTICA/Coherent et al.	Quantum lines not broken out	Evidence gap	Evidence gap	—

Source: Oxford Instruments¹¹, Bluefors¹⁴, Helsingin Sanomat Visio¹⁵, Hexin Instrument◦, QuantumCTek⁵⁶ Note: no public quantum-specific margin split exists anywhere in measurement & control or lasers — an evidence gap; QuantumCTek's quantum-computing segment gross margin is a China reference for "price-for-volume" in M&C/systems.

2.4 Value migration: midstream buys upstream while upstream pure-plays exit

2.4.1 Refrigeration profits are concentrating toward pure-play leaders and Chinese domestic substitutes

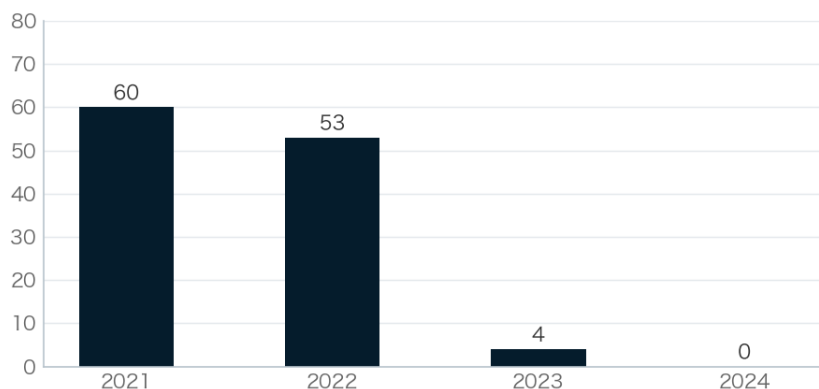
Over the past 3–5 years, value capture has moved from "upstream equipment vendors earning alone" — the 2021–2023 research procurement wave — to "midstream system makers scaling revenue while losses widen," the 2024–2026 government order wave; 2025–2026 then brought a landmark two-way movement.

- **At one pole, midstream is integrating upstream in reverse:** since 2024 IonQ has made 9–10 acquisitions along a chain running from quantum networking (Qubitekk)

through quantum security (ID Quantique, controlling stake, \$250M), photonic interconnect (Lightsynq), chip-scale trapped ion (Oxford Ionics, \$1.075B), SAR satellites (Capella Space), quantum sensing and timing (Vector Atomic), free-space optical communications (Skyloom) and semiconductor foundry (SkyWater, \$1.8B, closed 2026-07-31✓) to defense software (Seed Innovations)^{24 35} (Exhibit 10).

- **The notable detail is the consideration structure:** per a third-party review of its 10-Q, cash accounted for only ~3.9% of IonQ's ten acquisitions — cash went to just five, namely Qubitekk Federal at \$22.07M, Capella at \$48.35M, Skyloom at \$36.02M, Oxford Ionics at \$10.00M and Lightsynq at \$0.10M — the remainder being stock²⁵ (single source). IonQ's expansion is in essence "buying the value chain with printed stock": the dilution path matters more than the cash burn, and post-SkyWater IonQ has changed from an asset-light system maker into a vertically integrated player with a foundry, so peer comparability needs adjusting.
- **At the other pole, upstream is exiting in purified form:** OI sold NanoScience at 1.0x P/S¹¹, while in the Chinese mirror Hexin Instrument is buying 56% of Liangxi Technology at 4.5x P/S.
- **The same-niche price gap is itself a market vote:** 1.0x versus 4.5x in the same window reflects the profit pool's geographic migration — refrigeration profits are concentrating from diversified divisions of US and European majors toward pure-play leaders and Chinese domestic substitutes.

Exhibit 9: China dilution refrigerator imports (units, 2021–2024)



Source: Guanyan Tianxia²³, as_of 2024-12-31

2.4.2 Committee approval secured: Hexin–Liangxi opens a pricing channel for buyout exits of primary-market quantum upstream assets

- The deal constitutes a major asset restructuring, with the first-year performance commitment met: the Hexin–Liangxi transaction is the landmark event in the China branch of the "two-way movement"; full terms: *ST Hexin is acquiring a 56.00% stake in Liangxi Technology for ¥381.92M (income-approach appraised value of ¥687M, appreciation rate of 744.44%; implied deal value of ¥682M = consideration of ¥381.92M ÷ 56%); payment is all-stock for Wu Ming's 36% stake (¥17.60/share, 13.95M shares, locked up for 36 months with release in two tranches) plus all-cash consideration of ¥136.4M for Shanghai Yandao's 20% stake, with supporting fundraising of up to ¥150.4M (90.69% used for the cash payment); performance commitments require 2025/2026/2027 net profit of no less than ¥35M/¥50M/¥65M (cumulative ¥150M; ¥51.5557M already achieved in 2025, meeting the first-year target); the target's 2025 revenue is 1.54x that of the listed company, constituting a major asset restructuring¹⁶. The transaction was approved by the SSE M&A and Restructuring Review Committee on 2026-09-29 (still subject to CSRC registration)²⁸⁵; the revised filing disclosed Liangxi's order backlog of ¥332M (2026-08-31, +31.9% vs end-2025), 2024 domestic dilution-refrigerator market share of 30.77% ranked first, and 2026H1 revenue of ¥125M already exceeding 82% of full-year 2025²⁸⁵.
- The transaction was approved by the SSE M&A and Restructuring Review Committee on 2026-09-29 (the 18th review meeting of 2026) and still requires CSRC registration²⁸⁵.
- Once the committee approval is implemented, this will be China's first completed listed-company control-type acquisition of a quantum upstream asset — its demonstration significance lies in opening a "buyout exit" pricing channel for primary-market quantum upstream assets, forming a China–US mirror with the primary-to-secondary channel opened by the Quantinuum IPO.

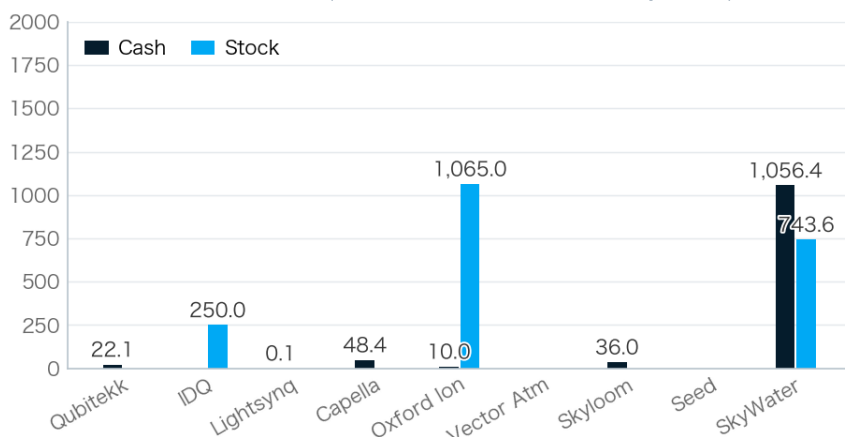
2.4.3 On our timeline, capital is already pricing the narrow-advantage window while

revenue delivery lags

Our timeline judgment for value redistribution is as follows. Before the back half of the narrow-advantage window (2028–2030), the profit pool stays anchored in upstream environmental hardware and system delivery; if FTQC arrives, it migrates toward scaled QPU manufacturing, error-correction decoding electronics and cloud-platform revenue share.

- **UBS has stated that decoding electronics end up as ASICs**, with GPUs benefiting in the interim⁵, and a ready example is Riverlane's 12nm ASIC decoder, which decodes a 1,057-qubit surface code in 240ns on 0.06mm² at 8mW.⁵
- **Capital migration is also under way**: global quantum startup funding reached \$12.6bn in 2025, 6.3x the 2024 level, with 90% going to quantum-computing companies⁹, and the top ten deals totaled \$7.6bn, 60% of the year⁹ — funding concentration is moving in the same direction as revenue concentration.
- **By contrast, listed pure-play system makers' combined annual revenue remains below \$200M⁴**⁵: the primary market is pricing the 2028–2030 window while secondary-market revenue delivery lags 3–5 years, and the split itself is a signal.
- **The Chinese primary-market mirror tells the same story**: TuringQ raised nearly ¥1bn across two 2026 rounds at a valuation above ¥7bn, Bose Quantum's ¥1bn Series B set a domestic single-round record, and Origin Quantum's Pre-IPO round valued it at ¥21bn pre-money (2026-06).⁴

Exhibit 10: IonQ M&A chain timeline (2024–2026, consideration basis per note)



Source: Quantum Zeitgeist²⁴, IonQ 10-Q³⁵, quantum-city.net²⁵, KIMI estimates⁸⁹, as of 2026-08-21

2.5 Technology-barrier ratings by segment: dilution refrigeration and QPU manufacturing are hardest; domestic M&C already benchmarks overseas leaders, and refrigeration localization is catching up quickly

We rate five segments on three axes — source of barrier, substitutability, and China accessibility — with ratings and evidence combined in Exhibit 12.

- **The QPU-manufacturing barrier is process know-how** (Josephson-junction uniformity, ion-trap electrodes) and multi-chip packaging and interconnect, not lithography: the process itself is lagging (200nm/e-beam)⁵, which explains why China's design and packaging accessibility is not bad. The entity-list basis needs separating by main business: QuantumCTek, with quantum communication as its main business, was placed on the first quantum entity list in 2021-11²², while Origin Quantum is the only company listed with quantum-computing systems as its main business.⁴
- **Dilution refrigeration stacks three barriers**: the dilution-refrigeration barrier is physics (10mK ultra-low temperature), cooling-power scale (1,000μW+ at 100mK) and reliability credentials combined, and Bluefors' installed-base reliability data across 1,700+ systems is a non-replicable hidden barrier.¹⁴ This segment has China's lowest accessibility: the US embargo since 2022 cut imports to zero by 2024²³, forcing out no fewer than 10 domestic suppliers whose specifications are approaching the frontier (minimum temperature 6.3–8.5mK, cooling power 400–1,700μW@100mK).^{3 4}
- **M&C is where China's accessibility is highest**: although the electronics barrier is microwave-link noise, channel density and cryogenic integration (cryo-CMOS remains immature), QuantumCTek's 1,000-qubit-class M&C benchmarks Keysight's 1,000+qubit product, and "domestic vendors' M&C systems show no significant gap with overseas leaders."³

- **The laser and photonics barrier is precision optics** (frequency stability, power and integrated photonics), with TOPTICA and Coherent dominating the high end and domestic players such as Frequency-Standard Laser ramping.⁴
- **The software-stack barrier is the lowest**, diluted by open-source ecosystems (Qiskit, Cirq), though real-time error-correction decoding (240ns class) forms a local high barrier: IBM's Relay-BP decoder delivers a 5–10x speedup and can run on FPGA and ASIC in real time.^{2 65}

2.5.1 In our ranking, dilution refrigeration and QPU manufacturing are the hardest barriers, but hardness does not equal investability

The five-segment barrier ratings and the per-modality bargaining-power scorecard are presented together in Exhibit 12. Our barrier ranking runs: dilution refrigeration $\approx$ QPU manufacturing $>$ M&C $\approx$ lasers $>$ software stack.

- **A hard barrier, however, does not by itself make an attractive investment**; investability must be overlaid. He-3 is the hardest chokepoint in the superconducting chain — 25–100 liters per dilution refrigerator, essentially no domestic capacity in China, single source²² — yet its supply is dominated by the US and Russia under administrative allocation, leaving essentially no secondary-market entry point.

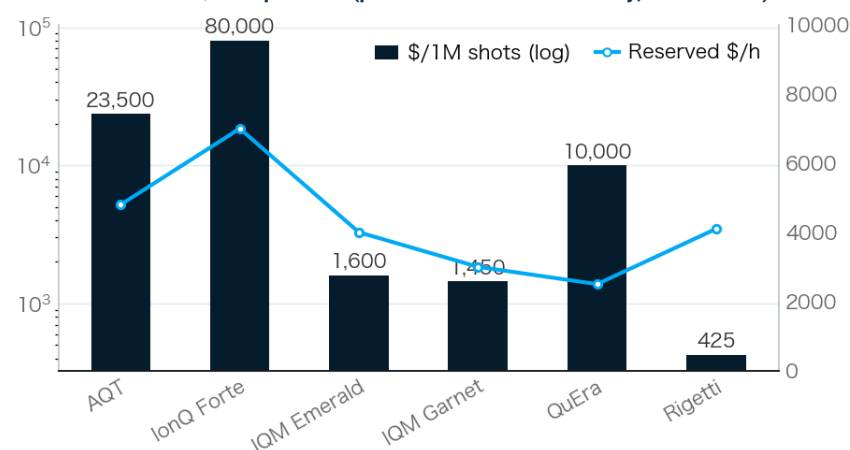
2.6 Bargaining-power structure: per-modality chokepoints, the two-sided cloud channel, and government's triple role

2.6.1 Superconducting chokepoints are the hardest, while the trapped-ion supply chain is still immature, with no oligopoly

The per-modality supply-chain chokepoints are mapped in Exhibit 12.

- **For superconducting, the strongest chokepoints are the dilution-refrigeration duopoly and He-3**: Bluefors holds $\sim 70\%$ of global dilution refrigerators — a single-source chain relayed by Sinolink Securities³ — a position that deepens after OI's exit, while He-3 supply is dominated by the US and Russia.²²
- **For trapped ion, the chokepoints are lasers, UHV and photonic interconnects**; the supply chain is immature, with no oligopoly, but high-end lasers depend on TOPTICA and Coherent, and IonQ has built its own chokepoints by acquiring Oxford Ionics (chips) and Lightsynq (photonic interconnects).²⁴
- **For photonic, the chokepoints are light sources, single-photon detectors and photonic wafer foundry**; Xanadu is working with AMAT on a 300mm photon-detector production process.⁵
- **For neutral atom, the chokepoints are lasers, vacuum and spatial light modulators** — heavily overlapping with trapped ion — and QuEra has taken strategic investment from NVIDIA.⁵

Exhibit 11: AWS Braket QCaaS price list (per-shot and reserved hourly, 2026-09-22)



Source: AWS²¹, KIMI estimates⁸⁹

2.6.2 The two-sided structure of the cloud channel holds

Cloud providers are simultaneously distributors (Braket hosts IonQ, Rigetti, IQM, QuEra and AQT), in-house competitors (the AWS Ocelot chip, the Azure topological QPU, Google Willow) and price-rule setters.

- **QCaaS pricing has seen no public price cut in three years** — a stable stratification of \$0.30 per task across the board plus per-shot pricing tiered by hardware²¹ — and the per-shot cross-vendor spread runs as high as 188x, far above the 2.8x hourly spread⁸⁹ (Exhibit 11).

- **That spread shows cloud pricing is anchored to modality scarcity and brand, not compute cost:** trapped ion (IonQ Forte) commands the highest premium, while Rigetti buys share at near-cost prices.
- **Take rates and customer-ownership terms are undisclosed by all three clouds** — an evidence gap — and the demotion risk is already real: AWS's in-house Ocelot (released 2025-02, claiming 90% lower QEC overhead) is a lab prototype that has never been listed on Braket, yet already competes with third-party vendors inside its own channel.⁵

Exhibit 12: Per-modality bargaining-power scorecard and technology-barrier ratings — superconducting chokepoints hardest, M&C most accessible for China

Modality/segment	Strongest chokepoint	Bargaining rating	Quantified evidence	China accessibility
Superconducting: dilution refrigeration + He-3	Bluefors/OI duopoly (OI exited) + He-3 allocation	Strong	Bluefors ~70% share (single-source chain) ³ ; China imports 60 units in 2021 0 in 2024 ²³	Lowmedium: forced domestic substitution; domestic minimum temperature 6.3–8.5mK, cooling power 400–1,700μW@100mK ^{3 4}
Superconducting: M&C electronics	Channel density/microwave-link noise	Medium	~\$25k/qubit ⁵ ; Rigetti claims \$10k/qubit (company claim) ⁵	Medium-high: QuantumCTek 1,000-qubit-class benchmarks Keysight ³
Trapped ion: lasers/vacuum/photonic interconnect	High-end laser dependence, immature interconnect	Medium	UHV ~\$100k ⁵ ; IonQ built chokepoints via Oxford Ionics/Lightsynq ²⁴	Medium: TOPTICA/Coherent dominate the high end
Photonic: sources/detectors/photonic wafers	Single-photon detection and foundry	Medium	Xanadu×AMAT 300mm process ⁵	Medium
Neutral atom: lasers/vacuum/SLM	Overlaps trapped-ion components	Medium	QuEra took NVIDIA strategic investment ⁵	Medium
QPU manufacturing	Process know-how/packaging interconnect	High (barrier)	Lagging nodes accessible (e-beam/200nm) ⁵	Medium: Origin Quantum is the only entity listed with QC systems as its main business ⁴
Software stack/decoding	Real-time decoding engineering	Medium	Riverlane 12nm ASIC decodes 1,057 qubits in 240ns ⁵ ; IBM Relay-BP 5–10x speedup ^{2 65}	Medium-high

Source: Sinolink Securities³, Guanyan Tianxia²³, UBS⁵, Quantum Zeitgeist²⁴, Caitong Securities⁴, Guosen Securities², IBM⁶⁵, postquantum.com²² Note: bargaining ratings are composite judgments; barrier "hardness" is separated from "investability" — He-3 has the strongest bargaining power but is essentially non-investable²².

2.6.3 Government's triple role — referee, first customer and shareholder — is present in full in this industry

The intersections and absences in the "dual-track lists" directly change how names are priced.

- Referee role: DARPA QBI screens in stages — Stage A (2025-04) had 18 companies, Stage B (2025-11) had 11, with the goal of determining utility-scale feasibility by 2033⁴⁵. On 2026-10-07, DARPA announced the Stage C list: Atom Computing, Diraq, IBM, and IonQ advanced from Stage B, joining Microsoft and PsiQuantum (which had entered directly) for six companies in total; at Stage C, a government evaluation team will physically test whether each company's utility-scale system can be built and operated as designed²⁷⁰ (Diraq announced an initial commitment of \$51M; DARPA said it has invested more than \$650M in the program²⁷⁰).
- As first customer, IonQ holds four AFRL contracts totaling \$114.5M^{32 33}, and IBM received CHIPS incentives to build the first dedicated quantum-chip fab in the US.⁴
- As shareholder, the US Department of Commerce has issued CHIPS LOIs totaling \$2.013bn to nine quantum companies with equity arrangements²⁸, while the

Chinese path runs through China Telecom Quantum Group's control of QuantumCTek.⁵⁶

- **The difference in who pays directly determines the revenue-quality pricing gap:** IonQ's 2025 commercial-customer share was ~60% (company basis, definition not broken down)⁴, while China's demand today comes mainly from research, government and SOE procurement.⁴

2.6.4 Control asymmetry is the underlying variable in the reallocation of bargaining power

- **The US side runs parameterized-threshold controls:** in 2024-09, BIS brought quantum-computing items into the EAR, with ECCN 4A906 imposing global licensing on a two-dimensional matrix of 34 physical qubits and C-NOT error rate; dilution refrigeration (3A904), M&C (4A906.c), quantum chips (4A906.b) and development software and technology (4D906/4E906) are controlled in parallel, with a presumption of denial for Country Groups D:1 and D:5, including China.^{50 51} Annealing machines — the D-Wave modality — are explicitly exempt.⁵⁰
- **China's export-control list does not include quantum hardware** ; its countermeasure runs through critical minerals, with gallium, germanium and antimony embargoed in 2024-12 and the suspension running 2025-11 through 2026-11.⁵²
- **The result is asymmetric:** China's upstream is forced into self-sufficiency (refrigeration imports to zero, M&C localization rising)^{23 3}, while the US upstream is forced into allied sourcing (He-3 allocation and ally diversification).
- **We believe further escalation has diminishing marginal damage to the Chinese chain** ; for names already on the Entity List²², such as QuantumCTek, however, the long-arm compliance risk on overseas deliveries (e.g., the 25-qubit system export) is one-directional.

2.6.5 The segments where bargaining power is rising are also the investment entry-point ranking

- 1) dilution refrigeration and cryogenic systems (duopoly to single oligopoly, plus China's forced substitution — the Bluefors, Liangxi-Hexin, QuantumCTek ez-Q and CETC 16th Institute chains);
- 2) error-correction decoding electronics (an FTQC necessity going from 0 to 1 — the Riverlane model plus NVIDIA positioning);
- 3) measurement & control systems (qubit-count scaling directly lifts value content, to ~\$21.7bn in 2030E³);
- 4) high-end lasers and photonics (picks-and-shovels across three modalities); and
- 5) He-3 and critical gases (strongest bargaining power but non-investable).²²

All five sit upstream, consistent with the profit-pool judgment. Midstream system makers' bargaining power depends on order conversion in the back half of the narrow-advantage window (2028–2030) — an option, not current bargaining power.

3. Technology modalities and maturity: error correction enters the engineering phase, logical qubits still 10–21x below the FTQC threshold

Key points

- The four general-purpose modalities are, in our view, in an engineering race within the same paradigm: none has shown the elimination signal of "error rates failing to fall as qubits scale"⁶
- The Barclays seven-dimension scorecard (as of 2025-11) ranks trapped ion at 25: ahead of neutral atom at 23, superconducting at 22, silicon spin at 20 and photonic at 17⁶
- Logical qubits must be cited with three labels — error-correction level, commercial versus demo, and timestamp: the broad-basis record is QuEra's 96⁶¹, and the commercial fully error-corrected record is Quantinuum Helios' 48^{62 63}
- Logical qubits are still 10–21x below the FTQC-scale threshold of ~1,000⁸⁹
- Error-correction feasibility is the meta-variable: each order-of-magnitude cut in the overhead ratio is equivalent to roadmaps moving years forward⁶

The four general-purpose modalities are, in our view, in an engineering race within the same paradigm rather than a paradigm-elimination contest. All four — superconducting, trapped ion, neutral atom and photonic — crossed their respective milestones in 2024–2026, and none has shown the elimination signal of "error rates failing to fall as qubits scale."⁶

- **Barclays' scorecard is dynamic:** as of 2025-11 it ranks trapped ion at 25, ahead of neutral atom at 23, superconducting at 22, silicon spin at 20 and photonic at 17⁶, and any single-point breakthrough can rewrite the ranking within 12–18 months
- **Logical qubits must be cited with three labels:** error-correction level, commercial versus demo, and timestamp — the current broad-basis record is QuEra's 96 (d=4 error-correcting code plus partial fault-tolerant operation, academic demo)⁶¹, and the commercial fully error-corrected record is Quantinuum Helios' 48 (d=4 concatenated code, 2:1 encoding rate)^{62 63}
- The distance to the FTQC-scale threshold of ~1,000 logical qubits is 10–21x⁸⁹
- **Error-correction feasibility is the meta-variable:** each order-of-magnitude cut in the overhead ratio is equivalent to roadmaps moving years forward, supply-chain demand reshuffling and modality rankings being rewritten⁶

3.1 Metric dictionary and the seven-dimension scorecard: unify definitions before ranking

3.1.1 Cross-comparison requires unified definitions, and this report uses the following metric dictionary

Physical qubit count is the best disclosed, but shows scale rather than reliability, and logical qubit count must be split into three labels — error-correction level, commercial versus demo, and timestamp — and is the most chaotically disclosed.

- **2Q gate fidelity leaves cherry-picking room:** vendors can test on different gate sets and qubit pairs
- **Gate speed is the worst disclosed:** only 3 of 31 trapped-ion companies report it⁷¹
- Coherence time and implied operation count are derived metrics
- **Custom metrics cannot be cross-compared:** IonQ's #AQ, IBM's CLOPS, and Quantinuum's rQOPS and QV use mutually incompatible definitions⁶

Exhibit 13: Quantum-computing metric dictionary — no cross-comparison without basis notes

Metric	Definition/measurement protocol	Direction	Disclosure adequacy
Physical qubit count	Programmable physical qubits on chip	Higher better	Best disclosed, but scale only
Logical qubit count	Error-corrected logical qubits, three labels	Higher better	Chaotic; media often confuses detection with correction
2Q gate fidelity	Median two-qubit gate error rate	Higher better	IBM/Google/Rigetti/IonQ most detailed
Gate speed	Single-gate execution time	Lower better	Very poor: 3 of 31 trapped-ion companies disclose ⁷¹

Coherence time	Qubit state retention time	Higher better	Partially disclosed
Implied operation count	Coherence time / gate speed	Higher better	Derived metric
Custom metrics (#AQ/CLOPS/rQOPS/QV)	Vendor-defined	—	Not cross-comparable

Source: Barclays⁶, MIT Initiative on the Digital Economy⁷¹

3.1.2 Neutral atom is closing fast, while silicon spin and photonic remain relatively immature

Trapped ion leads on precision and error correction (Barclays total 25/35, first place). Restating the position across the seven dimensions — gate fidelity, gate speed, qubit count, connectivity, error-correction overhead, scaling path and engineering maturity — the verifiable scorecard as of 2025-11 reads as follows.

- **Neutral atom is closing fast on qubit count and scalability:** 23⁶
- **Superconducting is the most mature but is starting to lag on several metrics:** 22⁶
- **Silicon spin (20) and photonic (17) are relatively immature:** each holds single-point strengths⁶ (Exhibit 14)

3.1.3 Barclays' modality verdicts: trapped ion's bottleneck is scalability, superconducting's is wiring and refrigeration

Barclays' verdicts on each modality's weakness are worth quoting for their content.⁶

- **Barclays sees trapped ion's key bottleneck as scalability:** on trapped ion, "the most common shortfall is slow speed, but the key bottleneck is scalability, as photonic components need to be integrated at chip level"
- **Barclays sees neutral atom's error rates lagging:** on neutral atom, "starting to lead on physical and logical qubit counts and lifetimes, but error rates lag, and the number of lasers required for high qubit counts could become a problem"
- **Barclays sees superconducting bottlenecked by wiring and refrigeration:** on superconducting, "relatively mature but already lagging on several metrics; speed is the key advantage, but the lack of all-to-all connectivity may offset it, and wiring and refrigeration are the current bottlenecks"
- **Barclays sees photonic leading on lifetime and interconnectivity:** on photonic, "performance lags, but it leads on qubit lifetime and interconnectivity, a key advantage for large-scale deployment"⁶

Exhibit 14: Five-modality seven-dimension scorecard (1–5, Barclays ratings, 2025-11)

Dimension	Trapped ion	Neutral atom	Superconducting	Silicon spin	Photonic
Maturity	4	3	5	1	2
Scalability	3	3	4	5	1
Max qubits before interconnect	3	4	2	5	1
Precision	5	3	4	1	2
Gate speed	2	1	5	4	3
Qubit lifetime (coherence)	3	4	1	2	5
Cooling requirement (higher = easier)	5	5	1	2	3
Total	25	23	22	20	17

Source: Barclays⁶ Note: scores are Barclays analysts' subjective ratings (underlying benchmark data verifiable); attribution retained. 2026 increments (IonQ's EQC chip-scale control, IBM's qLDPC modularization, neutral-atom gate fidelity catching up) have not overturned the ranking, but trapped ion's "slow gates" and superconducting's "high error-correction overhead" are both under engineering attack; any single-point breakthrough can rewrite the ranking within 12–18 months.

3.1.4 We believe the scorecard ranking is far less stable than the market assumes

Three dynamic variables in the 2026 increments point to where the scorecard moves next. Betting on modalities is inferior to betting on the pace of error-correction overhead decline.

- **Trapped ion's laser weakness is being attacked by "electronic qubit control":** IonQ's Superion 256 uses EQC (Electronic Qubit Control) to replace laser control with on-chip electronics — the same technology behind the 99.99% 2QG record of 2025-10³⁴
- **Superconducting's error-correction overhead is being attacked by qLDPC:** IBM's [[144,12,12]] code encodes 12 logical qubits into 144 data qubits, ~10x fewer qubits than the surface code⁶⁵
- **Neutral atom's precision gap is closing:** a QuEra 2026-05 preprint reportedly claims 99.9% 2Q gate fidelity — a single-source media report²⁶⁸, without peer review, directional only

- **The fourth variable is on the decoding side:** on 2026-09-22, IonQ demonstrated the industry's first end-to-end real-time quantum error-correction decoder — carried on a single commercial CPU (Apple M4 Max), simulating benchmark circuits up to 408 logical qubits and 31.5M+ operations with runtime increasing by only 0.02% (simulated load, not a hardware demonstration)²⁷³ — the bear argument that "classical control overhead grows exponentially with scale" now has its first public counterexample. (IONQ traded up as much as +11.8% pre-market the day after the announcement²⁹⁰)

3.2 Three labels for logical qubits: 96 broad-basis, 48 commercial fully error-corrected, and the media's "94" is detection-only

3.2.1 Only two logical-qubit records survive verbatim arbitration against the originals

The logical qubit is 2026's most abused metric. After arbitrating against the original papers and official sites verbatim, the verifiable three-label facts are as follows (Exhibits 15 and 16).

- **QuEra holds the broad-basis record:** the Harvard/MIT/QuEra team demonstrated 96 logical qubits encoded in a $d=4$ error-correcting code ($[[16,6,4]]$) running simultaneously in deep circuits — up to 448 physical atoms, 16 blocks of 6 logical qubits per block — in a February 2026 Nature paper (online 2025-11), the current public record for total logical qubits; the operation mode is teleportation-based error removal plus acceptance-rate post-selection — partial fault tolerance, not active repeated error correction on the 96 qubits — and the paper's below-threshold performance (2.14x) was achieved on a single surface-code logical qubit⁶¹
- **Quantinuum holds the commercial fully error-corrected record:** Helios (98 physical Ba^+ ions, commercially launched 2025-11) supports 48 fully error-corrected logical qubits ($d=4$ concatenated iceberg code, 2:1 encoding rate, 10–100x error suppression beyond breakeven, with reasonable post-selection), demonstrated on a commercial system whose customers include JPMorgan Chase and SoftBank^{62 63}
- **The media's "94 logical qubits" is error detection only, not correction:** a $d=2$ iceberg detection code with GHZ entanglement at 94.9% fidelity and a $\sim 1:1$ encoding rate — one code-distance level below correction, and the two must not be conflated^{62 63}

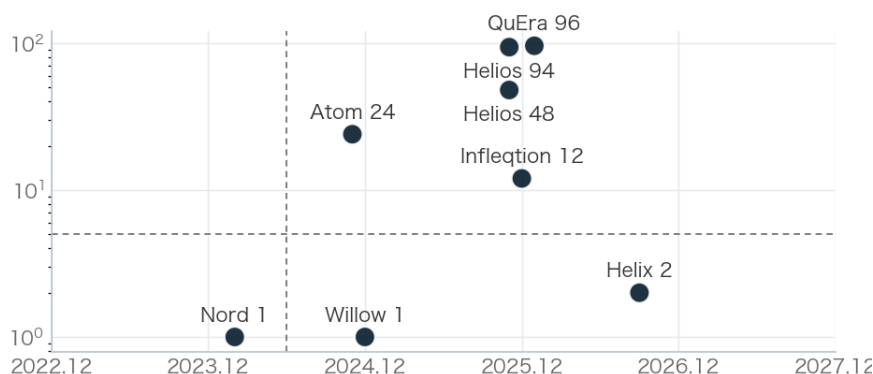
Exhibit 15: Logical qubits under a unified three-label basis (as of 2026-09-24)

Player	Physical qubits	Logical qubits	Error-correction level	Commercial vs demo	Timestamp
QuEra (Harvard/MIT/QuEra)	≤ 448 neutral atoms	96 (total-count record)	QEC-encoded + partial fault-tolerant operation ($[[16,6,4]]$ $d=4$)	Academic demo	Nature 2026-02 ⁶¹
Quantinuum Helios	98 Ba^+ ions	48 (commercial full-QEC record)	Fully error-corrected (concatenated iceberg $d=4$, 2:1, 10–100x suppression)	Demo on commercial system	Launched 2025-11 ^{62 63}
Quantinuum Helios (other configuration)	98 Ba^+ ions	94 (plus 50)	Detection only (iceberg $d=2$, GHZ/XY simulation, $\sim 1:1$)	Demo on commercial system	2025-11/2026-02 ^{62 63}
Quantinuum Helix (a code, not a new machine)	20 (on Helios)	2	Full-QEC architecture validation (C4-Helix $[[20,2,6]]$, no post-selection)	Demo on commercial machine	arXiv 2026-09-02 ⁶⁴
Atom Computing + Microsoft	256 atoms (demo basis)	24	Error detection + entanglement demo ($[[4,2,2]]$ code)	Demo	2024-11 ⁶
Google Willow	105 superconducting	1	Fully error-corrected (surface code $d=3/5/7$ past threshold)	Demo	2024-12 ⁶

USTC Zuchongzhi 3.2 (academic team)	107 superconducting	1 (academic demo)	Surface-code QEC below threshold (d=7; error-suppression factor 1.4)	Academic demo; not a QuantumCTek commercial product	2025-12 ²⁶⁰
Infleqtion Sqale	1,600 atoms	12	Error detection ([[4,2,2]] code + post-selection)	Demo	2025-12 ⁶
Infleqtion Sqale (updated)	80 physical qubits	30 (entangled logical qubits)	Error-correction encoding	Demonstration	2026-09-24 ²⁹³
Nord Quantique	1 mode	1	Error correction (GKP bosonic code)	Demo	2024-02 ⁶
IBM/IonQ/Rigetti	—	0 (publicly verifiable)	No public logical-qubit demonstration record	—	—

Source: Nature⁶¹, arXiv:2602.22211⁶², Quantinuum⁶³ ⁶⁴, Barclays⁶ Note: three labels = error-correction level, commercial vs demo, timestamp; earlier confused record formulations have been retired (detection configurations do not enter the full-QEC basis); records are cited on a dual basis — broad 96 (QuEra, academic demo) / commercial fully error-corrected 48 (Helios). Helios' logical-qubit count also has a 50-qubit basis (a separate error-detection configuration); this report uses 48. QuEra 96 and Helios 48 both involve post-selection; from 2026-09, "with or without post-selection" has become a fourth label for demo hardness, and Helix is the first no-post-selection three-piece validation⁶⁴. Quantum annealing and special-purpose machines need no error correction and are excluded.

Exhibit 16: Logical qubit evolution timeline (count, 2024–2026, by QEC level)



Source: Nature⁶¹, arXiv:2602.22211⁶², Quantinuum⁶³ ⁶⁴, Barclays⁶, as_of 2026-09-22

3.2.2 Helix is, in our view, the first no-post-selection validation of a "logical memory + logical compute + cross-code interface" architecture

It paves the way for Quantinuum's Apollo (2029 roadmap), but it does not rewrite the logical-qubit count record.

- **Helix is a code architecture, not a new machine:** the Helix of 2026-09-02 needs a proper introduction — it is a C4-Helix compact fault-tolerant code architecture validated on Helios ([[20,2,6]]: 2 logical qubits in 20 physical qubits, code distance 6, using ~3.5x fewer qubits than a rotated surface code of the same distance)⁶⁴
- Its significance lies in three experiments, all run without post-selection
 - A logical memory held over 20 syndrome-extraction rounds at a logical error rate of 4.6×10^{-5} per logical qubit per round
 - Full Clifford-group randomized benchmarking on two logical qubits at 2.8×10^{-4} per logical Clifford, ~1/4 of the physical layer's 1.2×10^{-3}
 - Cross-code-family entanglement with a [[25,1,5]] surface code at GHZ fidelity $\geq 99.925\%$ ⁶⁴
- **What it has not demonstrated matters equally:** universal Clifford+T computation (magic states must be imported from surface or color-code blocks) and real-time decoding (the memory experiment used offline decoding), and it remains 2–4 orders of magnitude above the early fault-tolerance band (10^{-6} – 10^{-8})⁶⁴

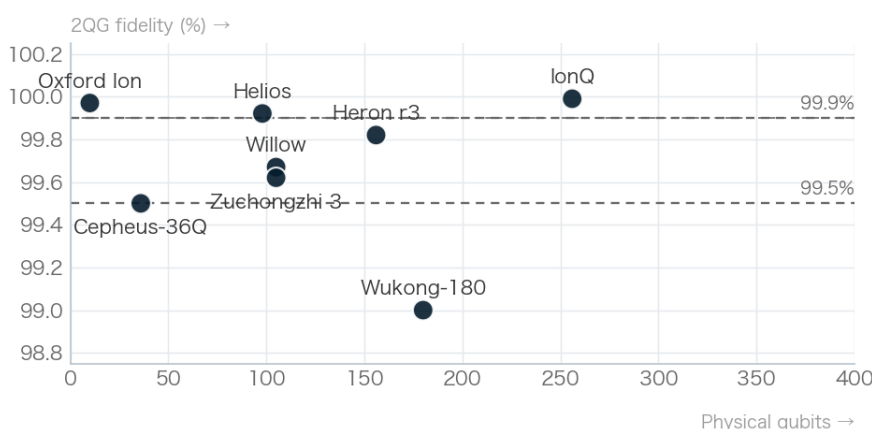
3.3 Two layers of 2QG fidelity and the gate-speed gap: trapped ion leads precision by ~2–50x, trails speed by ~3–4 orders of magnitude

3.3.1 2QG fidelity must be read in two layers, native and logical

On the native layer, trapped ion leads superconducting in 2QG fidelity by ~0.1–0.4 percentage points, corresponding to a ~2–50x error-rate gap (Exhibit 17).

- **The native-layer (physical 2Q gate) record is IonQ's 99.99%:** 2025-10, R&D lab prototype (the basis for the 2026 256-qubit system)³⁴, previously Oxford Ionics' 99.97% (10-qubit chip)⁶
- **Mainstream superconducting native layers trail trapped ion:** 99.82% for IBM's Heron r3, 99.67% for Google Willow, 99.62% for QuantumCTek's Zuchongzhi 3.0 and 99.50% for Rigetti's Cepheus-1-36Q (Barclays Fig. 39 benchmark basis, verified against the original; the 10-K internal-test basis is 99.6%, which this report uses uniformly below; the benchmark values all come from this single Barclays report, so cross-comparisons carry that single-source limitation)⁶, with Quantinuum Helios at 99.921% on launch basis⁶³
- **On the logical layer, Helios' error rate is about 1/4 of its physical-layer rate: the Helix code (on Helios hardware) achieves a logical-gate error rate of $\sim 2.8 \times 10^{-4}$ under active error correction (physical layer 1.2×10^{-3})⁶⁴**
- **China's latest is Origin Quantum's Wukong-180:** online 2026-05-09, posting 99.9% single-qubit gates, 99% two-qubit gates and 99% readout⁶⁷ — still about one order of magnitude in error rate from the global frontier (99.5–99.9%), a gap China is closing quickly: QuantumCTek's Zuchongzhi 3.0 (99.62%, above) already sits inside that band

Exhibit 17: Leading quantum processors: physical qubits x 2Q gate fidelity (% by modality)



Source: Barclays⁶, IonQ³⁴, Quantinuum⁶³, S&T Daily/People's Daily⁶⁷, as_of 2026-05-09

3.3.2 Gate speed is the worst-disclosed metric; on disclosed figures trapped ion trails superconducting by ~3–4 orders of magnitude

The gate-speed disclosure gap is itself a modality signal. Only 3 of 31 trapped-ion companies in the MIT Quantum Index Report database disclose gate speed — a clear pattern of "don't disclose when below par."⁷¹

- **On disclosed figures, trapped ion is ~3–4 orders of magnitude slower:** IonQ Forte E1's gate speed is ~650,000ns (0.65ms) against IBM Heron r3's ~88ns; coherence times of 95,000,000μs (95s) versus 345μs partially offset this, giving implied operation counts of 146,154 versus 3,920⁶
- **In the NISQ era, we believe, 2Q gate fidelity is the limiting factor:** once error correction lands, the bottleneck shifts to coherence time, gate speed and SPAM errors⁶ — which is exactly the strategic meaning of IonQ attacking gate speed and laser weaknesses with EQC chip-scale control, and the superconducting camp attacking overhead with qLDPC

3.4 The overhead-ratio quartet and error correction as meta-variable: a 1000:1 to 2:1 distribution; single-value citation is misleading

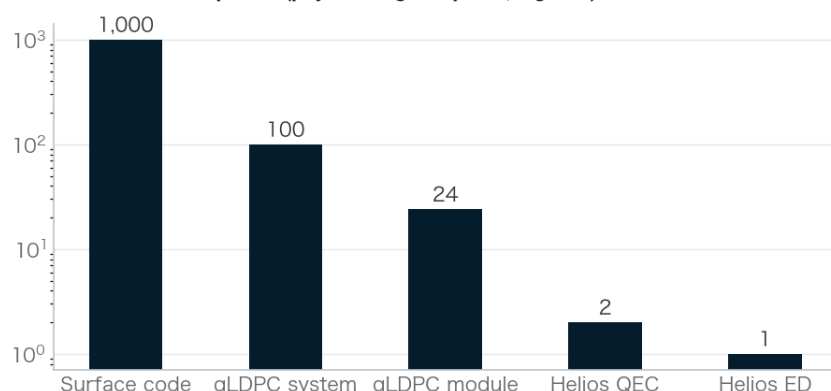
3.4.1 Any single-value citation of the overhead ratio is misleading

After Google Willow crossed the QEC breakeven — a logical error rate below the physical one — in 2024-12, 2025–2026 moved from single-point demos to batch crossings across modalities.

- **Quantinuum's Helios crossed comprehensively:** 48 error-corrected logical qubits, 10–100x suppression, 2026-02 paper⁶²
- **IonQ achieved qLDPC error-correction breakeven: a 2026-06 arXiv preprint (2606.06455) that names no machine, with independent verification lacking⁶⁶**
- IBM cut overhead to ~1/10 of the surface code with qLDPC⁶⁵
- **The overhead ratio itself must be presented as a quartet (Exhibit 18):** the surface-code conventional wisdom of ~1000:1⁷²; the Helios demo at ~2:1 for

correction and ~1:1 for detection⁶²; roadmap relaxations (IBM's Starling at module-level 24:1 and system-level ~100:1); and the academic simulation range of tens to thousands:^{1 65 89 72}

Exhibit 18: QEC overhead quartet (physical:logical qubits, log axis)



Source: Olivier Ezratty⁷², arXiv:2602.22211⁶², IBM⁶⁵, KIMI estimates⁸⁹, as_of 2026-09-22

3.4.2 Error-correction feasibility is, in our view, the meta-variable that simultaneously decides the modality verdict, supply-chain demand and the timeline

The core industry events of 2025–2026 are all overhead-ratio events in essence, and each order-of-magnitude cut in overhead is equivalent to roadmaps advancing years and to supply-chain demand (refrigeration, M&C and lasers) shrinking by an order of magnitude — the first variable to track in this industry.

- **FTQC capex feasibility needs per-qubit cost in the hundreds of dollars:** the cost transmission runs as follows — QPU cost per qubit is currently in the hundreds of thousands of dollars, and even at \$10k/qubit a million-qubit system still costs \$10bn+, so the industry must cut per-qubit cost to the hundreds of dollars (~1/1000 of today) for FTQC systems to be capex-feasible⁶
- **Code competition redistributes supply-chain demand:** qLDPC needs non-local connectivity (favoring modular interconnects), high-rate iceberg codes rely on all-to-all connectivity (a unique trapped-ion strength), and cat qubits shift the correction burden into hardware (AWS Ocelot 9:1)^{5 6}
- **The timeline transmission is just as direct:** qLDPC let IBM rewrite FTQC from "infeasible" to a 2029 Starling commitment⁶⁵, and EQC plus qLDPC let IonQ point "manufacturable commercial reality" at 2028 (management basis)³⁴

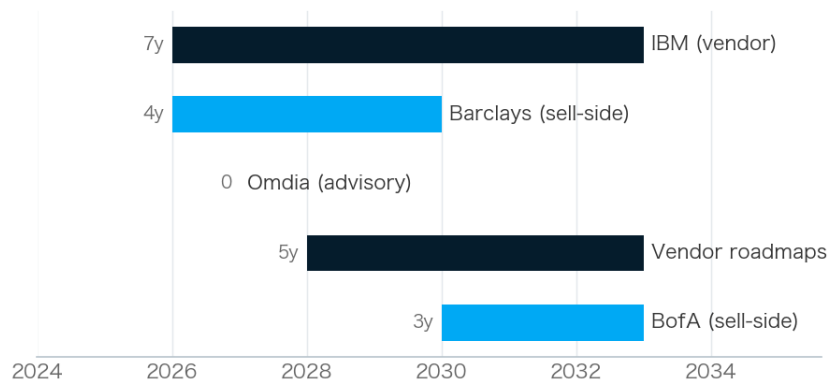
3.5 Distance to FTQC: narrow advantage median 2027–2029, full fault tolerance 2029–2033; the disagreement is definitions, not dates

3.5.1 The narrow-advantage window centers on ~2027–2029, full fault tolerance on 2029–2033, and the gap is definitional, not calendar

The dual-track timeline is set out in Exhibit 19, and the disagreement really is definitions, not dates. IBM and Barclays define "advantage" as beating classical on specific useful tasks, while BofA's "broad commercial advantage" sets a higher bar and therefore a later date; the new 2026 evidence — Helios' 48, Helix, qLDPC engineering — has pulled the median forward by about a year.

- **Narrow advantage (beating classical on specific useful tasks):** the window clusters in 2026–2030, with the latest sell-side and vendor median expectation around 2027–2029 — IBM claims end-2026, Barclays sees 2026/27 (criterion: about 100 logical qubits @99.99% fidelity), Omdia sees 2027, and BofA is more conservative at 2030–2033^{6 73 65}; Wedbush's 2026-09-29 QWC note likewise shows industry consensus shifting from "whether fault tolerance arrives" to "when and how it arrives", with vendor roadmaps pointing to hundreds of logical qubits in 2027–2028 (IonQ 800, Quantinuum Sol about 100, QuEra 256)²⁸²
- **Full fault tolerance concentrates in 2029–2033:** FTQC at commercial scale — IBM's Starling in 2029 (200 logical qubits and 100M gates), Quantinuum's Apollo in 2029, Barclays at 2029/30, IBM's Blue Jay in 2033 (2,000 logical qubits and 1B gates), and BofA at 2030–2033^{6 65 73}

Exhibit 19: Quantum advantage vs FTQC timing votes (year, dual track)



Source: IBM⁶⁵, Barclays⁶, BofA⁷³, Omdia (as relayed)⁶, as_of 2026-09-22

3.5.2 In our view no candidate satisfies all criteria before 2029–2030, and IBM is the most likely to fill three of the four first via qLDPC

Positioning each player against verifiable criteria requires a substitute test. The original text of the industry-standard "≥1,000 logical qubits + 99.9% fidelity + tens-of-ns gates + real-time correction" four-criteria test is not publicly closed, so this report uses two verifiable substitutes — IBM's six criteria (fault-tolerant, addressable, universal, adaptive real-time decoding, modular and efficient⁶⁵) and Barclays' advantage criterion of ~100 logical qubits at 99.99%⁶.

- On 99.9% fidelity, trapped ion has passed; superconducting has passed only at the academic level, with production machines at 99.82% best
- **Real-time error correction:** IBM Relay-BP has an FPGA-level demonstration⁶⁵; Quantinuum Helix is architecturally complete but decoding remains offline⁶⁴; IonQ demonstrated a single-CPU real-time decoder on 2026-09-22 (simulated up to 408 logical qubits²⁷³), the first time the ASIC/FPGA/general-purpose CPU paths have shared one stage
- **On tens-of-ns gates, only superconducting (60–88ns) qualifies:** trapped ion is ~3–4 orders of magnitude off⁶
- **On ~1,000 logical qubits, nobody is close:** the current record is 96 broad-basis and 48 commercial, a 10–21x gap^{61 62 89}
- **No candidate, in our view, satisfies all criteria before 2029–2030:** the player most likely to fill three of the four first is IBM via the qLDPC modular route; the falsification condition for this judgment is Quantinuum's Apollo 2029 or IonQ's 2028 roadmap over-delivering

3.5.3 Compressing every roadmap onto one timeline shows the 2029–2030 consensus threshold sits at ≥100 logical qubits

Compressing every announced commitment onto one timeline (Exhibit 19A) makes the consensus threshold directly readable. Every vendor with a logical-qubit (LQ) commitment in the 2029–2030 window is at ≥100. This corroborates Barclays' distillation that "roadmaps converge on at least 100 logical qubits by 2030" (2025-11-18⁶; its label-to-year alignment is a graphical read) and matches this chapter's commercial bar of 100–1,000 LQ⁶.

- **The government-side DOE framework points the same way:** the DOE stage framework also sets the 2028 scientifically relevant demonstration at 50–100+; the DOE Science Advisory Committee (SCAC) 2026-09 report further provides a government-side calibration anchor of 50–100+ logical qubits in 2028²⁹⁵
- **Two names sit outside the consensus window:** Atom's 50 (2027) and Google's no-date commitments
- **The division of labor versus Exhibit 19 (the dual-track vote median) and Exhibit 20 (the backward-looking delivery check) is deliberate:** this grid is the raw forward commitment set, sourced cell by cell from official roadmaps and documents, with no median processing

3.5.4 The outlier ends: IonQ's 80,000-logical-qubit roadmap is the most aggressive, no commitment at all is the most conservative

The two outlier ends and their delivery risks deserve naming. Falsifiability is itself information: IBM and Quantinuum delivered every 2024–2026 milestone on time (Exhibit 20), which makes their 2029 commitments more credible than either the hyper-aggressive or the no-commitment end; those who commit nothing cannot miss, but they offer no public anchor to track.

- **The most aggressive is IonQ:** 80,000 logical qubits on 2 million physical qubits by 2030 (ionq.com/roadmap, 2026-09-23, management basis²⁵³) — nearly three orders of magnitude above the consensus bar; the delivery risk has a track record — the 256-qubit system's timing and framing drifted (Exhibit 20 Δ), and UBS's compiled figure (40,000+) disagrees with the official site (80,000); we take the official site and record the divergence
- **The most conservative end is not a low commitment but no commitment at all:** Google publishes only physical-basis six-step milestones (M3 = 10³ physical/1 logical/10⁻⁶, official document undated²⁵⁵), and "M3≈2030" is a NERSC extrapolation rather than a company promise²⁵⁶; Rigetti has no logical-qubit roadmap at all (UBS and NERSC double-sourced^{5 256}), only >1,000 physical qubits by end-2027 (Jefferies relaying management)¹³²; Origin Quantum has no public LQ roadmap — an evidence gap
- **We believe 2027 is the grid's first dense checkpoint:** IonQ 800, Quantinuum Sol ~100, Atom Magne 50, DOE scalable systems 10–50 — if the median delivery rate then falls below half, Exhibit 19's full-fault-tolerance median will be pushed back mechanically

Exhibit 19A: Logical-qubit (LQ) roadmap overlay on one axis, 2026–2033
(commitment basis; cell-level sourcing)

Company/body	2026	2027	2028	2029	2030	2033+	Basis and source (date)
IBM	Kookaburra single-module prototype (LPU+memory +real-time decoder); Nighthawk 7,500 gates (physical basis)	Cockatoo inter-module entanglement	Nighthawk multi-module 1,080 physical + magic-state distillation demo	Starling: 200 LQ/100M gates	—	Blue Jay: 2,000 LQ/1B gates	LQ basis; IBM roadmap page 2026-09-23 ²⁵² + 2025-06 blog ⁶⁵ (company commitment)
IonQ	12 LQ	800 LQ	1,600 LQ	8,000 LQ	80,000 LQ/2M physical	—	LQ basis; ionq.com/roadmap 2026-09-23 ²⁵³ (company commitment, management basis)
Quantinuum	—	Sol: ~100 LQ	—	Apollo: hundreds of LQ/millions of gates	Lumos (2030+): >1M physical (DARPA concept design)	—	LQ basis; company press release 2024-09-10 ²⁵⁴ + BofA detail table 2026-06-30 ²⁴⁸
Google	Working toward M3 (long-lived logical qubit)	No dated commitment	No dated commitment	No dated commitment	"Commercially useful, error-corrected QC by end of decade" (BofA relaying company basis ²⁴⁸); "M3≈2030" is a NERSC extrapolation, not a promise	M6: 10 ⁶ physical/10 ⁻¹³ (undated)	Milestones on physical basis; Google official document ²⁵⁵ (undated) + NERSC ²⁵⁶
Atom Computing	—	Magne: 50 LQ/1,200+ physical (2027 delivery; "late 2026" and "early-2027 operational" bases also exist — divergence shown side by side)	—	—	No roadmap beyond (NERSC/UBS double-sourced)	—	LQ basis; EIFO website 2025-11-19 ²⁵⁷ ; timing divergence sources are the review ²⁵⁸ /media
Rigetti	>150 physical (year-end; the older "150+/99.7%" basis has a silent-replace	>1,000 physical (year-end) / revised "≈1,000 in roughly three	—	—	No LQ target	No LQ target	Physical basis only; company Q2'26 PR ¹⁷⁷ + Jefferies relaying management ¹

	ment record)	years"					³² ; "no LQ roadmap" UBS/NERSC
Origin Quantum	Wukong-180: 180 physical (online 2026-05, fact not commitment)	No public LQ roadmap	Same	Same	Same	—	Physical basis; Science and Technology Daily/People's Daily 2026-05-09 ⁶⁷ ; LQ target = evidence gap
Government reference (DOE)	Validation demo 1–10 LQ	Scalable systems 10–50 LQ	Science-relevant 50–100+ LQ	—	User facilities 1,000–10,000 LQ (2030+)	—	LQ basis; DOE SCAC report 2026-07-17 ²⁵⁹

Note: commitments are not deliveries — the 2024–2026 delivery record is Exhibit 20: IBM/Quantinuum consecutive on-time, IonQ delivered on technology but drifted on framing, Rigetti on time on a physical basis. China-side reference: the USTC Zuchongzhi team's d=7 surface code went below threshold in 2025-12 (USTC website, 2025-12-22⁶⁰), with d=9/11 in progress and no dated commitment; the committing body is the academic team, while QuantumCTek shares the research credibility as the "sole participating corporate entity" and makes no LQ commitment of its own⁸⁸. The label-to-year alignments in Barclays' Figure 10⁶ and UBS's Exhibit 4/43⁸ are graphical reads; this grid does not use them and goes back to primary sources cell by cell; UBS is internally inconsistent on IonQ 2030 (figure 40,000+ vs text 80k) — we take the official 80,000. The "most aggressive/most conservative" designations are this report's own conclusions.

3.6 Paradigms and interconnects: no interconnect falsified; superconducting cooling/wiring scale-up is the first possible tripwire

3.6.1 The evidence for an "engineering race within one paradigm" currently outweighs the evidence for a "paradigm knockout"

Barclays judges that multiple modalities will coexist long-term and divide by application⁶, and from 1995–2025 error rates fell continuously across the ion, superconducting and neutral-atom modalities, with no modality stalling on the 2025–2026 milestones (Willow crossing threshold, Helios' 48, IonQ's 99.99%)⁶.

- **The second axis received state-level endorsement in 2026:** general-purpose and fault-tolerant versus special-purpose, analog and annealing — China's "15th Five-Year Plan" outline for the first time lists "fault-tolerant general-purpose quantum computers" and "scalable special-purpose quantum computers" side by side⁵⁴
- **Special-purpose machines have commercialized first:** D-Wave Advantage2 (4,400+ qubits) reached GA in 2025-05⁶⁹, and QBoson's 1000-qubit coherent optical machine was delivered in 2026-01 and completed pre-acceptance⁶⁸; but Barclays warns that gate-model machines in the FTQC era could reclaim the application scope of special-purpose machines⁶; validation channels are also widening: on 2026-09-22, Microsoft's Maryland quantum research center opened, where DARPA personnel can independently test its Majorana 2 topological qubit system on site²⁹⁴

3.6.2 The first possible tripwire, in our view, is superconducting dilution-refrigeration scale-up

Interconnects are the shared falsification gate for three modalities, and the 2026 reading is "none falsified, all in early engineering validation". For superconducting, wiring and cooling power are hard physical constraints, named by Barclays as the current bottleneck⁶.

- **PsiQuantum provides the strongest single-point evidence:** its Omega chipset achieved 99.72% inter-chip interconnect fidelity over 42 meters of fiber — a Nature 2025-02 result, relayed via a single source⁷⁰
- **IonQ claimed a photonic-interconnect milestone in 2026-04:** it also published its Walking Cat fault-tolerant architecture blueprint³⁴
- **IBM's I-coupler has been demonstrated on Flamingo:** the Nighthawk path connects 9 modules and 1,080 qubits in 2028⁶⁵
- **Interconnect falsification would transmit to downgrades and M&A exits:** the transmission chain runs from an interconnect falsification to order and valuation downgrades for that modality to accelerated M&A exits; IonQ's serial acquisitions integrating Oxford Ionics and Lightsynq to patch interconnect and photonics weaknesses²⁴ are a rehearsal of exactly that chain
- **Falsification directions for the underlying feasibility variables are an evidence gap:** physical error rates holding stably below code thresholds, measurement and decoding staying real-time-faithful, and qubit counts scaling to what overhead ratios can afford — with no public eponymous framework to cite, we flag them as directional only

3.7 Delivery rates and lifecycle position: the switch point from

tech-demo to engineering-validation phase

3.7.1 Delivery rates rose sharply in 2024–2026, but the window dividend belongs to IBM, Google, Quantinuum and D-Wave, not this report's three names

Headline players' 2024–2026 delivery rates are markedly higher than in the 2021–2023 SPAC era. The industry as a whole has moved from "slide-deck promises" to "engineering delivery" (Exhibit 20). Two basis details need naming.

- **IonQ's 256-qubit system drifted:** from "operational Q4 2026" to "first fully integrated QPUs manufactured, first ions trapped, delivery 2027" (2026-09-08 basis) — the technology was delivered, but the timing and framing drifted³⁴
- **The window dividend must be attributed correctly:** the 2024–2026 delivery leaders are IBM, Google, Quantinuum and D-Wave, not this report's three names

Exhibit 20: Headline players' 2024–2026 milestone delivery checklist

Player	Commitment	Delivery status	Timestamp
Google	Willow crossing QEC threshold Quantum Echoes advantage	✓✓ both delivered	2024-12/2025-10 ⁶
IBM	Roadmap milestones (Nighthawk 120 qubits etc.)	✓ on time (self-assessment matches third-party records)	2025-11 ^{6 65}
Quantinuum	Helios launch (beyond breakeven), Helix validation	✓✓✓ consecutive delivery	2025-11/2026-02/2026-09 ^{62 64}
IonQ	99.99% 2QG ✓; 256-qubit "operational Q4 2026" "manufactured, delivery 2027"	Δ technology delivered but framing drifted	2025-10/2026-09 ³⁴
Rigetti	Cepheus-1-36Q 99.6%; 108Q system GA	✓	2025 (36Q) / 2026-04 (108Q GA) ⁶
D-Wave	Advantage2 4,400+ qubits GA (ahead of plan)	✓	2025-05 ⁶⁹
Origin Quantum	Wukong-180 (180 qubits, 2QG 99%)	✓	2026-05-09 ⁶⁷
Bose Quantum	1,000-qubit coherent light machine delivered	✓	2026-01 ⁶⁸
Microsoft	Majorana 1 topological qubit (8 qubits)	Δ claim stage, no independent QEC demo	2025-02 ⁶
Neutral atom (QuEra/Atom)	100 logical qubits by 2026 ²⁶⁹	Δ partial: QuEra demonstrated 96 (partial fault tolerance)	2026-02 ⁶¹

Source: Barclays⁶, IonQ³⁴, Quantinuum^{62 64}, D-Wave⁶⁹, Science and Technology Daily/People's Daily⁶⁷, Xinhua/Shanghai Securities News⁶⁸, Nature⁶¹, IBM⁶⁵

3.7.2 Four hard metrics put the industry at the switch point from tech-demo to engineering-validation phase

Lifecycle positioning rejects "early-stage" rhetoric in favor of four hard metrics (Exhibit 21). The composite judgment is that the industry is at the switch point from the "tech-demo phase" to the "engineering-validation phase," not yet in commercial expansion.

- **Logical qubits are in the late demo phase:** currently 96 broad-basis and 48 commercial fully error-corrected, against a commercial passing line of ~100–1,000 (Barclays' advantage criterion of 100 LQ at 99.99%, IBM's commercial criterion of 100–1,000 LQ)⁶ — late demo phase
- **The error-rate gap is wide but improving:** the logical layer sits at $\sim 2.8 \times 10^{-4}$ against the 10^{-10} needed for useful algorithms, a 6-order-of-magnitude gap, but one that is improving at $>10\times$ per year^{62 72}
- **Orders exist, but conversion is slow:** listed pure plays' combined 2024 revenue is below \$100M⁷
- **Commercial revenue share is unvalidated:** no leading name has crossed 50% (inferred; IONQ's ~60% commercial-customer share is on the company basis, definition not broken down)⁴
- **On TRL by modality, the lifecycle is uniformly the introduction phase but stratification has begun:** superconducting and trapped ion sit at 5–6, neutral atom at 4–5, photonic at 3–4 and special-purpose at 6–7, with special-purpose machines entering early commercialization and general-purpose machines entering engineering validation⁶

Exhibit 21: Lifecycle positioning on four hard metrics — the demo-to-engineering-validation switch point

Hard metric	Current position	Passing line/target	Gap	Judgment
Logical qubits	96 broad / 48	~100–1,000	10–21x ⁸⁹	Late demo phase

	commercial ^{61 62}	(Barclays/IBM criteria) ⁶		
Logical error rate	~2.8×10 ⁻⁴ (Helix, on Helios hardware) ⁶⁴	<10 ⁻¹⁰ for useful algorithms ⁷²	6 orders of magnitude	Improving >10x/yr
Order conversion	Pure plays' 2024 revenue <\$100M ⁷	Commercial revenue at scale	Orders exist, conversion slow	Government orders dominate
Commercial revenue share	None above 50% (inferred)	>50%	Unvalidated	Handoff partially validated

Source: Nature⁶¹, arXiv:2602.22211⁶², Barclays⁶, BofA⁷, Olivier Ezratty⁷², Caitong Securities⁴, KIMI estimates⁸⁹

3.7.3 The capital-market cycle and the technology cycle are currently badly dislocated but converging in direction

The dislocation means milestone slippage costs multiple compression, not percentage pullbacks.

- Valuations have already priced in the narrow-advantage window: IONQ, RGTI and QuantumCTek trade at P/S TTM of 64.9x, 353.5x and 103.6x respectively (2026-10-08²⁹⁰)¹, already pricing in the back half of the narrow-advantage window (2028–2030)
- Sell-side narrative temperature ("a sea of stars"², "biggest revolution for humanity since discovering fire"⁷³, "the next great tech revolution"⁵) and price action (the three names are -52.0%/-74.9%/-58.2% below their 2-year highs (2026-10-08²⁹⁰)¹) point in opposite directions; crowded-trade characteristics are present but partially released
- The misalignment means the cost of a milestone miss is multiple compression, not a percentage pullback; conversely, if the 2026Q4–2027 error-correction milestones (IBM Kookaburra module, IonQ 256 delivery) are delivered consecutively, the current valuation anchor could switch from "narrative" to "orders" — which is exactly the point of the demand-side validation in Section 4.

3.7.4 Fusion architecture decides whether the QPU is a "server replacement" or an "accelerator card"

Quantum-classical fusion architecture is an underlying variable taking shape in 2026. IBM released the industry's first quantum-centric supercomputing (QCSC) reference architecture in 2026-03, NVIDIA released NVQLink in 2025-10, and Xanadu worked with AMD on a 25x simulation speedup⁵⁴. It directly affects the direction of the installed-compute shock assumption chain (the UBS server model in Section 4).

4. Competitive landscape and demand validation: revenue converges on IONQ (80.8% of five names' TTM), demand still priced by government budget lines

Key points

- Revenue converges at the top while market value disperses across modalities: CR1 of independently listed pure plays is ~73% on 2026E revenue (sp_data consensus combined basis, eff 2026-09-10) and CR3 ~80% (Bernstein 2026-06 basis, historical reference)⁸⁹; on a TTM basis IONQ alone accounts for 80.8% of the five pure plays' revenue^{1 89}, yet the P/S ranking is fully decoupled from the revenue ranking.
- QNT's 2026-06-04 IPO (delivered✓) marks the sector valuation top, with the scarcity premium migrating from IONQ to QNT's "pedigree premium."^{40 41}
- Demand validation currently rates as "partially validated": annealing optimization and government procurement are validated, gate-model finance applications are partially validated, and gate-model scale applications remain at the narrative stage.
- Government program officers and SOE centralized procurement dominate the paying side, with enterprises still confined to innovation-lab budget lines.^{26 30 56}

The most accurate description of the competitive landscape, in our view, is "revenue converging at the top, market value dispersing across modalities." On the TTM basis IONQ alone holds 80.8% of the five pure plays' revenue^{1 89}, yet the P/S ranking is fully decoupled from the revenue ranking — the market prices modality options, not revenue.

- Revenue converges at the top on the 2026E basis:** CR1 of independently listed pure plays is ~73% (sp_data consensus combined basis, eff 2026-09-10) and CR3 ~80% (Bernstein 2026-06 basis, historical reference).⁸⁹
- Quantinuum's traditional IPO (2026-06-04, delivered✓) is the precise timestamp marker of the sector valuation top**, with the scarcity premium migrating from IONQ to QNT's "pedigree premium."^{40 41}
- Demand validation rates as "partially validated":** annealing optimization and government procurement validated, gate-model finance applications partially validated, and gate-model scale applications still at the narrative stage.
- The paying side is dominated by government program officers and SOE centralized procurement**, while enterprises remain in innovation-lab budget lines.^{26 30 56}

4.1 Three-layer structure and concentration: a blended CR is meaningless; only the independently listed layer is measurable

The industry's three layers must be measured separately.

4.1.1 The in-house R&D layer of the giants (IBM, Google, Microsoft, Amazon) discloses no standalone quantum revenue

This layer can only be proxied by R&D spending, papers and system deployments.

- IBM has deployed its first 120-qubit Nighthawk system** (2025-11).^{6 65}
- Google is at step two of its six-step quantum roadmap** (Bernstein 2026-06 basis⁸; the official-documents basis has it tackling M3 — see Exhibit 19A).
- Microsoft released Majorana 2 in 2026-06** and moved its scalable quantum-computer target to 2029, still to be broadly validated.⁸

4.1.2 The sovereign-funded private layer can only be proxied by primary-market valuations and funding

PsiQuantum received an A\$940M investment package from the Australian government (2024-04).⁴

- Origin Quantum's Pre-IPO round valued it at ¥21bn pre-money (2026-06)⁴**, with STAR Market IPO tutoring filed⁵⁵.
- TuringQ and Bose Quantum have also filed for tutoring.⁵⁵

4.1.3 In the listed layer, the market prices non-leaders as modality options

The independently listed pure-play layer is directly measurable (Exhibit 22). On the sp_data consensus (eff 2026-09-10) combined basis, the seven US pure plays (IONQ, QBTS, RGTI, XNDU, INFQ, QUBT, QNT) total ~\$623M of 2026E revenue — IONQ at \$455.1M³⁹ and the other six on Bernstein's 2026-06 basis — with IONQ at ~73% on the combined basis and ~63% on the organic basis (\$285M).

- **CR3 (IONQ, QBTS and INFQ) at ~80% is Bernstein's older 2026-06 basis**, kept as a historical reference with the vintage noted.^{8 89}
- **On the TTM basis (five names: IONQ, RGTI, QBTS, QUBT, QNT), combined market cap is \$39.0B against combined revenue of \$305M – a sector-weighted P/S of ~128x – with IONQ at 80.8% of revenue.**^{1 89}
- **Revenue concentration (CR1 ~73–81%) far exceeds market-cap concentration** (IONQ's market-cap share ~41%)⁸⁹; direct evidence that the market prices non-leaders as modality options (Exhibit 23).

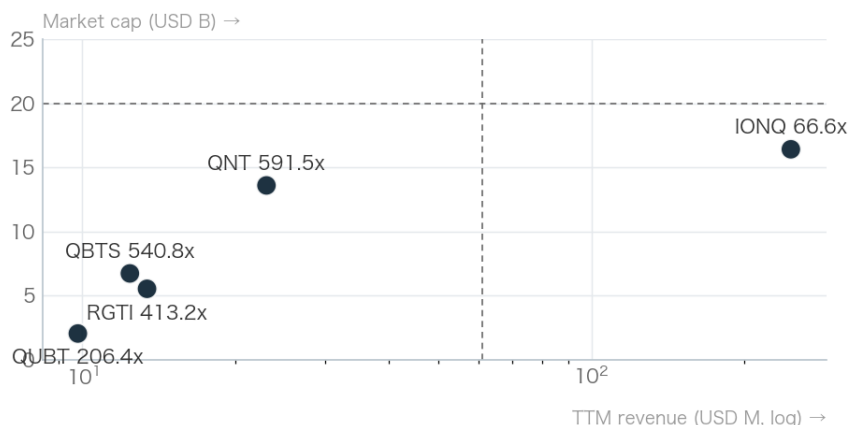
Exhibit 22: Independently listed pure plays, financials and valuation (mixed vintages, bases per note)

Name	Market cap	Revenue basis and value	P/S	Employees	Cash	Short % of float
IONQ	About \$16.0B (2026-10-08 ²⁹⁰) ¹	TTM \$246.5M ¹	64.9x(TTM, 2026-10-08 ²⁹⁰) ¹	1,132 ⁸	pro-forma \$1.9–2.0B ^{33 35}	10.2% ¹
QNT	About \$11.0B (2026-10-08 ²⁹⁰) ¹	TTM \$23.0M ¹	477.9x(TTM, 2026-10-08 ²⁹⁰) ¹	—	\$2.1B ⁴⁴	8.0% ¹
QBTS	About \$5.6B (2026-10-08 ²⁹⁰) ¹	TTM \$12.4M ¹	449.7x(TTM, 2026-10-08 ²⁹⁰) ¹	388 ⁸	\$0.55B ¹	21.2% ¹
RGTI	About \$4.7B (2026-10-08 ²⁹⁰) ¹	TTM \$13.4M ¹	353.5x(TTM, 2026-10-08 ²⁹⁰) ¹	162 ⁸ (2026-06; 10-K 2026-03 shows 164)	\$541.3M ²⁰	19.8% ¹
QUBT	About \$1.7B (2026-10-08 ²⁹⁰) ¹	TTM \$9.9M ¹	169.4x(TTM, 2026-10-08 ²⁹⁰) ¹	72 ⁸	\$0.95B ¹	33.6% ¹
QuantumCTek	About ¥32.4bn (2026-10-08 ²⁹⁰) ¹	TTM ¥313M ¹	103.6x(TTM, 2026-10-08 ²⁹⁰) ¹	—	—	—
XNDU	\$3.87B ⁸	2026E \$8M ⁸	477.7x (2026E) ⁸	240 ⁸	—	—
INFQ	\$3.18B ⁸	2026E \$41M ⁸	77.5x (2026E) ⁸	250 ⁸	—	—

Source: yahoo_finance¹, Bernstein⁸, IonQ^{33 35}, Rigetti²⁰, Quantinuum⁴⁴ Note: Market cap and P/S are TTM figures as of the 2026-10-08 close²⁹⁰; XNDU/INFQ are Bernstein snapshot (2026-06-05) 2026E consensus estimates⁸, and the two versions are not cross-comparable. IONQ cash is on a pro forma basis after the SkyWater cash payment^{33 35}; RGTI cash is as of 2026-06-30 (cash 27.76 + short-term AFS 365.9 + long-term AFS 147.6, \$M)²⁰. Market cap/cash multiples: IONQ 8.0–8.4x, RGTI 8.7x, QuantumCTek 13.0x⁸⁹.

On cash, IONQ's cash plus short- and long-term investments fell from \$3,336.8M at 2025-12-31 to \$2,959.3M at 2026-06-30, and pro-forma cash is ~\$1.9–2.0B after the \$1,056.4M SkyWater cash payment (2026-07-31, delivered✓).^{36 35 33}

- **We believe IONQ's and RGTI's cash floors are now essentially level on a unified pro-forma basis** (8.0–8.4x versus 8.7x), so the old "IONQ has the thickest cash floor" formulation no longer holds.
- **QuantumCTek at the bottom: QuantumCTek's 13.0x cash floor is the thinnest, and its valuation relies more heavily on the durability of policy-driven orders**⁸⁹

Exhibit 23: Five pure-play quantum names: market cap vs TTM revenue (USD B/USD M, P/S marked)

Source: yahoo_finance¹, KIMI estimates⁸⁹

4.2 The Quantinuum IPO and the migration of the scarcity premium: the "+13.3% debut" was the opening print; the close was just +0.6%

4.2.1 QNT has since broken its offer price, leaving IPO investors underwater

Quantinuum (QNT) completed the industry's first traditional IPO on Nasdaq on 2026-06-04 (company basis, delivered✓)⁴⁴, pricing 28,000,000 shares at \$60.00 to raise \$1.68bn, above a twice-raised range (\$45–50 → \$53–55).⁴⁰ The media narrative and the closing fact split on basis.

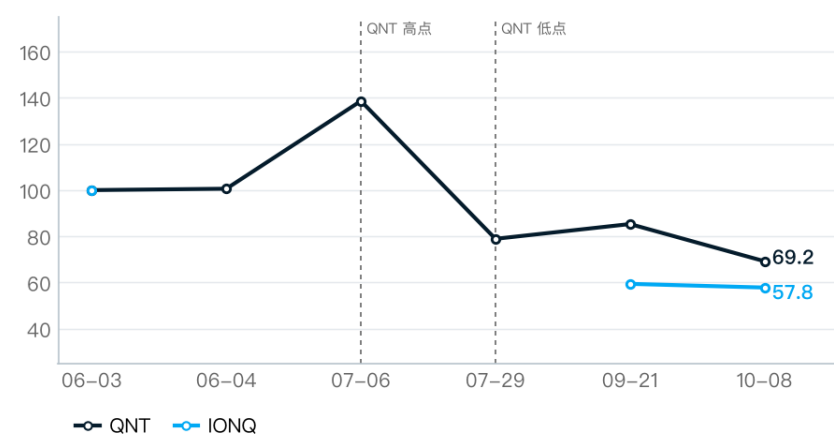
- The **"+13.3% debut, \$17.63bn valuation"** was the opening print, not the close: the stock opened at \$68⁴¹ but in fact opened high and closed low, ending at \$60.38, just +0.6% over the offer price.¹
- **IPO investors are underwater in aggregate: as of 2026-10-08, QNT closed at \$41.52 with a market cap of about \$11.0B²⁹⁰, down -30.8% from the offer price and -39.0% from the day-one open**
- **The market-cap pecking order is unchanged: the largest pure play has not changed hands, with IONQ at about \$16.0B > QNT at about \$11.0B (2026-10-08²⁹⁰)¹**

4.2.2 QNT's offering documents provide the industry's first audited demand sample, with two corrections to note

All three anchors were verified against the original text.

- **The customer-concentration narrative is outdated:** RIKEN was 63% of revenue in FY2024 and 60% in FY2025, but fell to 7% in 2026Q1 and just 16% in H1 2026, while the US government share rose to 29% (H1 2026) and the top two customers combined for 45%.^{42 43}
- **RPO has fallen for two consecutive quarters**, from \$80.7M (2025-12-31) to \$76.8M (2026-03-31) to \$74.2M (2026-06-30); FY26 guidance of \$28–32M implies full-year revenue of -9% to +4% YoY against FY2025 actual revenue of \$30.9M — zero growth — and H1 2026 revenue was down 37.5% YoY.^{42 43 44} The company concedes in its 10-Q risk factors that "many of our large customer relationships involve pilot projects, research collaborations, or grant-funded programs, rather than long-term production commitments."⁴³

Exhibit 24: QNT vs IONQ normalized since QNT listing (2026-06-03=100)



来源: yahoo_finance¹, as_of 2026-10-08

4.2.3 QNT's 450x+ clearing price cuts both ways for IONQ

IONQ has fallen 42.2%²⁹⁰ from the close before QNT's listing to 2026-10-08, and the sector premium has migrated to QNT's "pedigree premium" — a low float (about 32.3M Class A shares, only ~12.6% of total share capital) + Honeywell's ~47.8% post-IPO voting power + the S-1 vetting signal of a conventional IPO + the highest-fidelity narrative⁴².

- **QNT trades at 7.4x IONQ's P/S: QNT trades at about 478x TTM P/S, 7.4x IONQ's roughly 65x; on a forward basis (FY26) QNT is about 366x vs IONQ's about 35x (2026-10-08²⁹⁰)⁸⁹**
- **The implication for IONQ is two-way:** bulls see relative undervaluation against an "audited clearing price" (~10x cheaper on a forward basis within the same sector), while bears see the fragility of a 450x+ clearing price itself — QNT broke its offer price three months after a strong open.
- **The calendar cliff to track is QNT's lockup expiry around December 2026**, with Honeywell and CQC holding ~79% combined voting power post-IPO⁴² — a shared supply event for the whole sector in December 2026.
- **Another seating change came on the government-validation side:** in the DARPA QBI Stage C list announced on 2026-10-07, Quantinuum was absent from this round of advancement (IonQ, IBM, Atom and Diraq made the cut, joining Microsoft and PsiQuantum for six in total)²⁷⁰. Morgan Stanley cautions that the absence should not be read as a technical judgment²⁷⁷; we likewise note that QBI is not a knockout competition and DARPA has stated that more companies may be elevated to Stage C later²⁷⁰ — but the mismatch between the "highest-fidelity narrative" and the "government-validation list" is the latest marginal crack in the scarcity premium.

4.3 The China-US six-dimension verdict: the US leads the general-purpose race for now, while China is closing the gap quickly and keeps single-point leads in quantum communication and photonics

4.3.1 Rejecting the "neck-and-neck" fudge, we rule on six dimensions one by one

- **Papers and patents are split between China and the US:** China wins on paper volume (second globally in quantum computing, first in quantum communication), the US wins on corporate papers (IBM, Google, Samsung, Alibaba and Tencent lead), and China wins on patent applications while the US wins on grants, with the grant rate as a quality proxy.^{10 4}
- **The US holds the physical-qubit records except photonic:** the US wins superconducting (IBM's Condor at 1,121 qubits versus China's Tianyan-504), neutral atom (Caltech's 6,100-atom array) and trapped ion — the records are all in the US camp, IonQ's 256 (fabricated with first ions trapped, delivery 2027, system-level performance undisclosed) and Quantinuum's 98, with no comparable public record from China — while China wins photonic (Jiuzhang 4 with 3,050 photons, 2026-05; the prior Jiuzhang 3 with 255 photons is a research prototype, never commercially delivered).^{3 4}
- **The US currently leads on logical-qubit scale and commercial maturity:** QuEra's 96, Helios' 48 and Atom's 24 all come from the US camp. China has an academic below-threshold demonstration of one d=7 surface-code logical qubit on USTC's Zuchongzhi 3.2 (2025-12²⁶⁰), but no public Chinese demonstration yet matches the 48/96-logical-qubit scale or commercial-system maturity; Zuchongzhi 3.0 is a separate physical-qubit sampling-advantage result.^{61 62 6 4}
- **The US wins on order and revenue scale:** leading companies' revenues differ by a factor of 3–10 — IONQ's FY2025A revenue of \$130M against QuantumCTek's TTM of ~\$44M and Origin Quantum's 2024 revenue of ~¥99.38M.^{32 1 4}
- **Government investment splits between committed stock and total flow:** China wins on committed stock (cumulative announced public investment of ~\$15bn) and the US wins on total flow (2025 global quantum startup funding of \$12.6bn, 64% to the US and 97% private capital).^{78 79 80 9}
- **Supply-chain autonomy splits between completeness and performance:** China wins on closed-loop completeness, with refrigeration, M&C and chip production lines forced into being by the embargo, while the US camp wins on high-end performance and the global supply system — Bluefors' ~70% refrigeration share, Infineon fabricating trapped-ion chips, and IonQ acquiring SkyWater for a US-based foundry.^{3 23 3 5 35}

4.3.2 Two structural inferences matter more than the verdicts themselves

- **China's autonomy was accelerated by export controls, and its closed loop is now in place** — which also means further escalation does diminishing marginal damage to the Chinese chain. The control asymmetry — the US controls equipment, technology and people, while China controls materials^{50 52} — is turning the two markets into two pools that no longer fully circulate, and the addressable TAM of the Chinese chain must be computed separately.
- **Logical qubits and error correction, where the US camp currently holds the milestones, matter more than papers and qubit counts**, because error correction is the gating variable for FTQC; China's catch-up signal on this dimension, not paper counts, is the leading indicator of any China-US competitive reordering.

4.4 Demand-validation ledger: 13 cases graded; only two categories can answer "who is using it / what value / how much they pay" at once

4.4.1 Application cases have evolved from "press-release name-drops" to "quantifiable customer economics"

The structure becomes clear once the cases are graded by validation level (Exhibit 25).

- **Annealing and hybrid optimization (the D-Wave family) and government R&D procurement are validated** — paid, in a production environment, with quantifiable value.
- **Gate-model finance (HSBC and IBM), energy (ORNL) and IonQ system sales are partially validated** — paid pilots with value quantified but not yet in production.
- **Three uses remain at the narrative stage, with assumption chains only:** production-grade replacement by VQE pharma molecular simulation, scaled QPU-for-server substitution, and self-driven pay-per-use QCaaS growth.

Exhibit 25: Demand-validation ledger — 13 application cases graded by validation level

Scenario	Customer economics, magnitude	Validation level	Timestamp
Bond trading (HSBC×IBM Heron)	+34% in quote-fill probability prediction for European corporate bonds (trial basis) ²⁹	Partially validated	2025-09-25
Manufacturing scheduling (Ford Otosan×D-Wave, production)	1,000-vehicle sequencing 30 min < 5 min ²⁶	Validated	2025-03
Manufacturing scheduling (BASF×D-Wave, PoC)	Production scheduling 10 hours seconds ²⁶	Partially validated	2025-11
Telecom paging optimization (NTT DOCOMO×D-Wave)	Paging signals -15%, ~1.2x peak terminals, solve 27h 40s; production deployment planned ²⁶	Partially validated	2024-08
Public safety (North Wales Police×D-Wave)	Average incident response time halved, ≥90% on-time responses ²⁶	Partially validated	2025-09
Energy grid (IonQ×ORNL)	Unit Commitment solved over 24 periods × 26 units; follow-on contract after pilot ²⁶	Partially validated	2026
Energy exploration (Aramco×Pasqal 200-qubit machine)	Deployment grade (value not quantified); expanded to the Middle East's first commercial QCaaS in 2026-05 ⁵	Partially validated	2026-01/05
Pharma AI drug discovery (Shionogi×D-Wave)	10x improvement in LLM training pipeline (basis unspecified) ²⁷	Partially validated	2026-05
Financial capital allocation (BBVA×Multiverse)	Tensor networks + annealing shorten computation time (not quantified) ⁵	Partially validated	2026-01
Government/power QKD private networks (QuantumCTek×China Telecom)	¥166M of related-party orders in 2025Q3 (metro networks ¥77M + 280-qubit computing ¥63M etc.) ⁵⁸	Validated (policy procurement)	2025-09-30
State-owned quantum compute cloud (QuantumCTek 504/200-qubit systems)	504-qubit fully accepted + 200-qubit partially accepted ⁵⁸	Validated (policy procurement)	2025-09-30
Pharma molecular simulation (VQE×Lepodisiran)	Classical 109 GPU-hours vs hybrid VQE 0.5 QPU-hours + 1 GPU-hour (assumption chain; UBS states it is infeasible on current architectures) ⁵	Narrative stage	2026-01
QPU replacing classical servers (UBS server model)	Workload migration assumption of only 0–1% before 2027 ⁵	Narrative stage	2026-01

Source: HSBC²⁹, Jefferies²⁶, UBS⁵, China Galaxy Securities⁵⁸ Note: validation grading = validated (paid + production environment) / partially validated (paid pilot, not in production) / narrative stage (assumption chain); the only categories that can currently answer "who is using it / what value it creates / how much they pay" at once are D-Wave system sales (€10M-class per unit) and IonQ government contracts (\$10M–\$50M per deal)²⁶.

4.4.2 HSBC×IBM, D-Wave's annealing family and UBS's VQE paradigm sit on different rungs of the validation ladder

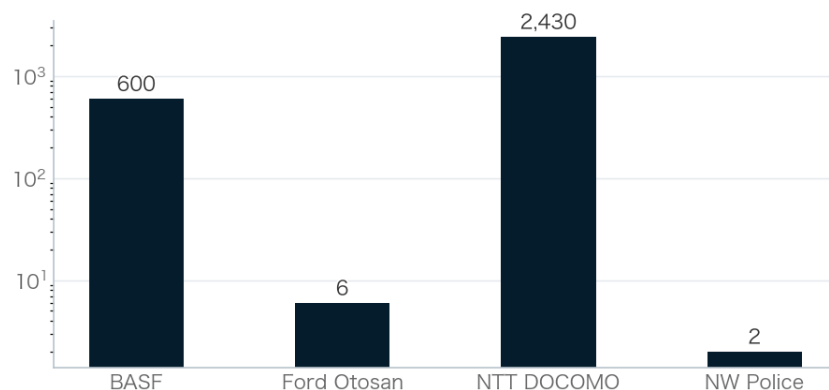
Three cases deserve expansion.

- **The hardest commercial case is HSBC and IBM:** on 2025-09-25 the two announced the world's first quantum algorithmic trading trial, improving quote-fill probability prediction by 34% in the European corporate bond market using an IBM Heron processor — the first quantum-advantage demonstration in a real financial-market setting²⁹, though its basis is still a trial, not a production deployment.
- **The group closest to answering "how much they pay" is D-Wave's annealing case family:** Ford Otosan's production scheduling cut from 30 minutes to under 5, NTT DOCOMO's solve time from 27 hours to 40 seconds, and North Wales Police response time halved (Exhibit 26)²⁶; on the payment side, D-Wave signed a €10M commitment with Swiss Quantum Technology SA to deploy Advantage2 in Europe,

with the system-sales tempo rising from 1 unit/year to 2–3 (at least 2 deliveries in 2026).^{26 27}

- **The most typical assumption chain is UBS's VQE Lepodisiran paradigm:** for the same 500-spin-orbital problem, classical CCSD(T) needs 109 GPU-hours while hybrid VQE needs only 0.5 QPU-hours plus 1 GPU-hour, but UBS states plainly that "this VQE is not feasible on current quantum-computing architectures and only becomes reachable in the medium term"⁵ — citations must carry the assumption-chain qualifier.

Exhibit 26: D-Wave annealing use cases: runtime compression (before vs after)



Source: Jefferies²⁶, KIMI estimates⁸⁹, as_of 2025-12-15

4.4.3 The demand signals point from pay-per-use cloud access toward owned systems

On demand elasticity, QCaaS pricing shows stable stratification, with no public price cut on the same product in three years (for effective per-unit price deflation across generations, see the Section 5.3 consumption-model price factor)²¹, and no public evidence of a "price cut → usage elasticity" mechanism.

- **The observable elasticity signal comes from revenue structure:** D-Wave's QCaaS revenue fell 13.4% YoY (3Q25 revenue of \$1.4M) while system sales ramped and average contract value more than doubled.^{26 27}
- **Customers are choosing to buy capacity outright over pay-per-use, in our view** — early customers treat quantum compute as an asset rather than a utility, a structural counterexample to the "QCaaS subscription" valuation narrative.
- **The order form is also migrating:** a Hyperion user survey shows cloud-access revenue share falling from 46% to 38% and on-prem deployment rising from 22% to 27%, with a further judgment that on-prem will be the largest hardware segment in 2028⁸⁷; system sales ramping and national-lab multi-modality procurement are mutually causal.
- **On substitutes, classical HPC still absorbs the vast majority of workloads** (ExxonMobil created >\$1Bn of value with classical supercomputing)⁵, and AWS sells simulators on the same shelf (SV1 at \$0.075/minute)²¹: QPU usage has not measurably substituted simulator usage — no public usage data, an evidence gap.

4.4.4 The QPU-demand range is scenario arithmetic that excludes three positive feedbacks

The recomputable framework for the installed-compute shock comes from UBS's server model (Exhibit 27), whose outputs are a server-shipment 2026–35 CAGR range of -4% (bull) to +3% (bear) and 2035 QPU demand of 399–2,010 units.⁵ Three caveats apply.

- This is scenario deduction, not forecast.
- **It counts only direct substitution and excludes Jevons-type positive feedback** — UBS itself notes the GPU-versus-CPU precedent, where efficiency gains grew total demand.⁵
- If the quantum-classical fusion architecture (Section 3) holds, the QPU's role is closer to an accelerator card than a server replacement.

Exhibit 27: UBS server model: QPU demand derivation chain (assumptions replaceable line by line; scenario arithmetic, not a forecast)

Chain link	Bear (low adoption)	Bull (high adoption)
Installed servers @2035 (UBS assumption: 5-year life + ~4%/yr growth)	117,185k units	117,185k units

Workload migration rate @2035 (pharma/chem/fin, UBS scenario assumption)	12%/10%/5%	50%/45%/35%
Idle capacity @2035	2,694k units (2%)	13,565k units (12%)
Server shipment CAGR 2026–35	+3%	-4%
Compute hours / jobs / QPU hours (QPU spec assumption: 100 qubits/unit)	141.6M hours / 944k jobs / 2.62M QPU hours	713.0M hours / 4.75M jobs / 13.2M QPU hours
QPU demand units @2035 (range)	399 units (39,917 physical / 40 logical qubits)	2,010 units (200,963 physical / 201 logical qubits)

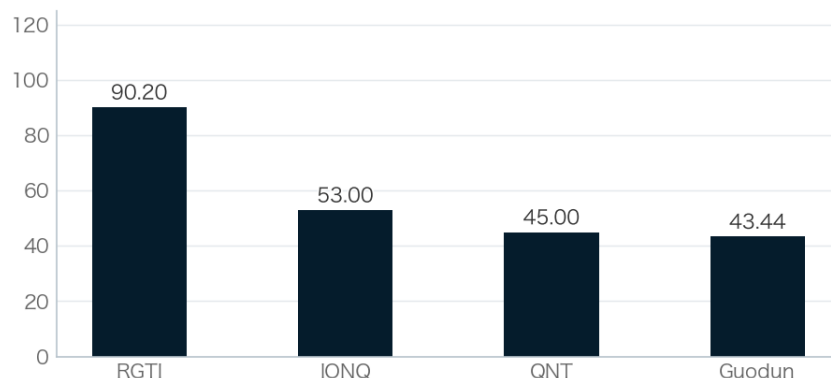
Source: UBS⁵ Note: all assumptions are UBS's (made explicit line by line), with no KIMI assumptions; readers can replace migration rates/QPU specs and recompute. UBS itself notes the model should be read as an order-of-magnitude reference, not a precise forecast, and excludes three positive feedbacks: the Jevons paradox, QEC classical compute needs (up to ~70 ASICs per 100 logical qubits) and classical-compute sharing in hybrid algorithms⁵.

4.5 Demand structure in three parts: government and subsidized demand dominates; no positive evidence for real growth ex-policy

Splitting demand into real commercial, government-and-subsidized, and speculative, all three names' revenue is dominated by government and subsidized demand (Exhibit 28).

- **RGTI is the cleanest case:** government entities were 90.2% of FY2025A revenue (89.4% in FY2024A), with US government entities at 48.0%.³⁰ The contracts are R&D-milestone in nature (time-and-materials, cost-share and fixed-price milestones)³⁰, and commercial system sales were \$1.6M for Novera in 2024, with none recognized in 2025 (two POs of ~\$5.7M booked that year for 2026 delivery).³⁰
- **For QNT, after RIKEN faded the US government backfilled:** RIKEN is a Japanese government agency, and the top two customers were 45% combined in H1 2026.⁴³
- **For IONQ, customer concentration is diluting but the government share is undisclosed:** the top three customers were 53% of revenue in FY2025A, diluting from 77% in FY2024³²; the precise government revenue share is undisclosed — an evidence gap — with main customers being government entities and large enterprises.²⁶ The demand reservoir is RPO of \$370M (2025-12-31), of which ~40% is expected to be recognized within 12 months.³²
- **For QuantumCTek, revenue leans on related parties and China Telecom:** related-party sales were 43.44% on the top-five-customer basis (FY2025A)⁵⁶, and 84.3% of quantum-computing revenue (ex-Dongfang Zhongke basis) comes from the China Telecom system²³⁴; the company took ¥166M of China Telecom-system orders in 2025Q3 alone.⁵⁸

Exhibit 28: Government-related revenue share (% , latest period, bases per note)



Source: Rigetti 10-K³⁰, Quantinuum 10-Q⁴³, IonQ 10-K³², Guodun annual report⁵⁶, as_of 2026-06-30

4.5.1 RGTI offers first-hand evidence that a high government share means high revenue volatility, no assumptions needed

The elasticity of policy rhythm has a natural experiment: RGTI directly attributes its FY2025A revenue decline of 34.3% (\$7.09M versus \$10.79M) to the NQI authorization lapsing un-renewed in 2023-09³⁰, with 3Q25 down ~18–21% YoY.

- **For real commercial growth ex-policy demand, there is currently no positive evidence:** speculative demand shows up mainly in secondary-market valuations rather than revenue, and D-Wave's RPO is only \$2.9M (3Q25, down from \$4.0M a year earlier)²⁶ — flagging the basis gap between the "bookings are surging" narrative and the fulfillment reservoir.
- **Demand penetration is also happening in the gate-model camp:** on 2026-10-01, D-Wave launched a gate-model quantum simulator in Beta (with BBVA, FirstQFM, Florida Atlantic and Jülich as the first four users); the underlying dual-rail

superconducting gate-model two-qubit gate results were recently published in Nature²⁸⁴.

4.5.2 Buyer profiles and procurement processes differ by track

- **The US government side runs through federal budget lines: DARPA/DOE/DOD/AFRL program officers and federal budget accounts — DARPA QBI Stage A pays up to ≤\$1M per company in concept fees and Stage B up to ≤\$15M/year per company^{45 46}; a single Stage C agreement already carries potential value of up to \$300M (IonQ, 2026-10-07²⁷¹)**
- **On the Chinese government side, funding comes from five-year-plan quantum programs and carrier centralized procurement:** the buyers are China Telecom Quantum Group (an SOE subsidiary and QuantumCTek's controlling party), local compute centers and government and power private networks.^{53 58}
- **At financial institutions, signing authority sits in innovation labs and CTO research budgets —** the HSBC case was co-published by the bank's research team and IBM, and Visa is openly recruiting a principal research scientist for quantum computing.^{29 5}
- **Pharma buys from R&D and computational-chemistry budgets**, with the QuPharm alliance of 17 pharma companies evaluating collectively rather than purchasing: all 13 covered pharma names have QC collaborations, but none has disclosed a paid amount — an evidence gap.⁵
- **The procurement chokepoints are POC-to-production conversion on the enterprise side** (no market-wide statistics, an evidence gap) and 12–18-month system delivery cycles²⁶, and appropriation cycles on the government side (the NQI precedent).³⁰

Primary-market heat is being priced in lockstep: on 2026-10-08, US neutral-atom startup Oratomic closed a \$475M Series B (at a \$5.4B valuation, 3.6x in three months, taking cumulative funding to \$775M)²⁹⁶; the same day, the UK's Universal Quantum closed a \$100M+ Series A (the largest ever for a UK quantum company, led by DCVC and Firgun)²⁹⁷; the day before, Korea's KQC Quantum signed a definitive merger agreement with a SPAC to list on Nasdaq (pre-money \$80M, expected to close in 2027H1)²⁹⁸ — primary-market endorsements of the neutral-atom and trapped-ion routes and secondary-market valuations are mutually corroborating.

- **The main current procurement driver is enterprise-side fear of being left behind** — UBS's bull-scenario definition, verbatim, is "due to fear of being left behind."⁵

4.6 Policy and lists: the three names are exposed to the referee list, the shareholder list and the negative list respectively

4.6.1 The funds are reconfigured rather than new, but the procurement flywheel is in place

US quantum policy changed qualitatively in May–September 2026, switching from R&D subsidies to a trio of equity binding, hard deadlines and national milestones.

- **On equity binding, the Department of Commerce issued \$2.013bn of investment intentions (LOIs) to nine quantum companies on 2026-05-21**, via the CHIPS R&D Office, with equity arrangements attached — minority, non-controlling, new shares issued at a discount, reported at 15%.^{28 49}
- **The \$100M each for RGTI, D-Wave and Quantinuum has gone definitive** (delivered✓ 2026-09-04/10)³¹, and IBM Aderon's \$1bn went definitive (delivered✓ 2026-09-16).⁶⁰
- **The nature of the funds must be flagged:** the \$2.013bn comes entirely from reconfiguring the 2022 CHIPS Act's existing authorization — no new money — but the procurement flywheel's institutional pieces (EO deadline, FY27 budget lines, FAR contractor rules, and a Commerce pilot by end-2027) are all in place.⁴⁸
- **RGTI's Commerce equity terms are 7,739,938 shares at an implied \$12.92 each (~2.27%), with no cash consideration ("As inducement")**; the OTA's \$100M is entirely restricted funds — \$43.9M, \$29.9M and \$26.2M in three milestone tranches — with clawback and march-in clauses.^{20 31}
- **The market reaction was immediate:** RGTI rose 6.8% and QBTS 5.7% in pre-market on the definitive signing day.³¹

4.6.2 List differentiation gives the three names completely different policy transmission lines

- **IONQ sits inside the QBI Stage B list of 11** (announced 2025-11-06; the list includes Atom Computing, IBM, Quantinuum, QuEra and others)^{45 32}, but not in the CHIPS nine-company LOI list — it is exposed to the "referee endorsement" line.

- **RGTI is not in QBI but holds a CHIPS definitive**, the shareholder-endorsement line.³¹
- **QuantumCTek is on the US Entity List** (first quantum entities, 2021-11)²², the negative-list line.
- **The Stage C list landed on 2026-10-07**: Atom Computing, Diraq, IBM and IonQ advanced, joining Microsoft and PsiQuantum for six companies in total²⁷⁰; IonQ's Stage C agreement carries potential value of up to \$300M (company-reported basis²⁷¹), and the prior cash-flow proof point was PsiQuantum's \$125M DARPA extension agreement (2026-07)⁴⁶
- **We judge that QBI Stage C (IONQ's exam) and the diffusion of CHIPS definitive agreements (RGTI has already handed in its paper) form a symmetric catalyst pair for 2026Q4**: IONQ advanced on 2026-10-07 (IBM/Atom selected in the same batch; Quantinuum absent this round²⁷⁰), so the adverse catalyst did not materialize; the right to interpret the absence has become new material for both bulls and bears — MS cautions that absence ≠ a technical judgment²⁷⁷.

4.6.3 Policy dependence quantifies into two layers

- **QuantumCTek has the most certain budget line and the most administrative timing**: on budget lines, the "15th Five-Year Plan" lists Quantum Technology among future industries^{53 54} and China Telecom has its 2030 action plan⁵⁷; on timing, revenue is concentrated in Q4 recognition⁵⁸ and government subsidies of ¥33.95M exceed net profit attributable to the parent of ¥5.39M⁵⁶; on 2026-09-29, the Ministry of Science and Technology's "15th Five-Year Plan" press conference further placed Quantum Technology among strategic frontier technologies and set out major national science and technology projects oriented toward 2035²⁹⁹
- **RGTI's budget line once lapsed and is repairing**: the NQI expiry of 2023-09³⁰; NQI 2.0 has passed both committees but is not yet law⁴⁷, and the five-year CHIPS definitive works as a hedge.³¹
- **IONQ has the most diversified exposure**: on the QBI Stage C list (agreement potential value up to \$300M²⁷¹) + allied governments + commercial^{32 45}
- **The single most critical policy variable is whether NQI 2.0 becomes law within the year**: if enacted, RGTI's government-contract line repairs (FY25's -34.3% adverse elasticity); if it dies, RGTI's disadvantage vs IONQ widens. Latest status: S.3597 (NQI reauthorization, \$2.7B over 5 years) failed to receive a full-Senate vote before the 2026-09-30 recess, pushing legislation to the lame-duck session after the 11-09 reconvening; the House version of the NDAA did not incorporate the full NQI text²⁹¹.

4.6.4 In our view, the US version's endorsement far outweighs dilution, while the Chinese version trades independence for a stronger endorsement

The net effect of government equity stakes — endorsement, dilution and lockup — differs structurally between the US and Chinese versions.

- **The US version is "minority non-controlling plus discounted new shares"**: the endorsement effect is immediate, dilution is manageable (\$100M for RGTI is ~2% of share capital)³¹, and lockup and governance terms are undisclosed — an evidence gap.
- **The Chinese version is "controlling stake plus shareholder-as-customer"**: China Telecom Quantum Group directly holds 21.86% and controls 40.43% of voting rights in concert, a stronger endorsement, but with a deeper independence discount and related-party dependence, and shareholder-as-customer discounts the market-based quality of the orders.⁵⁶
- **The US version's net effect is positive, in our view** (endorsement far outweighs dilution), while the Chinese version is double-edged — consistent with the revenue-quality pricing gap between the two names.

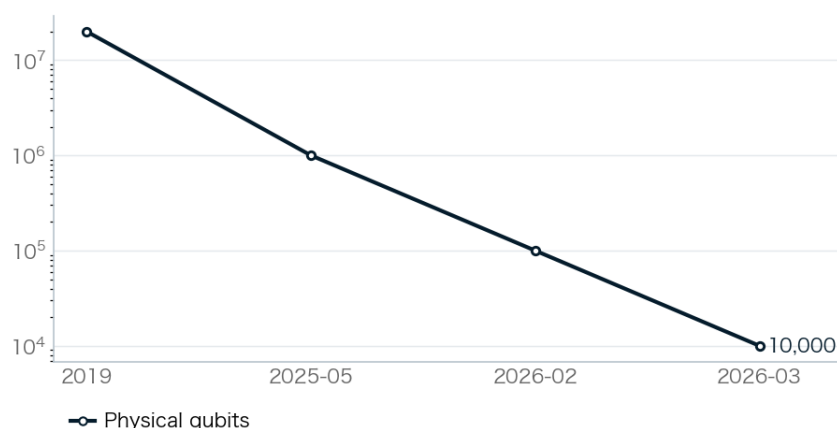
4.7 Adjacent-market transmission: the PQC replacement chain is driven by papers and deadlines in tandem; QKD is policy infrastructure orders

4.7.1 The algorithm-side threshold is falling faster than the hardware side is climbing

2026 is the year PQC (post-quantum cryptography) compliance deadlines became hard constraints. The resource-estimate paper chain has compressed by over 3 orders of magnitude since 2019, and by another ~2 orders of magnitude in the most recent 10 months (Exhibit 29).

- **RSA-2048 estimates went from 20M physical qubits and 8 hours (Gidney and Ekerå 2019) to <1M physical qubits and <1 week (Gidney 2025-05).**⁷⁴
- **The chain then runs to 100k physical qubits (Pinnacle 2026-02, qLDPC)**⁷⁵, then to 10,000 reconfigurable atomic qubits (Cain et al. 2026-03-30).⁷⁶
- On the ECC side, Babbush et al. (2026-03) gave <1,200 logical qubits for 256-bit ECDLP.⁷⁷
- **Hardware roadmaps are climbing more slowly than the threshold falls:** IBM's Starling 2029 at 200 logical qubits and Blue Jay 2033 at 2,000; IonQ's 2030 target of 80,000 logical qubits (management basis²⁵³).⁶⁵

Exhibit 29: Resource estimates for breaking RSA-2048 via Shor (physical qubits, log axis, 2019–2026)



Source: Gidney⁷⁴, Pinnacle⁷⁵, Cain et al.⁷⁶, Babbush et al.⁷⁷, as_of 2026-03-30

4.7.2 US federal PQC deadlines are set by executive order; industry and allied jurisdictions set their own timelines, and China follows its own commercial-cryptography path

On deadlines (Exhibit 30), EO 14412 (2026-06-22) sets binding deadlines for federal high-value assets — key exchange by 2030-12-31 and signatures by 2031-12-31 — supported by OMB M-26-15 and the DoW strategy (support or retire by end-2030).⁸³

- **Federal agencies must submit PQC migration plans to OMB by 2026-10-20**, a checkpoint testable as early as 2026Q4.⁸³
- **On the industry side, TLS certificate lifetimes shrink to 47 days from 2029-03-15** (CA/B Forum SC-081v3), forcing certificate automation and hybrid keys.⁸⁵
- The EU targets 2030 for critical infrastructure, the UK 2028/2031/2035, and Australia 2030.⁸³
- **China follows its own commercial-cryptography path** — a global call for quantum-resistant commercial-cryptography standards launched in 2025-02 — with no public year-by-year deadlines.⁸³

Exhibit 30: Global PQC compliance-deadline calendar (2026–2035)

Node	2026	2027	2029	2030–2031	2033–2035
US federal (EO 14412/CNSA 2.0)	• Agency migration plans due by 10-20 ⁸³	• New procurements must be CNSA 2.0 compliant ⁸³		• Key exchange 2030-12-31 / signatures 2031-12-31 ⁸³	
Industry (TLS/enterprise)	• TLS certificates 200 days ⁸⁵	• TLS 100 days ⁸⁵	• TLS 47 days (03-15) ⁸⁵ ; Google/Cloudflare self-set migration deadlines ⁸³		
EU/UK/Australia	• EU national roadmaps end-2026 ⁸³			• EU critical infrastructure 2030; UK priority 2031 ⁸³	• EU/UK full coverage 2035 ⁸³
China				• Administrative push on cryptography evaluation (no public deadlines) ⁸³	

Source: EO 14412 and supporting documents (as relayed by multiple sources)⁸³, CA/B Forum (as relayed)⁸⁵

4.7.3 The three PQC TAM bases are not additive

- **Total migration spending is an OMB federal estimate:** OMB estimates ~\$7.1B cumulative for US federal non-NSS priority systems over 2025–2035.⁸⁴
- **Hardware-security IP royalties are MS's three-factor estimate:** MS's base case of \$310mn at 2030, built from three factors — 25% adoption, a 50% PUF attach rate and crypto-processor ASP; bull \$600mn, bear \$190mn.⁸⁶
- **Long-dated quantum infrastructure is a separate MS estimate:** MS estimates \$110bn at 2040.⁸⁶
- **The fast variable in the replacement chain is the paper chain, not the deadlines:** if the next paper pushes RSA-2048 below the $\sim 10^3$ physical-qubit level, median Q-Day pricing moves forward from 2033–2035 to 2028–2030, resonating with MS's survey in which most experts put the probability of Q-Day before 2030 above 50%.⁸⁶ Almost no sell-side model currently includes the paper chain in PQC TAM sensitivities — that is the expectation gap.

The commercialization counterexample is also worth recording: Arqit disclosed preliminary FY2026 results on 2026-10-08 — full-year revenue of \$975K–1.0M (nearly doubling y/y) but H2 down 18–23% y/y (one large Middle East customer stopped recognizing revenue), with shares -18.3% on the day²⁸³. PQC's conversion from deadlines to revenue still depends heavily on single large customers. (Period-end cash of about \$51M²⁸³.)

- **For each year the main industry (FTQC) slips, the compliance-driven part of the replacement TAM does not move** (deadlines are executive-mandated), while the threat-driven part slips ~1–2 years; the effect of the 2026 policy design is precisely this hard decoupling of demand from technology uncertainty.

4.7.4 Much of IoT and automotive needs hardware replacement rather than remote patching

The exposure map is a data-lifecycle × device matrix (UBS's framework and estimates⁵). Harvest now, decrypt later (HNDL) pulls the distant threat forward: wherever the data's lifecycle extends past the arrival of quantum decryption, today's ciphertext is tomorrow's plaintext, so security spending starts 10+ years before quantum advantage.⁵

- **The 10+ year tier (government secrets, financial and medical records) carries the highest risk**, sitting on HSMs and servers and on IoT and automotive.
- **The 5+ year tier (critical infrastructure, R&D and IP) sits on servers and IoT**, and the 2+ year tier (private communications) sits on smartphones and PCs.
- **Migration paths split by device:** smartphones, PCs and servers can be patched remotely at the cost of latency, power and thermal budget, while much of IoT and automotive needs hardware replacement — UBS cites market reports that >50% of IoT devices cannot be remotely upgraded to PQC, and its own estimate puts high-risk IoT devices at 30%, with 3.9bn cumulative replacements over 2026–2030 (including repeat replacements of the same device).
- **Shipment anchors are 2024 IoT shipments of 2.01bn units against a 10.5bn installed base**, smartphones at 1.22bn and PCs at 247M (Gartner as relayed by UBS⁵; cross-checked by Gartner's own 2026-01-20 release and IDC's 2025-12-02 estimate, both consistent).^{265 266} The exposure matrix is in Exhibit 30A.

Exhibit 30A: PQC exposure matrix — data lifecycle × device (deadlines, shipments and replacement-volume anchors)

Data lifecycle	Typical data	Main devices	Migration path	Quantified anchors	Corresponding deadlines
10+ years (highest risk)	Government secrets, financial records, medical records	HSMs/servers, secure enterprise networks; IoT, automotive, industrial equipment	Hardware replacement-led: >50% of IoT devices not remotely upgradable (UBS citing market reports)	High-risk IoT devices 30% (UBSe); 3.9bn cumulative replacements 2026–2030 (incl. repeat replacements), cumulative TAM +32% (UBSe); IoT 2024 shipments 2.01bn/installed base 10.5bn (Gartner via UBS ⁵)	EO 14412 key exchange 2030-12-31 ⁸³ ; CNSA 2.0 for new procurements 2027-01-01 ²⁶⁷ ; NSA field-equipment transition by 2030 (relayed by UBS)
5+ years	Critical infrastructure, R&D/IP	Servers; manufacturing/healthcare/power-grid IoT	Mixed software/hardware	Large installed base of long-lifetime industrial IoT (same basis as above)	EU 2030 critical infrastructure ⁸³ ; NIST IR 8547: 112-bit algorithms deprecated after

					2030, quantum-vulnerable public key disallowed after 2035 (draft ²⁶⁴ ; timeline as relayed)
2+ years	Private communications	Smartphones (2024 shipments 1.22bn), PCs (247M)	Remote software upgrade at the cost of latency/power/ther- mal budget; Apple iOS 26 already ships ML-KEM-768 (2025-09, relayed by UBS ⁵)	Smartphones: 382M replacements in 2030, cumulative TAM +6% (mid-end ~30% most exposed, Counterpoint via UBS ⁵); PCs: 53.4M, +4% (UBSe)	TLS certificate lifetime 47 days from 2029-03-15 ⁸⁵ ; Cloudflare/Google 2029 corporate deadlines (relayed by MS ⁸⁶)

Note: the framework and replacement volumes are UBS single-source estimates (UBSe⁵, 2026-01-12), flagged throughout; shipment series are Gartner as relayed by UBS, cross-checked against Gartner's own release (2026-01-20²⁶⁵: 2025 PC shipments >270M, +9.1%) and IDC (2025-12-02²⁶⁶: 2025E smartphones 1.25bn), both consistent; China follows a sovereign commercial-cryptography path with no public year-by-year deadlines⁸³. Size multiples are recomputed from the NIST FIPS 203/204 standards text²⁶¹ ²⁶² against Cloudflare's measured baselines²⁶³; the divergence from UBS's round-order "100x/10x/10x" (method unspecified) is discussed in the text.

4.7.5 The real PQC cost battleground is bandwidth, memory and middlebox compatibility

The migration cost is quantifiable at the byte level (NIST final standards, 2024-08-13²⁶¹ ²⁶²): FIPS 203's ML-KEM-768 carries a 1,184-byte encapsulation key and a 1,088-byte ciphertext against X25519's 32 bytes — roughly 37x on key size and 35x on TLS handshake traffic (~24.5x for ML-KEM-512) — while FIPS 204's ML-DSA-44 carries a 1,312-byte public key and a 2,420-byte signature, ~38x Ed25519's 64-byte signature and ~9.5x RSA-2048's.

- **The round-order claim of "keys 100x larger, computation 10x slower, memory 10x higher" (UBS estimates (UBSe)⁵, method unspecified) sits in tension with measurement:** Cloudflare's benchmarks (2024-02²⁶³) show ML-KEM is actually faster than X25519 on general-purpose CPUs, and the real cost battleground is bandwidth (switching all TLS signatures to ML-DSA-44 adds 17KB per handshake), memory and middlebox compatibility (connection-failure cliffs at 10KB and 30KB certificate-chain sizes); no public memory benchmark exists for constrained devices — an evidence gap.
- **Three incremental deadlines stand beyond Exhibit 30:** the NIST IR 8547 draft (2024-11-12, CSRC website) would deprecate 112-bit-strength algorithms after 2030 and disallow all quantum-vulnerable public-key algorithms after 2035 (timeline cross-checked via relays; still a draft)²⁶⁴; CNSA 2.0 binds new US national-security-system procurements from 2027-01-01²⁶⁷, and the EU requires member states' national migration roadmaps by end-2026.²⁶⁷
- **The matrix's top-right cell is, in our view, the only "migrate or fail" hard demand in the replacement chain:** 10+ year lifecycles crossed with non-upgradable devices, whose overlap with the 2030 deadline gives it the highest delivery certainty; the smartphone and PC cells are more an acceleration of ordinary replacement cycles than incremental demand — which is exactly why UBS's TAM uplift diverges so widely across the three device categories, at +32%, +6% and +4%.

4.7.6 In our view, China's QKD backbone serves a different jurisdiction and payer base from global PQC

The PQC-versus-QKD divergence has been settled by official positions: the NSA does not support QKD for national-security systems, the UK NCSC does not endorse it for government and military use, ENISA concurs, and the DoW explicitly will not use QKD.⁸¹ ⁸² ⁸⁶ The reasoning chain is that QKD only distributes keys, requires dedicated networks and trusted relays, is weak against DoS, and sits at a cost disadvantage versus PQC.

- **China is the only large-scale bettor in the opposite direction** — the 2,000+km Beijing-Shanghai trunk line, the Micius satellite-to-ground link and China Telecom's 40+ city metro networks — on a logic of sovereign information-security infrastructure rather than pure cost-benefit.⁵⁷ ⁸³
- **China's QKD backbone will not divert the global PQC replacement TAM, in our view**, since the two systems serve different jurisdictions and payers; but it does lock QuantumCTek's QKD revenue into a single-channel structure in which government and SOE procurement is essentially everything.
- **QuantumCTek's QKD is policy infrastructure orders, not security-market demand:** 2025 quantum-communication revenue was ¥140M (45% of the total, down 4.10% YoY)⁵⁶, with production, sales and inventory of 232, 155 and 339 units⁵⁶; revenue in 2026H1 was ¥49.51M⁸⁸, and metro networks stalled at 40+ cities for two consecutive periods.⁵⁷

- Its "budget-line certainty" is high, but buyer concentration and acceptance-rhythm dependence are the highest in the portfolio. The falsification condition for this judgment is disclosure-grade evidence of market-driven QKD procurement beyond government and power — finance, or commercial carrier lines.

4.8 Quantum-applicability boundary matrix: when quantum pays, in four cells of data × algorithm

4.8.1 Quantum pays only when three conditions hold simultaneously

Whether quantum pays is decided by a data-type × algorithm-type matrix (see Exhibit 30B), tested with cost-speed accounting.

- Classical complexity rises steeply with scale while the quantum algorithm scales polynomially or better.
- The input is small and structured, avoiding the loading bottleneck.
- **The QPU-hour cost beats the same-task classical cost**, on which no public comparison exists — an evidence gap.
- **Two hard anchors, both textbook-level complexity facts, frame the matrix:** the gold standard CCSD(T) scales as $O(N^7)$, while the variational quantum eigensolver (VQE) scales polynomially — for the same 500-spin-orbital problem, 109 classical GPU-hours versus 0.5 QPU-hours plus 1 GPU-hour (assumption chain⁵); and Shor's $O((\log N)^3)$ against the sub-exponential general number field sieve is why the Exhibit 29 paper chain exists.⁷⁴
- **The negative judgment matters as much:** porting classical machine learning directly onto quantum hardware is uneconomic, because data-loading costs grow linearly or worse in data size and the cost increment exceeds the speed increment.

4.8.2 Classical HPC stays the default, and quantum pays only in specific cells

The cell verdicts read as follows (first letter = data type, second = algorithm).

- **CC is the default:** classical HPC absorbs the vast majority of workloads, as ExxonMobil's >\$1bn of value created on supercomputers shows.⁵
- **QC is already engineered:** the data is born quantum and classical processing faces no loading bottleneck (Riverlane's decoder⁵) — the first proof behind "QPU as accelerator card, not replacement" (Section 3).
- **QQ holds the structural advantage:** the state space is itself quantum, but delivery awaits fault-tolerant quantum computing (FTQC) hardware.
- **CQ is the hardest cell:** only "small input plus steep complexity" problems clear the line, and large-input cases never do.

This explains why only two categories in the Section 4.4 ledger answer all three questions at once: validated annealing sits in CQ's sweet spot, and government procurement does not need to clear the cost-speed line; the optimal QQ cell remains narrative-stage, and large-input CQ fails the accounting — the micro foundation of our "partially validated" rating.

Exhibit 30B: Quantum-applicability boundary matrix — data type × algorithm type

Cell	Verdict	Mechanism in one line	In-report numeric anchors
CC: classical data × classical algorithms	Not applicable to quantum (default)	No quantum-state structure to exploit; classical HPC keeps absorbing workloads	ExxonMobil created >\$1bn of value on classical supercomputers ⁵
CQ: classical data × quantum algorithms	Selective: only "small input + steep complexity" clears the line	Loading a large classical dataset into quantum states grows linearly or worse in data size, erasing the speedup	Annealing case family: Ford Otosan scheduling 30 min <5 min ²⁶ ; migration only 0–1% before 2027 ⁵
QC: quantum data × classical algorithms	Already engineered (reverse flow: classical serving quantum)	Data is born quantum (readout/control signals); classical processing has no loading bottleneck	Riverlane 12nm ASIC decoder: 240ns, 1,057-qubit surface code ⁵
QQ: quantum data × quantum algorithms	Structural advantage, awaiting FTQC hardware	The state space is itself quantum: classical $O(N^7)$ /sub-exponential vs quantum polynomial	Lepodisiran: 109 GPU-hours vs 0.5 QPU-hours + 1 GPU-hour (assumption chain) ⁵ ; Shor resource paper chain (Exhibit 29) ⁷⁴

Note: complexity orders are public textbook-level facts; the Lepodisiran comparison is a UBS assumption chain, infeasible on current architectures⁵; no public same-task QPU-hour vs GPU-hour cost comparison exists (evidence gap).

5. Sector narratives and expectation gaps: under a \$50bn TAM vote median, the 50% target-price dispersion is all framework differences

Key points

- Pricing frameworks, not fundamentals, are the sector's core disagreement, in our view.
- FY26 revenue anchors are nearly identical across five banks (combined basis \$450–460M), yet target prices span \$49–\$80 (50.2% full range, plus an unnamed \$100 high); ex the 2026-02-vintage Wedbush, the gap is entirely four framework axes — TAM, multiple, discount rate and share.^{95 96 97 109 110}
- TAM allegiance is the first principal component of that dispersion: the like-for-like 2035 vendor-revenue-layer vote median is \$50bn (7 votes), but sell-side target-model TAMs are polarized — Cantor uses \$7.5bn while Evercore's Base uses \$54bn.^{95 107 139}
- IONQ's price already reflects ~70–78% of the cautious side's base case; RGTI's requires FY28 revenue to multiply a further 2.1–3.4x over consensus.¹³⁹
- Pairwise weekly-return correlations among the four US-listed pure-play quantum names have risen to 0.86–0.96, with beta overwhelming alpha, and sell-side narrative temperature diverges sharply from price positioning (a 52.0%–74.9% drawdown from 2-year highs (2026-10-08²⁹⁰))

The sector's core disagreement today is not about fundamentals but about pricing frameworks, in our view.

- **Framework axes explain the target-price dispersion:** The five banks covering IONQ anchor FY26 revenue almost identically (combined basis \$450–460M), yet their target prices run from \$49 to \$80 across the five named houses — a 50.2% full range, with Yahoo Finance aggregating an additional unnamed \$100 high — and, excluding the 2026-02-vintage Wedbush, the disagreement comes entirely from four framework axes: TAM, multiple, discount rate and share.^{95 96 97 109 110}
- **TAM allegiance is the first principal component of target-price dispersion:** the like-for-like 2035 QC vendor-revenue-layer TAM vote median is \$50bn (7 votes, with a sensitivity range of \$50–52bn excluding any single vote), but the TAMs actually used in sell-side target models are polarized: Cantor uses \$7.5bn while Evercore's Base uses \$54bn, a 7x gap.^{95 107 139}
- **RGTI is the deepest-priced option of the three:** Price-implies reverse engineering shows IONQ's current price already includes ~70–78% of the cautious side's base case, while RGTI's price requires FY28 revenue to multiply another 2.1–3.4x over consensus — the deepest-priced option of the three names.¹³⁹
- **Sector correlation is rising and narrative diverges from price:** at the sector level, pairwise weekly-return correlations among the four US-listed pure-play quantum names have risen to 0.86–0.96, with beta overwhelming alpha; sell-side narrative temperature ("stars and seas") diverges sharply from price positioning (a 52.0%–74.9% drawdown from 2-year highs (2026-10-08²⁹⁰))^{139 2 73 1}.
- **The current valuation's fragility lies not in the revenue slope being falsified but in the pricing framework being switched:** Evercore's two target prices for the same name on the same page, in P/E language and EV/S language, differ by 52% — the textbook anchor for this cliff.¹⁰⁷

5.1 The four-stage narrative staircase: the industry is at the transition from the R&D-narrative phase to the order-validation phase; IONQ is the only pure play to have touched the order-validation phase

5.1.1 The three names sit on different steps of the staircase

This report divides the sector narrative into four steps:

- The technology-narrative phase
- The government-funded R&D-narrative phase
- The order-validated engineering-race phase
- The commercialization-delivery phase

The industry as a whole is at the transition from the R&D-narrative phase to the order-validation phase: revenue is mainly government contracts, R&D milestones and

early system sales, but the order book (RPO, remaining performance obligations and bookings) has become the primary pricing variable for the first time.

- **IONQ has entered order validation:** IONQ is the only pure play in the sector to have entered the order-validation phase, posting 2Q26 revenue of \$80.1M — a record — with RPO up 297% YoY (company basis).^{33 95}
- **RGTI sits between the two stages:** RGTI is still between the R&D-narrative and order-validation phases, with the 108Q system GA and the CHIPS endorsement landed but TTM revenue of only \$13.4M.^{30 20 1}
- **QuantumCTek is the domestic variant:** QuantumCTek is the Chinese variant of the order-validation phase, with QKD already commercialized and quantum-computing systems ramping through acceptance, but buyers highly concentrated in the China Telecom system.^{56 88}

5.1.2 The four highest-weight narrative threads of the past month all point to the confluence of policy and capital

- **Policy upgraded from "priority" to "mandate":** Jefferies records that two executive orders set US quantum computing on a clock — deploy large-scale quantum computers by 2028 and pull the federal PQC migration timeline forward — and names IONQ as the broadest beneficiary, followed by QBTS and RGTI.⁹¹
- **Direct government equity stakes became a pricing variable:** in May 2026 the US Department of Commerce's CHIPS office issued investment intentions totaling ~\$2bn to nine quantum companies with equity arrangements⁹², and RGTI was the first to convert to a definitive agreement (OTA) on 2026-09-04, with Commerce receiving 7,739,938 shares.¹²¹
- **Vertical integration and the M&A wave are advancing:** after consolidating SkyWater, IONQ calls itself the "world's only trusted, US-based quantum foundry," having manufactured more trapped-ion processors in the past six months than in its entire prior history⁹³; the primary-market IPO channel has reopened, with IQM already listed in the US, Pasqal listed on Nasdaq via a SPAC in 2026-08, TuringQ and SEEQC filing, and SpinQ and Atom Computing each raising ~\$300M.⁹⁴
- **IONQ's 2Q26 revenue of \$80.1M (+287% YoY, above the \$66.6M consensus)** with RPO up 297% YoY (company basis).^{33 95}

5.1.3 The marginal pricing power of subsequent catalysts lies in order-to-revenue conversion, not narrative expansion

What is already priced in needs saying first:

- **Past-month research reads the catalysts as "as expected":** the first 256-qubit customer early-access delivery, the completed SkyWater consolidation, the FY26 combined guidance raise to \$450–460M, the two executive orders and the nine investment intentions have all appeared in the past month's research in "as expected / already reflected" language.^{93 96}
- **JPMorgan sees optionality as discounted:** JPMorgan's judgment is that most of the long-term optionality is already discounted.⁹⁶

5.1.4 This "hot narrative, cold position" combination is typical of the order-validation phase, in our view

Narrative temperature and price position diverge markedly. Sell-side narrative language is still in its heating phase: Guosen Securities' 2026-09-10 value-chain report calls quantum computing, in translation, "the sea of stars of the next compute era"², and BofA on 2025-07-17 called it possibly "the biggest revolution for humanity since discovering fire."⁷³

- **But the three names have already retraced deeply:** IONQ is -52.0% from its 2-year high, RGTI -74.9% and QuantumCTek -58.2% (2026-10-08²⁹⁰) (closing-price basis), with 52-week range positions of 23.1%, 3.5% and 0.4% respectively (intraday-price basis)^{1 139}.
- **P/S absolute values remain high while 2-year percentiles are very low:** P/S TTM absolute values are still at elevated levels of 64.9x/353.5x/103.6x (2026-10-08²⁹⁰), yet self-calculated 2-year percentiles are only 3.7%/19.2%/23.7%¹³⁹. This "hot narrative, cold positioning" combination is typical of the order validation phase: the story is intact, but the market has begun demanding orders to deliver it.

Note: P/S percentiles are self-calculated values with three known distortion sources (share count back-projected at the current value across all history, TTM revenue step approximation, and the IONQ denominator containing the SkyWater consolidation jump); the direction is credible but the point values should not be taken as precise; 52-week ranges are on an intraday-price basis (25.89–84.64 / 12.53–58.15 / 313.13–760.88)¹.

Exhibit 31: four-stage narrative staircase positioning – the industry is at the transition from the R&D-narrative phase to the order-validation phase; IONQ is the only pure play to have touched the order-validation phase

Subject	Current step	Positioning criteria (key facts)	Next-step trigger	Main falsification signal
Industry overall	R&D narrative order validation	Revenue mainly government contracts, R&D milestones, early system sales; order book first becomes the primary pricing variable ^{93 96}	Order-to-revenue conversion validated for two consecutive quarters	QCaaS volatile (D-Wave 3Q25 -13.4% YoY, 2Q26 +50% ²⁶), RPO falling (QNT -8.0% over two quarters ⁴³)
IONQ	Order validation (transitioning toward commercial delivery)	2Q26 revenue \$80.1M record, RPO +297% y/y (company basis) YoY ^{33 95}	Superion 256 customer delivery, organic revenue doubling consecutively ⁹³	Organic growth below management's 100% target, RPO turning negative QoQ ⁹⁶
RGTI	Between R&D narrative and order validation	108Q system GA, CHIPS definitive landed; TTM revenue \$13.4M ^{30 20 1}	C-DAC recognition, 99.5% fidelity delivery ¹³²	108Q fidelity regressed to 99.1% ^{30 20}
QuantumCTek	Order validation (Chinese variant)	QKD commercialized, QC systems ramping through acceptance; buyers concentrated in the China Telecom system ^{56 88}	New system orders outside the system, related-party share declining	Quantum-communication revenue -4.10%, contract liabilities -12.3% vs year-end ^{56 88}

Source: IonQ earnings release³³, Cantor Fitzgerald⁹⁵, JPMorgan⁹⁶, Jefferies^{26 132}, Quantinuum 10-Q⁴³, Rigetti periodic reports^{30 20}, QuantumCTek periodic reports^{56 88}, Bernstein⁹³, yahoo_finance¹

5.2 Bull-bear premise decomposition: bulls bet on 2030 FTQC + 30% share + AI multiples; the cautious side bets the option value is already discounted; bear reports are absent

5.2.1 The disagreement reduces to two falsifiable propositions: demand durability and valuation-anchor stability

The bull bet is composed of three premises: quantum demand is inflecting (Cantor's report title, verbatim, is "Quantum Demand is Inflecting"), IONQ can take a 30% share of the 2035 quantum hardware, software and services market, and valuations can be anchored to AI data-center multiples.⁹⁵

The cautious side bets the opposite: JPMorgan acknowledges the credibility of roadmap execution but believes most value-creation catalysts lie 12–36 months out, that the current price already discounts the bulk of long-term optionality, that the SkyWater consolidation brings structurally lower margins and integration complexity, and that management has explicitly deferred the long-term financial framework.⁹⁶

Decomposing the premises being bet, rather than listing opinions, reduces the disagreement to two falsifiable propositions: the durability of the demand inflection (can RPO be linearly extrapolated) and the stability of the valuation anchor (can AI multiples be ported to quantum).

5.2.2 Zero sell-side underweights across all three names leave bearish views expressed only through cautious-side downgrades

The absence of bears is itself part of the consensus map.

- **IONQ has zero Underweight ratings:** IONQ's sell-side rating distribution is 79% Overweight, 21% Equal-weight and 0% Underweight (Refinitiv basis)⁹⁷, and 10 buy, 3 hold and 0 sell on another aggregated basis⁹⁶.
- RGTI has 12 unanimous buy ratings with targets of \$18–40¹.
- **QuantumCTek's domestic coverage over the past year is uniformly buy**, overweight or recommend.^{111 112 57 130}

Within JPMorgan's global rating distribution, Underweight is 12%, but not a single vote sits on quantum pure plays.⁹⁶ The disagreement exists only between "expensive but holdable" (JPM Neutral, \$50) and "expensive and worth buying" (Cantor, MS), and even the cautious side's target prices are rising: JPMorgan's IONQ target trajectory runs \$47 → \$42 → \$50 → \$50.⁹⁶ The missing bear leg means pessimistic scenarios can only be expressed through cautious-side downgrades, making consensus downgrades more lagged and steeper than in historical cycles.

5.2.3 The sector tracking metrics repeatedly cited by the sell side, and adopted by this report

- RPO and bookings growth
- Organic revenue growth (against management's 100% target)
- Logical-qubit and fidelity milestones (the 256Q customer delivery in 1H27, qLDPC error-correction breakeven, Superion 10K)

- Government orders and executive-order implementation (the QC-ADDS procurement flywheel)
- Cash runway (IONQ pro-forma \$1.9–2.0B)
- SkyWater third-party foundry revenue
- QBI list-type catalysts^{93 96 33}

Exhibit 32: Bull-bear premise decomposition — the market is betting on only two falsifiable propositions

Premise	Bulls bet it holds	Cautious side bets it fails or is discounted	Falsification condition (observable)
Quantum demand is inflecting	Cantor: "Quantum Demand is Inflecting"; 2Q26 revenue +287% ^{95 33}	JPMorgan: most value-creation catalysts lie 12–36 months out ⁹⁶	RPO growth halving, organic growth below the 100% target ⁹⁶
IONQ takes ~30% share	Cantor: 30% of the 2035 quantum hardware/software/services market ⁹⁵	Same framework with a different TAM basis: implied share only ~3–5% ¹³⁹	TAM basis falsified, QNT and giants diverting demand ⁴⁰
AI-level multiples are sustainable	Cantor 23.9x, MS 36x, Jefferies 46x ^{95 97 110}	JPMorgan: the price already discounts the bulk of long-term optionality ⁹⁶	Framework switch to near-term PS/P/E (the Evercore -52% anchor ¹⁰⁷)
Policy demand persists and escalates	Two executive orders, nine investment intentions, CHIPS definitive ^{91 92 121}	The NQI lapse precedent (RGTI FY2025 revenue - 34.3%) ^{30 20}	NQI 2.0 not enacted within the year ⁴⁷ (QBI C non-selection already occurred on 2026-10-07 ²⁷⁰)
Framework vacuum persists	Deferred long-term framework = protective cushion for the option premium ⁹⁶	Deferral = cannot be valued (Southwest Securities stopped giving a target price ⁹⁷)	The day the long-term financial framework is published ⁹⁶

Source: Cantor Fitzgerald⁹⁵, JPMorgan⁹⁶, Morgan Stanley⁹⁷, Jefferies^{91 92 110}, Rigetti 8-K¹²¹, Rigetti periodic reports^{30 20}, Evercore ISI¹⁰⁷, Southwest Securities⁹⁷, Quantinuum pricing announcement⁴⁰, DARPA⁴⁵, US Congress⁴⁷, KIMI estimates¹³⁹

5.3 TAM lineage vote: like-for-like median \$50bn (7 votes); inter-layer basis gaps exceed intra-layer forecast gaps

5.3.1 TAM citation must start by separating definition layers

This report organizes four layers:

- The vendor-revenue layer (hardware, software and services revenue of quantum-computing technology itself)
- The QT aggregate layer (computing plus sensing plus communication)
- The full-value-chain layer (upstream, midstream and downstream combined)
- The value-at-stake layer (economic value)

The four layers are not additive: ICV's \$811.7bn (2035E, full-value-chain layer) and BofA's ~\$4bn (2030E, vendor-revenue layer) differ by 200x — a difference in statistical boundary, not in forecast.^{2 7}

5.3.2 Industry research and sell-side votes converge, sell-side embedded TAMs run lower, and the lineage drifts upward

The vendor-revenue-layer 2035 vote has 7 ballots, with medians sorted at \$7.5, \$22.5, \$50, \$50, \$54, \$57 and \$57bn — a median of \$50bn, and a sensitivity range excluding any single vote of \$50–52bn that is stable¹³⁹ (vote details in Exhibit 34). Three structural readings follow.

- **Industry-research and sell-side scenarios converge in one band:** the two latest industry-research votes — the McKinsey QTM 2026 as the industry-research vote and BTIG as the sell-side vote — together with Evercore's Base scenario (\$54bn) and CCID (~\$50bn) cluster densely in \$43–71bn, forming the core convergence zone.^{9 103 107 105}
- **Sell-side embedded TAMs sit systematically below the industry-research lineage:** Cantor at \$7.5bn, Evercore's bear at \$19bn and BCG as relayed at \$15–30bn, versus McKinsey and CCID's \$43–71bn — a dual track of "pricing lineage versus research lineage."^{95 107 108}
- **The lineage is drifting upward as a whole:** McKinsey's two monitor editions within one year raised the 2035 lower bound from \$28bn to \$43bn (+54%), citing "a big shift in companies willing to spend on quantum computing."^{9 10}

5.3.3 The three wider layers reflect a basis difference, not a forecast disagreement

- **The QT aggregate layer runs above the vendor layer:** The QT aggregate layer forms its own three-vote lineage: JPMorgan at \$46–97bn ("in aggregate," verbatim),

McKinsey QTM 2026 at \$60–100bn and QTM 2025 at \$97bn — a median of ~\$80bn, ~1.6x the vendor layer.^{96 9 10}

- **The full-value-chain layer is cited qualitatively only:** The full-value-chain layer is a single-lineage scenario (Photon Box/ICV, relayed through domestic broker reports): ICV gives 2030E \$215.5bn and 2035E \$811.7bn², and its 2023 base of \$4.7bn differs ~5–16x from McKinsey's >\$1bn of QC company revenue in 2025 (2028E \$4.4bn) and BofA's ~\$300mn of pure QC vendor revenue in 2024 — the base-year gap proves a basis difference, not a forecast disagreement.^{2 9 7} This report cites that layer qualitatively only and does not chart or discuss it alongside the vendor layer.
- **The value-at-stake layer is not cross-cited:** On the value-at-stake layer, McKinsey QTM 2026 gives up to \$2.7tn of QC economic value in 2035, and BCG gives \$450–850bn for 2040 — 10–20x the vendor layer; cross-layer citation is prohibited.^{9 101}

5.3.4 Cross-checks from other years and from demand support the vote

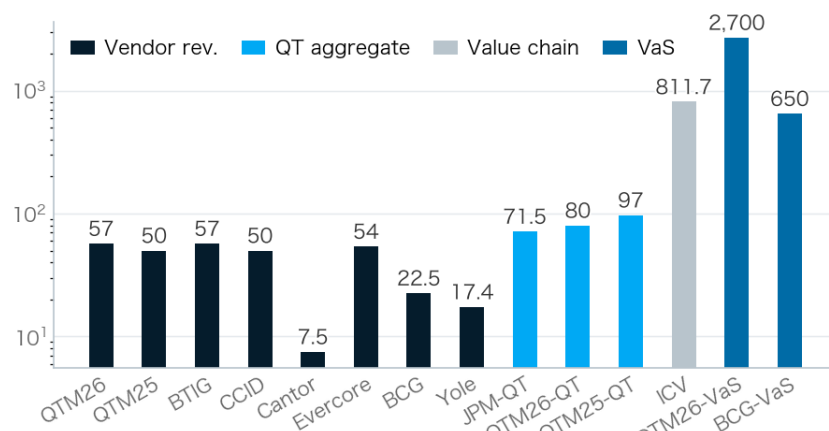
Near- and far-end references bracket the vote: the 2030 vendor-layer three-vote median is \$8.5bn — BofA at ~\$4bn, BTIG at \$7–10bn and QTM 2025 at \$16–37bn.^{7 103 10} Two 2040 votes give BCG's vendor layer at \$90–170bn and McKinsey's QT layer at \$198bn.^{101 10}

The demand-side structural evidence points the same way: McKinsey QTM 2026 counts QC company revenue above \$1bn in 2025, reaching \$4.4bn in 2028, with 2025 quantum-technology startup investment of \$12.6bn (6.3x 2024) and the public-funding share falling from one-third in 2024 to 3%; of the 300+ enterprises using quantum computing, 72% are privately held — the era of public-sector dominance is switching.⁹

5.3.5 TAM citations should stay on one layer with one denominator

The first risk source in TAM citation is inter-layer basis gaps — 1.6x to 200x — which are larger than intra-layer forecast gaps. This report uniformly uses the vendor-revenue-layer \$50bn median as the denominator for share reverse-engineering, with the four-layer distribution in Exhibit 33 and full vote details in Exhibit 34; readers can replace any vote and recompute.¹³⁹

Exhibit 33: 2035 quantum TAM votes across four definition layers (USD bn, log axis)



Source: McKinsey^{9 10}, BTIG¹⁰³, CCID¹⁰⁵, Cantor⁹⁵, Evercore^{107 108}, Yole¹⁰², JPMorgan⁹⁶, ICV², BCG¹⁰¹, KIMI estimates¹³⁹.

Exhibit 34: TAM vote details and sensitivity — like-for-like median \$50bn, still \$50–52bn excluding any single vote (USD bn)

Vote	Institution (version)	2030E	2035E (median)	2040E	Definition layer	Note
A1	McKinsey QTM 2026 ⁹	2028E \$4.4bn	\$43–71bn (57)	—	Vendor revenue	Official-site text; definition = the technology's own hardware/software/s ervices
A2	McKinsey QTM 2025 ¹⁰	\$16–37bn	\$28–72bn (50)	QT \$198bn	Vendor revenue	Qualified vote: includes tech giants' in-house investment; also an old edition
A3	BTIG ¹⁰³	\$7–10bn	\$43–71bn (57)	—	Vendor revenue	"today ~\$1.75bn" base year
A4	CCID ¹⁰⁵	—	~\$50bn (50)	—	Vendor revenue	Second-hand relay
A5	Cantor Fitzgerald ⁹⁵	—	\$7.5bn (7.5)	—	Vendor revenue	Sell-side embedded TAM; stale conservative extreme
A6	Evercore ISI ¹⁰⁷	—	Bear \$19 / Base \$54 / Bull \$178bn (54)	—	Vendor revenue	Sell-side scenario vote, Base taken

A7	BCG ¹⁰⁸	—	\$15–30bn (22.5)	—	Vendor revenue	Second-hand relay
Ref.	Yole Group ¹⁰²	—	Total quantum market \$17.4bn (QC segment \$3.74bn)	—	Total quantum-market layer (not the narrowest)	Not counted in the median; lower-bound reference
B1	JPMorgan ⁹⁶	—	\$46–97bn (71.5)	—	QT aggregate	"in aggregate" verbatim; moved here from the vendor layer
B2	McKinsey QTM 2026 ⁹	—	\$60–100bn (80)	—	QT aggregate	QT-layer median ~\$80bn
B3	McKinsey QTM 2025 ¹⁰	—	\$97bn (97)	—	QT aggregate	Includes giants' in-house investment
C	ICV ²	\$215.5bn	\$811.7bn	—	Full value chain	Single-lineage scenario; not additive with layers A/B
D	McKinsey QTM 2026 ⁹	—	Up to \$2.7tn	—	Value-at-stake	No cross-layer citation
D	BCG ¹⁰¹	—	—	Economic value \$450–850bn; vendor \$90–170bn	Value-at-stake + vendor	No cross-layer citation

Source: McKinsey^{9, 10}, BTIG¹⁰³, CCID¹⁰⁵, Cantor Fitzgerald⁹⁵, Evercore ISI^{107, 108}, Yole Group¹⁰², JPMorgan⁹⁶, ICV², BCG¹⁰¹, KIMI estimates¹³⁹ Note: median sensitivity — base 7 votes \$50bn; including the mixed B1 vote \$52bn (upper bound contaminated, old value retired); excluding CCID \$52bn; excluding Cantor \$52bn; QTM deduplicated \$52bn; industry-research votes only \$50bn¹³⁹.

5.3.6 Each driver anchors to a public disclosure

The consumption TAM model is self-built on three factors — customers, annual usage and price — and yields ~\$3.8bn of consumption-basis revenue by 2030. The vote gives the total; a consumption model gives the drivers, and all three factors anchor to public disclosures.

- **Customer counts anchor to BofA's estimate and IBM's user base:** On customers, BofA estimates 375 quantum-computing customers market-wide in 2024, with Forbes 2000 penetration rising from 19% to 36% by 2030E — a sell-side model whose customer definition is undisclosed.⁷ The ecosystem base is IBM's registered users, 250k to 600k+ (official press release 2020-08²⁴⁵; early-2024 figure per academic relay²⁴⁶ — both IBM self-reported), plus 250+ IBM Quantum Network organizations (IBM 2024 Annual Report).²⁴⁴
- **Usage anchors to IBM's Premium minimum, not BofA's path:** On usage, the IBM Premium tier carries a minimum annual commitment of 5,200 minutes (~\$249.6K; IBM pricing page, 2026-09-23²⁴¹); BofA's per-customer path of 5,200 to 9,828 minutes is its own assumption, which we flag and do not adopt.
- **List prices are sticky while effective prices deflate:** On price, IBM's pay-as-you-go rate of \$96/minute has not changed in nominal terms for 4.4 years since its 2022-04-12 launch (Wayback snapshots 2023-12 → 2025-04 match the current page^{242, 243}); the counter-signal is Rigetti's per-shot price falling 95% across hardware generations (Ankaa to Cepheus; BofA's 2025-09 relay versus the AWS pricing snapshot of 2026-09-22).²¹ Sticky list prices alongside deflating effective prices: we hold the \$48/minute Premium list price flat as the base case, and a -5%/yr price path would cut 2030 revenue by ~26%.

5.3.7 Bottom-up calibration backs out ~1,260 paying organizations in 2024; faster 2025 growth points to an accelerating base

The base year is calibrated bottom-up: the four listed pure plays' combined 2024 revenue of \$63.1M (IonQ \$43.1M³², Rigetti \$10.8M³⁰, D-Wave \$8.8M and QUBT \$0.4M, per BofA's split), divided by a 20% share assumption — BofA's own, self-described as subjective, with 20–25% implying a \$252–315M base — gives ~\$315M.⁷

- **Note that BofA's factor product (375 customers × 5,200 minutes × \$48 ≈ \$0.09bn) explains only ~30% of its own base:** the Forbes 2000 frame cannot hold the government, research and startup long tail.
- **We therefore redefine the customer factor as total paying organizations:** ~1,260 in 2024, backed out of \$315M divided by per-organization annual spend, of which Forbes 2000 enterprises are only ~30% — consistent with Chapter 4's government-and-subsidy-dominated demand structure.
- **The path reaches ~\$3.8bn by 2030, the same order as BofA:** Our path (Exhibit 34A) runs paying organizations +39%/yr to 9,000 by 2030 (the softest assumption, ~1.5% conversion of the registered-user pool), usage +9%/yr to 8,720 minutes, and price flat — giving ~\$3.8bn of 2030 consumption-basis revenue, the same order as BofA's \$4.25bn.
- **2025's reported growth, including M&A, outpaces the model:** The 2025 check: three pure plays combined for \$161.7M, +158% y/y (IonQ \$130.0M³², Rigetti \$7.1M³⁰ and D-Wave \$24.6M; including IonQ's M&A consolidation, lower on an

organic basis).^{4 32} That is faster than the model's +58% for 2025, cross-confirming an accelerating base.

5.3.8 The vote median prices a post-2030 FTQC inflection; the model splits it into three falsifiable factors

The layering must be explicit. Ours is a QCaaS (quantum computing as a service) metered-consumption basis, structurally below the vendor layer that includes systems, software and services: \$3.8bn in 2030 against the same year's three-vote vendor median of \$8.5bn, with the gap mapping to non-metered lines such as system sales (IonQ's hardware share of revenue has already risen to 54%).^{7 103 10 32}

- **Extending the path to 2035 implies a post-2030 inflection, not a straight line:** Extending \$3.8bn in 2030 to the \$50bn 2035 vote median implies +68%/yr for the back five years, above the model's +46% in 2030: the median prices a post-2030 FTQC (fault-tolerant quantum computing) inflection, not a linear extrapolation.
- **The model's value is decomposition, not precision, in our view:** The model's value, in our view, is not a more precise total but the decomposition of TAM into three trackable factors — penetration, usage and price: two consecutive quarters of deviation in any one is an early falsification signal for the \$50bn layer.
- **Key assumptions remain subjective and replaceable:** The share assumption, long-tail conversion and price path are subjective, and readers can recompute with their own.

Exhibit 34A: QCaaS consumption model — three factors and the revenue path, 2024–2030 (self-built parameters; subjective assumptions flagged)

Year	Paying organizations (total)	Annual usage per org (min)	Price (\$/min)	Consumption-basis revenue (\$M)	y/y
2024	1,260 (backed out)	5,200	48	315 (calibrated)	—
2025 E	1,830	5,670	48	498	+58%
2026 E	2,560	6,180	48	759	+52%
2027 E	3,580	6,740	48	1,158	+53%
2028 E	4,940	7,340	48	1,740	+50%
2029 E	6,720	8,000	48	2,580	+48%
2030 E	9,000	8,720	48	3,767	+46%

Note: 2024 base = four listed pure plays' combined revenue of \$63.1M ÷ 20% share assumption (subjective — BofA's own, self-described as subjective, reused here with attribution; a 20–25% band implies a \$252–315M base and scales the whole path by up to -20%, i.e. ~\$3.0bn in 2030). Paying organizations = base ÷ per-organization annual spend (5,200 min × \$48 = \$249.6K); customer growth of +45/40/40/38/36/34%/yr is the softest assumption (9,000 organizations in 2030 ≈ 1.5% conversion of IBM's 600k+ registered-user pool²⁴⁶). Usage growth of +9%/yr is ours; BofA's 9,828-minute 2030 path is its own assumption and is not adopted. Price held at IBM's Premium list of \$48/minute (IBM pricing page, 2026-09-23²⁴¹; the \$96/minute PAYG rate has been nominally unchanged since its 2022-04 launch²⁴² — Wayback snapshots 2023-12-03/2024-08-04/2025-04-01 match the current page²⁴³); Rigetti's per-shot -95% across generations (Ankaa \$0.009→Cepheus \$0.000425; BofA relay 2025-09 vs AWS snapshot 2026-09-22²¹) is the counter-signal — a -5%/yr price path cuts 2030 revenue by ~26%. 2030 cross-checks: BofA \$4.25bn (ours -11%); the 2030 vendor-layer three-vote median of \$8.5bn is a wider basis including systems/software/services^{7 103 10}. The 2025 check includes total hardware revenue: a directional check, not a like-for-like one.

5.4 Valuation paradigms and target-price dispersion: the FY26 revenue anchor is shared; excluding the 2026-02-vintage Wedbush, the \$49–100 disagreement is 100% from four framework axes

5.4.1 Revenue multiples dominate the six paradigms, while P/E and DCF carry little weight

All three names' pricing languages have switched to the "forward revenue × multiple" paradigm, but the six paradigms are distributed very unevenly across the sector (Exhibit 35).

- **Discounted forward EV/S and undiscounted dynamic PS are the two mainstays:** the former is used by JPMorgan and Cantor, the latter by domestic brokers on QuantumCTek.
- **Forward P/E carries no information at these multiples:** forward P/E is usable only for QuantumCTek, but at 9224, 2999 and 984x during marginal profitability it carries no information — Southwest Securities itself still anchors on revenue forecasts⁵⁷.
- **DCF has only one public instance in pure quantum:** Wedbush's 10-year DCF at 20% WACC and 5% perpetuity growth, on a 2026-02 pre-SkyWater-consolidation vintage that is less synchronized with the current price environment than the other four.¹⁰⁹

- **Market reverse-engineering and optionality framing are the foreign cautious side's actual working language:** MS's formulation is "LT optionality balanced against capital needs and execution risk," and JPMorgan's is "stock already discounts a substantial share of the long-term optionality."^{97 96}

5.4.2 Quantum carries an option premium over AI semis; every named target breaks down into multiple, discount and share

The multiple reference-frame lineage holds: pure-quantum peers' TTM P/S runs from IONQ's 64.9x to QNT's 477.9x (2026-10-08²⁹⁰), above AI semiconductors at 24–29x (JPMorgan anchor: NVDA/ALAB/CRDO/AVGO) and far above the SOX and software stocks^{1 96}.

The quantum sector as a whole stacks an ~2.2–14.7x option premium on top of the AI-semiconductor reference frame (the range excludes QNT and QBTS — early-IPO liquidity distortion for the former, an annealing and hybrid special-purpose revenue basis for the latter; exclusion rationale in Section 6.4 and Section 5.5).¹³⁹

- **JPMorgan's \$50 target decomposes cleanly into three axes:** 27x P/S (anchored to AI data-center 24–29x), a 15% annual discount, and share (\$1.2B of 2030 sales, 3.2–7.5% of McKinsey's 2030 \$16–37bn).^{96 10 139}
- **Cantor's \$70 uses the same three axes:** Cantor's \$70 is 23.9x EV/S with a 10% discount and a 30% share⁹⁵.
- Guotai Haitong's ¥651.38 is 180x 2026 dynamic PS with no discount and a qualitative "scarcity" share.¹¹²

5.4.3 With no disagreement on fundamental inputs, the spread is a framework question

The five named banks' FY26 revenue anchors are nearly identical: MS and Cantor both at \$455.0M combined basis, with JPMorgan split into \$280–290M organic plus \$240M SkyWater.^{97 95 96}

Yet with no disagreement on fundamental inputs, targets run from MS's \$49 (36x FY27 sales, undiscounted) to the \$100 high in Yahoo Finance's aggregation.¹

Two basis notes apply:

- MS's \$49 sits near the midpoint (\$48.5) of its base price range of \$34–63, and the MS sentence "36x is at the midpoint of our base case range of 12-24x sales" is cited on MS's disclosed basis — this report has not independently reproduced its multiple-to-price correspondence.
- The six-name set {49, 50, 60, 60, 70, 80} has a mean of \$61.5 and a full range of 50.4%, with maximum deviation from the mean of +30.1%/–20.3%; adding the unnamed high of \$100 makes a seven-name set in which the lowest PO deviates –26.9% from the mean¹³⁹; the second \$60 is BofA's 2026-09-28 initiation (Buy, PO \$60²⁷⁶).

Excluding the 2026-02-vintage Wedbush, the PO disagreement comes 100% from four framework axes:

- The vehicle axis (PV of forward EV/S, discounted forward P/S, undiscounted FY27 P/S, 46x CY30 revenue discounted, 10-year DCF)
- The multiple axis (23.9x, 27x, 36x and 46x, a 92% spread)
- The discount axis (10%, 15% and 20% WACC, a 10pp spread)
- The TAM-times-share axis (\$7.5bn × 30% versus McKinsey's \$16–37bn × 3.2–7.5% versus Evercore's \$54bn × 20%)^{95 96 97 109 110 139}

5.4.4 Cantor's \$70 target is internally consistent to 0.5% but rests on the most conservative TAM in the lineage

Cantor's \$70 is the best sample for auditing framework self-consistency.

- **Internal consistency is fully locked:** \$7.5bn TAM times a 30% share gives \$2.25bn of 2035 sales, discounted at 10% for 9 years to a present value of \$954M; 368M shares at \$70 give a \$25.76B market cap, which less \$3.0B of cash gives \$22.76B of EV, and that divided by \$954M is exactly 23.9x — all four identities within 0.5% error.⁹⁵
- **External consistency breaks:** McKinsey QTM 2026's definition of the "internal quantum market" — the market for the technology itself, including hardware, software, and services — is the same layer and meaning as Cantor's market definition, and on that same definition Cantor's \$7.5bn is 5.7–9.5x below McKinsey's \$43–71bn, 57% below even Yole's total quantum-market basis (\$17.4bn, of which the 2035 quantum-computing segment is only \$3.74bn), and in the same magnitude as BofA's 2030 market (~\$4bn): effectively using someone else's 2030 market as the 2035 market.^{95 9 102 7}

- **Single-axis elasticity is steep:** swapping the TAM axis from \$7.5bn to \$57bn takes the TP from \$70 to ~\$479 (6.8x). Moving the discount axis from 10% to 15% takes the TP to ~\$50 (-29%), and moving the multiple axis from 23.9x to 27x takes it to ~\$78 (+12%).¹³⁹

In other words, Cantor's bull case is a composite of the most conservative TAM in the lineage, a top-of-range 30% share and AI-level multiples; if McKinsey and BTIG's TAM is true, its model implies IONQ's share is only ~3–5%, and the \$70 gifts 25 percentage points of share optionality.¹³⁹

5.4.5 Cantor's multiple is the only axis in its framework that moves

Another mechanical finding: the 2026-02-27 note shows EV/S raised from 18.3x to 23.6x (2026-02 vintage; the current 23.9x is the 2026-08 vintage) for one reason only — share count growth ("as the number of actual shares outstanding increased") — while the target stayed at \$70.^{95 139}

Under "TP-anchored" behavior, dilution is capitalized into the multiple rather than pressing the target down.

This is directly relevant to understanding IONQ's warrant dilution (Section 10): by the same behavior pattern, if all 79M warrants were exercised, 23.9x would be mechanically lifted to ~29x with the TP unchanged.¹³⁹ Its forward-slope assumption is equally conservative: FY27E revenue of \$823M to \$2.25B in 2035 implies a CAGR of only 13.4%.^{95 139}

5.4.6 QNT's convergent targets show the framework vacuum, not company quality, drives IONQ's dispersion

The control group is QNT: the IPO coverage wave's target prices are highly convergent — Evercore at \$98¹⁰⁷ and Yahoo Finance's 12-broker mean at \$97.17¹ — versus IONQ's 50% full range.

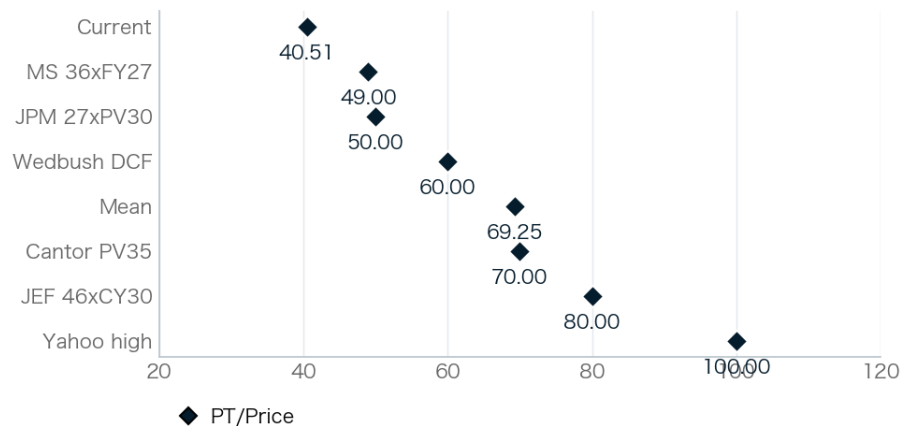
The divide between convergence and dispersion is not company quality but the presence of a long-term financial framework: QNT's S-1 gave the market a shared financial anchor, while IONQ management's deferred long-term framework forces each bank to bring its own.^{96 42} Sell-side PO dispersion is itself the observable indicator of the "framework vacuum": the day management publishes a long-term financial framework is the day the whole sector's framework is forced to switch (see Section 5.6 and Section 10).

Exhibit 35: Six valuation paradigms — discounted forward EV/S and undiscounted dynamic PS are the two mainstays; DCF has one instance

Paradigm	IONQ	RGTI	QuantumCTek
① Discounted forward EV/S	JPMorgan: 27x P/S × 2030E ~\$1.2B+ ÷ 15%/yr = \$50 (Dec-27) ⁹⁶ ; Cantor: 23.9x EV/S × PV(2035 sales) = \$70 ⁹⁵	No public named instance (Yahoo Finance 12-broker TP \$18–40, mean \$28.81 ¹)	None seen
② Undiscounted dynamic PS	—	—	Guotai Haitong: 95x 2025 dynamic PS 180x 2026 dynamic PS, TP ¥336.17→¥651.38 ^{111 112}
③ Forward P/E	n.a. (loss-making, fwd PE - 31) ¹	n.a. (loss-making, fwd PE - 80.6) ¹	Southwest Securities: 2026–28E PE 9224/2999/984x ⁵⁷ ; no information during marginal profitability
④ DCF	Wedbush: 10-yr DCF, 20% WACC, 5% perpetuity, \$60 ¹⁰⁹ (2026-02 vintage, the sector's only public instance)	None seen	None seen
⑤ Market reverse-engineering (market-implied expectations)	This report (Exhibit 37) ¹³⁹	Same	Same
⑥ Optionality framing	MS "LT optionality balanced against capital needs and execution risk" ⁹⁷ ; JPM "discounts a substantial share of the long-term optionality" ⁹⁶	Jefferies: government equity = optionality repricing ⁹²	Domestic "scarcity premium" (Guotai Haitong ¹¹²)

Source: JPMorgan⁹⁶, Cantor Fitzgerald⁹⁵, Morgan Stanley⁹⁷, Wedbush¹⁰⁹, Jefferies⁹², Guotai Haitong^{111 112}, Southwest Securities⁵⁷, yahoo_finance¹, KIMI estimates¹³⁹

Exhibit 36: IONQ sell-side target prices and pricing frameworks (\$)



Source: MS⁹⁷, JPMorgan⁹⁶, Wedbush¹⁰⁹, Cantor⁹⁵, Jefferies¹¹⁰, stockanalysis.com¹³⁸, Yahoo Finance¹

5.5 Market-implied expectations: IONQ has priced ~70–78% of the cautious side's base case; RGTI is the deepest option; QuantumCTek prices scarcity

5.5.1 FY28 execution supports the current price, but upside needs post-2030 share and slope

On JPMorgan's own framework (27x P/S, 15% discount), IONQ's current ~\$16.0B market cap already implies 2030 revenue of ~\$0.82–0.94B — ~70–78% of JPM's \$1.2B assumption.¹³⁹

The market's pricing of IONQ is close to the cautious side's base case, and anything beyond depends on the post-2030 FTQC option.

Reverse-engineering at a mature-stage 15x P/S requires revenue of \$1.07B, exactly 1.01x the FY28 consensus (\$1,059.9M)^{39 139}; full FY28 execution supports the current price but not much more; upside must come from post-2030 share and slope.

5.5.2 RGTI's price is a pure bet on the FTQC window and the government stake

RGTI is the deepest-priced option of the three: EV/FY28 consensus is still ~49x (IONQ just 12x); reverse-engineering at the 27x AI multiple requires 2030 revenue of ~\$175M, 2.1x FY28 consensus, and at a 10x mature multiple it requires ~\$472M, 5.7x FY28.^{39 139}

The current price discounts almost no financial delivery within the next three years — a pure bet on the FTQC window plus the government-stake option.

5.5.3 QuantumCTek prices scarcity rather than earnings

Reverse-engineering at 30x PS requires 1.65x the effective FY28E: based on QuantumCTek's post-interim effective consensus (Southwest Securities: FY26E ¥366M, FY27E ¥478M, FY28E ¥654M⁵⁷), the current price corresponds to 89x/68x/50x; reverse-engineering at a 30x "mature growth stock" PS requires revenue of ¥1.08bn, 1.65x the effective FY28E¹³⁹.

- Both bases are presented side by side, with the effective basis primary: using ifind's un-cleaned mean (¥0.44bn/¥0.685bn/¥1.095bn¹¹⁵), the multiples are 74x/47x/30x and the 30x reverse-engineering is 0.99x FY28E¹³⁹; both bases are shown with the effective basis as primary (the ifind mean contains stale pre-interim forecasts, 20%/43%/67% above the effective anchor; note: un-cleaned)^{115 139}.
- Froth is lower than RGTI's but higher than the headline PE (TTM ~5,400x) suggests¹; Guotai Haitong's 180x target PS implies its target price embeds a "doubling of the scarcity premium"¹¹².

5.5.4 The TAM basis decides whether the price bets on execution or on modality

The implied-share basis experiment (Exhibit 39) is instructive: the same IONQ 2030 revenue assumption of \$1.2B is a 30% share of BofA's 2030 TAM (~\$4bn) — self-consistent with Cantor's bet — 12–17% of BTIG's (\$7–10bn), and only 3.2–7.5% of McKinsey QTM 2025 (\$16–37bn).^{96 7 103 10 139} On Yole's 2035 total quantum-market basis (\$17.4bn), IONQ reaching \$4.9B of revenue would be a 28% share (over 130% of its \$3.74bn quantum-computing segment); on the McKinsey QTM 2026 basis, the same value is only 6.9–11.4%.^{102 9 139}

This comparison is the arbiter of "pricing the modality versus pricing execution": the larger the TAM basis, the more the current valuation prices execution and share; the smaller the basis, the more it bets on modality and execution simultaneously.

5.5.5 QNT's listing rewrote the distribution of the scarcity premium

IONQ's decline is far larger than QNT's: from QNT's pricing date (2026-06-03 close of \$68.23) to 2026-10-08, IONQ fell 42.2%, far more than QNT's own -30.8% versus its offer price^{290 139}.

But the premium has not disappeared — it has migrated: QNT trades at about 478x TTM P/S, 7.4x IONQ (about 65x), while its TTM revenue is only about 1/11 of IONQ's (2026-10-08²⁹⁰).

- On a forward basis, QNT is about 366x and IONQ about 35x (2026-10-08²⁹⁰): QNT is market cap / FY26 guidance midpoint of \$30M; IONQ is market cap / FY26 consensus of \$455.1M^{1 44 39 139}.

QNT's premium decomposes into four factors: a low float (Class A float of 32.3M shares, only ~12.6% of the total), Honeywell's ~47.8% post-IPO voting endorsement, the S-1 audit signal of a traditional IPO, and the "industry's highest accuracy" narrative.^{42 1}

We judge that IONQ has shifted from "the only investable large-cap pure-play quantum name" to "the sector's value stock": its TTM P/S of about 65x is the lowest of the five, while its revenue is 4.2x the other four combined (2026-10-08²⁹⁰)^{1 139}.

5.5.6 The cash-floor parity holds only on the broad basis

The revenue-valuation decoupling also holds at the comparable-set level: the five pure plays' combined market cap is \$39.0B with combined TTM revenue of \$305M — a weighted P/S of ~128x — and IONQ holds 80.8% of TTM revenue but only ~41% of market cap.^{1 139}

Short interest moves broadly with P/S (QBTS excepted): QUBT at 33.6%, QBTS at 21.2%, RGTI at 19.8%, and QNT at just 8.0%.¹

- **Pro forma market cap/cash of IONQ 8.0–8.4x: a cross-name comparison on the cash floor (a supplementary basis for loss-making stocks):** on a harmonized pro forma basis, market cap/cash is IONQ 8.0–8.4x, RGTI about 8.7x, QuantumCTek 13.0x¹³⁹.
- **RGTI's low end depends on a CHIPS equity award:** Note that RGTI's 7.5x low end is a pro-forma that counts the Commerce Department equity-injection consideration (+7.74M shares, +\$100M award); CHIPS funds are restricted to project use (Section 7), and excluding them the low end returns to 8.7x, and to 12.0x on the narrow cash basis, so the "essentially level" conclusion holds only on the broad basis.
- **IONQ's cash floor is hedged by the warrant liability:** the \$3,052.4M warrant liability already exceeds pro-forma cash of \$1.9–2.0B.^{32 35 33} This report does not recommend netting it off (mark-to-market of out-of-the-money equity derivatives, not debt, with no cash-settlement obligation) but lists it as an overhang (Section 10).¹³⁹

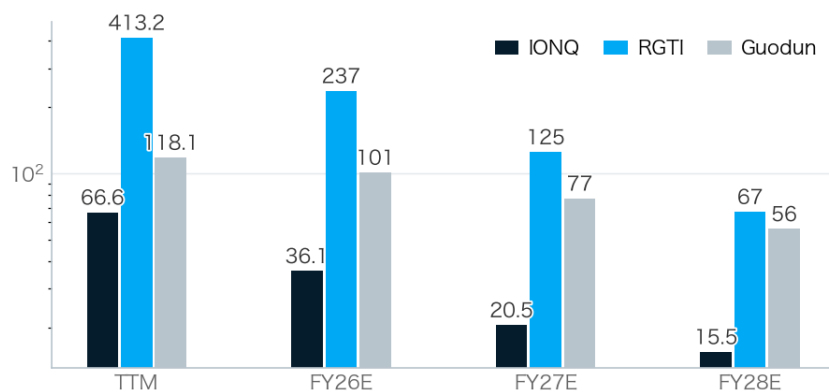
Exhibit 37: Price-implies reverse-engineering worksheet — IONQ has priced ~70–78% of the cautious base case; RGTI needs another 2.1–3.4x over FY28

Name	Market cap / EV	Consensus revenue (FY26/27/28E)	Implied multiple path at current price (market-cap basis, TTM / FY26E / FY27E / FY28E)	Reverse-engineered implied assumptions
IONQ	\$15.98B / \$12.43B ^{1 139}	\$455.1M / \$814.4M / \$1,059.9M (sp_data, 10 brokers, eff 2026-10-08 ²⁸⁸) ³⁹	64.9x 35.2x / 19.6x / 15.1x ¹³⁹	JPM-framework implied 2030 revenue \$0.82–0.94B (~70–78% of its \$1.2B assumption); 15x mature P/S needs \$1.07B (=1.01x FY28E); 27x needs \$592M (0.56x FY28E) ¹³⁹
RGTI	\$4.72B / \$4.07B ^{1 139}	\$23.3M / \$43.92M / \$83.42M (sp_data ³⁹)	353.5x 203x / 107x / 57x ¹³⁹	27x needs 2030 revenue ~\$175M (2.1x FY28E); 10x needs ~\$472M (5.7x); JPM same framework implies ~\$277M (3.3x) ¹³⁹
QuantumCTek	¥32.4bn / ¥29.92bn ^{1 139}	Effective: ¥366M / ¥478M / ¥654M (Southwest ⁵⁷); iFinD uncleaned: ¥440M / ¥685M / ¥1,095M ¹¹⁵	Effective basis: 103.6x 89x / 68x / 50x; ifind basis: 74x / 47x / 30x ¹³⁹	A 30x mature PS requires ¥1.08bn (1.65x effective FY28E; 0.99x on the ifind basis) ¹³⁹

Note: EV is the yahoo_finance enterprise-value field (*); the gap vs market cap minus latest disclosed net cash reflects interest-bearing liabilities and field-caliber adjustments; QuantumCTek's effective consensus is the post-interim updated value, and the iFinD mean contains stale pre-interim forecasts (uncleaned). P/S is the loss-maker basis with revenue as denominator; TTM is the Yahoo Finance field basis, FY-E is consensus.

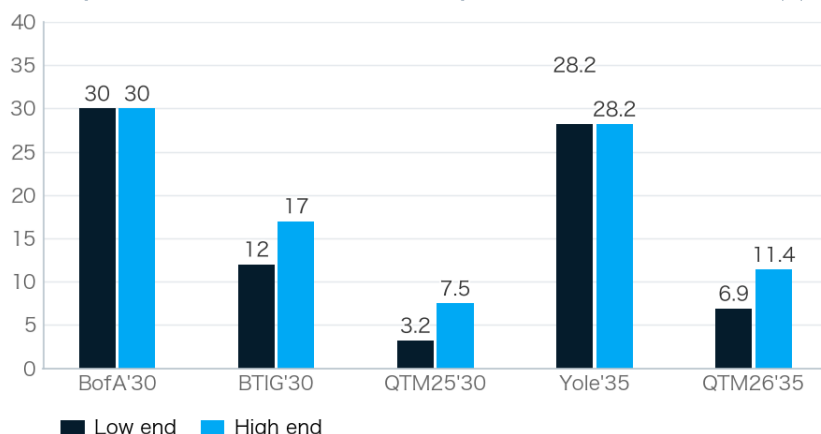
Source: yahoo_finance¹, sp_data³⁹, Southwest Securities⁵⁷, iFinD¹¹⁵, KIMI estimates¹³⁹

Exhibit 38: Three names' P/S compression paths across consensus years (x, market-cap basis)



Source: Yahoo Finance¹, sp_data³⁹, Southwest Securities⁵⁷, Report calc.¹³⁹

Exhibit 39: Implied share of the same revenue assumption under different TAM bases (%)



Source: JPMorgan⁹⁶, BofA⁷, BTIG¹⁰³, McKinsey¹⁰⁹, Yole Group¹⁰², Report calc.¹³⁹

5.6 Consensus and the cliff: IONQ's basis-jump +69% vs organic +6%; QuantumCTek's forecasts cut 25% while the target rose 94%

5.6.1 Bernstein: acquisition-driven, not a better IonQ outlook

IONQ's consensus underwent a basis-jump upgrade after the 2026Q2 earnings and Investor Day: FY26 revenue went from the pre-earnings \$268.6M (FactSet consensus) to \$455.11M (sp_data, 10 brokers), a jump of +\$186.5M driven mainly by the consolidation basis switch — ~\$170M is SkyWater net external revenue (\$240M gross minus ~\$70M intercompany eliminations) rather than an organic upgrade, with the organic comparable rising only from \$268.6M to ~\$285M, +6%.^{39 95 139}

FY27 revenue jumped in tandem: FY27 rose from Cantor's old estimate of \$357.7M to \$814.42M (+128%, including full-year SkyWater consolidation, eff 2026-10-08²⁸⁸)^{95 39}.

- **Management's guidance ladder recorded the basis switch in parallel:** organic guidance was raised twice within the year (old vintage values retired) to \$280–290M (2026-08-05), then switched to a combined \$450–460M (2026-09-08).^{33 34}
- **Bernstein calls it acquisition-driven:** Bernstein's characterization is explicit: "The increase is therefore acquisition-driven rather than an upgrade to the underlying IonQ outlook."⁹³
- **Losses widen through FY27, then narrow slightly:** On earnings, FY26–FY28 EBITDA consensus is -\$430.8M, -\$482.5M and -\$444.6M: losses widen through FY27 and narrow slightly in FY28.³⁹

5.6.2 RGTI's consensus rose mildly, while QuantumCTek's forecasts were cut even as Guotai Haitong's target rose 94%

FY26 \$23.26M, FY27 \$43.92M, FY28 \$83.42M (sp_data, as of 2026-10-08²⁸⁸)³⁹; QBTS/QUBT consensus (sp_data²⁸⁸): QBTS FY26 \$42.5M, FY27 \$80.6M (as of 2026-10-08); QUBT FY26 \$28.2M, FY27 \$52.4M (as of 2026-08-26)

- **Guotai Haitong cut revenue 25% while raising the target 94%:** QuantumCTek's domestic forecasts were instead cut after the interim report: Guotai Haitong's 2026E revenue went from ¥493M (2025-09) to ¥372M (2026-04, down 25%), while its target price rose from ¥336.17 to ¥651.38 (+94%) over the same period, the multiple jumping from 95x 2025 dynamic PS to 180x 2026 dynamic PS.^{111 112}

- **Southwest Securities cut revenue 32% and net income 67%, then stopped giving a target:** The same Southwest Securities analyst gave ¥538M at initiation (2026-04) and cut to ¥366M (2026-09, down 32%), with net-income forecasts cut 67% in parallel, and the September note no longer gives a target price at all.^{130 57}

The coexistence of "forecast cut plus target raise" is direct evidence that QuantumCTek is priced by the multiple (scarcity premium), not earnings; the domestic pricing language is shifting from optimistic extrapolation toward backlog-based arithmetic, with Southwest Securities' September note no longer giving a target price.^{57 139}

5.6.3 A pricing-language switch alone can move the same name's target

The textbook anchor for the cliff is closed: Evercore's initiation on QNT gives a dual-framework scenario on the same page — a Base at 60x P/E times CY30E EPS of \$2.40, discounted at 10% for 4 years, for a PT of \$98, and a Bear at 35x EV/S times CY30 sales, at the same discount, for a PT of \$47 ($\$47 \div \$98 - 1 = -52.0\%$).¹⁰⁷

Same name, same forward year: the P/E-language and EV/S-language targets differ by 52%.

Evercore also gives the conversion bridge: 60x P/E is equivalent to 14x EV/S of CY30 sales, at the low end of the 13–48x EV/S range for high-growth semis; its 2035 QC market scenarios are \$19, \$54 and \$178bn with QNT share assumptions of 15/20/25%.¹⁰⁷

5.6.4 IONQ is partially cliff-immune, RGTI's is steepest, and QuantumCTek faces a double cliff

The three names sit at different distances from the cliff.

- **IONQ is partially immune:** if the market switches its pricing language from "2030–35 discounted forward" to "FY26–27 undiscounted PS," 27x FY26 consensus gives \$12.3B (down 23% from the current market cap) and 27x FY27 gives \$22.0B (up 38%); the cliff triggers only when growth stalls and basis regression happen together.^{39 139}
- **RGTI's cliff is the steepest: EV/FY28 is still ~49x,** so any reversion to a near-term revenue framework is a -50%-magnitude event.^{39 139}
- **QuantumCTek faces a double cliff: a framework cliff (the 180x target PS rolling back toward any earnings anchor) plus a trading-structure cliff (PE TTM ~5,400x — once the pricing language switches to P/E, the denominator is too small to support the current price)**^{112 1 139}.

The negative-elasticity ranking check confirms the ordering: on the JPM framework's single-axis sensitivities, a 2030 revenue assumption cut of 20% takes value down 20%, a multiple cut from 27x to 20x takes 26%, and a discount-rate rise from 15% to 20% takes 16% — revenue slope and multiple are of the same magnitude, and both significantly exceed discount-rate elasticity.¹³⁹

5.6.5 The coverage wave is still heating up, with no downgrades

Foreign-broker coverage is dense, with ratings all upgrades or reiterations: over the past three months foreign brokers have continued to roll out quantum coverage and serialized products at pace (Barclays' weekly series, among others⁹⁴), with rating actions all upgrades or reiterations; even the cautious side's JPMorgan raised its target price ($\$42 \rightarrow \$50$)^{96 139}. Latest examples: BofA initiated IonQ on 2026-09-28 (Buy, PO \$60²⁷⁶) and TD Cowen initiated IQM on 2026-10-02 (Buy, Europe's on-prem system leader²⁸¹); Wedbush reiterated its IonQ PT of \$75²⁷⁹ and MS reiterated EW²⁷⁸. Third-party bases are also converging: Gartner expects global quantum computing revenue of \$869.9M in 2026 (+22.9%) and \$1.1B in 2027, and warns that more than half of quantum startups will fail before 2030³⁰⁰;

- FY27 consensus stops being raised
- The pace of new coverage slows
- Framework-switch discussions (P/E, near-term PS) appear in bull reports

None of the three is present now¹³⁹; the only marginal signal is that the latest domestic interim reviews no longer give a QuantumCTek target price.⁵⁷

5.6.6 We believe sector timing should dominate for the highest-multiple names

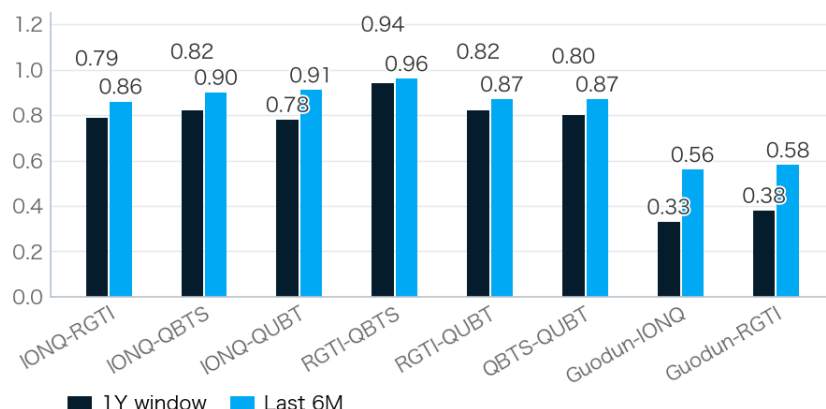
Beta overwhelms alpha: pairwise weekly-return correlations among the four US pure plays (IONQ, RGTI, QBTS, QUBT) are 0.78–0.94 over one year and have risen to 0.86–0.96 over the last six months (Exhibit 40).¹³⁹

QuantumCTek's correlation with US quantum is only 0.31–0.41 over one year (0.56–0.58 over six months) — an effective diversification leg within the sector.¹³⁹

For names with EV/FY28 of ~49x and above (RGTI, QBTS, QUBT), we believe sector

timing should carry materially more weight than name-level research ; IONQ is the only name in the sector whose alpha weight is debatable, as revenue delivery and M&A integration have independent variables.¹³⁹

Exhibit 40: Pairwise weekly-return correlations of four US pure plays (correlation, 1 year vs last 6 months)



Source: Yahoo Finance¹, Report calc.¹³⁹

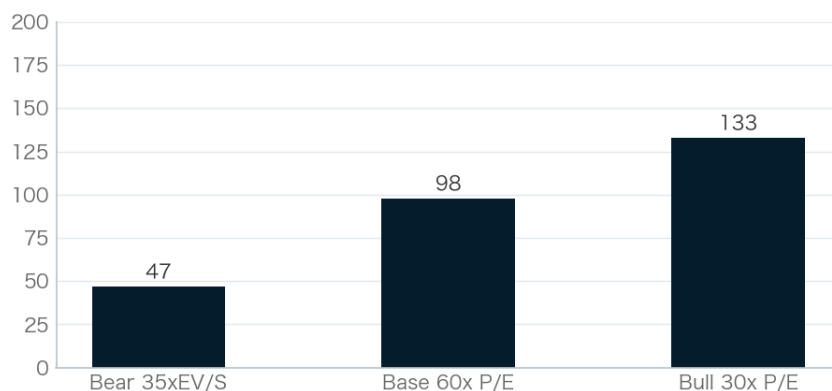
Exhibit 41: Consensus at two cross-sections – IONQ's basis-jump +69%; QuantumCTek's forecast -25% with target +94%

Name	Metric	Pre-event vintage	Latest vintage	Change
IONQ	FY26 revenue	\$268.6M (FactSet consensus, pre-earnings snapshot ⁹⁵)	\$455.11M (sp_data, 10 brokers, eff 2026-10-08 ²⁸⁸) ³⁹	+69% (basis jump: SkyWater \$240M – eliminations \$70M; organic comparable ~\$285M, +6%) ¹³⁹
IONQ	FY27 revenue	\$357.7M (Cantor old estimate ⁹⁵)	\$814.42M (eff 2026-10-08 ²⁸⁸) ³⁹	+128% (full-year SkyWater consolidation)
IONQ	FY26 EPS (adj, diluted)	-\$1.32 / -\$1.30 (Cantor, before/after adjustment ⁹⁵)	-\$1.238 ³⁹	Loss narrowing
IONQ	FY26–28 EBITDA	—	-\$430.8M / -\$482.5M / -\$444.6M ³⁹	widening through FY27, narrowing slightly in FY28
RGTI	FY26 revenue	Pre-event value not captured (evidence gap)	\$23.26M (sp_data, eff 2026-10-08 ²⁸⁸) ³⁹	—
RGTI	FY27/FY28 revenue	—	\$43.92M / \$83.42M ³⁹	—
QuantumCTek	2026E revenue	¥493M (Guotai Haitong 2025-09 ¹¹¹)	¥372M (Guotai Haitong 2026-04 ¹¹²); ¥366M (Southwest 2026-09 ⁵⁷); ¥366M (ifind consensus, 2026-10-09 ²⁸⁹)	Report point values cut ~25%; post-interim effective anchor ¥366M
QuantumCTek	2026E net income	¥12M (Southwest 2026-04 ¹³⁰)	¥4M (Southwest 2026-09 ⁵⁷)	-67%
QuantumCTek	Target price	¥336.17 (95x 2025 dynamic PS ¹¹¹)	¥651.38 (180x 2026 dynamic PS ¹¹²); Southwest no longer gives a TP ⁵⁷	TP +94% while revenue forecast -25%

Note: QuantumCTek's ifind consensus mean has been cut to ¥366M since the interim report (2026-10-09²⁸⁹), converging with the cleaned effective anchor (the earlier ¥440M¹¹⁵ contained stale pre-interim forecasts, about 20% above the effective anchor)¹³⁹. All consensus figures are sell-side/data-vendor aggregated bases.

Source: sp_data³⁹, Cantor Fitzgerald⁹⁵, Guotai Haitong^{111 112}, Southwest Securities^{57 130}, iFinD¹¹⁵, KIMI estimates¹³⁹

Exhibit 42: Evercore's three-scenario dual-framework target prices for QNT (\$)



Source: Evercore ISI¹⁰⁷

Exhibit 43: Cliff-trigger watchlist – the framework vacuum is the protective cushion for current multiples

#	Trigger	Current reading	Consequence if triggered	Monitoring frequency
1	IONQ organic growth below management's 100% target	FY26 organic guidance \$280–290M ³³	JPMorgan's warning scenario materializes; RPO linear extrapolation fails ⁹⁶	Quarterly
2	RPO growth halves from +297% y/y (company basis)	2Q26 +297% y/y (company basis) ^{33 95}	Bookings falsified (cliff scenario)	Quarterly
3	Management publishes long-term financial framework	Explicitly deferred ⁹⁶	Forced framework-switch day; downgrade if accompanied by FY27 upgrades stalling	Event
4	SkyWater third-party foundry customer retention	MS reports tension in customer relationships post-consolidation ⁹⁷	First observable falsification point for "vertical integration vs ecosystem neutrality"	Quarterly
5	QuantumCTek: lockup, related-party order rhythm, quality of the annual profit turnaround	2028-01-02 lockup expiry (first trading day 01-03) 21.86% ¹²⁸ ; FY2025 related-party share 43.44% ⁵⁶	Scarcity-premium re-rating	Quarterly
6	Three signals of the coverage wave turning (FY27 upgrades stall, new coverage slows, bull reports discuss framework switch)	None present ¹³⁹	Sell-side consensus downgrade cycle begins	Monthly

Source: IonQ earnings release³³, Cantor Fitzgerald⁹⁵, JPMorgan⁹⁶, Morgan Stanley⁹⁷, QuantumCTek private-placement announcement¹²⁸, QuantumCTek periodic reports^{56 88}, KIMI estimates¹³⁹

6. IONQ deep dive: organic revenue doubling and a \$3.05B warrant overhang are both true; the full-stack premium remains an unvalidated option

Key points

- All three of IONQ's headline metrics are inflated by basis effects: FY2025 revenue of \$130.0M, up 202%³², FY26 organic guidance of \$280–290M implying ~+100% organic growth³³, and RPO of \$485M³⁵
- SkyWater consolidation accounts for roughly 37–38% of the \$450–460M FY26 combined guidance³⁴ (Exhibit 46).⁹⁷
- Warrant fair-value noise makes up 88% of the \$1.87B Q2'26 GAAP loss.³⁵
- Profitability is deteriorating even before the warrant noise: Gross margin has fallen from FY25's 40.4% to Q2'26's 24.9%, a 15.5pp decline²³⁰, and the \$3,052.4M warrant liability already exceeds pro-forma cash^{35 33}.
- The current price of \$39.45 (2026-10-08²⁹⁰) already discounts ~70–78% of JPMorgan's base case²³⁹; Neutral-leaning rating, valuation corridor \$34–63, falsification scenario corresponds to a cash floor of \$6–12⁹⁷ (\$6 is MS's bear-case value).

IONQ has the most solid fundamentals of the three names. FY2025 revenue of \$130.0M, up 202%³², FY26 organic guidance of \$280–290M implying ~+100% organic growth³³, and RPO of \$485M.³⁵ All three headlines, however, are inflated by basis effects.

- Roughly 37–38% of the FY26 combined guidance of \$450–460M³⁴ is the SkyWater consolidation (Exhibit 46).⁹⁷
- 88% of the Q2'26 GAAP loss of \$1.87B is warrant fair-value noise.³⁵
- **Gross margin fell 15.5pp:** Gross margin has fallen from FY25's 40.4% to Q2'26's 24.9%, a 15.5pp decline.²³⁰
- **The warrant liability already exceeds pro-forma cash:** IONQ's true profile is "revenue inflection confirmed, profit model unvalidated, and a self-punishing loop buried in the capital structure": the warrant liability of \$3,052.4M already exceeds pro-forma cash of \$1.9–2.0B.^{35 33}
- **We lean Neutral: under the Section 5 framework of expectations implied by the current price, the current price of \$39.45 (2026-10-08²⁹⁰) already discounts ~70–78% of JPMorgan's base case²³⁹; we assign a Neutral-leaning rating, with a valuation corridor of \$34–63 and a falsification scenario corresponding to a cash floor of \$6–12⁹⁷ (\$6 is MS's bear-case value).**

Exhibit 44: IONQ standard company page (\$M; FY-A/FY26E consensus)

Item	FY2024A	FY2025A	FY2026E
Revenue (\$M)	43.1	130.0	455.1 (sp_data consensus ³⁹)
Net income (\$M, GAAP)	-331.6	-510.4	n.m. (GAAP dominated by warrant MTM ³⁵)
Adj. EBITDA (\$M)	—	-186.8	-430.8 (sp_data consensus ³⁹)
EPS (\$, diluted)	-1.56	-1.82	-1.21 (adj, sp_data ³⁹)
Valuation	Loss-making (P/S TTM 64.9x, 2026-10-08 ²⁹⁰) ¹		

IONQ valuation percentile band (\$; 52-week intraday basis)

Why

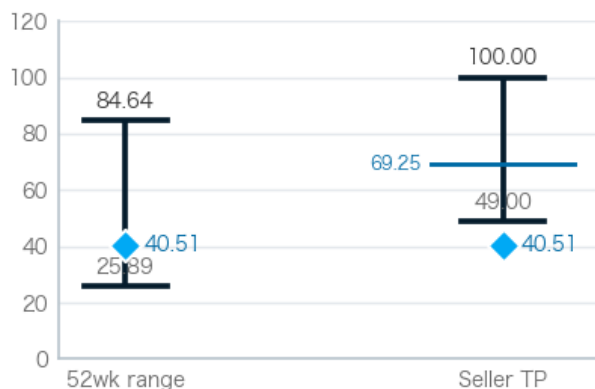
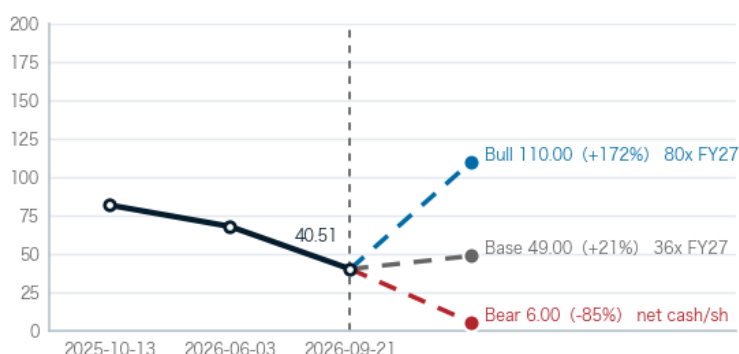
- The only pure play combining all three of: physical-metric records (99.99% 2QG fidelity¹⁴⁴), system-level commercial delivery (repeat purchases by KISTI/QuantumBasel¹⁴⁴), and trusted US manufacturing (SkyWater consolidated¹⁴⁷)
- FY26 organic revenue guidance of \$280–290M, ~+100% (company guidance basis; +115–123% vs FY2025A \$130.0M)³³; RPO of \$485M, with the 12-month portion covering ~84–87% of standalone guidance²³⁰
- Pro-forma cash of \$1.9–2.0B³³ plus zero interest-bearing debt³²; runway of ~42 months at the H1'26 burn rate²³⁰

Upside

Bull-case anchor: Superior 256 completes customer deployment in early 2027 with system-level fidelity on target; the MS bull scenario of 80x FY27 sales implies \$110 (+179%)⁹⁷

Downside

Bear-case anchor: a 256-milestone slip plus error-correction falsification reverts valuation to the 2027 year-end net cash per share of \$6 (-85%)⁹⁷

Source: Yahoo Finance¹**Exhibit 45: IONQ risk-reward two-piece set (\$; sell-side scenario basis)****IONQ three-scenario fan (\$; sell-side scenarios)**Source: Morgan Stanley⁹⁷, JPMorgan⁹⁶, Yahoo Finance¹**IONQ sell-side rating distribution (count; n=13)**

Buy Hold Sell 0

Source: JPMorgan^{96, 135}

Risk-reward in one line: the sell side's own scenarios span \$6–\$110⁹⁷, and the current price of \$39.45 (2026-10-08²⁹⁰) sits in the lower half of the MS base-case range of \$34–63⁹⁷; the odds ratio (upper bound +179% vs lower bound -85%) looks positive, but reaching the upper bound requires Superior 256 and the error-correction roadmap to be delivered at the same time; the single most important decision point is the 256-qubit customer deployment and system-level performance disclosure in early 2027⁹⁷. Source: Morgan Stanley⁹⁷, JPMorgan^{155, 96}

6.1 Business introduction and commercial mechanics: the revenue mechanism switched from pay-per-use cloud access to system delivery, and M&A is rewriting a single-product company into a full-stack platform

6.1.1 Revenue mechanism shifted from cloud time-rental to complete-system sales

IONQ's business essence is changing form. In 2021 the company ran QCaaS time-rental and government R&D milestones via three-cloud distribution, listed across AWS Braket, Azure Quantum and GCP.³² From 2025 the revenue mechanism switched to complete-system sales, with single 100-qubit Tempo system-level deals becoming the unit-price anchor: KISTI's fifth-generation 100-qubit system for Korea, and QuantumBasel's framework agreement expanded to over \$60M across 4 years and 4 generations.¹⁴⁴

- **Hardware climbed to 58% of Q2'26 revenue:** The revenue mix hardened accordingly: quantum hardware rose from 32% of FY2023 revenue (\$7.1M of \$22.0M) to 54% of FY2025 (\$69.9M of \$130.0M), reaching 58% in Q2'26 alone (\$46.5M of \$80.1M).^{32, 35}
- **Channel mix broadened via three new M&A lines:** The channel is direct sales — government tenders and large-enterprise contracts on staged milestone terms³² — plus three-cloud distribution, overlaid with three new channels from M&A: Capella's SAR data services, IDQ's quantum networking and SkyWater's foundry.^{32, 35}

6.1.2 M&A is funded almost entirely with equity, and synergies remain management-sourced claims

M&A is the second key to understanding this company. The six 2025 acquisitions — ID Quantique, Lightsynq, an unnamed market-intelligence business (\$40.6M consideration), Capella, Oxford Ionics and Vector Atomic — totaled \$2,659.0M of consideration, of which cash was only \$58.4M, or 2.2%; stock and equity awards accounted for 97.8%.^{32, 231}

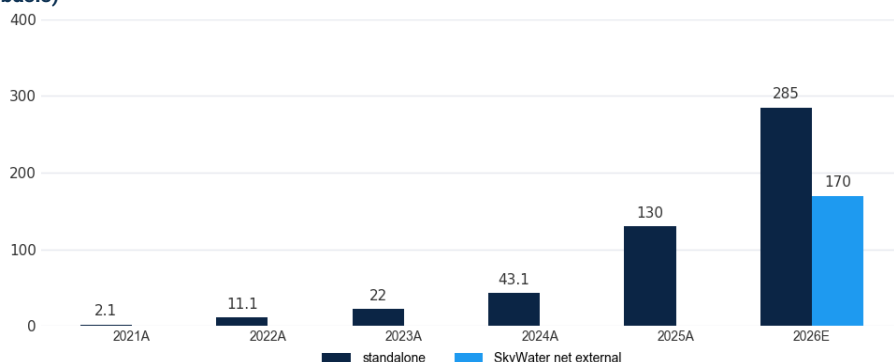
- **SkyWater closed mid-2026 for ~\$1.8B:** H1 2026 added three more — Skyloom, Seed Innovations and Nexus Photonics³⁵ — and SkyWater closed on July 31 (delivered✓) at ~\$1.8B of consideration, split between \$741.3M of cash and 24,135,775 shares, with another \$315.1M of cash spent on debt repayment and transaction costs.^{35 147}
- **The four companies acquired in FY2025 contributed 39% of that year's revenue.³² The company-basis organic growth rate is ~+80%¹⁴⁴ , and Q2'26 organic growth was +132% on the company basis.⁹⁵**
- **Full-stack synergy evidence is entirely management-sourced:** The "full-stack platform" is currently closer to an R&D portfolio acquired with printed stock: the synergy evidence — chip development cycles cut from 8–9 months to 2, 12x wafer lots, 100+ learning cycles per year — is all management-sourced.^{97 93} The first observable falsification point is the retention rate of SkyWater's 8 existing merchant foundry customers after being acquired by a direct competitor.⁹³

6.1.3 Customer concentration is improving but remains high, and government revenue share is undisclosed

Customer and geographic structure offers a third angle. The top three customers accounted for 53% of FY2025 revenue, after two customers at 77% in FY2024 and two at 58% in FY2023: concentration is improving but remains high.³² On the Q2'26 company basis, commercial customers were ~60%, international ~50% and multi-product customers ~25%.³³

- **Government revenue share remains undisclosed:** Government customers include AFRL, DARPA and Oak Ridge³², with four AFRL contracts totaling \$114.5M (\$13.4M in 2022-09, \$25.5M in 2023-09, \$54.5M in 2024-09 and \$21.1M in 2025-01).^{159 160 161 162} The precise government revenue share is undisclosed — an evidence gap — and the "commercial ~60%" figure is a company-basis number whose definition is not broken down.³³
- **Korea became a new large single market:** In Q2'26's geographic split, Korea contributed \$17.8M in a single quarter, a new large single market.³⁵
- **The company is also laying a second product line in quantum communications and optical interconnects** , with 84 on-orbit optical communication terminals in Q2'26.³³

Exhibit 46: IONQ annual revenue series and the FY26 guidance bridge (\$M; FY-A/guidance basis)



Source: company announcements^{32 33 34 148}, Morgan Stanley⁹⁷

Note: within FY26E, standalone \$280–290M is company guidance³³, and SkyWater's net external ~\$170M is the company's Investor Day guidance bridge (SkyWater ~\$240M in August–December 2026 minus ~\$70M of intercompany eliminations)⁹⁷.

6.1.4 Segment TAM mapping: the "full stack" is a union of three independent TAMs — compute is the main battleground, communications and sensing remain options

The "full-stack platform" narrative can be checked segment by segment against third-party TAM splits. On McKinsey's QTM 2025 three-way split (original text, 2025-06-23¹⁰), 2035 TAM is \$28–72B for quantum computing, \$11–15B for quantum communications and \$7–10B for quantum sensing; JPMorgan applies the same framework to a \$46–97B aggregate.⁹⁶ These are three independently standing segments.

- **Layering follows Section 5.3's four-layer discipline:** The basis relationship follows Section 5.3's four-layer discipline: the compute segment's \$28–72B is itself vendor-revenue-layer — ballot A2 of the TAM vote, the same layer as the \$50bn median¹³⁹ — while communications and sensing are incremental TAM beyond the vendor layer, and the total sits at the QT aggregate layer (ballot B1, layer median ~\$80bn).
- **Full stack is a union of three TAMs, not a revenue denominator:** In short, "full stack" is not a marketing phrase but the union of three independent TAMs. Yet the

union cannot serve directly as a revenue denominator: value creation is not revenue capture, and vendors capture only the vendor-layer share.¹³⁹

The segment-to-asset mapping is one-to-one (Exhibit 46A), but the three TAMs monetize on different clocks. Compute is already the battlefield: ~61% of FY2025 revenue was organic³², and the payer base is broadening from government R&D milestones to repeat system purchases of the KISTI/QuantumBasel type.¹⁴⁴

- **Communications and sensing remain options, potentially for some time:** Demand proof sits almost entirely on government accounts — the AFRL quantum-networking and optical-link contracts of \$54.5M and \$21.1M^{159 160}, plus DARPA's timing award of up to \$58M for 125 quantum clocks (company press release, 2026-08-06²⁴⁷) — with a first enterprise communications deployment only just appearing (Congruity360, \$8.18M, company press release 2026-09-08²⁴⁷).

Exhibit 46A: IONQ's three-segment TAM and asset/M&A mapping (2035E, third-party basis)

Segment	2035E TAM (third-party basis)	Commercial mechanics: who pays, in what form	IONQ assets / M&A mapping	Monetization cadence and demand proof
Quantum computing	\$28–72B (McKinsey QTM 2025 ¹⁰ ; QTM 2026 has raised the lower bound to \$43B ⁹); BofA cross-check \$60B ²⁴⁸	Enterprises and governments pay for compute: complete-system sales + QCaaS time-rental	Organic systems (Tempo/Superion) + three-cloud distribution; Oxford Ionics (EQC); SkyWater (manufacturing, \$1.8B, closed 2026-07-31 ✓) ^{32 35 147}	The battlefield: ~61% of FY2025 revenue organic ³² ; KISTI/QuantumBasel repeat system purchases ¹⁴⁴
Quantum communications (networking + security)	\$11–15B (McKinsey QTM 2025 ¹⁰ , JPMorgan ⁹⁶); BofA cross-check \$14B ²⁴⁸	Governments / carriers / large enterprises pay for networking and security: quantum-network gear, QKD, optical links in orbit, enterprise deployments	Qubitekk, ID Quantique, Lightsynq, Skyloom ^{24 35}	Option: AFRL quantum networking \$54.5M ¹⁵⁹ + optical links \$21.1M ¹⁶⁰ ; Congruity360 enterprise deployment \$8.18M (2026-09-08 company press release ²⁴⁷); 84 on-orbit optical communication terminals ³³
Quantum sensing	\$7–10B (McKinsey QTM 2025 ¹⁰ , JPMorgan ⁹⁶); BofA cross-check \$6B ²⁴⁸	Defense/space pays for timing and sensing: quantum clocks, gravity mapping, SAR data services	Vector Atomic, Capella ^{24 32}	Option: DARPA "It's About Time" award of up to \$58M for 125 quantum clocks (2026-08-06 company press release ²⁴⁷); Capella SAR data services already inside consolidated revenue ³²

Source: McKinsey^{10 9}, JPMorgan⁹⁶, BofA²⁴⁸, Jefferies²⁴⁷, IonQ^{32 33 35 144 147}, AFRL contract records^{159 160}, Quantum Zeitgeist²⁴, KIMI estimates¹³⁹. Note: (1) all TAM figures are third-party — McKinsey's three-way split from the 2025-06-23 original¹⁰; JPMorgan applies the same framework, splitting communications into "networking + security" columns with the combined range unchanged⁹⁶; BofA's in-house segment model (2035: compute \$60B / communications \$14B / sensing \$6B, \$80B total) is the second cross-check²⁴⁸; company IR separately claims a >\$200B addressable market by 2040 (company basis, as relayed by MS from the Analyst Day⁹⁷, excluding SkyWater's foundry business), the same order as McKinsey's \$198B on the same basis¹⁰ and likely the same origin — flagged, not adopted. (2) Layering per Section 5.3: the compute segment is the vendor-revenue layer (ballot A2), the three-segment total is the QT aggregate layer (ballot B1); the layers are neither comparable nor additive (value creation is not revenue capture). (3) The DARPA timing award (up to \$58M; company press release 2026-08-06) and the Congruity360 contract (\$8.18M; company press release 2026-09-08) both have official company announcements²⁴⁷. (4) Two further AFRL contracts (\$13.4M/\$25.5M, including the purchase of two barium-based systems^{161 162}) belong to the compute segment and are not counted in the communications row. (5) M&A-chain Seed Innovations (defense software) is not mapped to a segment.

6.2 Moat: migrating from physical records to manufacturing vertical integration; the EQC scaling assumption is unvalidated at 256-qubit system level

6.2.1 IONQ's hardest current moat layer is physical-metric records

The 99.99% two-qubit gate fidelity world record was achieved in 2025 — a company claim, with a relayed basis of 99.997% also in circulation; we use the company basis and note the discrepancy^{144 170} — and the Tempo system's #AQ 64 was achieved three months ahead of schedule in 2025-09.¹⁴⁴

- **Trapped-ion physics caps this layer's ceiling:** The ceiling of this layer is clear: trapped-ion gate speeds are inherently ~3–4 orders of magnitude slower than superconducting, and laser and optical-system complexity spills over as qubits scale.
- **The moat is migrating to manufacturing vertical integration:** The company's own answer is to replace optical control with on-chip electronic control (EQC, from the Oxford Ionics acquisition) and to carry scaling on SkyWater's semiconductor manufacturing capability.⁹³ The moat is thus migrating from physical records to engineering scale-out and manufacturing vertical integration.

6.2.2 The moat migration is not yet backed by sufficient evidence

Bernstein lists four unproven items for Superior 256 — production yield, reliability, deployment timing and economics — and the company has not disclosed complete 256-qubit processor system-level performance.⁹³

- **JPMorgan places the value-creation catalysts 12–36 months out:** 256Q system customer commissioning in 1H27, the first 10K system in 2027–28 and initial fault-tolerant deployment in 2028–30, all with non-trivial execution risk.¹⁵⁵
- **Company says six-month processor output exceeds its prior history:** On the SkyWater side, the company says it manufactured more trapped-ion processors in the past six months than in its entire prior history⁹³, and the first fully integrated 256-qubit QPUs are back from SkyWater.¹⁵⁵
- **MS and JPMorgan flag margin dilution and a conflict of interest:** Morgan Stanley, however, explicitly questions the uniqueness of SkyWater's capability — GlobalFoundries is also investing in quantum manufacturing — and points out the conflict of interest in the merchant foundry model, with SkyWater now owned by a direct quantum competitor.⁹⁷ JPMorgan flags that SkyWater's structurally lower gross margin will dilute the combined margin¹⁵⁵, and Q2'26's 24.9% gross margin, down 15.5pp from FY25's 40.4%, is already the leading indicator.²³⁰

6.2.3 Cost-structure advantage rests on unverified company-basis claims

Cost structure is the economic half of the moat migration. IONQ claims a bill-of-materials (BOM) cost below \$30M for its 2-million-physical-qubit trapped-ion system — a management-basis figure²⁴⁹, sharpened on the Q4'25 call to "materially under \$30 million" and filed under SEC 425.²⁵⁰

- **The \$1B comparator has no independent verification:** The comparator, a comparable superconducting system at \$1B or more, exists only in sell-side relay: JPMorgan cites it⁹⁶, and BofA's exhibit is labeled "Source: IonQ" outright²⁴⁸, while the original deck was never filed with the SEC. The entire comparison is therefore company-basis, without independent verification.
- **No dilution refrigerator is needed:** No dilution refrigerator — the Section 2.2 anchor is ~\$1M per large unit, rising with qubit count⁵, and Barclays names scale-up as the superconducting chain's bottleneck.⁶
- Standard racks drop into ordinary data centers.
- **Room-temperature optics replace cryogenic control electronics**, which run ~\$25k/qubit for superconducting.⁵ Architecture advantage is thereby translated into cost advantage at scale.

6.2.4 SkyWater's manufacturing economics offer partial corroboration, at limited granularity

FY2025 revenue of \$442.1M, up 29%, with quantum ATS revenue up more than 30% in the year and eight commercial customers at year-end.¹⁵⁸

- **Fab 25 adds roughly 400,000 wafer starts per year²⁵¹**, quantum devices run on mature 90nm, and 200mm-node economics underpin the claim of "cost-per-qubit down 330x from Aria to Superior 10K" (company basis).²⁴⁷
- **IONQ paid ~\$1.8B for this capability:** IONQ bought this line for ~\$1.8B in cash plus stock^{35 147}, upgrading Section 2.2's component-level BOM discussion into an in-house, system-level cost curve.
- **Wafer pricing and the \$1B comparator remain unverified:** The gaps on the ledger are equally clear: wafer pricing and absolute quantum revenue are undisclosed¹⁵⁸, and the \$1B superconducting figure has no primary source. Until both are filled, the cost advantage stands as a company-basis unvalidated assumption, filed alongside this section's "two layers pending" below.

6.2.5 The moat's true state is one layer proven and two layers pending

The physical records are proven, while the EQC scaling assumption and the vertical-integration synergy await validation.

- The ecosystem layer — three-cloud distribution plus full-stack platform breadth — is real but the weakest of the four.³²
- **Quantinuum is the single most dangerous competitor:** Competitively, the single most dangerous competitor is Quantinuum: same trapped-ion modality, already public (2026-06-04, delivered✓), and leading on QV records and the Helios error-correction demo.⁹⁷
- **Regulation is a tailwind, not a risk, for IONQ:** the company was selected for DARPA QBI Stage B, an 11-company list market-wide¹⁴⁴ ¹⁶⁸, won a DARPA HARQ contract in 2026-04 — a single-source report, pending company-announcement verification¹⁶⁹ — and SkyWater is a DMEA 1A trusted foundry¹⁴⁷, leaving export controls with IONQ on the beneficiary side of the US trusted supply chain.

6.2.6 IONQ's roadmap is more aggressive; Quantinuum's is slower but demonstrated

Putting the two trapped-ion leaders' roadmaps on one year-by-year timeline (Exhibit 46B) clarifies the competitive rhythm inside the moat-migration window. IONQ's roadmap is the more aggressive: physical qubits jump from the 100-qubit Tempo to the 256-qubit Superior and on to a 10K system, with initial fault-tolerant deployment in a 2028–30 window.¹⁵⁵

- **Quantinuum's roadmap is more conservative but demonstrated:** Quantinuum's is the more conservative: it already holds the commercial record of 48 fully error-corrected logical qubits (LQ)⁶² ⁶³, and its generational path — Helios, then Sol, Apollo and Lumos, with the years for the latter three on the company public-roadmap basis — moves at a slower cadence but with harder demonstrated content at each step.
- **Pricing sensitivity runs opposite for the two names:** The pricing implications run opposite. IONQ's valuation is highly sensitive to a single milestone in early 2027 (see this chapter's closing section for the decision-point structure), so its optionality is stronger.
- **Quantinuum's delivery streak underpins its premium despite RPO declines:** Quantinuum's streak of consecutive deliveries (Exhibit 20: ✓✓✓) underpins its pedigree premium, even as its commercial side shows two consecutive quarterly RPO declines.⁴² ⁴³
- **2027–2028 is the first head-on collision window:** The link back to the moat argument is that IONQ's moat is migrating from the two-qubit gate fidelity (2QG) physical record toward manufacturing vertical integration (above), and the migration must complete before Quantinuum extends its error-correction lead into a system-delivery lead. The first head-on collision window of the two roadmaps is 2027–2028: if Superior 256 slips while Sol arrives on time, IONQ's competitive position could deteriorate from "behind on error correction, ahead on delivery" to "behind on both."

Exhibit 46B: IONQ vs Quantinuum roadmap, year by year (delivered events vs company commitments shown separately; basis in notes)

Year	IONQ	Quantinuum	Delivery-risk notes
2025 (delivered)	Tempo #AQ 64 reached three months early (2025-09) ¹⁴⁴ ; 99.99% 2QG world record (2025-10, company-claimed; an alternative 99.997% transcription exists) ³⁴ ¹⁴⁴ ¹⁷⁰	Helios commercial launch with 48 fully error-corrected logical qubits (2025-11) ⁶² ⁶³	IONQ fidelity is company-claimed, not third-party retested ³² ³⁵ ; QNT's 48 LQ include accepted post-selection ⁶²
2026 (partly delivered)	qLDPC error-correction breakeven demo (2026-06 arXiv preprint, no machine named; no independent verification) ⁶⁶ ; 256-qubit framing drifted from "operational Q4 2026" to "first fully integrated QPUs manufactured, delivery 2027" (2026-09-08) ³⁴	Above-breakeven paper (2026-02) ⁶² ; Helix's no-post-selection trio — logical memory + logical computation + cross-code interface — verified (2026-09) ⁶⁴	IONQ delivered the technology but drifted on timing and framing (Exhibit 20 Δ) ³⁴ ; QNT delivered three times running ✓✓✓ (Exhibit 20)
2027E	Superior 256 customer deployment and system-level performance disclosure (guided early 2027) ⁹⁷ ⁹³ ; first 10K-system window opens (2027–28) ¹⁵⁵	Sol generation (company public-roadmap basis, 2027; parameters not in this report's evidence base — evidence gap)	IONQ: Bernstein's four unproven items (yield/reliability/deployment timing/economics) ⁹³ ; a slip of more than two quarters triggers cash-floor pricing ⁹⁷ ¹⁴⁰ . QNT: Sol parameters pending primary-source verification
2028E	10K system ramps; start of the initial fault-tolerant deployment window (2028–30, JPM-compiled)	— (no single-year public-roadmap node for 2028 — evidence gap)	IONQ's window is sell-side-compiled ¹⁵⁵ , not a year-by-year company

	basis) ¹⁵⁵		commitment
2029E	— (no single-year public commitment — evidence gap)	Apollo (2029, company-roadmap basis) ⁶⁴	Industry-voted window for fault-tolerant quantum computing (FTQC): median 2029–2033 ^{6 65 73}
2030+E	Tail of the initial fault-tolerant deployment window (2028–30) ¹⁵⁵	Lumos (company public-roadmap basis, 2030+; parameters an evidence gap)	Neither side's long-dated nodes is third-party verified; the industry yardstick of ~1,000 logical qubits remains 10–21x above current records ^{61 62 89}

Source: IonQ^{32 33 34}, Quantinuum^{62 63 64}, JPMorgan¹⁵⁵, Morgan Stanley⁹⁷, Bernstein⁹³, Barclays⁶, IBM⁶⁵, BofA⁷³, compiled by this report. Note: 2025–2026 rows are historical events; rows from 2027E are company commitments or sell-side compilations, labeled as such. IONQ's "initial fault-tolerant deployment 2028–30" and "10K system 2027–28" are JPMorgan's compilation of management guidance¹⁵⁵; for Quantinuum's Sol/Lumos only the public-roadmap years are cited — parameters (qubit counts/error rates) are not in this report's evidence base and are marked as evidence gaps pending primary sources.

6.3 Financial analysis: GAAP net income is fully distorted; the breakeven threshold is \$1.7B against a 42-month runway

6.3.1 GAAP net income is fully distorted by warrant mark-to-market noise

Analyzing IONQ starts by dismantling GAAP net income. 88% of the Q2'26 net loss of -\$1,868.6M is a non-cash warrant fair-value remeasurement loss of -\$1,649.1M.³⁵

- **Q4'25 and Q1'26 GAAP profits are the same mirror-image noise:** The mirror-image Q4'25 net profit of +\$753.7M¹⁴⁴ and Q1'26 net profit of ~+\$804.6M¹⁷¹ come from the same warrant remeasurement.
- **True operating loss was -\$337.2M in Q2'26:** The true operating-level basis is loss from operations, which was -\$337.2M in Q2'26.³⁵
- **The warrant liability swelled from \$23.0M to \$3,052.4M:** The warrant liability balance has swollen from \$23.0M at end-2023 to \$3,052.4M at 2026-06-30, comprising Level 1 public warrants of \$44.2M plus Level 3 private warrants of \$3,008.3M, Black-Scholes priced with 95–100% volatility assumptions.^{32 35}
- **In our view, GAAP net income narratives are invalid:** Any IONQ narrative based on GAAP net income is, in our view, invalid (Exhibit 49), and this accounting structure is itself a risk source: the higher the stock, the larger the MTM loss on the liability side, and the nearer the dilution.

6.3.2 The three-way revenue-quality split concludes that the organic inflection is real while structure and profitability deteriorate

FY2025 revenue was \$130.0M, up 201.9%.³² H1'26 revenue of \$144.7M already exceeds all of last year and excludes the SkyWater consolidation, which closed only in Q3.³⁵ TTM revenue stands at \$246.5M.^{35 1}

- **39% of FY25 revenue came from M&A:** That said, 39% of FY25 revenue came from that year's M&A³², and gross margin fell from FY25's 40.4% to Q2'26's 24.9% (Exhibit 48), a decline attributed to the rising hardware-delivery share and SkyWater's commercial-relationship costs.²³⁰
- Morgan Stanley's schedule ties to the 10-K line by line with 0.00% difference.¹⁵⁷
- **Cost growth of +177% trails revenue growth of +202%:** On costs, FY25 total costs and expenses grew +177% against revenue growth of +202%, so operating leverage is not yet falsified.³²
- **SBC ballooned to 2.4x revenue, a profit-quality deduction:** SBC, however, ballooned from FY24's \$106.9M to FY25's \$312.0M, roughly 2.4x revenue³², a profit-quality deduction.
- **Operating losses widened to -\$608.8M in H1'26:** Absolute operating losses are still widening, from -\$236.3M in H1'25 to -\$608.8M in H1'26.³⁵

6.3.3 Revenue visibility should be measured as year-by-year coverage, not read off the RPO headline

About \$242.5M recognizable within 12 months: RPO at 2026-06-30 was \$485M³⁵, of which about \$242.5M is recognizable within 12 months²³⁰; denominators are consensus FY26E \$455.1M, FY27E \$814.4M and FY28E \$1,059.9M³⁹.

- **RPO excludes SkyWater's backlog, so 53.3% is a conservative floor:** RPO is a pre-close (2026-07-31) basis and excludes SkyWater's foundry backlog, while the FY26E denominator includes ~\$170M of net external SkyWater revenue.⁹⁷ The 53.3% figure is therefore a conservative, mixed-basis floor. On the standalone basis, \$242.5M covers 84–87% of the \$280–290M organic guidance^{33 230}, and the two readings are not interchangeable.
- **RPO includes an unfunded portion that is not broken out³⁵,** so the numerator is an upper bound in quality terms.

- **The tail's recognition schedule beyond 12 months is undisclosed:** The recognition schedule of the beyond-12-month portion is undisclosed (evidence gap). The FY27 cap assumes the entire \$242.5M tail lands in FY27; the 12-month bucket actually spans 2026H2–2027H1, so the annual split is a scenario assumption, not a contractual schedule.
- **FY27–28 revenue must mainly come from new signings: on this math, at least \$571.9M (about 70%) of FY27 consensus and nearly all of FY28's \$1,059.9M must come from new signings (both on the scenario assumption below, not contractual caps) — this is exactly the quantitative meaning of the stop-loss trigger "two consecutive quarters of sequential RPO decline".**
- **Realized plus 12-month backlog covers ~85% of FY26 consensus:** Counting the \$144.7M already realized in H1'26³⁵, "realized plus 12-month backlog" covers ~85% of full-year FY26 consensus on the approximate-window basis.

Exhibit 46C: Year-by-year coverage of future revenue from IONQ RPO and QuantumCTek contracts on hand (consensus basis; assumptions annotated line by line)

Name	Year	Effective consensus revenue	Covered by backlog/RPO on hand	Coverage	Assumptions and basis
IONQ	FY2026E	\$455.1M ³⁹	\$242.5M (12-month portion ²³⁰)	53.3%	RPO is pre-SkyWater-close ³⁵ and includes an unbroken-out unfunded portion ³⁵ ; the 12-month window (2026H2–2027H1) is approximately aligned to the calendar-year denominator, following the coverage convention ²³⁰ ; reference: 84–87% of the \$280–290M organic guidance ^{33 230}
IONQ	FY2027E	\$814.4M ³⁹	≤\$242.5M (RPO tail)	≤29.8%	Tail recognition schedule undisclosed (evidence gap); cap assumes the entire tail lands in FY27
IONQ	FY2028E	\$1,059.9M ³⁹	≈0	≈0%	Assumes the tail is fully recognized by FY27; actual timing depends on contract delivery terms (evidence gap)
QuantumCTek	FY2026E	¥366M ^{57 209}	¥146M (contracts on hand, ex-tax ⁵⁶)	40.0%	Of which the 287 project's ¥55.8M was already recognized in 2026H1 ²³⁵ ; the remaining ¥91M covers 37.4% of the implied H2 gap of ¥242M ²⁴⁰
QuantumCTek	FY2027E	¥473–478M ^{57 209}	≈0 (current backlog exhausted)	≈0% (naive cap ~12%)	Cap extrapolates the "one system a year" rhythm (~¥56M next-generation machine), no contract in hand (evidence gap); contract liabilities - 12.3% vs year-end ⁸⁸ as leading indicator

Source: IonQ 10-Q³⁵, sp_data³⁹, QuantumCTek periodic reports^{56 88}, Southwest Securities⁵⁷, China Galaxy Securities²⁰⁹, KIMI estimates^{230 235 240}. Note: new-bookings gap — IONQ FY27 ≥\$571.9M and essentially all of FY28; QuantumCTek essentially all of FY27 — all dependent on future orders.

6.3.4 The ~42-month static runway rests on two assumptions: no more large cash acquisitions and no burn acceleration from consolidation

Cash and runway are IONQ's biggest safety cushion versus peers, but the basis must be right (threshold derivation in Exhibit 47). Cash plus investments at 2026-06-30 was \$2,959.3M.³⁵ After the \$1,056.4M SkyWater cash payment on July 31, pro-forma cash stands at \$1.9–2.0B.^{33 231}

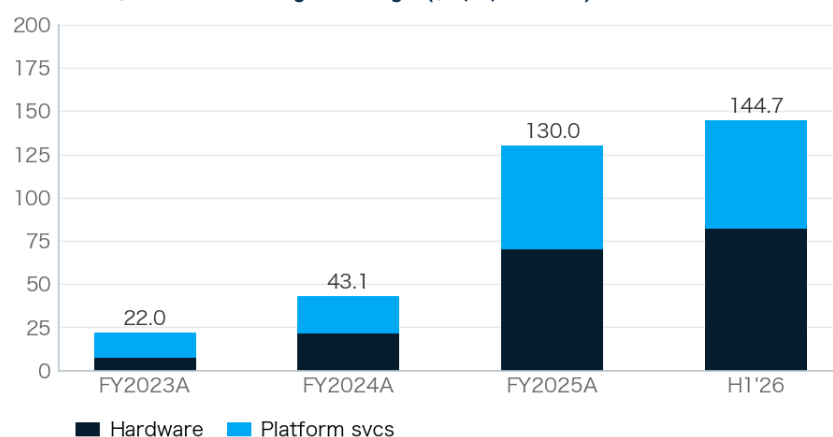
- **H1'26 burn roughly tripled to \$273.4M:** H1'26 operating cash flow was -\$254.8M with capex of -\$18.6M, a half-year burn of \$273.4M and roughly triple H1'25's \$89.1M.³⁵
- **The static runway including capex is ~42 months.²³⁰ That runway rests on two assumptions:** no more large cash acquisitions, and burn not accelerating with consolidation.
- **SkyWater's own revenue changes the burn structure:** SkyWater itself had FY25 revenue of \$442.1M¹⁵⁸, which changes the burn structure post-consolidation.
- **JPMorgan's -\$506M CFO estimate implies ~45 months of runway:** JPMorgan estimates FY26 CFO at -\$506M¹⁵⁵, implying a runway of ~45 months on pro-forma cash of ~\$1.9B against an annualized burn of ~\$510M.
- **Runway could compress to ~22 months if burn doubles:** If integration and expansion double the burn, the runway could compress to ~22 months.
- **Essentially on par with RGTI and better than QuantumCTek on the broad basis:** with the market cap/cash basis unified to pro forma, IONQ stands at 8.0–8.4x, essentially on par with RGTI's 8.7x and better than QuantumCTek's 13.0x²³¹ (see Exhibit 50 for the share-dilution sequence).
- **RGTI's 7.5x low end relies on the CHIPS equity injection:** One basis note: RGTI's 7.5x low end is a pro-forma that counts the Commerce Department equity-injection consideration (+7.74M shares, +\$100M award), and CHIPS funds are restricted to project use (Section 7). Excluding them, the low end returns to 8.7x, and to 12.0x on the narrow cash basis, so the "essentially level" conclusion holds only on the broad basis.

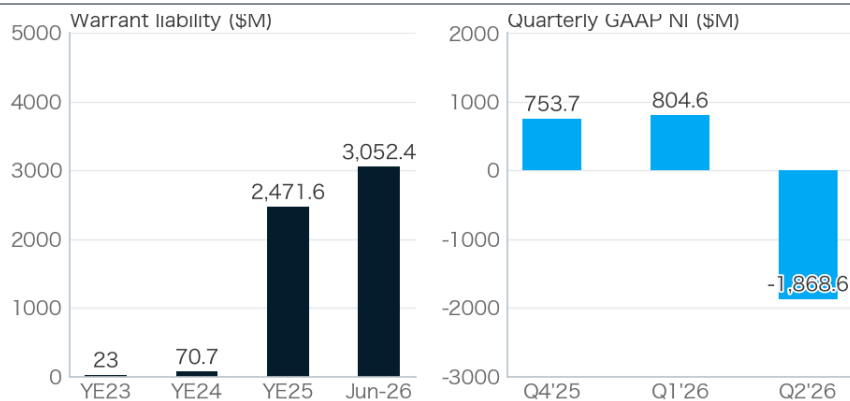
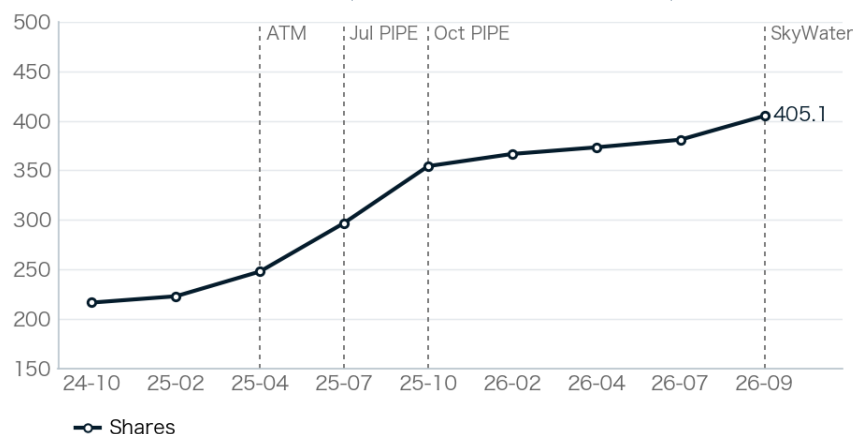
Exhibit 47: IONQ breakeven-threshold derivation chain (\$M; FY2025A cost structure)

Line	Assumption/input	Derivation	Conservative	Base	Optimistic
Fixed operating expenses (opex ex-COGS)	FY25 actual \$686.2M ³²	Anchored to FY25 structure	686.2	686.2	686.2
Gross margin (ex-D&A)	FY25 actual 40.4% ²³⁰	Scenario substitution	30.0%	40.4%	50.0%
Breakeven revenue threshold	Fixed expenses ÷ gross margin	686.2 ÷ margin	2,287	1,699	1,372
Multiple of FY25 revenue	FY25 revenue \$130.0M ³²	Threshold ÷ 130.0	17.6x	13.1x	10.6x
Multiple of FY26 organic guidance	Guidance midpoint \$285M ³³	Threshold ÷ 285	8.0x	6.0x	4.8x

Source: company announcements^{32 33}, KIMI estimates²³⁰

Note: statically recomputed on the FY2025 cost structure, the threshold is ~\$1.7B; if the gross margin is swapped for Q2'26's post-consolidation 24.9%, the threshold rises to ~\$2.8B. This is an assumption-chain scenario presentation, not a KIMI earnings forecast.

Exhibit 48: IONQ revenue mix and gross margin (\$M; %; FY-A/H1)Source: Company filings^{32 35}, Report calc.²³⁰**Exhibit 49: IONQ warrant liability balance and GAAP net income (\$M; quarterly)**

Source: Company filings^{32 35 144}, Vested¹⁷¹**Exhibit 50: IONQ share-count evolution (M shares; 10-Q/10-K cover basis)**Source: SEC EDGAR XBRL¹⁶³, Yahoo Finance¹

Note: share count +59.0% over the eight months from 2025-02-19 to 2025-10-29¹⁶³; the 2026-09 cross-section includes the 24,135,775 SkyWater consideration shares¹⁴⁷.

6.4 Valuation: the current price already discounts ~70–78% of JPMorgan's base case; the valuation corridor is \$34–63

6.4.1 IONQ has the most complete sell-side framework set of the three names, with three named frameworks forming the corridor

- **JPMorgan's \$50 target (Dec-27) applies 27x P/S to ~\$1.2B of potential 2030 sales**, discounted at 15%/yr, with the 27x anchored to the 24–29x P/S range of AI data-center leaders (NVDA/ALAB/CRDO/AVGO).⁹⁶
- **Cantor's \$70 target assumes a 30% 2035 market share:** Cantor's \$70 target applies 23.9x EV/S to the present value of 2035 sales at a 10% discount, assuming IONQ takes a 30% share of the 2035 quantum hardware, software and services market.⁹⁵
- **MS spans a \$6 bear case to a \$110 bull case, \$34–63 base:** Morgan Stanley's risk-reward framework spans a bull case of \$110 (80x FY27 sales), a base range of \$34–63 (12–24x FY27) and a bear case of \$6 (2027 year-end net cash per share).⁹⁷
- **The MS range cannot be recomputed against consensus:** note that MS's FY27E is \$910.9M (about 11.9% above this report's consensus of \$814.4M), and its mechanism is "raising revenue while cutting the applied multiple (>50% of 2027 revenue from SkyWater)"; recomputing 12–24x on this report's consensus gives \$24–47/share, which cannot be mixed with the MS range – the mapping is cited as disclosed by MS; the bull 80x cannot be recomputed on FY27 consensus.

The three frameworks disagree not on direction but on share and multiple. Cantor bets on a 30% share, JPM on AI-level multiples without monopoly share.

- **Coverage is one-sided:** the Refinitiv consensus is 79% Overweight/21% Equal-weight/0% Underweight¹⁷⁴, and even when the SkyWater deal was announced TD Cowen and Piper Sandler only cut to Hold/Neutral¹⁷³ – there is no genuine bear report, which corroborates the consensus map in Section 5. BofA initiated coverage on 2026-09-28 (Buy, PO \$60²⁷⁶); its framework also expects Superior 256 to launch in Q2'27 and deliver the first commercial fully error-corrected logical qubit²⁷⁶
- **There is no true bear report**, which corroborates Section 5's consensus map.

- **Consensus jumped mostly on the SkyWater basis switch:** The consensus basis jump is equally notable: pre-earnings FactSet consensus FY26 revenue was \$268.6M¹⁷², rising to \$455.1M on the post-earnings/Investor Day sp_data cross-section³⁹, of which ~\$170M is the SkyWater net external basis switch (\$240M gross minus ~\$70M intercompany eliminations) rather than an organic upgrade.^{96 39}

Five of six peer multiples are excluded as anchors, each for a stated reason

The \$34–63 corridor, the rating and the target prices are unchanged; what broadens is only the reference frame. Beyond the three named sell-side frameworks, we build our own multiple reference frame, extending the corridor's anchor from Morgan Stanley's ladder alone to a twin anchor of own comparable set plus MS ladder.

Pure-quantum P/S TTM spectrum, IONQ at the low end: the P/S TTM spectrum of pure-quantum names (2026-10-08 close, market-cap basis²⁹⁰) is: IONQ 64.9x, QuantumCTek 103.6x, QUBT 169.4x, RGTI 353.5x, QBTS 449.7x, QNT 477.9x, with IONQ at the bottom of the spectrum.

- QNT 477.9x (2026-10-08²⁹⁰) reflects early-IPO liquidity distortion — the Class A free float is only about 12.6%⁴², day one opened high and closed just +0.6%, and the stock later broke issue to -30.8% versus the offer price (2026-10-08²⁹⁰)¹, with the lock-up expiring in 2026-12⁴²; price discovery is not yet complete;
- QBTS 449.7x has a non-comparable revenue basis — revenue from annealing/hybrid special-purpose machines and gate-model revenue do not belong to the same demand pool, and its QCaaS revenue fell -13.4% YoY in 3Q25 (2Q26 back to +50%)²⁶;
- RGTI 353.5x has distorted revenue quality — the +191% growth in H1'26 came almost entirely from one-off system sales, with QCaaS only 1.5%²⁰;
- QuantumCTek's 103.6x is an A-share related-party mapping structure (84.3% of 2026H1 quantum-computing revenue came from the controlling shareholder's system²³⁴), and Section 8 has argued it deserves a discount rather than a premium²³⁹;
- QUBT 169.4x is too small (TTM revenue \$9.9M¹) for the multiple to carry any pricing information.
- Guotai Haitong's 125x mean is cited at reduced weight: As a peripheral reference, Guotai Haitong's 2026E dynamic PS comp mean is 125x (IONQ 44x, D-Wave 117x, Rigetti 212x)¹¹², but that team has raised its multiple three times within a year, from 82x to 95x to 180x^{112 111}, so we cite it at reduced weight.
- All P/S here is market-cap basis; EV/S multiples don't enter: One basis note: all P/S here is market cap over revenue, and EV/S-basis multiples (Cantor's 23.9x⁹⁵) do not enter this spectrum.

After the exclusions, the usable frame converges on three anchors of our own

- Anchor one, IONQ's own lowest-in-spectrum pricing: first, IONQ itself — TTM 64.9x¹ and forward 35.2x (2026-10-08²⁹⁰)⁸⁹ — is the lowest pricing within the pure-play spectrum.
- Anchor 2: AI data-center leaders at 24–29x P/S: The second is the AI data-center leaders at 24–29x P/S (NVDA/ALAB/CRDO/AVGO)⁹⁶, the mature-state terminal anchor, which JPM applies to 2030 sales.⁹⁶
- The current 64.9x (81.4x fully diluted, 2026-10-08²⁹⁰) sits in the bottom quartile of that equivalent band (about the 19% percentile on both share-count bases), consistent with the reading that "the current price sits in the lower half of the MS base range"⁹⁷.
- All three anchors corroborate the same \$34–63 corridor: The three anchors corroborate one another in the same territory: the \$34–63 corridor is no longer an extrapolation of MS alone but the intersection of the own comparable spectrum, the AI terminal anchor and the MS ladder.

FY28 execution supports the current price, so any upside must come from post-2030 share and slope

The current price embeds ~70–78% of JPM's revenue assumption: reverse-engineering JPMorgan's own framework, the current price of \$39.45 and market cap of about \$16.0B (2026-10-08²⁹⁰)¹ imply 2030 revenue of about \$0.82–0.94B, or roughly ~70–78% of JPM's \$1.2B assumption²³⁹.

- **The 15x reverse-derivation roughly requires FY28 consensus revenue: reverse-engineering a mature-stage 15x P/S requires revenue of \$1.07B, about 1.01x the FY28 consensus of \$1,059.9M^{39 239}.**

- **We read any upside as post-2030 share and slope:** We read this as follows: FY28 execution supports the current price but not much upside, so any upside must come from post-2030 share and slope.
- **A framework switch implies -23% on FY26 but +38% on FY27:** The framework-switch cliff arithmetic runs in one direction: if the market switches from discounted-forward to undiscounted 27x P/S on FY26, the implied market cap is \$12.3B, down 23%; on FY27, there is no cliff, with implied upside of +38% (\$22.0B).²³⁹
- IONQ's cliff triggers only when growth stalls and basis regression happen together.

The valuation judgment, in our view, should also price two structural items the sell side rarely marks

- **Using the basic share count understates the implied valuation by about 25%:** first, the fully diluted share count is 508.6M (narrow basis, +25.5% versus basic) to 514.4M (broad basis)²³¹; beyond the basic 405.1M there are 80.7M warrants (Series A 36.0M @\$99.88, Series B 43.0M @\$155, public 1.07M @\$11.50, customer 0.54M @\$1.38; tranches are approximate)^{35 231}. If the basic share count is used for the expectations implied by the current price, the implied valuation is understated by about 25%²³¹. The SPAC-era public warrants (1.07M @\$11.50) expired on 2026-09-30 and are scheduled to be delisted from the NYSE on 10-12²⁷⁵, affecting the share count by less than 0.3%; the bulk of the 80.7M total (the 79.05M Heights private warrants) remains outstanding;
- **The \$3,052.4M warrant liability exceeds pro-forma cash.**^{35 33} **It is MTM of out-of-the-money equity derivatives**, not debt, and we do not recommend netting it against cash, but it is a self-punishing mechanism as the stock rises, barely discussed by the sell side outside JPMorgan.^{155 231}
- **Rating: Neutral, with \$34 and \$63 tied to explicit paths:** Our rating stance is Neutral: the lower bound of \$34 corresponds to the bottom of MS's base range (12x FY27, the "organic growth holds but the multiple converges toward AI semis" path)⁹⁷, and the upper bound of \$63 corresponds to 24x FY27 (the "Superion 256 deploys on schedule plus RPO turns positive QoQ" path).⁹⁷
- **Falsification maps to a \$6–12 cash floor and triggers cliff pricing:** The falsification case — a 256 slip plus error-correction falsification — maps to the \$6–12 cash floor⁹⁷, \$6 being the MS bear value, and triggers Section 5's cliff pricing.

6.5 Management credibility: five straight misses on the SPAC deck vs four straight beats in the last two years — credibility must be used in tranches

6.5.1 IONQ management's long-term financial promises carry a D rating and cannot be used in valuation

The March 2021 SPAC deck promised 2025 revenue of \$237M, EBITDA turning positive at +\$61M and an 88% gross margin. Actual FY2025 delivered revenue of \$130.0M, Adj. EBITDA of -\$186.8M and a 40.4% gross margin.^{150 32 144}

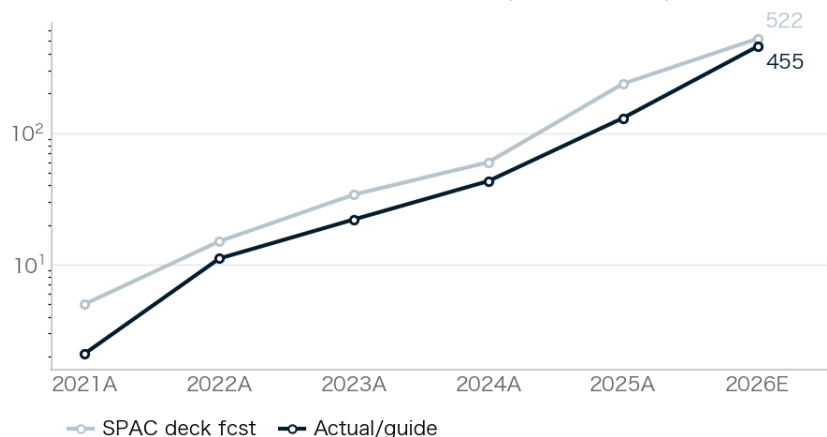
- **Revenue missed the deck for five consecutive years from 2021 to 2025**, by 28–58% (Exhibit 51), and the 2026E deck promise of \$522M still stands 13.5–16.0% above the current combined guidance of \$450–460M, with the shortfall now being backfilled by consolidation.^{150 34}
- **The deck's promise that "SPAC+PIPE funds carry the company to cash-flow breakeven in 2027" is also falsified:** in 2025 the company needed an ATM plus two Heights placements netting ~\$3.31B combined (net \$358.3M, \$977.2M and \$1,977.1M) to hold the balance sheet.^{32 148 149 163}
- **The SPAC redemption rate was only 950,923 shares**, or \$9.5M (~2.5–3.5%)^{151 167} — a period trust-vote contrast with RGTI's 67% redemption rate.¹⁸⁴

6.5.2 Near-term guidance credibility, however, is a different matter: annual guidance merits an A–

- **FY2025 revenue beat guidance by ~20%**, attributed by the company to "organic growth and commercial traction"¹⁴⁴ — though 39% of that year's revenue came from M&A³², so the attribution sits in tension with the worksheet basis, a headline-versus-worksheet gap worth noting.
- **Guidance raised repeatedly; Bernstein says the third was acquisition-driven:** FY2026 guidance was raised multiple times within the year, with old vintage values retired: the two latest steps stand at \$280–290M (2026-08-05, organic) and \$450–460M (2026-09-08, consolidated)^{144 146 33 34}, and Bernstein points out the third raise was purely acquisition-driven, not an upgrade to the organic outlook.⁹³

- **Technology-roadmap credibility is B+:** Technology-roadmap credibility is B+: #AQ 36 was delivered 12 months early and #AQ 64 three months early¹⁴⁴, but the 2026 #AQ 256 has substantively drifted to "256 physical-qubit Superion", with deployment pushed to early 2027.^{97 93}
- **KPI tracking switched from bookings to RPO mid-stream:** On KPI discipline, the company stopped reporting bookings in FY2025 (\$95.6M in FY24)¹⁶⁶ and switched to RPO, which went from \$370M to \$485M^{32 35} — a typical basis switch, and tracking must rebuild the series on the new basis.

Exhibit 51: IONQ SPAC deck forecasts vs actual revenue (\$M; 2021–2026)

Source: IonQ SPAC deck¹⁵⁰, Company filings^{32 34}

6.5.3 Governance: Heights Capital's warrant-sweetened placements carried a hidden funding cost

Governance and capital-allocation discipline is the last credibility item. CEO Niccolo de Masi took over in 2025-02, with former CEO Peter Chapman moving to executive chair.³² The two 2025 Heights Capital private placements — \$977.2M net¹⁴⁸ plus \$1,977.1M net¹⁴⁹ — priced at 20–25% premiums but came with 79.05M seven-year warrants for no additional consideration.

- **Nearly all placement proceeds were initially booked as derivative liabilities:** Reverse-engineering from the liability rollforward, almost the entire proceeds of the two rounds were initially recognized as derivative liabilities, an initial warrant fair value of ~\$3.0B, with only the ATM's \$358.3M recorded on the common-stock equity line.²³¹
- **The true funding cost of this structure far exceeds the nominal premium:** the free warrants Heights received were prepaid by all shareholders in option value at issuance.²³¹
- **No large 2026 executive sales; supply temporarily stable:** On insider activity, there were no large executive sales in 2026, only small CEO/director 10b5-1 sales and tax withholdings, so supply is temporarily stable.¹⁶³

6.6 Risks and decision points: the warrant's rising-stock self-punishment loop and four stop-loss triggers

6.6.1 Three risks stand out: the warrant loop, consolidation dilution and demand-structure opacity

The private warrants are deep out of the money, but moving in the money triggers a double hit: the 79.05M private warrants (\$99.88/\$155 strikes) are deep out of the money versus the current \$39.45 (2026-10-08²⁹⁰)^{35 1} and look harmless; but once the stock moves back above \$99.88, 36.0M shares of dilution and an acceleration of liability-side MTM losses would be triggered simultaneously — Q2'26's single-quarter -\$1,649.1M already demonstrated that magnitude³⁵.

- **Above \$99.88, the warrants trigger dilution and accelerate MTM losses:** But once the stock returns above \$99.88, they simultaneously trigger 36.0M shares of dilution and accelerate MTM losses on the liability side, and Q2'26's single-quarter -\$1,649.1M already demonstrated the magnitude.³⁵ If both tranches go into the money, the 79.05M shares of dilution equal 19.5% of basic shares.²³¹
- **Consolidation: MS expects foundry to exceed 50% of 2027 revenue:** The second risk is consolidation integration: from 2027, over 50% of revenue will come from the low-multiple semiconductor foundry business (MS estimate)⁹⁷, so headline growth will severely overstate core-business momentum. Q2'26's 24.9% gross margin²³⁰ and the retention of SkyWater's 8 merchant customers⁹³ are the two leading indicators.

- **Demand-structure risk: RPO includes an undisclosed unfunded portion:** The third is demand structure: RPO of \$485M includes an undisclosed unfunded portion³⁵, and government contracts are appropriated in stages whose rhythm cannot be quantified from the statements.³²
- **QBI Stage B and cumulative AFRL contracts of \$114.5M provide government-line endorsement**^{159 160 168}. On 2026-10-07 the company advanced to DARPA QBI Stage C (potential agreement value up to \$300M²⁷¹), adding one more notch of government-line endorsement

Exhibit 52: IONQ catalysts and decision points for the next 12 months (all short-tested)

Catalyst	Timing	Bull logic	Bear test and fallback
Superion 256 system-level performance disclosure and first customer deployment	Early 2027 (guidance) ^{97 93}	Validates the EQC scaling assumption; the core of the moat	A demo without a signed order, or performance below Tempo level, backfires ⁹³ ; fallback: Tempo sales can still carry standalone guidance
Q3'26 earnings (first full quarter with SkyWater consolidated)	Early 2026-11	First test of the \$450–460M consolidated guidance; segment disclosure provides the de-hallucination key ³⁴	Larger-than-expected margin dilution from consolidation triggers "bought revenue" questions ¹⁵⁵ ; fallback: organic growth holding 100% can hedge
DARPA QBI Stage C (already advanced)	Landed on 2026-10-07	Potential agreement value up to \$300M ²⁷¹ ; government assessment team IV&V through 2029	Funding beyond the initial appropriation depends on future appropriation actions; Stage C is a validation endorsement, not a full procurement commitment ^{270 271}
NVIDIA's accelerated quantum research center's first on-site QPU (Superion 256)	Installation in 2027 ²⁷⁴	NVIDIA ecosystem validates Superion	Revenue contribution comes in 2027; a deployment signal, not an order; fallback: Tempo sales can still support standalone guidance
Public warrants expire and delist	Expired 2026-09-30, to be delisted 10-12 ²⁷⁵	Capital-structure cleanup (SPAC legacy of 1.07M warrants)	Less than 2% of the total; the 79.05M Heights private warrants remain an overhang ³⁵
Formal publication of hardware error-correction results	2026H2 ³³	qLDPC breakeven already demonstrated (arXiv:2606.06455, no machine named) ¹⁵⁵ ; publication adds route credibility	If the overhead ratio is far above the competitive narrative, it backfires; no near-term revenue impact
NQI 2.0 reauthorization and government quantum budgets	2026Q4–2027 ⁴⁷	Sector beta up, order pool expands	A slip pushes government demand out; IONQ's commercial share is ~60% (company basis) ³³ , so elasticity is below RGTI's

Source: company announcements^{33 34}, Morgan Stanley⁹⁷, Bernstein⁹³, JPMorgan¹⁵⁵, grantedai¹⁶⁸, congress.gov⁴⁷

6.6.2 Early-2027 deployment splits valuation between \$63 and a \$6–12 cash floor

Superion 256 customer deployment and system-level performance disclosure is IONQ's bull-bear dividing line. It is expected in early 2027 (historical anchor: Tempo #AQ 64 delivered 3 months early¹⁴⁴; full catalyst table in Exhibit 52).

- **Bull case: fidelity disclosed and contract signed → \$63 (24x FY27):** If full-processor fidelity is disclosed and the first deployment contract signed, the EQC scaling assumption is validated and valuation switches to the top of MS's base range at \$63 (24x FY27)⁹⁷
- **Bear case: slip or non-disclosure → \$6–12 cash floor:** If deployment slips more than 2 quarters beyond early 2027, or complete 256-qubit performance is not disclosed (Bernstein's four-unproven list⁹³), technology-roadmap credibility is downgraded and valuation switches to cash-floor pricing of \$6 (MS bear case⁹⁷)–\$12 (this report's scenario including foundry residual value¹⁴⁰) (-70% to -85%)
- Supporting stop-loss triggers are quantified:
 - Organic growth below 50%
 - RPO negative QoQ for two consecutive quarters

- Pro-forma cash below \$1.2B (~24 months of burn)²³⁰
- FY26 combined revenue below the \$450M guidance floor³⁴
- **Subjective probabilities make "survives but mediocre" largest at 42%:** Four-outcome subjective probabilities (subjective assignment; anchors: MS's three scenarios and the sell-side rating distribution^{97 1}): platform-leader delivery 30%, survives but mediocre 42%, roadmap falsified 20%, acquired 8%²³⁶ — the largest item at 42% satisfies the distribution-shape discipline, reflecting the judgment that "the base case is already mostly discounted"²³⁹.
- **The rating anchors to the corridor, not the expected value:** the probability-weighted value is about \$57 (+45% versus the current price), of which about 58% comes from the 30% delivery scenario — positive expectancy is carried by low-probability, high-payoff items, so the rating anchors to the \$34–63 corridor rather than the expected value (see Exhibit 74 for the derivation).

7. Rigetti deep dive: \$7M of revenue supporting a ~\$4.7B market cap; 99.5% fidelity by end-2026 is the chiplet route's make-or-break line

Key points

- FY2025 revenue of just \$7.088M, down 34.3%³⁰, sits against a ~\$4.7B market cap¹ and EV/FY28 consensus of ~49x²³⁹, so the price bakes in almost no financial delivery over the next three years
- 2026 brought two deliverables: the 108Q system reached GA (2026-04-07, delivered✓)¹⁸⁷, and the CHIPS OTA landed with a Commerce equity stake (2026-09-08 8-K, delivered✓)¹²¹
- Working the other way: 108Q fidelity regressed from 99.6% to 99.1%¹⁷⁷, all 33 insider Form 4 filings since 2025-09 were sales with zero open-market buys¹²³, and H1'26's +191% growth was almost entirely one-off system sales, with QCaaS at just 1.5%²⁰
- The cash side is hedged: a neutral runway of 49–67 months with no financing likely before 2028²³²; the technology side is not — the end-2026 99.5% fidelity goal (the company restated the 99.5% target but committed no deadline; the end-2026 timing is sell-side framing) is the shared foundation of the chiplet narrative, Jefferies' rating premise and the government-endorsement logic¹³²
- Our rating stance is Neutral (speculative), target range \$18–22, with the falsification case mapping to Jefferies Downside of \$7¹³²

The price discounts almost no financial delivery within the next three years. Rigetti is the purest option of the three names: FY2025 revenue of just \$7.088M, down 34.3%³⁰, against a ~\$4.7B market cap¹ and EV/FY28 consensus of ~49x²³⁹.

- Two real things happened to the bull story in 2026:
 - the 108Q system reached GA (2026-04-07, delivered✓)¹⁸⁷
 - the CHIPS OTA landed with a Commerce equity stake (2026-09-08 8-K, delivered✓)¹²¹
- Three things point the other way over the same period:
 - The 108Q's two-qubit gate fidelity regressed from the 36Q's 99.6% to 99.1%¹⁷⁷.
 - All 33 insider Form 4 filings since 2025-09 were sales, with zero open-market buys¹²³.
 - H1'26 growth of +191% came almost entirely from one-off system sales, with QCaaS at just 1.5%²⁰.
- RGTI's true profile is "cash side hedged by government, technology side unhedged":** a neutral runway of 49–67 months with no financing likely before 2028²³², but with the end-2026 99.5% fidelity goal (the company restated the 99.5% target but committed no deadline; the end-2026 timing is sell-side framing) as the shared foundation of the chiplet narrative, Jefferies' rating premise and the government-endorsement logic¹³².
- We assign a Neutral (speculative) rating stance** with a target range of \$18–22; the falsification case maps to Jefferies Downside of \$7¹³².

Exhibit 53: RGTI standard company page (\$M; FY-A/FY26E consensus)

Item	FY2024A	FY2025A	FY2026E
Revenue (\$M)	10.8	7.1	23.3 (sp_data consensus ³⁹)
Net income (\$M, GAAP)	-201.0	-216.2	n.m. (GAAP dominated by warrant FV ²⁰)
Non-GAAP net income (\$M)	—	-50.5 (Cantor basis ¹⁸²)	—
EPS (\$, basic)	-1.09	-0.70	-0.19 (adj, sp_data ³⁹)
Valuation	Loss-making (P/S TTM 353.5x, 2026-10-		

Why

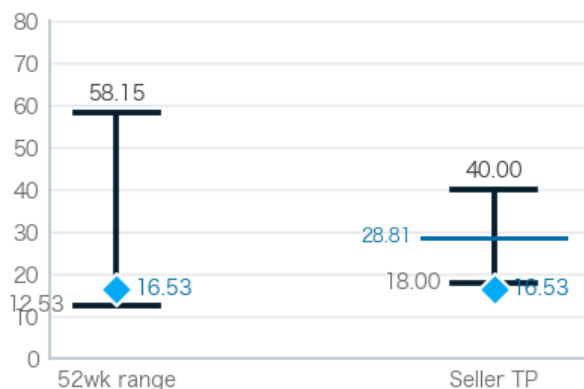
- One of only three gate-model platforms above 100 qubits globally (commercial system-level platforms: RGTI 108Q/IBM 120Q/Google 105Q)¹³²; superconducting gate speeds of 60–88ns, ~3–4 orders of magnitude faster than trapped ion¹⁷⁷
- Own Fab-1 wafer fab plus chiplet modularization (36Q=4x9Q, 108Q=12x9Q), a self-contained design-tapeout-test loop³⁰
- Cash plus investments of \$541.3M with zero debt²⁰; neutral runway of 49–67 months; no financing likely before 2028²³²

Upside

Bull-case anchor: delivery of 99.5% fidelity by end-2026 (sell-side timing) plus C-DAC confirmation, a repaired chiplet scaling narrative, and Jefferies' upside scenario

08²⁹⁰)¹of \$44 (+211%)¹³²

RGTI valuation percentile band (\$; 52-week intraday basis)

**Downside**

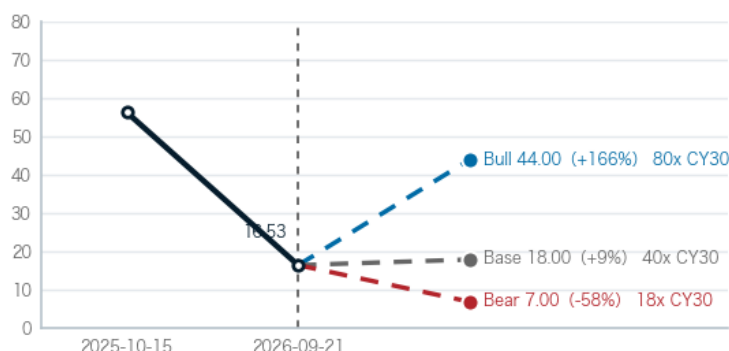
Downside

Bear-case anchor: a 99.5% slip plus another NQI stall, with valuation reverting toward Jefferies' downside scenario of \$7 (-50%)¹³² or even net cash of \$1.6/share²³²

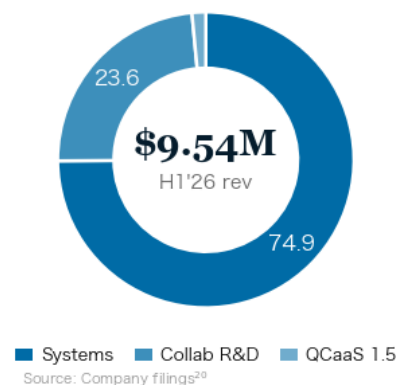
Source: Yahoo Finance¹

Exhibit 54: RGTI risk-reward two-piece set (\$; %; sell-side scenario and 10-Q basis)

RGTI three-scenario fan (\$; Jefferies scenarios)

Source: Jefferies¹³², Yahoo Finance¹

RGTI H1'26 revenue mix (%; 10-Q basis)

Source: Company filings²⁰

Risk-reward in one line: applying Jefferies' three scenarios (\$7/\$18/\$44)¹³² to our four-outcome balancing (survival 45%→\$18, delivery 25%→\$44, falsification 25%→\$7, M&A 5%→\$18) gives a probability-weighted \$19.1–\$21.8²³³. The current price of \$14.14 (2026-10-08²⁹⁰) sits 26–35% below the weighted value, but 51% of the expected value comes from the 25% delivery scenario²³³ — a positive-expectation, high-kurtosis payoff structure; the single most important decision point is whether 108Q fidelity reaches 99.5% by end-2026¹³². Source: Jefferies¹³², company filings²⁰, our scenario assumptions²³³

7.1 Business introduction and commercial mechanics: revenue is research institutions' capex, not extrapolable recurring revenue

7.1.1 RGTI's commercial mechanics reduce to one sentence: it sells quantum computers and R&D services to governments, universities and national labs, and gets paid on procurement cycles

The revenue mix underwent a structural shift in 2026.

- **FY2025 was collaborative R&D-led, with no system sales recognized:** collaborative R&D and professional services of \$6.676M (94.2%), QCaaS access of \$0.412M and no system sales recognized — the 10-K, verbatim: "During the year ended December 31, 2025, there were no Novera sales".³⁰ (Two further Novera purchase orders of ~\$5.7M were booked the same year, for 2026 delivery.)
- **H1'26, by contrast, was led by system sales:** system sales of \$7.144M (75%), collaborative R&D of \$2.251M and QCaaS of just \$0.143M (1.5%)²⁰ (Exhibit 55).
- **A single customer drove 64% of Q2'26 revenue:** within Q2'26's \$5.138M, a single large customer, Customer A, accounted for 64%²⁰.
- "Commercialization is happening" currently equals, in our view, research institutions' capex-type one-off procurement: the Novera 9Q system launched in 2023 at \$900K (single source)¹⁸⁸, two upgrade orders in 2025 totaled ~\$5.7M (~\$2.85M/unit including upgrades and accessories)³⁰, and C-DAC's 108Q system order came in at \$8.4M¹⁷⁹.
- **Price scaling is the revenue slope's most solid positive evidence:** system prices rising with qubit count while cost per qubit falls — from the Novera 9Q at \$0.9M to the 108Q at \$8.4M, a total-price multiple of 9.3x against qubits at 12x, and per-qubit pricing from \$100k to \$78k.

7.1.2 Order visibility is the thinnest in the sector

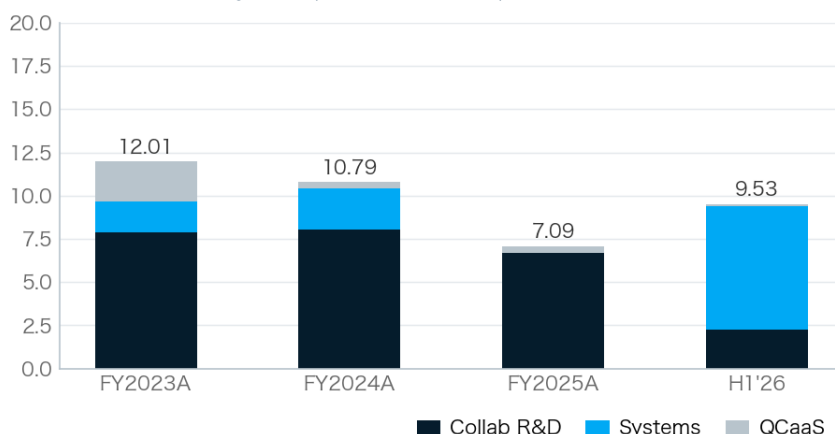
RPO is only \$2.7M, of which \$1.1M falls beyond 12 months²⁰, covering 11.6% of FY2026 consensus revenue of \$23.3M³⁹ – about 1.4 months²³².

- **Deferred revenue totals just \$4.0M**²⁰: orders of magnitude below IONQ's \$485M RPO³⁵.
- **RGTI's quarterly revenue is therefore driven by same-quarter new orders and is inherently volatile**: \$12.01M in FY2023, \$10.79M in FY2024 (down 10.2%) and \$7.088M in FY2025 (down 34.3%)³⁰, then +191.7% in H1'26²⁰.
- **The swing in government share corroborates the "procurement-cycle function" characterization**: US government entities were 48.0% of FY2025 revenue, while the all-government basis fell sharply to 22.2% in H1'26, with 18.0% in Q2 alone versus 90.7% and 91.7% a year earlier^{30 20}. This is not successful de-governmentalization but a mirror image of the revenue mix switching from US government R&D contracts to one-off system purchases by universities and enterprises; the government share should swing back once C-DAC, an Indian government customer, is recognized in Q4'26^{179 132}.
- **Annual and interim government revenue shares must be compared on the same basis**: the 10-K discloses both an all-government 90.2% and a US-government 48.0% basis, while the 10-Q's 22.2% is on the all-government basis^{30 20}.

7.1.3 On the mechanics timeline, the company is laying track in three directions at once

- **The first is system commercialization**: from the Novera 9Q (2023-12) to the Cepheus-1-36Q (2025) to the Cepheus-1-108Q (GA 2026-04-07, listed on AWS Braket)¹⁸⁷, with C-DAC's 108Q to be deployed on-prem in Bangalore in 2H26¹⁷⁹.
- **The second is hybrid supercomputing**: a 9Q Novera delivered to the Pittsburgh Supercomputing Center's TangleLab testbed (NSF-funded)¹⁷⁷, with HPE deployment planned for 2027¹⁷⁷. The five-year collaboration agreement with Quanta commits each side to invest at least \$250M, and Quanta took a \$35M private placement at ~\$11.59/share in 2025-04³⁰.
- **The third is overseas and government endorsement**: the UK NQCC deployed a 36Q system with Riverlane's error-correction stack, and the company plans to invest up to \$100M in the UK over several years¹⁷⁷.
- **The channel is primarily direct sales** – government and university tenders – supplemented by cloud distribution across its own QCS plus AWS Braket, Azure and qBraid^{30 177}.
- **The evidence gaps are Novera's current list price, QCaaS hourly rates and usage, and repurchase rates**, all undisclosed³⁰.

Exhibit 55: RGTI revenue segments (\$M; FY-A/H1 basis)



Source: Company filings^{30 20}

7.2 Moat: the Fab-1 iteration flywheel plus chiplet manufacturability; the fidelity regression is the most vulnerable link

7.2.1 The moat lies in two engineering assets

RGTI's moat does not lie in physical metrics. The 108Q's 99.1% two-qubit gate fidelity trails IBM's and Google's same-generation platforms and sits far behind the trapped-ion modality¹³²; the company has no logical qubits, no QEC breakeven demo and no QBI Stage B endorsement¹⁶⁸.

- **The first is Fab-1:** an in-house US wafer fab with a self-contained design-tapeout-test loop, already serving external foundry customers, including national and defense labs, as Rigetti Foundry Services³⁰.
- **The second is the chiplet modular architecture**, which tiles 9Q units with known yields — 36Q as 4×9Q and 108Q as 12×9Q — to bypass the single-die yield wall¹⁷⁷.
- **Jefferies believes early results validate the route**, but near-term execution must still solve crosstalk suppression, automated packaging and cryogenic I/O¹³².
- **The company claims a control-system cost of ~\$10k/qubit versus an industry ~\$35k**, a single source awaiting a second source¹⁹⁰.

7.2.2 The moat is being squeezed from two sides

On one side are the giants: the most dangerous competitor is not IONQ but IBM — same superconducting transmon modality, larger qubit counts (120Q), error-correction leadership.

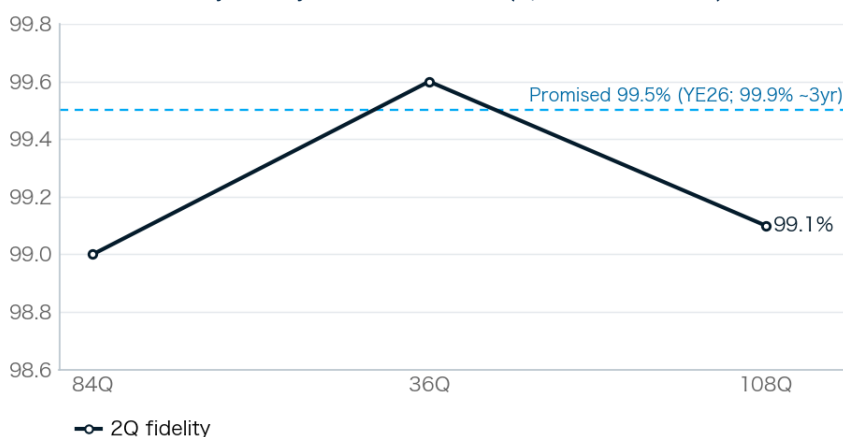
- IBM's wholly owned Amon has received a \$1.0bn CHIPS definitive award (2026-09-16, delivered✓) to build a 300mm pure-quantum foundry line⁶⁰.
- If IBM's foundry capacity lands, RGTI's Fab-1 scarcity and its "only US superconducting quantum fab" narrative could be punctured simultaneously.
- **RGTI's opening is IBM's closed ecosystem:** IBM does not sell complete systems externally, and Novera/C-DAC-style on-prem sales drill exactly into that gap¹³².
- **On the other side is the backlash of government terms:** the CHIPS OTA provides endorsement but comes with IP march-in rights, technology-transfer restrictions, and U.S. domestic ownership and manufacturing requirements¹²¹ — the price of accepting \$100M is a partial cession of IP sovereignty, and Jefferies' government-equity thematic already tracks such clauses as pricing variables⁹². Missing QBI Stage B (the 2025-11 list of 11 companies excluded RGTI)¹⁶⁸ was a substantive loss on the government technology-endorsement dimension; the Stage C list was announced on 2026-10-07 and RGTI was again not selected (Atom/Dirac/IBM/IonQ advanced²⁷⁰) — the catch-up option did not pay out, and the deficit persists.

7.2.3 The most fragile technical link is already visible

Qubit count tripled, from 36Q to 108Q, while two-qubit gate fidelity regressed from 99.6% to 99.1%¹⁷⁷ (Exhibit 56), partially triggering the elimination criterion of "error rates failing to fall as qubits scale".

- **Management's explanation chain runs through coherence time:** the current 25–30μs is the first constraint on fidelity, and a Fermilab collaboration targets a 2–3x improvement over several years¹³².
- **Our subjective break probabilities for the two core assumptions over a 3–5 year window:** ~35% that coherence time cannot be engineered upward, and ~30% that the fidelity cost of chiplet scaling cannot be controlled; either alone is a severe hit, and jointly they reach ~55%²³³.
- **The frontier prototype** — an adiabatic CZ scheme reaching 99.9% at 28ns on a prototype platform³⁰ — is mitigating evidence, but a prototype is not a product.

Exhibit 56: RGTI 2Q fidelity delivery vs commitment line (%; internal-test basis)



Source: Company filings^{30 20 177}, Jefferies¹³²

Note: Ankaa-3's 99.0% is the 10-K statutory basis³⁰; the launch release and secondary sources widely cite 99.5%^{188 132} — the two bases are not ranked side by side, and the 10-K prevails.

7.3 Financial analysis: the cash side is hedged by government; the

technology side is not

7.3.1 RGTI's statements must pass two basis checks

First, GAAP net income is dominated by warrant fair value: Q1'26 GAAP net income of +\$33.1M included +\$53.7M of warrant gains, and Q2'26's -\$52.6M included -\$29.6M of warrant losses²⁰; the operating truth is a non-GAAP quarterly loss of ~\$16M (Q2'26, Cantor basis)¹⁸².

- **The corresponding Jefferies table's 1Q26 GAAP net-income field contradicts the 10-Q XBRL's +\$33.1M** — the difference is exactly the quarter's warrant gain — and this report relies on the 10-Q^{20 232}.
- **Second, the cash basis has a single authoritative value:** cash plus all available-for-sale investments of \$541.3M at 2026-06-30, against \$393.7M on the narrow basis of cash plus short-term investments²⁰. Bernstein's table field and the Q1-end old value are outdated bases and are retired^{93 192}.
- The company carries zero interest-bearing debt, the Trinity Capital loan having been repaid early in 2024-12³⁰.

7.3.2 The burn-and-runway verdict is that the cash side is safe

The monthly burn point estimate is \$8.1M, built from H1'26 actual CFO of -\$32.0M plus capex of -\$16.4M, annualized^{20 232}, with a sensitivity band running from \$6.4M (FY2025 actual) to \$14.0M (Jefferies FY26E CFO of -\$127.1M plus capex of -\$40.4M)^{132 232}.

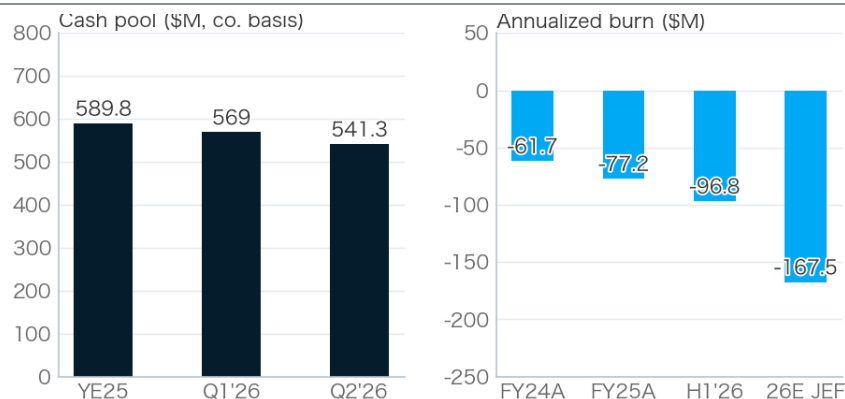
- **The runway spans six cells:** neutral 67 months on the broad basis and 49 on the narrow, conservative 39 and 28, optimistic 84 and 61²³² (Exhibit 58; cash pool and burn trajectory in Exhibit 57).
- **The single authoritative refinancing verdict:** no financing need within 2027, "no financing likely before 2028" holds, and we expect the first need-driven financing window to fall in 2028Q4–2032Q1²³². Two notes must travel with it:
 - **First, RGTI's historical behavior is lightning-fast financing into stock-price windows** — a \$350M ATM sold out within one quarter in 2025Q2 at a weighted-average price of \$11.55^{20 195} — so opportunistic financing could precede need.
 - **Second, the CHIPS OTA's \$100M is entirely project-restricted**, carries milestone clawbacks and does not count toward general liquidity^{121 232}, while Commerce's 7,739,938 shares are inducement in nature with no cash consideration, an implied issue price of \$12.92 and an 8.6% discount to the current price^{121 1}.
- **The breakeven revenue threshold is ~\$230–265M/yr** — opex FY2026E of ~\$93M divided by a 35–40% gross margin — or 10–11x FY2026 consensus revenue²³².

7.3.3 The profit structure oscillates between improvement and deterioration

Gross margin moved from 52.8% in FY2024 to 29.1% in FY2025 as revenue declined 34.3% while cost of revenue remained broadly flat; the detailed drivers require contract-level evidence. It recovered to 42.6% in Q2'26 on a rising Novera system-sales share^{30 20}.

- **FY2025 opex of \$86.7M grew +16.9% against revenue down 34.3%:** all four quarters of 2025 met the operating-leverage-falsified condition of "opex growth above revenue growth".
- **H1'26 opex of +35.4% against revenue of +191.7% has turned the signal positive**, but it is not yet entrenched^{30 20}.
- **Capex is accelerating:** H1'26 spending of -\$16.4M doubles H1'25's -\$8.2M, with another \$10.1M of accrued capex sitting in payables, so an H2 cash pulse exists^{20 232}.
- **Jefferies implies H2'26 CFO of -\$95.1M**, roughly 3x the H1 actual, potentially including working-capital stocking ahead of the C-DAC delivery; the 3Q26 10-Q is the verification point^{132 232}.
- **The accumulated deficit stands at \$790.5M**, with federal NOL carryforwards of \$455.3M^{30 20}.

Exhibit 57: RGTI cash pool and annualized burn (\$M; quarterly/annual)



Source: Company filings^{20 192}, Jefferies¹³², Report calc.²³²

Exhibit 58: RGTI cash-runway six-cell sensitivity (months; from 2026-06-30)

Burn band (monthly burn)	Basis	Broad basis \$541.3M	Narrow basis \$393.7M
Optimistic (\$6.4M, FY2025 actual³⁰)	Runway months	84 (2033Q3)	61 (2031Q3)
Neutral (\$8.1M, H1'26 annualized²⁰)	Runway months	67 (2032Q1)	49 (2030Q3)
Conservative (\$14.0M, Jefferies FY26E¹³²)	Runway months	39 (2029Q4)	28 (2028Q4)

Source: company announcements^{30 20}, Jefferies¹³², KIMI estimates²³²

Note: the CHIPS OTA's first \$43.9M is project-restricted¹²¹; if counted as offsetting project R&D spend, each band gains ~3–7 months²³²; 2028Q4 is the earliest financing boundary across all combinations.

7.4 Valuation: EV/FY28 still ~49x; the deepest option faces the steepest cliff

7.4.1 RGTI has the thinnest sell-side framework set and the most deep-option pricing of the three

The only complete named framework is Jefferies: Base of \$18 (40x CY30 revenue of \$206M, discounted), Upside of \$44 (80x \$257M) and Downside of \$7 (18x \$154M), rated Hold¹³².

- **Yahoo Finance's aggregated 12-broker TP range is \$18–40** with a mean of \$28.81¹, methodologies undisclosed.
- **Price-implies reverse-engineering (back to Section 5) shows an EV/FY28 consensus multiple of ~49x, against IONQ at just 12x: at the 27x AI multiple, the required 2030 revenue is ~\$175M, or 2.1x FY28 consensus; at a 10x mature multiple, it is ~\$472M, or 5.7x FY28²³⁹.**
- The current price discounts almost no financial delivery within the next three years — a pure bet on the FTQC window plus the government-endorsement option — and any reversion to a near-term revenue framework is a -50%-magnitude event, the steepest cliff of the three²³⁹.

7.4.2 The risk-reward asymmetry comes from upside dependence, not symmetric deviation

We balanced Jefferies' framework across four outcomes, using subjective probabilities plus sell-side scenario anchors: niche survival at 45% mapping to \$18, roadmap delivery at 25% to \$44, technology falsified at 25% to \$7 and a premium M&A exit at 5% to \$18.

- **The primary mapping weights to \$21.75**, and the strict mapping — survival revenue of \$20–80M, below Jefferies Base's implied CY30 \$206M, mapped down to \$12 — weights to \$19.05, giving a single citation range of \$19.1–\$21.8²³³.
- **A broken assumption is not terminal falsification:** most broken paths fall into niche survival — a downgrade to government-research supplier, the downward-shifted part of the 45% — while terminal falsification, with narrative and cash both impaired, carries the 25%. The two bases run on different time windows, a 3–5 year assumption window versus the terminal distribution.
- **Two structural conclusions:** first, the current price of \$14.14 (2026-10-08²⁹⁰)¹ sits 26–35% below the weighted value, so expectation is positive; second, 51% of the expected value comes from the 25% delivery scenario — the asymmetry in risk-reward comes from upside dependence rather than symmetric dispersion²³³.
- This weighted value serves only as an internal-consistency check of the scenario framework, not as an independent valuation conclusion²³³.

7.4.3 RGTI's multiple is the highest of the three names because its revenue base is

the smallest, not because its quality is highest

Our target range of \$18–22 is path-differentiated. The lower bound of \$18 corresponds to Jefferies Base's niche survival path — a government and research system supplier, with Novera/C-DAC-style orders rolling¹³² — while the upper bound of \$22 corresponds to this report's balancing upper bound, survival plus partial delivery, including 99.5% fidelity delivered within the year²³³.

- **The falsification case maps to Jefferies' downside scenario of \$7 (-50%):** a 99.5% slip plus another NQI stall¹³²; the extreme case (technical falsification plus a sector winter) reverts to net cash of about \$1.6/share²³².
- **As a bottom-up multiple reference, Jefferies Base's 40x CY30 sits above the AI data-center 24–29x P/S anchor**⁹⁶ by a government-endorsement option premium, and against pure-quantum peers' P/S TTM — IONQ at 64.9x and RGTI at 353.5x¹ — RGTI's absolute multiple is the highest among the three names, reflecting its smallest revenue base, not the highest quality.

7.5 Management credibility: 2.5% SPAC-deck delivery; technology promises should be taken at 50–70% of face value

7.5.1 RGTI management's financial-promise credibility is disaster-grade

The 2021-10 SPAC deck promised FY2025 revenue of \$288M and EBITDA turning positive at +\$142M. Actual FY2025 delivered revenue of \$7.088M and an operating loss of -\$84.66M, a 2.5% delivery rate^{183 30}.

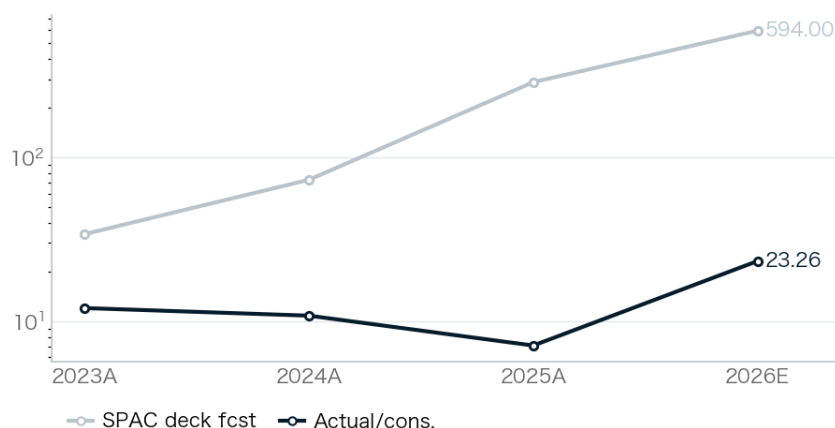
- **By year, 2023–2025 delivery rates were 35%, 15% and 2.5%**^{183 30} (Exhibit 59)
- **The market's trust vote at the time also answered early:** the SNII trust's \$345M was expected to deliver only \$114.24M after the redemption deadline, a 66.9% redemption rate^{184 185 186} and a textbook contrast with IONQ's ~2.5–3.5%^{151 167}.
- **The company provides no formal financial guidance** — Jefferies, verbatim: "Mgmt did not provide formal guidance"¹³² — so the deck cannot be used in valuation.

7.5.2 The pattern of technology promises is keep delivering, keep downgrading

Three system generations — Ankaa-3 84Q, Cepheus-1-36Q and Cepheus-1-108Q — were delivered in three consecutive years^{30 177}, but every node came with a metric or timing discount: 108Q GA slipped from "end-2025" to 2026-04-07, about a week later again after the 8-K revision^{178 187}.

- **GA fidelity was 99.0–99.1%** rather than the promised 99.5%^{178 177}.
- **"Halving the error rate every year" was met** at the 36Q node, from 99.0% to 99.6%, and broke at the 108Q node^{30 177}.
- **Basis drift is also documented:** at Ankaa-3's launch, the PR and secondary sources cited 99.5% while the 10-K statutory basis is 99.0%^{30 188}, and the "150+ qubits/99.7% by end-2026" language from the 2025-11 earnings season quietly disappeared after the January 2026 roadmap revision, replaced by "~1,000 qubits/99.9%/<50ns/~3 years"^{189 177}
- **Credit where due on attribution honesty:** the FY2025 revenue decline is explicitly attributed in the MD&A to the NQI Act's expiry, with no macro scapegoating³⁰.
- **The composite rating is C+:** technology guidance should be taken at 50–70% of face value, and financial guidance is unusable¹³².

Exhibit 59: RGTI SPAC deck forecasts vs actual revenue (\$M; 2023–2026E)



Source: Rigetti SPAC deck¹⁸³, Company filings³⁰, sp_data³⁹

7.6 Risks and decision points: all 33 insider Form 4 filings were

sales — opposite to the government-endorsement narrative

7.6.1 Insider behavior runs opposite to the government-endorsement narrative

RGTI's sharpest bear evidence is not technology but share supply — the supply-side trio in Exhibit 60. Since 2025-09, all 33 Form 4 filings by directors and executives were sales, with zero open-market buys¹²³: CTO/COO David Rivas sold 499,328 shares for \$12.68M in a single trade on 2026-05-29 (filed 2026-06-01), and CEO Kulkarni holds only 140,411 shares after two rounds of selling in 2026-06 and 2026-09-10 (the September tranche under a 10b5-1 plan, the May/June tranche not)¹²³.

- Over the same period, however, the company received the CHIPS OTA and the Commerce equity stake¹²¹.
- **Insider ownership is just 1.7%¹**, a weak alignment between management and shareholders.
- **The Commerce stake's implied issue price of \$12.92 is an 8.6% discount to the current price^{121 1} — but the \$100M is milestone funding restricted to project use and the shares are an inducement issued with no cash consideration, so this funding/share ratio should not be read as a market-based pricing anchor.**
- **The mitigants:** the CEO's sales were inside a 10b5-1 plan¹²³, and RGTI has only 164 employees³⁰ — a lean organization, which also means key-person departure risk is concentrated and equity-incentive monetization has structural causes.

Exhibit 60: RGTI supply-side trio: insider selling, share dilution and warrants (2022-05 to 2026-09)

Dimension	Facts	Numeric anchors
Insider transactions	All 33 Form 4 filings since 2025-09 were sales, zero open-market buys; Rivas single trade -\$12.68M (2026-05-29); Kulkarni down to 140k shares after cumulative selling	Form 4 ¹²³
Share-count evolution	113.8M (2022-05) 333.7M (2026-06-30) 341.4M pro forma (including Commerce's 7.74M); the most violent stretch was +68.6% over the nine months from 2024-11 to 2025-08	10-K/10-Q/8-K ^{30 20 121}
Warrant overhang	8,436,597 public warrants @\$11.50 (in the money) plus private warrants, 11,716,146 in total, ~3.5% of float; the \$78.4M liability fully reclassified as current	10-Q ²⁰
Government equity terms	7,739,938 shares @ implied \$12.92 (~2.27%), inducement with no cash consideration; OTA \$100M entirely restricted (\$43.9M+\$29.9M+\$26.2M milestones), with clawback/march-in	8-K ¹²¹

Source: company announcements^{30 20 121}, SEC Form 4¹²³

7.6.2 A second technology-roadmap slip is the highest-impact of four further risks

Four more risk items follow, in impact order.

- **First, a second technical roadmap slip: if 4Q26 fidelity remains below 99.5% with no new timeline committed, the valuation framework collapses to cash plus option value — downside of -50% to -89%^{132 232}.**
- **Second, policy dependence:** if NQI reauthorization — S.3597/H.R.8462, through both committees but not yet law⁴⁷ — stalls again, the collaborative-R&D line keeps shrinking, having already demonstrated -34.3% in FY2025³⁰, and missed CHIPS milestones cut tranches or even trigger clawbacks¹²¹. On policy direction, Jefferies says two executive orders upgraded quantum from priority to mandate — a deadline to deploy large-scale quantum computers by 2028 plus an earlier PQC migration — and RGTI sits in the beneficiary sequence⁹¹, but direction does not override terms.
- **Third, single-customer, single-order concentration:** Customer A was 64% of Q2'26 revenue²⁰, C-DAC's \$8.4M is 36% of FY2026 consensus, and an installation or acceptance delay directly knocks out the full-year expectation^{179 132 232}.
- **Fourth, sector beta:** a beta of 2.01 and short interest at 19.8% of float, the top of the sector¹, amplify declines when the sector de-rates.
- **The mitigants are cash of \$541.3M plus zero debt²⁰**, with the runway spanning management's ~three-year advantage window²³², and system prices that rise with qubit count while per-qubit cost falls — from the Novera 9Q at \$0.9M to the 108Q at \$8.4M, a total-price multiple of 9.3x against qubits at 12x, and per-qubit pricing from \$100k to \$78k^{30 179}. If the 336Q and 1,000Q nodes deliver, the revenue slope could open non-linearly.

Exhibit 61: RGTI catalysts and decision points for the next 12 months (all short-tested)

Catalyst	Timing	Bull logic	Bear test and fallback
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99.5% 2Q fidelity goal delivered (108Q)	By 2026-12 (4Q26 call; sell-side timing) ¹³²	Roadmap credibility repaired; chiplet falsification lifted	Absence is kill-switch #1; Jefferies states it as the Hold-rating premise ¹³²
C-DAC \$8.4M revenue recognition	4Q26 ^{179 132}	Unit price validated; 36% of FY26E revenue ²³²	Installation/acceptance delay knocks out FY26 consensus; fallback: 1H27 recognition, but guidance credibility damaged
CHIPS OTA tranche disbursements (\$29.9M/\$26.2M milestones)	2026Q4–2027 ¹²¹	Cash and endorsement both increase; the three R&D tasks hit the chokepoints directly	Missed milestones clawback plus endorsement reversal; funds are project-restricted
NQI reauthorization enacted	2026Q4–2027 (lame-duck session) ⁴⁷	The first attribution of the FY2025 revenue decline is removed	Another stall keeps the collaborative-R&D line shrinking ³⁰
QBI Stage C list (announced; not selected)	2026-10-07 ²⁷⁰	A surprise re-entry repairs the endorsement	The 2026-10-07 list landed without RGTI ²⁷⁰ ; the absence caused no incremental damage
New system POs and the 336Q node	Ongoing	Evidence that system sales go from one-off to product line	A quarter with no PO halves revenue directly (RPO only \$2.7M) ²⁰
Quanta/HPE collaboration deepens (TangleLab 2027 deployment)	2027 ^{30 177}	Hybrid quantum-classical supercomputing narrative lands	The commitment is framework-level, with no binding timetable

Source: company announcements^{30 20 177 179 121}, Jefferies¹³², grantedai¹⁶⁸, congress.gov⁴⁷

7.6.3 Reaching 99.5% opens the \$22–\$44 upside paths; missing it again points to Jefferies Downside at \$7

[Decision point] 108Q two-qubit gate fidelity by end-2026 is RGTI's bull-bear dividing line (expected on the 4Q26 earnings call; the end-2026 timing is sell-side framing; historical anchor: the 36Q node delivered the "error-rate halving"³⁰; full catalyst table in Exhibit 61). Reaching 99.5% lifts the falsification of the chiplet scaling fidelity cost and, combined with C-DAC recognition, switches valuation to the balancing upper bound of \$22 or even the Jefferies Upside path of \$44^{132 233}.

- **Still below 99.5% with no new timeline committed means a second bankruptcy of roadmap credibility** — downgrade to the "government research supplier" framework at Jefferies Downside \$7¹³².
- Supporting stop-loss triggers (quantified):
 - C-DAC's \$8.4M not recognized in 4Q26¹⁷⁹
 - two consecutive quarters with no new system PO and RPO below \$2M²⁰
 - CHIPS clawback or OTA termination¹²¹
 - the stock breaking \$12.53 (52-week low) with the sector breaking down in sympathy¹
- On the reverse trade: delivery of 99.5% would be the core confirmation for an upgrade; the QBI Phase C re-entry path was falsified on 2026-10-07 (RGTI was not selected²⁷⁰), leaving fidelity as the only remaining leg of the dual-confirmation setup

8. QuantumCTek deep dive: 84.3% of 2026H1 quantum-Computing revenue comes from the controlling shareholder; the second curve is deeply bound to shareholder procurement

Key points

- FY2025 revenue rose 22.53%, and quantum computing overtook communication in 2026H1: quantum-computing revenue reached 53.6% of the total in 2026H1, overtaking quantum communication for the first time^{56 88}
- 84.3% of 2026H1 quantum-computing revenue comes from China Telecom: the "second curve" runs through the controlling shareholder's own system²³⁴
- The FY2025 turnaround came entirely from grants and wealth-management income: non-recurring items ran 9.1x net income^{56 235}
- The quantum-communication base business is stagnant: FY2025 revenue fell 4.10% and the metro-network city count stayed flat at 40+ for two periods^{56 88}
- Sell-side pricing language has degenerated: neither of the two post-interim-report commentaries (Galaxy/Southwest) gives a target price any longer, and the same Southwest analyst cut 2026E revenue from 538M to 366M within six months^{57 209 130}
- We believe QuantumCTek today is a "reporting structure dominated by China Telecom's annual capex and underpinned by subsidies" rather than commercialization being delivered: the current price corresponds to 89x PS²³⁹; we lean toward an Overweight (cautious) rating with a target range of ¥350–470

QuantumCTek is the doubly scarce asset in the A-share quantum narrative

QuantumCTek is the A-share quantum narrative's dual scarcity listing — "first quantum-communication stock" plus "first domestic quantum-computing system stock" — with FY2025 revenue of ¥310M, up 22.53%⁵⁶, and quantum-computing revenue reaching 53.6% of the total in 2026H1, overtaking quantum communication for the first time.⁸⁸ Three layers of breakdown, however, change the picture completely: 84.3% of 2026H1 quantum-computing revenue comes from the controlling-shareholder China Telecom system.²³⁴

- The entire FY2025 accounting turnaround came from government grants and wealth-management income**, with non-recurring items at 9.1x net income.^{56 235}
- The quantum-communication base business shows stagnation**, with FY2025 revenue down 4.10% and the metro-network city count flat at 40+ for two periods.^{56 88}
- The sell-side pricing language is degrading**: neither of the two post-interim reviews, from China Galaxy and Southwest, gives a target price, and the same Southwest analyst cut 2026E revenue from ¥538M to ¥366M within six months.^{57 209 130}
- We believe QuantumCTek today is not "quantum computing commercialization delivered" but a "reporting structure dominated by China Telecom's annual capex and underpinned by subsidies"; on the effective consensus 2026E revenue of 366M^{57 209}, the current price corresponds to 89x PS²³⁹; we lean toward an Overweight (cautious) rating with a target range of ¥350–470, with the upper end contingent on China Telecom procurement beating expectations and system-external orders landing**

Exhibit 62: QuantumCTek standard company page (¥M; FY-A/FY26E effective consensus)

Item	FY2024A	FY2025A	FY2026E	Why
Revenue (¥M)	253.4	310.5	366 (China Galaxy/Southwest effective consensus ^{57 209})	The only listed platform of China's national quantum-information team: SASAC as ultimate controller, 40.43% voting rights in concert^{56 128}, and "the sole corporate entity of the Zuchongzhi series"⁸⁸
Net income (¥M)	-31.8	+5.4	4–6 (same sources ^{57 209})	QKD engineering incumbency: the 12,000+km backbone network and 40+ city metro networks all use the company's products, with a full family of commercial-cryptography certifications⁸⁸
Net income ex-non-recurring (¥M)	-62.6	-43.5	—	
EPS (¥, basic)	-0.40	0.05	0.04–0.05 ^{57 209}	Net cash of ¥2.492bn plus zero interest-bearing debt^{88 219}, the thickest absolute cash runway in the sector (though the thinnest on market-cap/cash, see Section 4)

Valuation

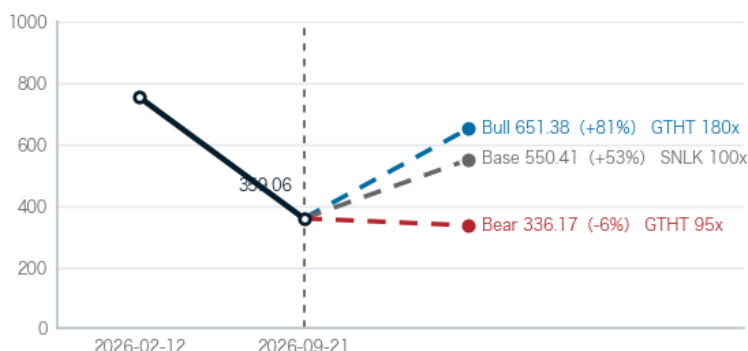
P/S TTM
103.6x
(2026-10-08²⁹⁰)¹ (PE
TTM of
about 5,400x
distorted by
marginal
profitability¹)

Upside

Bull-case anchor: system-external whole-machine orders land (overseas 25-qubit confirmation plus new buyers) with China Telecom procurement sustained, the scarcity premium holds, and the sell-side TP upper end is Guotai Haitong's ¥651.38 (+107%)¹¹²

Downside

Bear-case anchor for the downside scenario: related-party machine acceptance breaks down plus subsidies fade, PS switches toward 40–60x, and a market cap of ¥13–20bn corresponds to ¥126–194 per share (-38% to -60%)²³⁷

QuantumCTek valuation percentile band (¥; 52-week intraday basis)Source: Yahoo Finance¹, Guotai Haitong^{112 111}**Exhibit 63: QuantumCTek risk-reward two-piece set (¥; sell-side scenario and rating basis)****QuantumCTek sell-side target-price scenario fan (¥; vintage marked)**Source: Guotai Haitong^{112 111}, Sinolink²¹², Yahoo Finance¹**QuantumCTek domestic rating distribution (reports; n=14, full past-year set)**

■ Buy/OW ■ Hold ■ Not rated

Source: CGS²⁰⁹, SWSC^{57 130}, GTHT^{112 111 59}, Sinolink²¹², ifind¹¹

Risk-reward in one sentence: sell-side target prices have only one language left — "dynamic PS times current-year revenue" — and the same institution lifted the multiple from 82x to 180x within a year, making the multiple the sole source of target-price upside^{112 111 59}. Our target range of ¥350–470 corresponds to +11% to +49% versus the current price; the odds skew upward, and the single most important decision point is whether 2026 annual-report quantum computing non-related revenue can exceed ¥50M and include acceptance of at least one system-external whole machine. Source: Guotai Haitong^{112 111 59}, Sinolink Securities²¹², our calculations²⁴⁰

8.1 Business introduction and commercial mechanics: the QKD base has stalled; quantum computing switched on by "one system a year" of shareholder procurement

8.1.1 QuantumCTek's revenue structure has completed a historic swap

Quantum-computing revenue rose from 28.7% of FY2023 to 53.6% of 2026H1, overtaking quantum communication (40.1%) for the first time^{56 88} (Exhibit 64). Yet both lines share the same demand nature: policy and shareholder budgets.

- **On the quantum-communication line, FY2025 revenue was ¥140M, down 4.10%**, with production exceeding sales — 232 produced, 155 sold and 339 in inventory — and the metro-network city count flat at 40+ for two periods.^{56 88} The base-business stagnation signal has already occurred.
- **The quantum-measurement line contributed just ¥4.53M in 2026H1**, and the interim report does not disclose prior-year segment comparatives (evidence gap).⁸⁸
- **One whole machine a year, all sold to the controlling shareholder:** 2026H1 quantum-computing revenue was ¥66.22M (+18.34%), of which ¥55.8M was sold

to China Telecom Quantum Group (Tianyan-287 acceptance)^{56 88}; whole-machine sales follow a "one machine a year, all sold to the controlling shareholder" rhythm, with a single 504/287-qubit-class machine priced at ¥54–55.8M^{56 88} (see Exhibit 65 for the dual-basis related-party share series); Hexin Instrument's M&A inquiry response cites the same line item (¥120M in 2025, ¥66.222M in 2026H1²⁸⁵), corroborating the annual-report figures

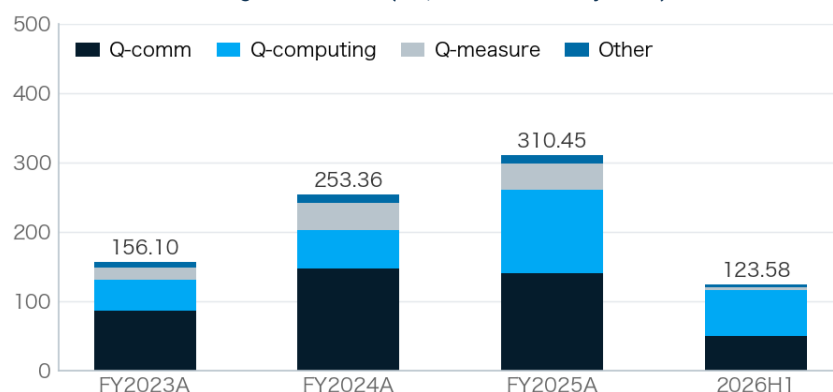
8.1.2 Contract and acceptance mechanics determine the strong seasonality of revenue

- **The company states that its main-business revenue concentrates in Q4, especially December⁸⁸.** Quarterly FY2025 net income ran -¥20.31M, -¥3.48M, -¥2.68M and +¥31.86M, with Q4 revenue alone reaching ~¥120M, or ~39% of the year.^{56 210}
- **All visible backlog sits with related parties (contract-performance table in Exhibit 67):** major sales contracts pending performance at end-FY2025 totaled ¥165.5208M including tax — QKD equipment contracts of ¥37.3396M, QKD procurement contracts of ¥65.1272M and the 287 project at ¥63.0540M.⁵⁶
- **Stripping out the 13% VAT, the 504 project's contract value maps exactly to FY2025 related-party sales of ¥54M**, and the 287 project to 2026H1's ¥55.8M, to the decimal.²³⁵
- **The channel is 100% direct sales⁵⁶**, and customer economics is government and SOE budget-based procurement with long collection cycles — receivables turnover of 1.50x/yr and inventory turnover of 0.59x.⁵⁷
- **The ¥288M of inventory at end-2026H1 includes products shipped but not yet acceptance-settled**, attributed by the company to "some delivered projects not yet completing customer acceptance".²⁰⁶

8.1.3 Real demand outside the system is thin — a fact, not a data gap

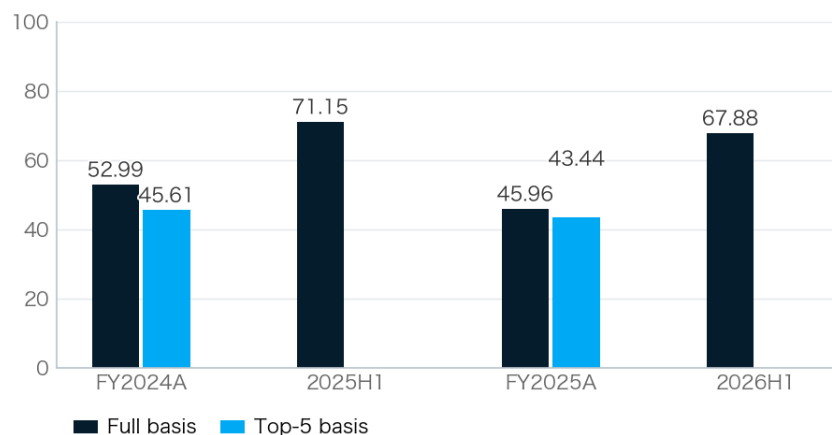
- **The full list of quantum-computing buyers outside the China Telecom system has only three categories**. The first is the Hefei Advanced Computing Center's "Chaohu Mingyue" 200-qubit project, awarded at ¥45M with acceptance completed in 2025H2 as one of three lots, the other two going to Origin Quantum and CIQTEK.^{223 56}
- **The second is an unnamed overseas customer's 25-qubit system export**, still "in progress" across two periods with no revenue recognized.⁸⁸
- **The third is a component-level tail of universities and research institutes**, spanning the 1,000-qubit M&C system ez-Q Engine 2.0, dilution refrigerators, cryogenic components and single-photon detectors.^{88 217}
- Since 2025-09, no new system order outside the system has been detected in public channels.
- **Industry tender monitoring also shows 2026 awards all landing inside the China Telecom system**, a single source pending verification.²²⁸
- In the same period, the market-based quantum-computing procurement in finance — Taiping Jinke et al. — was won by Bose Quantum.²²⁴
- **The "quantum-computing ramp" narrative must be marked down one grade:** the ramp is real, but the buyer is the shareholder.

Exhibit 64: QuantumCTek segment revenue (¥M; FY-A/H1 industry basis)



Source: Company filings^{56 88 201}

Exhibit 65: QuantumCTek related-party sales share, dual-basis series (%; annual/interim report basis)



Source: Company filings^{56 88 201}, Report calc.²³⁴

Note: the top-five-customer basis is disclosed verbatim in annual reports (FY2024 45.61%, FY2025 43.44%)^{56 201}; the full basis is the line-by-line sum of the related-party purchase/sales tables (FY2024 52.99%, FY2025 45.96%, 2025H1 71.15%, 2026H1 67.88%)²³⁴. 2026H1 declined 3.3pct YoY rather than setting a new high; H1 shares run systematically above full-year (2025H1 71.15% vs FY2025 45.96%)²³⁴. The related-party share of the quantum-computing business was 84.3% in 2026H1 (Dongfang Zhongke's current-period amount is 0, so the full basis is the same 84.3%)²³⁴, and the China Telecom system was 63.15% of total revenue²³⁴.

8.2 Moat: installed base, identity exclusivity and shareholder-channel lock-in — none related to physical metrics

8.2.1 QuantumCTek's moat does not lie in quantum-computing physical metrics

The qubit-count and fidelity records belong to USTC's Zuchongzhi team, not the company, which itself says "the hard part is maintaining fidelity while scaling qubit count".²⁰⁶ The moat sits in three places.

- **The first is quantum-communication engineering credentials and installed base:** the 12,000+km fiber quantum-secure-communication backbone network, multiple satellite-to-ground nodes and 40+ city quantum metro networks all use the company's products.⁸⁸
 - Four product families, including miniaturized polarization-encoded QKD, were first to pass commercial-cryptography testing and certification.⁸⁸
 - The company holds 731 cumulative granted patents — 387 inventions, including 26 international — with the Derwent quantum-communication patent family ranking first globally and leadership of national and ITU-T international standards.⁸⁸
 - A third-party estimate puts its domestic QKD market share at ~90%, a Sealand Securities single source used at reduced weight.²¹⁰
- **The second is the exclusive engineering channel for superconducting systems conferred by the "sole corporate entity of the Zuchongzhi series" identity:** Tianyan-504, China's highest qubit count in a single system, and Tianyan-287, the same model as Zuchongzhi 3, completed acceptance, a self-use 294-qubit platform was built, and the Hefei 200-qubit project was delivered.^{56 88}
- **The third is the shareholder-as-customer channel lock-in after SOE control:** China Telecom Quantum Group holds 21.86% and controls 40.43% of voting rights in concert^{56 128}, nominating 4 non-independent directors of the 11-seat board (7 non-independent, incl. 1 employee director, plus 4 independent), including the chairman.^{128 88}

8.2.2 Each of the three moat layers has a decay path

- **The QKD installed base decays through PQC substitution:** PQC reuses existing infrastructure at near-zero marginal cost, making QKD non-essential in most scenarios. The company's own response is to reposition from QKD to "quantum security" — QKD fused with classical cryptography — and it discloses that the network is "evolving from a single communication-security technology network toward a new-type information-security infrastructure".⁸⁸ Our rating of the PQC substitution threat: low-to-medium over 5 years and medium-to-high over 10, a slow variable that structurally caps QKD's long-term TAM ceiling.²³⁷
- **Identity exclusivity decays if the USTC system's roadmap progresses more slowly than expected or the superconducting route is eliminated** — a subjective 3–5-year break probability of 15–25%²³⁷ — or if China Telecom diversifies suppliers: Origin Quantum, also a Hefei superconducting system maker with its own domestic supply chain, could dilute the controlling-shareholder benefit if it enters China Telecom's centralized-procurement shortlist.²³⁷

- **Shareholder-channel lock-in decays with the procurement rhythm itself:** quantum-computing product revenue once fell 29.73% in FY2024, and a single large project's acceptance timing can swing revenue by $\pm 3x$.^{56 201}

8.2.3 The component line is the most picks-and-shovels part of the moat

The evidence for a third-party component ramp-up, however, currently consists of delivery facts without revenue splits. "Picks-and-shovels" is a direction, not a validated second curve.

- **The ez-Q F1500 dilution refrigerator tested at internationally advanced levels for its class**, and the new single-core model reaches internationally advanced cooling power.^{56 88}
- **The 1,000-qubit-scale superconducting M&C system keeps upgrading** and has been delivered to universities and research institutes.⁸⁸
- Cryogenic components, single-photon detectors and light-source products already support multiple universities and institutes.⁸⁸
- **The quantum-computing product gross margin of 38.58% in FY2025 sits well below the quantum-communication product's 73.07%⁵⁶**, implying a system unit price of ~¥11.84M/unit on a mixed basis including components.^{56 235}

8.3 Financial analysis: the turnaround comes entirely from grants and wealth-management income; on an ex-non-recurring basis the operation is not yet profitable

8.3.1 Every profit since QuantumCTek's listing has come from non-operating items

FY2025 net income of +¥5.3919M rests on non-recurring items of ¥48.9417M — government grants of ¥33.9501M, wealth-management income of ¥12.1772M and fair-value changes of ¥1.5625M, among others — some 9.1x net income, and net income ex-non-recurring was -¥43.5497M.^{56 235}

- **Government grants across all categories within other income totaled ¥42.9245M⁵⁶**, and the deferred-income government-grant pool closed at ¥105.06M unamortized — an opening ¥90.23M plus new grants of ¥45.86M less ¥31.03M transferred — so the income statement will remain grant-cushioned for the next 2–3 years.⁵⁶
- **The company itself admits grant dependence:** it states in its risk factors that it "is dependent on government grants".⁵⁶
- **In 2026H1, other income fell 53.64% YoY, from ¥23.01M to ¥10.67M⁸⁸:** the grant fade has begun.
- **In 2026-06 the company announced a single government grant of ¥22.02M**, split between ¥15.40M asset-related and ¥6.62M income-related. , an incremental refill of the deferred pool, not demand validation.
- **Full-year net income most likely returns to loss** if 2026 grants stay low.
- **Analysis of QuantumCTek must therefore use the ex-non-recurring basis;** headline net income cannot be used in valuation (Exhibit 66).

8.3.2 The operating-level constraint is the breakeven threshold, not cash

- **At end-2026H1, monetary funds were ¥568M plus trading financial assets of ¥1.924bn** — broad cash of ¥2.492bn with zero interest-bearing debt^{88 219}, a static runway above 20 years at the current burn.²³⁵
- **The real threshold is the expense base:** FY2025 selling expenses of ¥30.87M, administrative expenses of ¥88.99M and R&D of ¥118.71M sum to roughly ¥239M, which against a 51.44% gross margin on the consolidated basis gives an operating-breakeven revenue of ~¥460M²³⁵, or 1.5x FY2025 actual revenue.
- **Self-sustaining operations become possible only in 2027**, on effective-consensus 2027E revenue of ¥473–478M^{57 209} (the 2026E attainability chain is in Exhibit 69).
- **Cash-flow quality is also weak:** operating cash flow was negative in three of four years — FY2023 at -¥4.05M, FY2025 at -¥10.8955M and 2026H1 at -¥38.5041M^{56 88 201} — and inventory of ¥282M at end-FY2025 is ~1.87x FY2025 COGS, so pre-stocking ahead of the ramp eats working capital.⁵⁶
- The cash-collection ratio of 1.13 in FY2025 is acceptable.²³⁵

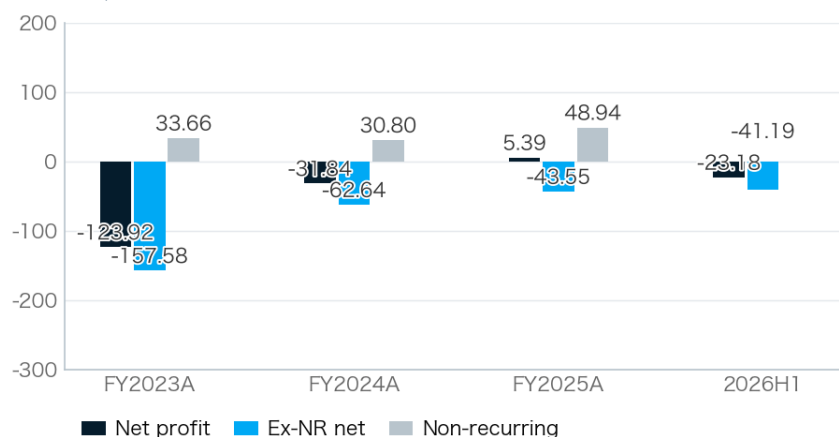
8.3.3 Operating leverage has yet to appear

- **In 2026H1, revenue grew +1.83% against COGS up 17.07%, selling expenses up 28.38% and R&D expenses up 0.19%⁸⁸**, and the gross-margin decline is mainly

attributed to the changing sales-product mix, a rising share of low-margin quantum computing.^{88 56}

- **FY2025 main-business gross margin was 52.05%, down 3.12pct YoY⁵⁶**, and the segment gross-margin gradient runs from quantum communication at 66.27% (73.07% on the product basis) through technical services at 45.83% (product basis) and quantum measurement at 43.66% to quantum computing at 38.07% (38.58% on the product basis).⁵⁶
- **Segment margins for 2026H1 are undisclosed (evidence gap)**, so H1 margin attribution can only use the overall basis.
- The fastest-growing business is the one with the lowest margin and the highest related-party content.
- **R&D intensity stays high:** FY2025 R&D investment of ¥123M was 39.70% of revenue, at a capitalization rate of 3.68%⁵⁶, and reached 41.04% in 2026H1.⁸⁸
- **Expense ratios could be significantly diluted for the first time** if 2026H2 revenue delivers on effective consensus, implying ~¥242M in H2²⁴⁰ — the bulls' only near-term verification point on the statement side.

Exhibit 66: QuantumCTek net income / ex-non-recurring net income and non-recurring items (¥M; FY-A/H1)



Source: Company filings^{56 88 201}, Report calc.²³⁵

Exhibit 67: QuantumCTek major sales-contract performance table (¥10k, incl. tax; FY2025 annual-report basis)

Contract subject	Counterparty	Total contract value	Performed	Performed this period	Pending
QKD hardware/software equipment etc.	China Telecom Quantum Technology	8,106.83	4,372.87	757.30	3,733.96
QKD product procurement	China Telecom Quantum Group	7,654.18	1,141.46	1,141.46	6,512.72
Superconducting QC 504 project	China Telecom Quantum Group	6,102.00	6,102.00	6,102.00	0
Superconducting QC 287 project	China Telecom Quantum Group	6,305.40	0	0	6,305.40

Source: company announcements⁵⁶, KIMI estimates²³⁵

Note: the 504 project's ¥61.02M ÷ 1.13 = ¥54M, exactly matching FY2025 related-party sales of quantum-computing products; the 287 project's ¥63.0540M ÷ 1.13 = ¥55.8M, exactly matching 2026H1 related-party sales²³⁵. Pending performance totals ¥165.5208M incl. tax ≈ ¥146M ex-tax — the visible backlog for 2026 revenue, all with the controlling-shareholder system⁵⁶. Also note: "China Telecom Quantum Technology" and "China Telecom Quantum Group" are two short forms of the same legal entity (China Telecom Quantum Information Technology Group Co., Ltd.) in the annual-report original text; the table follows the original wording.

8.3.4 The visible backlog covers about 40% of 2026E effective consensus, and we expect its FY2027 contribution to approach zero

The same math applies to QuantumCTek (year-by-year coverage table in Exhibit 46C).

- The ~¥146M ex-tax backlog on hand⁵⁶ covers ~40.0% of the FY2026 effective consensus of ¥366M^{57 209}, in two pieces: the 287 project's ¥55.8M was already recognized in 2026H1²³⁵, and the remaining ~¥91M — QKD related-party contracts on hand of ¥102.4668M incl. tax, divided by 1.13^{56 235} — covers ~37.4% of the implied H2 revenue gap of ¥242M.²⁴⁰
- Roughly 60% of the effective consensus therefore still depends on the component tail, new metro-network signings and Q4-loaded acceptance, and this report's own attainability chain tops out at ¥323M even in its optimistic case (Exhibit 69), below the ¥366M mark.

- **The FY2027 decay is steeper:** if the current backlog is fully recognized within 2026, we expect its contribution to FY2027 effective consensus of ¥473–478M^{57 209} to approach zero, and even extrapolating the "one system a year" rhythm — ~¥56M for the next-generation machine, with no contract in hand, an evidence gap — naive coverage is only ~12%.
- **Contract liabilities are the leading-indicator yellow light for exactly this decay:** down 12.3% vs year-end from ¥75.27M to ¥66.02M.⁸⁸
- **Unlike IONQ's "thick numerator, thicker denominator," QuantumCTek is "thin numerator, single buyer":** the entire ~¥146M backlog sits with the controlling-shareholder system⁵⁶, so the coverage reading itself is not demand validation.

8.4 Valuation: the sell side has degenerated into "unvaluable"; the current price is 89x PS on the effective consensus (2026-10-08²⁹⁰)

8.4.1 QuantumCTek's sell-side valuation frameworks are failing, which is itself pricing information

- **Southwest Securities' interim review gives neither a target price nor a rating, with valuation degraded to a schedule of multiples** — 2026E PE of 9224x and PS of 103x — effectively cannot be valued.⁵⁷
- No institution has published a target since the interim report.
- The pre-interim targets were Guotai Haitong's in 2026-04 and Sinolink's in 2025-10.²¹²
- **Guotai Haitong's TP of ¥651.38 equals 2026E revenue per share of ¥3.62 times a 180x dynamic PS**, and the same team raised the multiple three times within a year, from 82x to 95x to 180x, while cutting 2026E revenue from ¥493M to ¥372M, down 25%: the multiple is the sole source of the target increase.^{112 111 59}
- **Its comps-table mean is 125x** (IONQ 44x, D-Wave 117x, Rigetti 212x), QuantumCTek itself is already at 152x, and 180x is another 18% above a level already 22% above the comps mean, the premium justified only by the qualitative "scarcity + 15th Five-Year Plan".¹¹²
- Sinolink Securities gives 100x 2026 PS and a TP of ¥550.41.²¹²
- **Domestic valuation methodology is uniformly "dynamic PS times current- or next-year revenue"**, with multiple selection of 82x, 95x, 100x or 180x having no shared anchor.^{57 112 212}

8.4.2 Consensus must be cleaned before use

The iFind aggregated mean has been revised down since the interim report to 2026E revenue of 366M (2026-10-09²⁸⁹), converging with the cleaned effective anchor; the earlier 440M¹¹⁵ was systematically inflated by stale pre-interim values (see Exhibit 68 for the by-institution scatter^{211 216 218}): only Galaxy and Southwest updated after the interim report, independently converging on 366M^{57 209}, and the aggregate's follow-through validates the cleaning.

- **The iFind mean overstates FY1, FY2 and FY3 revenue by roughly +20%, +43% and +67% respectively**, and FY1 net income by ~2.3–3.5x.²⁴⁰
- The effective consensus is 2026E revenue of ¥366M, 2027E of ¥473–478M and 2026E net income of ¥4–6M.^{57 209}
- **Note that the two converged on almost the same point value because both worksheets anchor on the same order book** — the 287 project's ¥55.8M plus the QKD backlog — so the "consensus" here is closer to arithmetic on one backlog than to independent judgment, and should be cited at reduced weight.²⁴⁰
- **The current price implies 2026E PS of 89x:** cross-checking the price-implied expectations against the effective version (looping back to Section 5): the current price corresponds to 2026E PS of 89x and 2028E PS of 50x (2026-10-08²⁹⁰)²³⁹; reverse-engineering from a 30x mature-growth-stock PS, 2028 revenue would need to reach 1.7x the effective consensus²³⁹ — the froth is one notch higher than the apparent reading on the iFind basis

8.4.3 The four-outcome expected value sits below the entire target range, at +1% from the current price

Our target range of ¥350–470 is path-differentiated.

- **The lower bound of ¥350 corresponds to the "QKD platformization plus related procurement sustained at one system a year" path:** 98x 2026E effective-consensus PS, roughly 80% of the comps mean of 125x, reflecting the related-party-mirror discount, the QKD top and grant dependence while retaining part of the scarcity premium.²³⁹

- The upper bound of ¥470 corresponds to the "orders outside the shareholder system land plus continued procurement of the next-generation system" path: 132x 2026E PS.²³⁹
- Probability-weighted expected market cap of about ¥32.8bn, roughly in line with the current price: the four-outcome probability-weighted expected market cap is about ¥32.8bn (about ¥319 per share), +1% versus the current price, sitting below the ¥350–470 target range; the range midpoint of about ¥410 corresponds to about +30%, so the expected value is below the midpoint, reflecting the fatter combined probability of downside outcomes
- The falsification case maps to PS of 40–60x — related-party acceptance breaks plus grants fade — on revenue falling back to a ~¥320–340M denominator, a market cap of ¥13–20bn and a share price of ¥126–194.²³⁷
- On the 2026E effective consensus of ¥366M, the denominator implies PS of 35.5–54.6x, or ¥126–194, a near-term valuation-switch basis distinct from the terminal mapping in Exhibit 74.
- On the bottom-up multiple argument, QuantumCTek deserves a discount, not a premium: comps are IONQ, D-Wave and Rigetti, all pure plays¹¹², and the discount applies because 84.3% of its 2026H1 quantum-computing revenue comes from the shareholder's own system, QKD is already negative and profit relies on grants.^{56 234 235}
- The 98–132x granted is the residual pricing of A-share scarcity and ¥2.492bn of net cash.⁸⁸

Exhibit 68: QuantumCTek 2026E revenue forecasts by broker (¥100M; vintage-colored scatter)

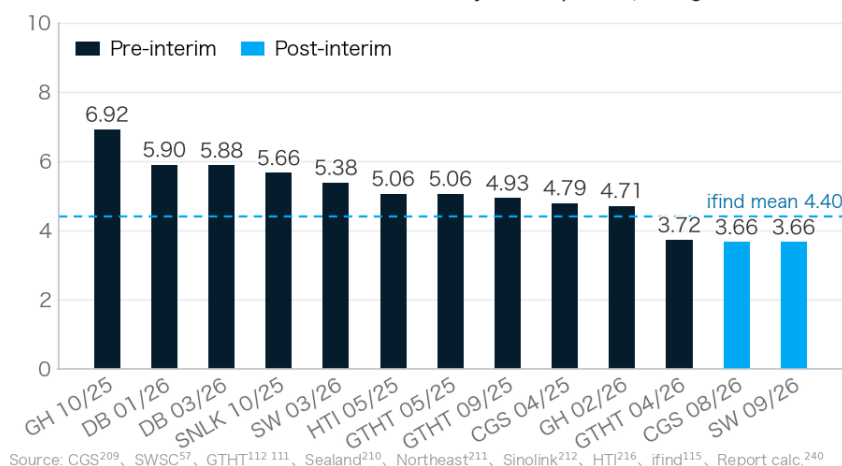


Exhibit 69: QuantumCTek 2026E revenue attainability derivation chain (¥100M; assumption-chain scenario arithmetic)

Line	Assumption/in put	Derivation	Conservative	Base	Optimistic
H1 realized revenue	Interim actual 1.236 ⁸⁸	Actual	1.24	1.24	1.24
next-generation system (no contract on hand; evidence gap)	—	—	0.00	0.00	0.00
QKD related-party contracts on hand	Pending ¥102.4668M incl. tax ÷ 1.13 ≈ 0.91 ^{56 235}	Recognition rate 40%/70%/100 %	0.36	0.63	0.91
Components and services tail	H1 pace 0.68 ⁸⁸	Flat to slightly up QoQ	0.45	0.68	0.80
New metro-network contracts	Three 2026 contracts ¥52.1416M incl. tax.	Current-period recognition 0%/30%/60%	0.00	0.14	0.28
FY2026 revenue total	H1 + four H2 items	Range result	2.05	2.69	3.23

Source: company announcements^{56 88}, KIMI estimates²³⁵

Note: on the above assumption chain, the Southwest/China Galaxy ¥366M^{57 209} exceeds the optimistic case by ~¥40M, requiring 100% recognition of QKD on-hand contracts and a Q4-concentrated recognition rhythm stronger than the FY2025 repeat; the pre-interim ¥538M¹³⁰ implies ~¥414M in H2 (+119% YoY) with no corresponding order book — falsified by the interim report²⁴⁰. This table is assumption-chain scenario arithmetic, not a KIMI earnings forecast.

8.5 Management credibility: precise earnings pre-announcements and honest attribution, but negative returns on raised capital — B+

8.5.1 QuantumCTek management's credibility is strongest on short-term verifiable items

- **The 2025 earnings pre-announcement matched actuals precisely:** it pre-announced revenue of ¥310M and net income of ¥5M for the turnaround, against actual revenue of ¥310M and net income of ¥5.3919M.^{210 56}
- **Attribution habits are honest:** the 2025 annual report attributes the turnaround explicitly to "revenue growth in quantum computing and increased government grants and investment income recognized in current profit or loss"⁵⁶, so management itself wrote government grants into the turnaround attribution rather than packaging non-recurring items as operating improvement.
- **Technology delivery commitments have a high hit rate:** the Tianyan-504 acceptance, the Tianyan-287 acceptance, the Hefei 200-qubit delivery and the self-use 294-qubit platform all landed on schedule.^{56 88}
- In the investor relations activity record disclosed on 2026-09-24, management offered two formulations worth archiving: ① after quantum computing revenue's share exceeded that of quantum communication in the first half, the "one body, two wings" strategy is unchanged and quantum communication remains the core base business; ② its industry view is that "special-purpose quantum simulators will develop relatively quickly over 3–5 years, while general-purpose fault-tolerant quantum computers are at least 10 years away"²⁸⁷ — the latter is consistent with the company's stance of "endorsing via research credibility while making no LQ commitments of its own", and provides a company-side calibration for long-dated expectations
- **That said, all of these carry "research/government/related-party" labels**, and the only commercial-attribute overseas 25-qubit system has been "in progress" across two periods.⁸⁸
- **The company itself makes no logical-qubit or error-correction roadmap commitments**, sharing the research credibility of the USTC Zuchongzhi system through its "sole corporate entity" identity.⁸⁸

8.5.2 The weak side is the capital-allocation record

- **The core IPO fundraising project, the "quantum-communication network equipment project," concluded in July 2023 with cumulative realized benefits of -¥20.8403M.** IPO proceeds of ¥227.5998M were repurposed, with permanent working-capital supplementation increased from ¥121M to ¥222M.⁸⁸
- **Governance commitments from the China Telecom investment have been fulfilled item by item:** the board-nomination arrangement delivered, Zhang Wenqiang, legal representative of China Telecom Quantum Group, was elected chairman on 2026-02-06, and the 36-month lockup is being honored.^{128 88}
- **But the signing status of the core team's five-year service contracts has had no follow-up disclosure**, an evidence gap.¹²⁸
- **Three related-party sales contracts announced in 2026 totaling ¥52.1416M, including No. 2026-035 at ¥37.707M,** were priced "through multiple rounds of negotiation between the parties," with no third-party price comparison. : the fairness of related-party pricing is a long-term governance watch item.
- **The composite rating is B+:** seasonality rhythm, R&D intensity and metro-network buildout progress can be used directly, while the annual report's "operating plan" is qualitative without numeric anchors and cannot be used in valuation.⁵⁷

8.6 Risks and decision points: the single most fragile variable is China Telecom's system-procurement rhythm

8.6.1 QuantumCTek's risk structure is simpler than the two US names'

No warrants, no ATM, no burn anxiety — all risk converges on one question: is the shareholder's demand market demand? The second curve, in our view, has not yet proven that it is. 84.3% of 2026H1 quantum-computing revenue comes from the controlling-shareholder system²³⁴, on a one-system-a-year rhythm running from ¥54M to ¥55.8M.^{56 88}

- **If China Telecom's pace changes, revenue can go negative immediately:** if China Telecom's capex or acceptance cadence shifts in any given year, quantum computing revenue can turn negative that same year — FY2024's -29.73% on the quantum-computing product sub-line already demonstrated this (the industry-basis figure was +26.36% that year)²⁰¹. Separately, note: as of the report date, the company has not disclosed a third-quarter earnings pre-announcement or flash report (not mandatory on the STAR Market²⁸⁷); the next fundamental validation point is the formal third-quarter report disclosure due in late October (the 10th month)

- **Contract liabilities are a yellow light for the on-hand-order leading indicator:** down 12.3% vs year-end from ¥75.27M to ¥66.02M.⁸⁸
- **2026 revenue visibility is higher than the 1H headline reading suggests:** mitigants include about 146M of contracts on hand (ex-tax)⁵⁶, a deferred-grant pool of 105M⁵⁶, and 2.492bn of net cash⁸⁸. Latest signal: on 2026-09-30, China Telecom Quantum Group posted a direct-procurement notice for a superconducting quantum computer (posted 2026-09-30; amount and supplier undisclosed; the two stated reasons — "supporting related enterprises within the group" and "only 1 qualified supplier" — point strongly to an intra-system procurement, an inference pending confirmation by the award announcement²⁸⁶) — the first empirical signal of "one system per year" in 2026Q4, but the buyer is still the shareholder;

Exhibit 70: QuantumCTek catalysts and decision points for the next 12 months (all short-tested)

Catalyst	Timing	Bull logic	Bear test and fallback
2026Q4 concentrated revenue recognition and annual report	2027-01 to 03	Q4 is ~39% of the year ^{56 210} ; effective consensus of ¥366M implies strong Q4 growth ^{57 209}	Acceptance rhythm is administratively uncontrollable; a miss switches valuation below PS 60x ²³⁹
China Telecom Quantum Group's direct-procurement notice for a superconducting quantum computer	Posted 2026-09-30 ²⁸⁶	The first system procurement signal of the Q4 tender season	Amount and supplier undisclosed; not counted until the award announcement lands; the buyer remains within the shareholder system
2026 third-quarter report	Expected in late 2026-10 ²⁸⁷	Interim validation of the full-year 366M valid consensus	No precedent for earnings pre-announcements (not mandatory on the STAR Market); the third-quarter report is not itself a decision point
Overseas 25-qubit system delivery recognition	2026H2 ⁸⁸	First commercial-attribute system export, opening non-related revenue	"In progress" across two periods; sensitive-technology export-control risk; fallback: further delay zeroes the overseas narrative
China Telecom's 40+ city metro-network expansion and new centralized procurement	Rolling。	Three related-party contracts of ¥52.14M already announced in 2026	Price and rhythm set unilaterally by the shareholder; volume may rise while price falls。
Quantum industry fund (¥1.5bn) landing	2026H2–2027 ⁸⁸	Company contributes ¥300M for a 20% stake, positioning in the value chain	Still in approval/filing; delay is sentiment-only
15th Five-Year Plan quantum programs and major project tenders	2026–2027 ⁸⁸	Quantum technology tops the future-industries list	A budget line's existence does not fix its rhythm; valuation beta falls with the sector
2028-01-03 lockup expiry (21.86%)	2028-01-03 ^{128 221}	Reverse catalyst	China Telecom is a strategic controller and unlikely to sell, but the float theoretically expands 28%, pressuring valuation from 6 months ahead

Source: company announcements^{56 88 128} , Southwest Securities⁵⁷, China Galaxy Securities²⁰⁹, Sealand Securities²¹⁰, East Money²²¹, KIMI estimates²³⁹

8.6.2 Related-party revenue interruption ranks first among six risks by impact

The risk items, in impact order, run as follows.

- **First, related-party revenue interruption (medium probability, large impact):** the observable signal is a stoppage in routine related-party transaction announcements, and if China Telecom's system procurement pauses for one year, quantum-computing revenue could fall more than 40% that year (one full system is roughly half a year of the segment's revenue).^{56 234}
- **Second, government-grant fade (medium, large):** 2026H1 other income is already down 53.64%⁸⁸, and if full-year grants fall below ¥20M, net income turns negative.²³⁵

- **Third, QKD demand platformization (medium-high, medium):** quantum communication is already down 4.10% in FY2025⁵⁶, with the metro-network city count unchanged for two periods.⁸⁸
- **Valuation framework switch (probability medium-high / impact large):** 104x PS TTM (2026-10-08²⁹⁰)¹ rests on a dual-scarcity narrative, and the share price is already -58.2% from its peak (closing basis; in cadence terms, after a +9.0% pulse on 9-23 from IonQ's real-time error-correction catalyst, it has drifted lower with no company-level negative announcements in the interim^{287 290})¹ — sector beta is receding
- **2028-01 lock-up cliff (probability certain / impact medium):** the lock-up on 22,486,631 shares (21.86%) expires on 2028-01-02, with 2028-01-03 the first tradable day; the cost is ¥78.94 and the current price is about 4.0x cost (an unrealized gain of about +299%, 2026-10-08²⁹⁰)^{128 221 238}; the primary-market anchor has triple-jumped (IPO 36.18 → private placement 78.94 → current price 314.96)^{225 128 1}, meaning any repricing back to a primary-market anchor implies -75% downside
- **Sixth, technology-modality and identity devaluation (low-medium, very large):** if the superconducting error-correction route is falsified or the USTC system's roadmap progresses more slowly than expected, the "sole corporate partner" identity devalues.^{88 237} The signals would be Zuchongzhi milestones stalling or Origin Quantum entering China Telecom's centralized procurement.

8.6.3 Revenue at the ¥366M effective consensus validates the market-based handoff; below ¥360M confirms the bear case

[Decision point] The 2026 annual report is QuantumCTek's bull-bear dividing line. (2027-01 pre-announcement, full report expected 2027-03; historical anchor: FY2025's pre-announcement matched actuals precisely^{210 56}; full catalyst table in Exhibit 70).

- **If full-year revenue reaches the ¥366M effective consensus**, non-related-party quantum-computing revenue exceeds ¥50M, and at least one system is accepted outside the shareholder system (the share metric mechanically falls on the seasonality of H1-concentrated system recognition and is not a trigger condition), the "market-based handoff" is validated for the first time — hold Overweight and switch valuation to the ¥470 upper-bound path²³⁹
- **If full-year revenue falls below ¥360M** (below Southwest's ¥366M⁵⁷) or the ex-non-recurring loss exceeds ¥100M, the bear scenario is confirmed — switch to the PS 40–60x pricing framework (¥126–194)²³⁷.
- Supporting monitors:
 - contract liabilities negative QoQ for two consecutive periods with declines above 15%⁸⁸
 - quantum-communication revenue negative for a second consecutive year^{56 88}
 - the overseas 25-qubit system not completing delivery recognition within 2026⁸⁸
 - whether China Telecom announces share-reduction plans from 2027H2^{128 221}.
- **Expected value is roughly in line with the current price and has narrowed significantly from before:** subjective probabilities across four outcomes (subjective assignments; anchors: the structure of contracts on hand⁵⁶ and valid consensus^{57 209}): national-team platformization 30%, dual-engine delivery 40%, platformization stall 25%, falsification 5%²³⁷; expected market cap of about 32.8bn, roughly in line with the current price (+1%); the expected value still sits below the target range but has narrowed significantly from -36% — the quantitative basis for the "cautious" characterization²³⁷

9. Catalysts and decision points: after eighteen delivered catalysts, the 2026Q4 list season and the 2027 delivery season decide whether the framework switches

Key points

- Twelve hard catalysts landed in April–September 2026: the pricing language has switched from narrative to orders.
- Catalyst density over the next 12 months concentrates in two windows: the 2026Q4 list season, led by QBI Stage C, NQI 2.0 and the QNT lockup expiry, and the 2027 delivery season, led by IONQ's Superion 256 deployment and CHIPS milestone disbursements.
- Every bull catalyst has an already-occurred bear counter-sample: the NQI lapse, which cost RGTI 34.3% of FY2025 revenue^{30 20}; RPO is falling, with QNT down 8.0% over two quarters^{42 43}; and the 108Q fidelity regression ran from the 36Q's 99.6% to the 108Q's 99.1%.^{30 20}
- The operating question is order-language delivery vs. framework-language events: order-language delivery — RPO, delivery, acceptance — supports current valuations, while framework-language events — a long-term financial framework published, or consensus upgrades stalling — decide the cliff's direction.

Catalyst density over the next 12 months is concentrated in two windows: the 2026Q4 list season (QBI Stage C landed early on 10-07²⁷; NQI 2.0, QNT lock-up expiry, RGTI's C-DAC recognition and 99.5% fidelity goal (no deadline committed)) and the 2027 delivery season (IONQ Superion 256 deployment, CHIPS milestone disbursements, QuantumCTek's annual report and system-procurement cadence)

- **Every bull catalyst has an already-occurred counter-sample:** for government orders, the NQI lapse, which cost RGTI 34.3% of FY2025 revenue.^{30 20}
 - For system delivery, RPO is falling, with QNT down 8.0% over two quarters.^{42 43}
 - For technology milestones, the 108Q fidelity regression ran from the 36Q's 99.6% to the 108Q's 99.1%.^{30 20}
- The operating mainline over the next 12 months is not "whether catalysts exist" but "whether catalysts deliver in the order language or the framework language"
 - Order-language delivery — RPO, delivery, acceptance — supports current valuations
 - Framework-language events — a long-term financial framework published, or consensus upgrades stalling — decide the cliff's direction.

9.1 Delivered✓: twelve hard catalysts in April–September 2026; the pricing language has switched from narrative to orders

Exhibit 71: Delivered✓ catalyst ledger — twelve hard catalysts, April–September 2026

Date	Event	What was delivered	Pricing implication
2026-04-07	RGTI 108Q system GA✓	108-qubit system online, 2Q fidelity 99.1%, gate speed 60ns ^{30 20}	Superconducting pure-play engineering milestone landed, but fidelity regressed from 36Q
2026-05-21	Commerce CHIPS nine-company investment intentions✓	~\$2bn total with equity arrangements ⁹²	Government equity stakes become a pricing variable
2026-06	Two executive orders✓	Deadline to deploy large-scale QC by 2028, federal PQC migration pulled forward; Jefferies names IONQ the broadest beneficiary ⁹¹	Policy upgraded from priority to mandate
2026-06-03/04	Quantinuum IPO✓	\$60×28M shares, \$1.68bn raised, the industry's first traditional IPO ⁴⁰	Primary/secondary exit channel opened; timestamp marker of the sector valuation top
2026-06-17	SSE STAR Market adds a "quantum" category✓	Quantum technology tops the "15th Five-Year Plan" future-industries list ¹³⁶	China's policy channel opens
2026-07-31	SkyWater closing✓	IONQ completes consolidation of the US-based foundry ^{32 35 34}	Vertical integration landed; a consolidation step-change from FY26
2026-08-05	IONQ 2Q26 earnings✓	Record revenue of \$80.1M (+287%), RPO +297% y/y (company basis) YoY, organic guidance raised to \$280–290M ³³	First test of the revenue inflection

2026-08-11	QNT's first formal guidance✓	FY26 revenue guidance of \$28–32M (implying -9% to +4% YoY, against FY2025 actual \$30.9M) ⁴⁴	Demand-quality confession; the government/commercial handoff has not happened
2026-09-04/08	RGTI CHIPS goes definitive✓	OTA \$100M (all restricted funds) + Commerce issued 7,739,938 shares (implied \$12.92/share) ¹²¹	Government stake goes from option to reality; endorsement and binding in one body
2026-09-08	IONQ FY26 combined guidance raise✓	\$450–460M (including SkyWater consolidated from 2026-07-31) ³⁴	Superficially an upgrade; Bernstein characterizes it as consolidation-driven ⁹³
2026-09-08	IONQ Investor Day✓	256-qubit milestone on track; five reviews (MS Overweight/Bernstein/Cantor/JPM Neutral/Wedbush) ^{93 96 97}	Long-term financial framework deferred again; the framework vacuum continues ⁹⁶
2026-09-16	IBM Anderton \$1bn CHIPS formally signed✓	Definitive agreement ⁶⁰	Giant-layer endorsement; government binding diffuses from pure plays to giants

Source: Rigetti periodic reports^{30 20}, Jefferies^{91 92}, Quantinuum pricing announcement⁴⁰, Securities Times¹³⁶, IonQ periodic reports^{32 35}, IonQ earnings releases^{33 34}, Quantinuum 8-K⁴⁴, Rigetti 8-K¹²¹, Bernstein⁹³, JPMorgan⁹⁶, Morgan Stanley⁹⁷, IBM Newsroom⁶⁰

Since late September, six hard catalysts have landed in quick succession: IonQ demonstrated the first end-to-end real-time quantum error-correction decoder (2026-09-22²⁷³); *ST Hexin's acquisition of a 56% stake in Liangxi Technology was approved by the SSE M&A and Restructuring Committee (2026-09-29²⁸⁵); IONQ's SPAC-legacy public warrants expired (expiry 2026-09-30, delisting on 10-12²⁷⁵); the DARPA QBI Stage C list landed with IonQ advancing (2026-10-07^{270 271}); DoW announced a \$350M quantum computing package (about \$200M for QBI evaluation plus an OSC conditional loan of up to \$150M to PsiQuantum, 2026-10-08²⁷²); and DOE the same day published the Quantum Genesis priority application list (8 directions, Q Competition up to \$215M, deadline 10-19²⁹²) – government involvement has upgraded from "R&D funding" to a three-pillar model of "validation + manufacturing + application", and debt financing instruments are being used for quantum companies for the first time.

9.1.1 Two "delivered" pricing implications need unpacking

- The QNT IPO is the precise timestamp marker of the sector valuation top:
 - The QNT IPO is a precise time marker of the sector's valuation peak: IONQ fell 42.2% from the QNT pricing date to 2026-10-08²⁹⁰, with no industry-level negative news over the same period – the executive-order catalyst in June was, if anything, positive^{1 91 139}; a supply shock and the end of the scarcity narrative is the most direct explanation (timing overlap does not equal causation; this judgment is an inference)
 - The supply shock and the end of the scarcity narrative are the most direct explanations, though temporal overlap is not causation and this judgment is an inference.
- IONQ's "guidance raise" is consolidation-driven, not organic:
 - SkyWater's contribution is ~\$240M in August–December 2026 with ~\$70M of intercompany eliminations, and the organic portion of the \$450–460M combined guidance is \$280–290M.^{34 96}
 - Reading the consolidation jump as demand acceleration is the easiest directional mistake to make right now.

9.2 The next-12-month calendar: 2026Q4 list season, 2027 delivery season, 2028 lockup year

9.2.1 IONQ and RGTI form a natural long-short pair around the Stage C list

The QBI Stage C list landed on 2026-10-07: IONQ advanced (potential agreement value of up to \$300M²⁷¹), while RGTI was not selected – the symmetric catalyst pair ended with "IONQ turning in its paper, RGTI's free option expiring unexercised but with no additional loss"²⁷⁰.

- Stage C is RGTI's free option:** RGTI is absent from Stage B – selection is upside, absence costs nothing.⁴⁵

Exhibit 72: Next-12-month catalyst calendar with bear tests – every bull catalyst has an already-occurred counter-sample

Window	Name(s)	Event	Bull reading	Bear test	Fallback
2026-10-07 (landed)	Sector/IONQ/RGTI	QBI Stage C list: Atom/Diraq/IBM/IonQ advance, six companies in total ²⁷⁰	IONQ's referee endorsement delivers (agreement capped at \$300M ²⁷¹); RGTI's option goes unexercised	Quantinuum is absent from this round – MS cautions this should not be read as a technical verdict ²⁷⁷ ; the list is a validation screen, not a procurement commitment	DoW added about \$200M of Stage C evaluation funding on 10-08 ²⁷² ; absentees' existing contracts are unaffected

2026-10-19	Sector	DOE Q Competition application deadline (up to \$215M, target of ≥ 100 logical qubits ²⁹²)	Another expansion of the government demand pool	An application milestone, not funding delivery	—
2026-09-30 (posted)	QuantumCTek	China Telecom Quantum Group direct-procurement notice for a superconducting quantum computer ²⁸⁶	The first system signal of the Q4 tender season	Amount and supplier undisclosed; intra-system procurement	Re-check against the related-party transaction announcement once the award announcement lands
Late 2026-10	QuantumCTek	2026 third-quarter report ²⁸⁷	Interim validation of the 366M valid consensus	No precedent for earnings pre-announcement; the third-quarter report is not a decision point	—
2026-10-12	IONQ	Public warrants delisting takes effect ²⁷⁵	Capital-structure cleanup	Less than 2% of the total share base; the Heights private-placement warrants remain outstanding	—
2027	IONQ	Installation of the first on-premises QPU at NVIDIA's accelerated quantum research center ²⁷⁴	NVIDIA ecosystem validation of Superion 256	Revenue contribution comes in 2027; a deployment signal	—
After the 2026-11-09 reconvening (lame duck)	Sector/RGTI	NQI 2.0 enacted into law (S.3597, 5 years, \$2.7B ²⁹¹)	Federal budget line restored	The Senate adjourned on 9-30 without a vote ²⁹¹ ; the gap elasticity has already occurred (FY2025 - 34.3%) ^{30 20}	If the lame-duck session fails again, provision per the gap elasticity; CHIPS restricted funds do not hedge revenue ¹²¹
2026-11 (est.)	IONQ	Q3 earnings: segment disclosure, RPO QoQ, gross margin ^{32 35}	RPO keeps rising; the quantum business becomes separately valued for the first time	JPMorgan warns RPO has inherent lumpiness ⁹⁶	RPO negative QoQ = bookings falsified (cliff scenario)
2026-12 (est.)	QNT/sector	Lockup expiry (~180 days) ^{42 139}	Supply overhang clears	Honeywell and CQC hold ~79% of post-IPO voting power ⁴²	Selling pressure may be limited while underwater; holding above the offer price = repricing complete
End-2026	RGTI	99.5% 2Q fidelity goal (no deadline committed) ¹³²	Chiplet elimination criterion lifted	108Q already regressed to 99.1% ^{30 20}	Miss Downside \$7 ¹³²
2026Q4	RGTI	C-DAC \$8.4M recognition ¹³²	Quarterly revenue magnitude doubles	Q2 single customer was 64% of revenue ^{30 20}	Delayed recognition FY26 consensus \$23.3M cut ³⁹
2026Q4–2027	RGTI	CHIPS milestone	First \$43.9M + two tranches of	All restricted funds, with	Missed milestones are

		disbursements ¹ ²¹	\$29.9M/\$26.2 M	clawback and IP march-in	recovered; not counted toward general liquidity
2027-01 (est.)	QuantumCTek	2026 annual-report pre-announcement ^{56 88}	Q4 concentrated recognition, ex-non-recurring loss narrowing	The precedent of non-recurring items at 9.1x net income ^{56 88}	See Decision point 3 (Section 9)
1H27	IONQ	Superior 256 customer delivery ⁹³	Order validation commercial delivery	System-level performance not third-party verified ^{32 35}	Basis drifts again valuation floor \$6–12 ¹⁴⁰
2026–2027	Sector/QuantumCTek	"15th Five-Year Plan" tender rhythm ¹³⁶	China's policy channel ramps	Government procurement rhythm is administrative; the QKD base has stalled (- 4.10%) ^{56 88}	Weak tenders QuantumCTek's base business pressured
Ongoing	Sector	IPO wave: IQM listed in the US, Pasqal listed via SPAC (2026- 08), TuringQ/SEEQC filings ⁹⁴	Exit channels and primary-market repricing	Added supply dilutes the scarcity premium	The QNT underwater precedent ^{40 1}
Unscheduled	IONQ/sector	Long-term financial framework published ⁹⁶	Removes the framework vacuum	Publication day = forced repricing day for the whole sector	Downgrade if accompanied by FY27 upgrades stalling
2028-01-02	QuantumCTek	Lockup expiry (first trading day 01-03) 21.86% ¹²⁸	Far-dated event, not counted in 12 months	Cost of ¥78.94; the current price is about 4.0x cost (unrealized gain of about +299%) ¹³⁹	Reprice as it approaches; no unlocks in the next 3 months ¹²⁷

Source: DARPA⁴⁵, US Congress⁴⁷, Rigetti 8-K¹²¹, Rigetti periodic reports^{30 20}, Jefferies¹³², Quantinuum 424B4⁴², IonQ periodic reports^{32 35}, JPMorgan⁹⁶, Bernstein⁹³, QuantumCTek periodic reports^{56 88}, QuantumCTek private-placement announcement¹²⁸, iFinD¹²⁷, Securities Times¹³⁶, Barclays⁹⁴, sp_data³⁹, yahoo_finance¹, KIMI estimates¹³⁹, KIMI scenario assumptions¹⁴⁰

9.3 Bear tests and fallbacks: every bull catalyst has an already-occurred counter-sample

9.3.1 List-type catalysts have the weakest bear tests

- **The QBI list mechanism is R&D-funding screening, not a procurement commitment:** Stage B's 11 already include IonQ, but selection did not change its revenue mix, and IONQ's precise government revenue share is undisclosed, an evidence gap, with the 10-K only disclosing the top three customers at 53% combined.^{32 35 45} The fallback is also mild: a miss does not affect existing contracts and only downgrades the "referee endorsement" narrative.
- **NQI 2.0 has the hardest bear test:** the lapse elasticity is a fact rather than an assumption — RGTI's 10-K directly attributes FY2025 revenue of -34.3% to the NQI expiring un-renewed^{30 20}; If it is not enacted this year, RGTI's government line would likely keep provisioning at the lapse elasticity, while the CHIPS \$100M is restricted funds — milestones plus clawback — that can only offset R&D spend, not hedge revenue.^{121 47}

9.3.2 Delivery-type catalysts are bear-tested on order quality

- Three watch items for IONQ's Q3 earnings, expected 2026-11:
 - The first is RPO QoQ, where JPMorgan has warned that system delivery has inherent lumpiness and cannot be linearly extrapolated.⁹⁶
 - The second is gross-margin direction, after the decline to 24.9% in 2Q26 from FY2025's 40.4%.^{32 35}
 - The third is the shape of segment disclosure — the first post-SkyWater consolidation — where only separate presentation makes the "quantum business" separately valued.^{32 35}
- **RGTI's C-DAC recognition is bear-tested on customer concentration:** a single Q2 customer was 64% of revenue, and the recognition rhythm is a procurement-cycle

function^{30 20}, so a delayed recognition could hurt the ~49x EV/FY28 pricing more than it hurts cash.^{39 139}

- **Superion 256 is bear-tested on the verification gap:** the 99.99% 2QG and #AQ 64 are company claims, not third-party retested.^{32 35}

9.3.3 Supply-type catalysts are bear-tested on shareholding structure

- QNT's lockup selling pressure could prove smaller than feared:
 - When the lockup expires around 2026-12, the ~79% post-IPO voting stake held by Honeywell and CQC faces a broken-issue price of \$41.52 (2026-10-08, -30.8% vs the \$60 offer); a broken issue price does not mean the controlling holders are underwater — their original cost is far below the offer price — so the unlock selling pressure may be smaller than feared.^{42 1}
 - If the stock holds above the offer price after the expiry, the primary-to-secondary repricing is complete and the sector's valuation anchor stabilizes.
- **QuantumCTek's annual report is bear-tested on profit quality:** with the pre-announcement expected 2027-01, concentrated Q4 recognition and grant dependence have precedents, with FY2025 non-recurring items at 9.1x net income.^{56 88 139}
- **The long-term financial framework publication is the only "negative catalyst":** the framework vacuum is the protective cushion for current multiples, publication day equals forced repricing day, and the tracking signals are any management disclosure of an FY27+ revenue trajectory, an EBITDA path or capital intensity.⁹⁶

9.4 Decision-point playbook: three mainlines for the three names and two for the industry

9.4.1 Delivery validates the bull case; another slip falsifies IONQ's roadmap

[Decision point 1] IONQ Superion 256 customer delivery and system-level performance disclosure (expected 1H27; historical anchor: the first early-access batch has been delivered⁹⁶ — early-access delivery is not customer deployment; customer deployment still means early 2027) is the add/downgrade decision point.

- **Bull:** delivery with system-level performance at the #AQ 64 magnitude (company-claim basis^{32 35}) validates the bull case — hold Neutral and confirm the upgrade path to Overweight (valuation switches to the corridor top of \$63, 24x FY27, see Section 6);
- **Bear:** if the delivery basis slips again (more than 2 quarters beyond early 2027), the roadmap is falsified — downgrade to Underweight and switch to cash-floor pricing (\$6–12¹⁴⁰).

9.4.2 Delivery lifts the chiplet elimination criterion; a miss triggers a downgrade

[Decision point 2] RGTI's 99.5% 2Q fidelity by end-2026 (management restated the goal without a deadline; the end-2026 timing is sell-side framing¹³²; historical anchor: 36Q 99.6% → 108Q 99.1%^{30 20}) is the chiplet route's bull-bear dividing line.

- **Bull:** on delivery, the "error rates fail to fall as qubits scale" elimination criterion is lifted — hold Neutral (speculative) and switch valuation to the balancing upper bound of \$22 or even the Jefferies Upside path of \$44¹³²;
- **Bear threshold:** if 99.5% is missed and management no longer commits to a new deadline, the chiplet criterion triggers — downgrade and switch to the downside scenario of \$7¹³² (-50% vs. the current price)

9.4.3 Full-year revenue and non-related acceptance test the market-based handoff

[Decision point 3] QuantumCTek's 2026 annual report (expected 2027-01 pre-announcement; historical anchor: FY2025 related-party sales share of 43.44%⁵⁶) is the two-way decision point for the Overweight (cautious) rating.

- **Bull:** if full-year revenue reaches the ¥366M effective consensus⁵⁷, non-related-party quantum-computing revenue exceeds ¥50M, and at least one system is accepted outside the shareholder system (the share metric mechanically falls on seasonality and is not a trigger condition), the market-based handoff is validated for the first time — hold Overweight and switch to the ¥470 upper-bound path (Section 8);
- **Bear:** if full-year revenue falls below ¥360M or the ex-non-recurring loss exceeds ¥100M, downgrade to Neutral and switch to the PS 40–60x pricing framework (¥126–194, Section 8)¹⁴⁰.

9.4.4 Decision point 4: QBI list announced — IONQ advanced, RGTI left out

[Decision point 4] The industry QBI Stage C list is the decision point for the direction of

the government-endorsement narrative; it was announced on 2026-10-07: IonQ, IBM, Atom, and Diraq advanced, joining Microsoft and PsiQuantum for six companies in total²⁷⁰.

- The bull case has been delivered: IONQ was selected (potential agreement value of up to \$300M²⁷¹), extending the referee's endorsement
- The bear case did not occur; Quantinuum was absent from this round, and MS cautions this should not be read as a technical judgment²⁷⁷

9.4.5 If NQI 2.0 is not enacted this year, RGTI's government line would likely keep provisioning at the lapse elasticity

[Decision point 5] Whether industry NQI 2.0 (through both committees, not yet law⁴⁷) is enacted decides whether RGTI's government line repairs.

- **Bull:** if enacted, RGTI's government line repairs;
- **Bear:** if not enacted this year, provision government-revenue risk at the FY2025 - 34.3% lapse elasticity^{30 20}.

Exhibit 73: Decision-point playbook — three mainlines for the three names and two for the industry

#	Decision point	Window	Historical anchor	Bull threshold	Bear threshold	Trigger action
1	IONQ Superion 256 delivery	1H27	First early-access batch delivered ⁹⁶	Delivery + performance at #AQ 64 magnitude ^{32 35}	Delivery basis slips again	Bull: hold Neutral, upgrade path confirmed (corridor top \$63); bear: downgrade to Underweight, cash floor \$6–12 ¹⁴⁰
2	RGTI 99.5% fidelity	End-2026 (sell-side timing)	36Q 99.6% 108Q 99.1% ^{30 20}	≥99.5%	misses 99.5% and management no longer commits to a new timeline	Bull: balancing upper bound \$22 or Upside \$44 ¹³² ; bear: Downside \$7 ¹³²
3	QuantumCTek 2026 annual report	2027-01 (est.)	FY2025 related-party share 43.44% ⁵⁶	Revenue ≥¥366M + non-related revenue >¥50M and at least one system accepted outside the shareholder system	Revenue <¥360M or ex-non-recurring loss >¥100M	Bull: hold Overweight, ¥470 upper-bound path; bear: downgrade to Neutral, PS 40–60x (¥126–194) ¹⁴⁰
4	QBI Stage C list (announced)	2026-10-07	Stage C six companies (10-07 ²⁷⁰)	IONQ selected	RGTI not selected	IONQ: endorsement delivered (\$300M ²⁷¹); RGTI: option not exercised but no additional loss
5	NQI 2.0	Within 2026	Lapse elasticity FY2025 -34.3% ^{30 20}	Enacted	Not enacted	Enacted: RGTI government line repairs; not enacted: provision at the lapse elasticity ⁴⁷

Source: Bernstein⁹³, IonQ periodic reports^{32 35}, Jefferies¹³², Rigetti periodic reports^{30 20}, QuantumCTek periodic reports^{56 88}, Southwest Securities⁵⁷, DARPA⁴⁵, US Congress⁴⁷, KIMI estimates¹³⁹, KIMI scenario assumptions¹⁴⁰

10. Key risks and scenarios: three cracks already have occurred-level evidence; the four-outcome asymmetry comes from upside dependence

Key points

- In our view, the three names' risks share three common threads: customer quality — government/related revenue shares of 43–90% — revenue quality, meaning QCaaS volatility and order lumpiness, and policy rhythm, the NQI lapse precedent.
- Three cracks already have occurred-level evidence; two fuses show early signs: valuation-framework switching, with the Evercore -52% anchor, and crowded trading, with pairwise correlations of 0.86–0.96, absent bear reports and a one-sided coverage wave.^{139 97 96}
- IONQ's neutral path is already close to the current price, and QuantumCTek's probability-weighted market cap of about ¥32.8bn is roughly in line with the current price (+1%)
- We believe the risk-reward asymmetry reflects upside dependence, not base cases: operationally, decision points outweigh target prices.

The three names' risks, in our view, have more in common than not: customer quality — government/related revenue shares of 43–90% — revenue quality, meaning QCaaS volatility and order lumpiness, and policy rhythm, the NQI lapse precedent. These are three cracks that already have occurred-level evidence, plus two fuses with early signs: valuation-framework switching, with the Evercore -52% anchor, and crowded trading, with pairwise correlations of 0.86–0.96, absent bear reports and a one-sided coverage wave.^{139 97 96}

- **Four-outcome sensitivity shows that the risk-reward asymmetry comes from upside dependence:** 51% of RGTI's probability-weighted \$19.1–21.8 comes from the 25% delivery scenario, IONQ's neutral path (from the valuation corridor floor of \$34 to the four-outcome sensitivity floor of \$54.4, -14%~+38%) is already close to the current price, and QuantumCTek's probability-weighted market cap of about ¥32.8bn is roughly in line with the current price (+1%)¹⁴⁰
- **We believe the three names' risk-reward asymmetry comes not from their base cases but from upside dependence.** The operating implication is that decision points should carry more weight than target prices.

10.1 Key Risks: seven items with four elements each, in impact order

10.1.1 Risk 1: government and related-party customer concentration — ratings hold only while budget lines persist (occurred-level)

Four disclosure samples show government/related revenue shares of 43–90%, while the market prices them as commercial revenue (occurred-level).

- RGTI's government revenue share is 90.2% (FY2025, all-government basis).^{30 20}
- IONQ's top three customers are 53% combined (FY2025, a customer-concentration basis with the composition not broken down, though the company cites ~60% commercial customers).^{32 35}
- QNT's RIKEN plus US government is 45% in 2026H1, and its 10-Q risk factors concede that "many of our large customer relationships involve pilot projects, research collaborations, or grant-funded programs, rather than long-term production commitments".⁴³
- QuantumCTek's related-party sales share is 43.44% (FY2025, top-five-customer basis)⁵⁶ and 67.88% on the full basis in 2026H1²³⁴, with the related-party share of quantum-computing revenue at 84.3% (2026H1, ex-Dongfang Zhongke basis).²³⁴
- **Quantified exposure:** the revenue elasticity of a government or related procurement-rhythm interruption has measured values — the NQI lapse cost RGTI 34.3% of FY2025 revenue^{30 20}, QuantumCTek's quantum-computing product sub-line revenue once fell 29.73% in 2024 (industry basis +26.36%)⁵⁶, and an interruption of China Telecom's system procurement, one system a year running from ¥54M to ¥55.8M, could cost over 40% in a year (one full system is roughly half a year of segment revenue).^{56 88 140} The revenue slope is the first axis of negative valuation elasticity: under the JPM framework, a -20% change in the 2030 revenue assumption maps to -20% of value.¹³⁹
- **Mitigants:** policy demand is being institutionalized (executive-order deadlines, formal CHIPS agreements, the QBI list)^{91 121 45}; QNT has already seen the U.S.

government backfill RIKEN (RIKEN's share fell from 60% in FY2025 to 16% in 2026H1 while the U.S. government rose to 29%)^{42 43}; IONQ management also says commercial customers account for about 60% (company-reported basis; the definition of "commercial" is not broken out, and this report cites it with this caveat)⁹³; the latest institutionalization evidence: the DARPA QBI Stage C list landed on 2026-10-07 (six companies, IonQ agreement ceiling of \$300M^{270 271}), and on 2026-10-08 DoW announced a \$350M package (about \$200M for QBI evaluation plus an OSC conditional loan of up to \$150M to PsiQuantum²⁷²) — government involvement has upgraded from R&D funding to a three-pillar model of "validation + manufacturing + application"

- **Relationship to ratings:** the sector and stock ratings hold on the premise that the "government demand line item continues." The downgrade scenario of "QBI Stage C and NQI 2.0 both falling through" did not occur: Stage C has landed (IONQ advanced, RGTI not selected²⁷⁰), and the residual variable is the NQI 2.0 vote in the lame-duck session (reconvening 11-09²⁹¹); if it dies there, RGTI switches to a policy-life-support pricing framework and its rating is reviewed; there is no direct fundamental transmission to QuantumCTek, which moves by beta linkage (correlation 0.31–0.41) with a magnitude significantly smaller than U.S. stocks — a rating review rather than a synchronized downgrade

10.1.2 Risk 2: revenue quality and demand-form reversal — pay-per-use QCaaS growth is volatile, and the buyout trend challenges the "subscription compute" narrative (occurred-level)

- D-Wave's QCaaS revenue fell 13.4% YoY in 3Q25 (2Q26 back to +50%) while system sales rose from 1 to 2–3 units a year and average contract value more than doubled, as early customers treat quantum compute as an "asset," not a utility.²⁶
- QNT's RPO fell for two consecutive quarters, from \$80.7M to \$76.8M to \$74.2M, down 8.0%.^{42 43}
- IONQ's RPO includes an undisclosed unfunded portion.^{32 35}
- QuantumCTek's concentrated Q4 recognition has precedents, with FY2025 non-recurring items at 9.1x net income.^{56 88 139}
- Pilot-to-production conversion has no public market-wide statistics, an evidence gap.²⁶
- **Quantified exposure:** if the pricing language switches back from "order validation" to "revenue validation," RGTI's framework reversion, priced at ~49x EV/FY28, is a -50%-magnitude event, and IONQ at 27x FY26 is -23%.^{39 139}
- **Mitigants:** IONQ's RPO is up 297% y/y on the company basis.^{33 95} System prices rise with qubit count while per-qubit cost falls, from the Novera 9Q at \$0.9M to the 108Q at \$8.4M, a total-price multiple of 9.3x against qubits at 12x, and per-qubit pricing from \$100k to \$78k.^{30 20} QuantumCTek has ¥166M of related-party major contracts pending performance, incl. tax.^{56 88}
- **Relationship to ratings:** this report judges "commercialization is happening" as partially validated, and if IONQ's RPO turns negative QoQ and D-Wave-style QCaaS contraction spreads to gate-model vendors, the R&D-to-order-validation transition narrative reverts and the sector could reprice on policy life support (the Section 5 cliff scenario).

10.1.3 Risk 3: valuation-framework switch cliff — the framework vacuum is both cushion and fuse (early signs)

On the same page of the same bank, the P/E-language and EV/S-language target prices differ by 52% (early signs, anchor quantified).

- Evercore's QNT targets are \$98 for Base — 60x P/E on CY30E EPS of \$2.40, discounted 10% over 4 years — and \$47 for Bear, at 35x EV/S on CY30 sales.¹⁰⁷
- Quantified exposure: IONQ 27x FY26 = -23%, 27x FY27 = +38% (partially immune; the cliff triggers only when a growth gap and a basis rollback occur together). For RGTI, a rollback to a near-term revenue framework is a -50%-magnitude event; QuantumCTek faces a double cliff, with the 180x target PS rolling back toward an earnings anchor, compounded by the denominator distortion of PE TTM ~5,400x^{39 112 1 139}
- **Mitigants:** FY27 consensus is already large enough (IONQ \$814.4M³⁹), and a framework switch requires two conditions to occur simultaneously; framework talk alone is no longer fatal¹³⁹
- **Relationship to ratings:** the day management publishes a long-term financial framework triggers a rating review, and if that is accompanied by FY27 consensus upgrades stalling, we downgrade directly.

10.1.4 Risk 4: for the highest-multiple names, sector timing outweighs name

research (early signs)

Sector crowded trading and beta collapse: pairwise correlations of 0.86–0.96, absent bear reports, one-sided coverage wave (early signs).

- Pairwise weekly-return correlations among the four US pure plays over the last six months run 0.86–0.96.¹³⁹
- There is not a single Underweight rating across the sell side.^{97 96}
- All new coverage in the past three months is raise or maintain, with even the cautious side's targets rising, JPM from \$42 to \$50.^{96 139}
- **Quantified exposure:** high correlation means name alpha cannot hedge sector beta collapses, and for names with EV/FY28 of ~49x and above — RGTI at ~49x, QBTS and QUBT — sector timing outweighs name research.^{39 139}
- **Mitigants:** QuantumCTek's correlation with US quantum is only 0.31–0.41, a diversification leg.¹³⁹ IONQ's revenue delivery and M&A integration have independent variables.¹³⁹ Short interest is not low everywhere, with QUBT at 33.6% and RGTI at 19.8%.¹
- **Relationship to ratings:** sector positions should be managed as one aggregate beta position, and if two of the three signals appear — FY27 upgrades stalling, new coverage slowing and bull reports discussing a framework switch — aggregate sector exposure should be cut.

10.1.5 Risk 5: policy-rhythm interruption and control escalation — the NQI lapse is an already-occurred natural experiment, and export controls are already parameterized to physical-qubit thresholds (lapse occurred, controls showing signs)

- RGTI directly attributes its revenue decline to the NQI gap: NQI expired in 2023-09 without reauthorization, and RGTI's 10-K directly attributes the FY2025 revenue decline of -34.3% to it^{30 20}; NQI 2.0 has passed both chambers' committees but is not yet law⁴⁷; latest status: S.3597 did not receive a full Senate vote before the 2026-09-30 recess and was postponed to the lame-duck session after reconvening on 11-09, and the House version of the NDAA did not incorporate the full NQI text²⁹¹
- The CHIPS OTA's \$100M is entirely restricted: a first \$43.9M plus two milestone tranches of \$29.9M and \$26.2M, with clawback and IP march-in clauses, and Commerce's shares carry no cash consideration.¹²¹
- On controls, ECCN 4A906 has already parameterized control into a 34-physical-qubit times C-NOT error-rate matrix, and the administrative cost of lowering the threshold is minimal.⁵⁰
- **Quantified exposure:** government revenue share times the lapse elasticity — for RGTI, 90.2% times the -34.3% precedent — while QuantumCTek's administrative demand rhythm means concentrated Q4 recognition and grant dependence are likely to persist, with FY2025 grant-basis non-recurring items at 9.1x net income.^{56 88 139}
- **Mitigants:** CHIPS definitives have landed for RGTI and IBM Anderson^{121 60}, and the executive orders set hard deadlines for large-scale QC deployment and PQC migration.⁹¹
- **Relationship to ratings: enactment of NQI 2.0 within the year is the precondition for repairing RGTI's government revenue line; the QBI Stage C omission already occurred on 2026-10-07 (RGTI not selected²⁷⁰); if NQI 2.0 still fails to become law in the lame-duck session, RGTI switches to survival-path floor pricing (\$12–18^{132 140})**

10.1.6 Risk 6: technology-milestone slippage — the valuation cycle leads the technology cycle by one body length, so slippage costs multiple compression, not percentage pullbacks (early signs)

- RGTI's 108Q 2Q fidelity regressed from the 36Q's 99.6% to 99.1%, partially triggering the "error rates fail to fall as qubits scale" elimination criterion.^{30 20}
- IONQ's 99.99% 2QG and #AQ 64 are company claims, not third-party retested.^{32 35}
- The window dividend does not necessarily accrue to the pure plays: Quantinuum's Helix code (on Helios hardware) achieves a logical-gate error rate of $\sim 2.8 \times 10^{-464}$, and IBM's Anderson has a \$1bn CHIPS definitive.⁶⁰
- **Quantified exposure:** milestone falsification means framework reversion, a -50%-magnitude event for RGTI and -23% for IONQ (Section 5 cliff arithmetic).¹³⁹
- **Mitigants: the goals are verifiable and near-dated — RGTI's 99.5% by end-2026 (sell-side timing)¹³² and IONQ's 1H27 delivery⁹³ — and fault-tolerance progress is accelerating, with QNT's Helix code logical-gate error rate at $\sim 2.8 \times 10^{-4}$.⁶⁴**

- **Relationship to ratings:** Decision points 1 and 2 are the operationalization of this risk, and touching a bear threshold switches to valuation-floor pricing — RGTI at \$7¹³² and IONQ at \$6–12.¹⁴⁰

10.1.7 Risk 7: supply-side overhang (partially occurred)

The supply overhang has partially materialized. RGTI insiders sold in two rounds against the direction of the public narrative, IONQ's warrants are an "automatic penalty on upside" structure, and for QuantumCTek's 2028 unlock the current price is about 4.0x cost (paper gain of about +299%, 2026-10-08²⁹⁰).

- RGTI executives cashed out over \$19M in two rounds in 2026-06/09 — the CEO holds just 140k shares after selling, and the CTO sold \$12.68M in one trade — against the simultaneous CHIPS positives.¹²³
- IONQ warrants: 79.05M private placement warrants (strike prices \$99.88/\$155) correspond to a liability of \$3,052.4M, which already exceeds pro forma cash of \$1.9–2.0B; the higher the stock price, the larger the GAAP loss and the nearer the dilution, with a fully diluted share count of 508.6M, +25.5% above basic^{32 35 33}; the SPAC-legacy public warrants (1.07M @ \$11.50) expired on 2026-09-30 and are scheduled to be delisted on 10-12²⁷⁵, under 2% of the total share base, leaving the main overhang (the Heights private placement warrants) unchanged
- Stock paid for 97.8% of the \$2.66B consideration for the six 2025 acquisitions: M&A expansion is in essence buying the value chain with printed stock, and the share count rose +59.0% in eight months.^{32 35}
- QuantumCTek: 22,486,631 shares unlock on 2028-01-02 (21.86% of total share capital, cost ¥78.94, paper gain of about 4.0x, 2026-10-08²⁹⁰)^{128 238}
- **Quantified exposure: if IONQ's share price reaches \$99.88/\$155, incremental dilution would be 36.0M/79.1M shares^{32 35}; QuantumCTek's unlocking market value is about ¥7.08bn, equivalent to 21.86% of total share capital²³⁸**
- **Mitigants: IONQ insiders have made no large sales and there is no active ATM in 2026¹²³; the warrants are deep out of the money (current price \$39.45 vs. \$99.88/\$155, 2026-10-08²⁹⁰) and do not dilute before exercise^{32 35 1}; QuantumCTek has no unlocks in the next 3 months¹²⁷**
- **Relationship to ratings:** supply events do not change the direction of the mainline judgment, but they decide the pace and top formation of upside delivery, and a third round of concentrated RGTI executive selling triggers a downgrade to Underweight.

10.2 Terminal scenarios: the adoption × QPU-capability 2×2 and the four-outcome sensitivity

10.2.1 The following arithmetic is an explicit derivation chain of this report's scenario assumptions

Every line is replaceable and recomputable, and it is not a KIMI earnings forecast. The probabilities are subjective assignments, with mapping anchors from sell-side scenarios (Jefferies) or consensus.¹⁴⁰

- End-state weighted values are above the current price for IONQ and RGTI, and roughly in line for QuantumCTek: IONQ +45% (relying on the 30% delivery scenario and M&A mapping assumptions), RGTI +35%~+54% (51% reliant on the 25% delivery scenario), QuantumCTek +1%
 - QuantumCTek stands at +1%.
- **The probability-weighted values are four-outcome terminal figures, not 12M expectations:** The 12M ratings and target ranges anchor to the valuation corridors, and terminal upside is operationalized through the decision points.
- **We believe all three names' positive expectations are built on "low-probability, high-mapping" upside items:** a mathematical necessity of option pricing, not a victory of the base cases. Small probability moves of ±5pp affect expected values more than multiple fine-tuning, so decision points should carry more weight than target prices.

10.2.2 We organize terminal-state uncertainty on two axes, adoption and QPU capability

The vertical axis measures workload migration and order conversion, and the horizontal axis measures delivery on logical qubits (LQ) and gate fidelity.

- **The relationship to the four-outcome table (Exhibit 74) in one sentence:** the 2×2 is the industry-level organizing framework, and the four-outcome table is the name-level mapping.
- **Each name's four outcomes fall into different quadrants:** the probabilities serve as subjective quadrant weights, and the probability-weighted values — IONQ at

~\$57.3, RGTI at \$19.1–21.8 and QuantumCTek at ~¥32.8bn¹⁴⁰ — are the across-quadrant sums.

- **The horizon basis matches the section preamble:** both are 2030 terminal views, not 12M expectations. The 12M ratings and target ranges anchor to the valuation corridors of \$34–63, \$18–22 and ¥350–470, and cross-quadrant migration is operationalized through Decision points 1–5.

10.2.3 Today the industry sits in the policy-funded upper-left quadrant

Every quadrant anchor comes from this report's existing arithmetic (Exhibit 73A).

- **Upper right — "advantage delivered":** combines the UBS bull settings of 12% server idling and 2,010 QPUs by 2035⁵ with the three upside outcomes.
- **Lower right — "capability first, demand late":** combines the UBS bear settings of 2% idling and 399 QPUs⁵ with IONQ's "survives but mediocre" outcome — at 15x mature P/S, the current price implies \$1.07bn of revenue, exactly 1.01x FY28 consensus^{39 139}, so FY28 delivery supports the price but little more.
- **Upper left — "policy-funded adoption":** is the industry today: government/related revenue at 43–90%¹³⁹ and capability 10–21x short of the fault-tolerant quantum computing (FTQC) threshold of ~1,000 LQ^{61 62}; RGTI's "niche survival" and QuantumCTek's "national-team platform" sit here.
- **Lower left — "falsification and clearing":** holds the three downside outcomes of \$7, \$9 and ¥6bn.^{132 140}
- **The industry sits in the upper left, on the eve of a possible move right:** capability-side decision points 1 and 2 gate entry into the right half, and demand-side decision points 3, 4 and 5 decide up or down within it.

Exhibit 73A: Terminal-state scenario 2x2 — adoption × QPU capability

Quadrant (adoption × QPU capability)	Profile	In-report numeric anchors	Decision points
Upper right: advantage delivered	High adoption × high capability: commercial migration delivered, FTQC window opens	UBS bull: 12% idling and 2,010 QPUs (~201 LQ) by 2035 ⁵ ; maps to IONQ \$110 (30%), RGTI \$44 (25%), QuantumCTek ¥62.5bn (40%) ¹⁴⁰	DP 1 (Superion 256 delivery + #AQ 64-class performance) and DP 2 (99.5% two-qubit gate fidelity (2QG)) break positive
Lower right: capability first, demand late	High capability × low adoption: milestones land, migration stays at bear settings	UBS bear: 2% idling and 399 QPUs by 2035 ⁵ ; IONQ mediocre outcome 42%/\$45 ¹⁴⁰ ; 15x mature P/S implies \$1.07bn = 1.01x FY28E ^{39 139}	DP 3/4/5 break bearish (demand-side falsification)
Upper left: policy-funded adoption	Policy adoption × low capability: government budget lines pay, capability below the FTQC threshold	Government/related revenue share 43–90% ¹³⁹ ; 10–21x short of the ~1,000-LQ threshold ^{61 62} ; RGTI niche survival 45%/\$18 ¹³² , QuantumCTek national-team platform 30%/¥20bn ¹⁴⁰	Decision points 3 (QuantumCTek annual report), 4 (QBI Stage C, announced on 10-07 ²⁷⁰), 5 (NQI 2.0)
Lower left: falsification and clearing	Low adoption × low capability: narrative and cash both impaired	RGTI \$7 (25%) ¹³² , IONQ \$9 (20%), QuantumCTek ¥6bn (25%+5%) ¹⁴⁰ ; cliff arithmetic: RGTI framework reversion -50% magnitude ¹³⁹	DP 1/2/3 bear thresholds (cash floor \$6–12 / Downside \$7 / PS 40–60x ¥126–194) ^{132 140}

Note: the 2x2 is the industry-level organizing framework; the four-outcome table (Exhibit 74) is the name-level mapping. Probabilities are subjective assignments; both this table and the four-outcome table are 2030 terminal views, not 12M expectations — scenario deduction, not a forecast^{5 140}.

Exhibit 74: Outcome probabilities and mapped prices for the three names — 51% of RGTI's expected value comes from the 25% delivery scenario (KIMI scenario assumptions, not an earnings forecast)

Name	Outcome (assumption)	Probability (assumption)	Mapped price/market cap (anchor)	Weighted contribution	Mapping basis
RGTI	Niche survival (government/research system supplier)	45%	\$18 (Jefferies Base ¹³²)	\$8.10	Government revenue continues + no roadmap misstep
RGTI	Roadmap delivery (chiplet scaling holds)	25%	\$44 (Jefferies Upside ¹³²)	\$11.00	Technology roadmap accelerates, scalability arrives early
RGTI	Technology falsified / crushed by giants	25%	\$7 (Jefferies Downside ¹³²)	\$1.75	Roadmap misstep + government funds not renewed
RGTI	Premium M&A exit	5%	\$18 (conservative =	\$0.90	Going-concern

			base price ¹⁴⁰⁾		strategic value; sensitivity range \$7–44
RGTI	Probability-weighted (primary mapping)	100%	—	\$21.75	Strict mapping (survival\$12) = \$19.05; single citation range \$19.1–21.8 ¹⁴⁰⁾
IONQ	Platform-leader delivery	30%	\$110 (80x FY27 sales framework ¹⁴⁰⁾	\$33.00	2030 revenue \$3B+, trapped ion enters the narrow-advantage window
IONQ	Survives but mediocre	42%	\$45 (midpoint of neutral \$35–55 ¹⁴⁰⁾	\$18.90	Revenue climbs along consensus, multiple compresses to 10–15x
IONQ	Roadmap falsified	20%	\$9 (midpoint of bear \$6–12 ¹⁴⁰⁾	\$1.80	Cash floor + foundry residual value
IONQ	Acquired/integrated exit	8%	\$45 (conservative = neutral midpoint ¹⁴⁰⁾	\$3.60	Alternative assumptions: M&A mapping cut to \$9 gives \$54.4, falsification mapping raised to \$45 gives \$64.5
IONQ	Probability-weighted	100%	—	~\$57.3 (sensitivity range \$54–65)	Largest outcome at 42%, satisfying the distribution-shape discipline ¹⁴⁰⁾
QuantumCTek	National-team platformization	30%	¥20bn (20x 2030E revenue ¥1bn ¹⁴⁰⁾	¥6bn	Main path (metro networks + Tianyan + fund validated)
QuantumCTek	Dual-engine delivery	40%	¥62.5bn (25x 2030E revenue ¥2.5bn ¹⁴⁰⁾	¥25bn	Requires non-related revenue to take over (no evidence yet)
QuantumCTek	Platformization stalls	25%	¥6bn (15x 2030E revenue ¥400M ¹⁴⁰⁾	¥1.5bn	QKD peak passed + research procurement drifts
QuantumCTek	Falsified	5%	¥6bn (same bear mapping, conservatively not lower ¹⁴⁰⁾	¥300M	Superconducting route loses / supplier diversification / governance event
QuantumCTek	Probability-weighted market cap	100%	—	About ¥32.8bn (+1% vs. current price)	The four outcomes are the sole outcome distribution; current pricing implies a more optimistic distribution than this subjective one ¹⁴⁰⁾

Source: Jefferies¹³²⁾, KIMI scenario assumptions¹⁴⁰⁾ Note: probabilities are subjective assignments; mapping anchors are sell-side scenarios (Jefferies¹³²⁾) or KIMI scenario assumptions. 51% of RGTI's weighted value (\$11.00/\$21.75) comes from the 25% delivery scenario; a ±5pp move in the delivery probability maps to \$20.45/\$23.05¹⁴⁰⁾. QuantumCTek's four outcomes at 30/40/25/5 are the sole outcome distribution (the old three-scenario split has been superseded). This table is a 2030-horizon terminal distribution: "falsified" means route-level failure (superconducting loses out / supplier diversification / governance events), a different scenario level from the main text's near-term 'falsification case' (related-party acceptance breaks + grants fade → PS 40–60x → ¥13–20bn); this table takes the more conservative mapping, and the expected value is insensitive to that choice (5% weight; the near-term mapping would give ~¥33.3bn, conclusion unchanged). This table is scenario-sensitivity presentation, not a KIMI earnings forecast; readers can replace any line and recompute.

10.3 Lifecycle positioning: the revenue curve is in the late introduction phase; the valuation cycle leads the technology cycle by one body length

10.3.1 The revenue curve is a classic S-curve late introduction phase

- **IONQ's revenue climbed at an actual CAGR of ~180% over 2021–2025:** IONQ revenue climbed from \$2.1M in 2021 to \$11.1M in 2022, \$22.0M in 2023, \$43.1M in 2024 and \$130.0M in 2025, with 2026 guidance of \$455M on the combined basis.^{32 35 34 139}
- **The profit model, however, is unvalidated:** absolute Adj. EBITDA losses are still widening, from -\$186.8M in FY25 to a FY26E consensus of -\$430.8M.^{32 35 39}
- **Demand validation is partial:** annealing optimization and government procurement are validated, gate-model scale applications are still in the narrative phase, and pilot-to-production conversion has no public statistics, an evidence gap.²⁶

10.3.2 The capital-market cycle and the technology cycle are dislocated but

converging in direction

- **Technology cycle vs valuation cycle:** the technology cycle is in an upswing of dense milestone delivery — Quantinuum's Helix code logical-gate error rate of $\sim 2.8 \times 10^{-464}$, IONQ's 99.99% 2QG company claim^{32 35}, and the Superion roadmap progressing⁹³ — while the valuation cycle has already pre-paid the back half of the narrow-advantage window (2028–2030) and is now in a post-repricing drawdown.
- **The sector is currently in a post-repricing drawdown: the three names trade at P/S TTM of 64.9x/353.5x/103.6x (2026-10-08²⁹⁰), but their 2-year self-computed percentiles are only 3.7%/19.2%/23.7% (see the basis note in Section 5), down 52.0%/74.9%/58.2% from 2-year highs (2026-10-08²⁹⁰)^{1 139}. The QNT IPO in 2026-06 marks the timing of the sector's valuation peak¹³⁹**
- **The SPAC-era trust vote offers a comparison:** IONQ's redemption rate was $\sim 2.5\text{--}3.5\%$ ^{151 167} against RGTI's 66.9%.^{184 185 186}
- **QuantumCTek's A-shares are in a "beta ebb + alpha yet to be proven" phase: the 52-week gain has fallen back to -21.0%, the 50-day line has crossed below the 200-day line, and 2026H1 revenue was only +1.83%^{1 56 88}**

10.3.3 We believe the valuation cycle leading the technology cycle by one body length is the most essential current positional relationship

Milestone slippage costs multiple compression, not percentage pullbacks (the Section 5 cliff), while milestone delivery is partly pre-spent, with IONQ's current price at $\sim 70\text{--}78\%$ of the cautious side's base case.¹³⁹

- **The lifecycle implication for positioning:** late-introduction-phase names should be managed as "decision-point-driven option positions," not "earnings-driven value positions."

Exhibit 75: Lifecycle positioning on six hard metrics — the revenue curve is in the late introduction phase, the profit model unvalidated

Metric	Current reading	Lifecycle implication
Logical qubits (commercial full-QEC record)	48 (Quantinuum Helios) ^{62 63}	Late demo phase, still orders of magnitude from engineering validation
Pure-play revenue (2024)	Combined <\$100mn (BoFA) ⁷	Introduction phase; the revenue pool cannot decide endgame share
Revenue mix (commercial share)	IONQ commercial customers $\sim 60\%$ (company basis, definition not broken down) ⁹³ ; QNT government & academic $\sim 90\%$ (2026E) ¹⁰⁷ ; RGTI government 90.2% (FY2025) ^{30 20}	Government-paid phase; handoff and slope unvalidated
QCaaS closed loop	D-Wave QCaaS 3Q25 revenue -13.4% YoY (2Q26 back to +50%) ²⁶	Pay-per-use closed loop unvalidated; form shifting to system buyouts
Profit model	IONQ FY26E EBITDA -\$430.8M ³⁹ ; RGTI non-GAAP quarterly loss $\sim \$16\text{M}$ (Cantor basis) ¹⁸² ; QuantumCTek ex-non-recurring -¥43.55M ^{56 88}	None of the three names' profit models is validated
Capital-market position	P/S 2-year percentiles 3.7%/19.2%/23.7% ¹³⁹ ; -52.0%/-74.9%/-58.2% from 2-year highs (2026-10-08 ²⁹⁰) ¹	Post-repricing drawdown phase, not a bubble high

Source: Quantinuum 424B4⁴², Quantinuum 8-K⁴⁴, BoFA⁷, Bernstein⁹³, Evercore ISI¹⁰⁷, Rigetti periodic reports^{30 20}, Jefferies²⁶, sp_data³⁹, QuantumCTek periodic reports^{56 88}, yahoo_finance¹, KIMI estimates¹³⁹

Appendix

Management profiles (three names)

Name	Role	Person	Tenure and background	Holdings and compensation anchors
IONQ	CEO	Niccolo de Masi	Took over 2025-02; former CEO Peter Chapman moved to executive chair ³²	Sold 16,120 shares on 2026-09-11 ¹⁶³
IONQ	CFO & COO	Inder Singh	Incumbent ³²	Only tax withholdings in 2026, no sales ¹⁶³
RGTI	CEO	Subodh Kulkarni	Took over 2022, semiconductor background; founder Chad Rigetti departed earlier ³⁰	Down to 140,411 shares after cumulative selling (September tranche under a 10b5-1 plan, the May/June tranche not) ¹²³ ; insiders 1.7% combined ¹
RGTI	CFO	Jeffrey Bertelsen	Incumbent ³⁰	168,067 shares per Form 4 ¹²³
RGTI	COO	David Rivas	Moved from CTO to COO 2026-08 ¹⁹⁷	Single trade of \$12.68M sold on 2026-05-29 ¹²³
RGTI	CTO	Andrew Bestwick	Incumbent ¹²³	1,036,121 shares per Form 4 ¹²³
QuantumCTek	Chairman	Zhang Wenqiang (47)	Since 2026-02-06; legal representative of China Telecom Quantum Group; remunerated by the related party ⁸⁸	0 shares ⁸⁸
QuantumCTek	President	Ying Yong (58)	Since 2021-07 ⁵⁶	35,000 shares; 2025 compensation ¥1.1525M ⁵⁶
QuantumCTek	CFO & Deputy Manager	Tan Qi (45)	Since 2025-03 ⁵⁶	—
QuantumCTek	Board Secretary	Tong Lu (35)	Since 2023-04 ⁵⁶	1,500 shares ⁵⁶
QuantumCTek	Core technical staff	Yu Lin, Tang Yanlin et al. (5)	Per company IR activity records ²⁰⁶	—

Source: company announcements^{32 30 197 56 88 206}, SEC Form 4^{163 123}, yahoo_finance¹

Note: RGTI has 164 employees (2026-03-01)³⁰; QuantumCTek's 11-seat board = 7 non-independent directors (4 China Telecom system, 1 USTC Holdings, 1 president, 1 employee director) + 4 independent directors, with the China Telecom system holding an absolute majority of non-independent seats^{88 128}.

Shareholding structure (three names)

Dimension	IONQ	RGTI	QuantumCTek
Insider ownership	0.72% ¹	1.7% ¹	Management combined below 0.1% ⁵⁶
Institutional ownership	50.6% ¹	53.9% ¹	32,137 shareholders ⁸⁸
Government/SOE shareholders	None (government is only a contract customer) ³²	Commerce 7,739,938 shares, ~2.27% pro forma (voting-restricted, transfer to competitors prohibited, shares tied to undisbursed portions repurchasable at \$1 on termination) ¹²¹	China Telecom Quantum Group 21.86% (all locked up until 2028-01-02) ^{88 128}
Strategic/industrial shareholders	Heights Capital (sole buyer in both placements) ^{148 149}	Quanta ~3.02M shares @~\$11.59 ³⁰	USTC Holdings 10.50%, Pan Jianwei 6.42% (voting rights delegated to USTC Holdings), CAS Holdings 3.43% ⁸⁸
Control structure	No controlling shareholder ³²	No controlling shareholder ³⁰	China Telecom + USTC Holdings + Pan Jianwei's delegation + Peng Chengzhi acting in concert — 40.43% of voting rights combined; ultimate controller SASAC ^{56 128}
Forward supply nodes	80.66M warrants (\$11.50/\$99.88/\$155/\$1.38) ^{35 231}	11.72M warrants (~3.5%) ²⁰	22,486,631 shares (21.86%), first trading day 2028-01-03, cost ¥78.94 ^{128 221}
Dividends/buybacks	None ³²	None ³⁰	FY2025 dividend of ¥0.16 per 10 shares, ¥1.6458M total (payout ratio 30.52%) ⁵⁶ ;

FY2020 dividend of ¥1.2 per 10 shares (ex-date 2021-06)²²⁷; no buybacks⁸⁸

Source: company announcements^{32 35 148 149 30 20 121 56 88 128}, yahoo_finance¹, East Money²²¹, Xueqiu²²⁷

Note: QuantumCTek's private placement raised ¥1.775bn gross, ¥1.752bn net^{128 222}; the 33.25M IPO lockup shares all became tradable on 2023-07-10²²⁶. Original financial shareholders keep exiting: CAS Holdings net-sold 1.0286M shares in 2025 alone and left the 5%+ shareholder list; in 2026H1, Hefei Kunteng sold - 293.3k shares and Lou Yongliang -197.0k shares⁸⁸.

Falsification checklist (synthesis of two independent falsification passes, each with a sign grade)

Note: synthesized from this report's two independent falsification passes (industry-side and name-side). Sign grades = occurred / early signs / pure hypothesis; monitoring signals are report-level tracking items.

Dimension	Crack	Key evidence	Sign grade	Monitoring signal
Customer quality	QuantumCTek's QC buyers = the controlling-shareholder system	84.3% related-party share of QC revenue ²³⁴	Occurred	Whether related-party transaction announcements stop
Customer quality	RGTI single customer 64% of a quarter (Customer A), RPO \$2.7M	10-Q ²⁰	Occurred	10-Q customer-concentration notes
Customer quality	IONQ top three customers 53% (FY25), precise government share unknown	10-K ³² (share = evidence gap)	Occurred	10-K/earnings-call customer splits
Revenue quality	IONQ FY26 headline ~37–38% is consolidation	Guidance bridge ^{34 97}	Occurred	Q3'26 segment disclosure shape
Revenue quality	QuantumCTek profit comes mainly from grants and wealth-management income (non-recurring = 9.1x net income)	Annual report ^{56 235}	Occurred	Quarterly other-income line
Revenue quality	RGTI growth = one-off system delivery (QCaaS only 1.5%)	10-Q ²⁰	Occurred	Rolling new-system POs
Revenue quality	Weak repurchase, high lumpiness: D-Wave QCaaS 3Q25 -13.4% Y/Y (2Q26 +50%), RPO down QoQ	DEMAND ledger (industry-side pre-run C2)	Occurred	Each name's RPO QoQ
Moat	RGTI chiplet fidelity regression (99.6%→99.1%) = elimination criterion partially triggered	PR/8-K ^{177 178}	Occurred	End-2026 99.5% (sell-side timing) kill-switch ¹³²
Moat	IONQ EQC scaling assumption unvalidated at 256-qubit system level	Bernstein's four-unproven list ⁹³	Pure hypothesis (pending validation)	Superior 256 performance disclosure ^{97 93}
Moat	QuantumCTek's "sole corporate partner of Zuchongzhi" identity depends on the USTC system not falling behind	No counter-evidence, slow variable ⁸⁸	Pure hypothesis	Zuchongzhi milestones, Origin entering centralized procurement
Moat	Modality ranking can be rewritten in 12–18 months; giants lead on milestones and hold cloud channels	Industry-side pre-run C3	Early signs	IBM/Google/Quantinuum milestones
Valuation premise	All three names need sector beta not to collapse: drawdowns already -52% to -75%	yahoo ^{1 238}	Occurred (ongoing)	Sector pairwise correlations and EV/S
Valuation premise	IONQ's valuation implies "equity financing capacity persists"	2025 ATM (net \$358.3M) plus two Heights placements (net \$977.2M/\$1,977.1M), ~\$3.31B combined net ^{32 148 149} ; no ATM in 2026 ¹⁶³	Early signs	S-3/ATM filings
Valuation premise	QuantumCTek's 104x PS implies "continued China Telecom procurement without supplier diversification"	Contracts on hand only cover through the 287 project's acceptance ⁵⁶	Early signs	New system-contract announcements
Valuation premise	The bull case needs NQI 2.0 enacted + QBI not	NQI lapse already happened once ^{30 47} ; IONQ	Early signs	Congressional votes, QBI lists, LT framework

	missed + FTQC not slipping + the framework vacuum persisting	deferred the LT framework ⁹⁶		publication day
Extreme tail	IONQ warrants going into the money dilution plus MTM-loss loop (liability \$3.05B > pro-forma cash)	Q2'26 single quarter - \$1,649.1M already demonstrated ³⁵	Early signs (partially occurred)	Stock position vs \$99.88/\$155 ¹
Extreme tail	RGTI CHIPS clawback/IP march-in triggered	Terms on record ¹²¹ , no trigger signs	Pure hypothesis	Commerce milestone announcements
Extreme tail	QuantumCTek related-party pricing fairness regulatory event	Pricing "through multiple rounds of negotiation between the parties," no third-party comparison.	Pure hypothesis	Regulatory inquiries, audit opinions
Extreme tail	Further export-control escalation (threshold lowered / He-3 embargo) input cutoff for the Chinese chain	4A906 already parameterized to 34 qubits (industry-side pre-run C5)	Early signs	Control-rule revisions, He-3 supply

Appendix: Source Table

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- [231] KIMI estimates (T4), 2026-10-08: IONQ fully diluted shares 508.6M (narrow)/~514.4M (broad), market-cap/cash pro-forma 8.0–8.4x (RGTI ~8.7x, QuantumCTek 13.0x), 2025 M&A cash-consideration share 2.2%, two placement rounds' initial warrant FV of ~\$3.0B booked as liabilities, SkyWater implied VWAP \$40.96; inputs: ^{32 35 147 148 149 163 1 20 88 219}
- [232] KIMI estimates (T4), 2026-10-08: RGTI monthly burn point estimate \$8.1M (band \$6.4–14.0M), runway six cells (28–84 months), refinancing window 2028Q4–2032Q1, breakeven threshold \$230–265M, C-DAC as 36.1% of FY26E, backlog coverage 11.6%; inputs: ^{30 20 132}
- [233] KIMI scenario assumptions (T4), 2026-10-08: RGTI four-outcome probabilities (45/25/25/5, subjective) and mapping balance \$21.75 (primary)/\$19.05 (strict), single citation range \$19.1–\$21.8, DoA joint break probability ~55%; inputs: ^{132 1}

- [234] KIMI estimates (T4), 2026-10-08: QuantumCTek related-party sales full-basis series (FY2024 52.99%/FY2025 45.96%/2025H1 71.15%/2026H1 67.88%), QC related-party share 84.3%, China Telecom system combined 63.15% (line-by-line T1 sums of related purchase/sales tables, ratios self-computed); inputs: ^{56 88 201}
- [235] KIMI estimates (T4), 2026-10-08: QuantumCTek non-recurring/net income 9.1x, breakeven threshold ~¥460M, 504/287 contracts incl. tax ÷ 1.13 penetration, cash-collection ratio 1.13, implied system unit price ~¥11.84M/unit, 2026E attainability assumption chain; inputs: ^{56 88 57 219}
- [236] KIMI scenario assumptions (T4), 2026-10-08: IONQ four-outcome probabilities 30/42/20/8 (subjective, anchored to MS's three scenarios and the sell-side rating distribution); inputs: ^{97 1 39}
- [237] KIMI scenario assumptions (T4), 2026-10-08: QuantumCTek four-outcome probabilities 30/40/25/5 and mappings (¥20bn/¥62.5bn/¥6bn/¥6bn), expected market cap ~¥32.8bn (+1%), PQC substitution-threat rating, DoA probabilities; inputs: ^{56 57 209 219 115}
- [238] KIMI estimates (T4), 2026-10-08: three names' 52-week positions and drawdowns (intraday basis), market-cap/cash comparison, China Telecom paper gain ~+299% (~4.0x); inputs: ^{1 128 219}
- [239] KIMI estimates (T4), 2026-10-08: Price-implies reverse engineering (IONQ implied 2030 revenue \$0.82–0.94B = ~70–78% of JPM's assumption, 15x needs \$1.07B; RGTI 27x needs ~\$175M = 2.1x FY28; QuantumCTek effective-vintage PS 89x/50x, 30x needs 1.7x effective consensus), cliff arithmetic (IONQ -23%, RGTI -50% magnitude); inputs: ^{1 39 57 209 115}
- [240] KIMI estimates (T4), 2026-10-08: QuantumCTek consensus cleaning (14 reports rebuilt one by one, latest-per-broker mean ¥462M/excluding the two oldest ¥433M; iFinD ¥440M overstates FY1/2/3 revenue by +20%/+43%/+67%, FY1 net income of ¥14.1M at 2.3–3.5x the effective value; effective range 366/473–478/643–654M); inputs: ^{57 112 209 210 211 212 130 111 59 216 217 218 115}
- [241] IBM: "Quantum computing products & services" pricing page (five tiers and minimum commitments), retrieved 2026-09-23 (T1)
- [242] IBM Quantum Blog: "Qiskit Runtime makes algorithm development easier than ever" (PAYG launch, \$1.60/runtime second), 2022-04-12 (T1)
- [243] Wayback Machine: ibm.com/quantum/pricing snapshots 2023-12-03 / 2024-08-04 / 2025-04-01 (T1)
- [244] IBM: 2024 Annual Report (70+ systems, 250+ Quantum Network organizations), filed 2025-02-25 (T1)
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- [246] Conde-Torres et al.: EPJ Quantum Technology (600k+ registered users / 3 trillion circuits as of early 2024, IBM self-reported), 2026-01-15 (T3)
- [247] Jefferies: "IonQ: AD Recap: Vertical Integration Already Paying Dividends", 2026-09-09 (T3); IonQ press releases: DARPA timing award (2026-08-06, up to \$58M), Congruity360 (2026-09-08, \$8.18M) (T1)
- [248] BofA: "Quantinuum: Quantum performance leader, Initiate at Buy" (Exhibit 5 segment TAM model, Exhibit 13 BOM comparison, Exhibit 15 roadmap detail), 2026-06-30 (T3)
- [249] IonQ: Q3 2025 earnings call transcript ("A.T. Kearney have validated our bill of materials for our 2 million qubit machines to be sub-\$30 million"), 2025-11-05 (T1, company statement)
- [250] IonQ: Q4 2025 earnings call ("materially under \$30 million"), SEC 425 filing, 2026-02-27 (T1)
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- [252] IBM: "IBM Quantum Roadmap" page, retrieved 2026-09-23 (T1 commitment)
- [253] IonQ: roadmap page (year-by-year LQ table; 80,000 LQ / 2M physical by 2030), retrieved 2026-09-23 (T1 commitment, management basis)
- [254] Quantinuum: press release "Quantinuum Unveils Accelerated Roadmap to Achieve Universal, Fully Fault-Tolerant Quantum Computing by 2030", 2024-09-10 (T1)
- [255] Google: "Our focused and responsible approach to quantum computing" (six-step milestones), undated (T1)
- [256] NERSC/LBNL: "Quantum Computing Technology Roadmaps and Capability Assessment for Scientific Computing" (LBNL-2001699), v1 2025-09-11 (T3)
- [257] EIFO (Export and Investment Fund of Denmark): Magne specifications (50 LQ / 1,200+ physical), 2025-11-19 (T1)
- [258] Wang et al.: "Neutral Atom Quantum Computing: Principles, Routes, Progress, and Challenges" (arXiv:2608.05010; Magne 2027 delivery basis), 2026-08-05 (T3)
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- [261] NIST: FIPS 203 "Module-Lattice-Based Key-Encapsulation Mechanism Standard", final (Table 3 size table), 2024-08-13 (T1)
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- [265] Gartner: press release (2025 global PC shipments >270M, +9.1%), 2026-01-20 (T1)
- [266] IDC: Worldwide Quarterly Mobile Phone Tracker release (2025E smartphone shipments 1.25bn, +1.5%), 2025-12-02 (T1)
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- [268] STEM News Lab: coverage of QuEra's 99.9% 2Q gate fidelity preprint, 2026-07-16 (T4 single-source media citation; not peer-reviewed)
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- [271] IonQ: official press release "IonQ Advances to Final Stage of DARPA's Quantum Benchmarking Initiative" (Stage C agreement potential value of up to \$300M, company-reported basis), 2026-10-07 (T1)

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