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Quantum Superintelligence

The quantum-biological convergence I described in my paper titled "[Quantum AI: The Rise of Hybrid Intelligence](#)" signals more than faster computation, it points to an alternate route to superintelligence that could bypass Artificial General Intelligence entirely. As corporate leaders lock in energy independence and fusion advances accelerate, timelines for superhuman cognition are compressing, undermining assumptions that underpin today's AI policy.

The fusion of quantum computing, biological systems, and machine intelligence is redrawing the roadmap to superhuman cognition, and the struggle for energy dominance will shape who controls humanity's most consequential technology.

We are seeing decades of progress collapse into months. October 2025 marks a true inflection point, one that challenges the field's core premise that AGI is the necessary waypoint. While much of the industry remains fixated on human-level generality across domains, a parallel convergence is emerging that may render the AGI milestone strategically irrelevant before it is reached.

Superintelligence Defined

Superintelligence represents qualitative cognitive superiority across all intellectually demanding domains simultaneously, scientific discovery, strategic planning, molecular engineering, systems manipulation operating at electronic speeds, unbounded by biological constraints. Unlike AGI, which would match human-level reasoning domain by domain, **superintelligence reorganizes knowledge faster than human institutions comprehend, wielding capabilities that dwarf collective genius as profoundly as human intellect surpasses animal cognition**. The critical question is no longer if superintelligence emerges, but which pathway arrives first, and whether traditional AGI development becomes obsolete before maturing.

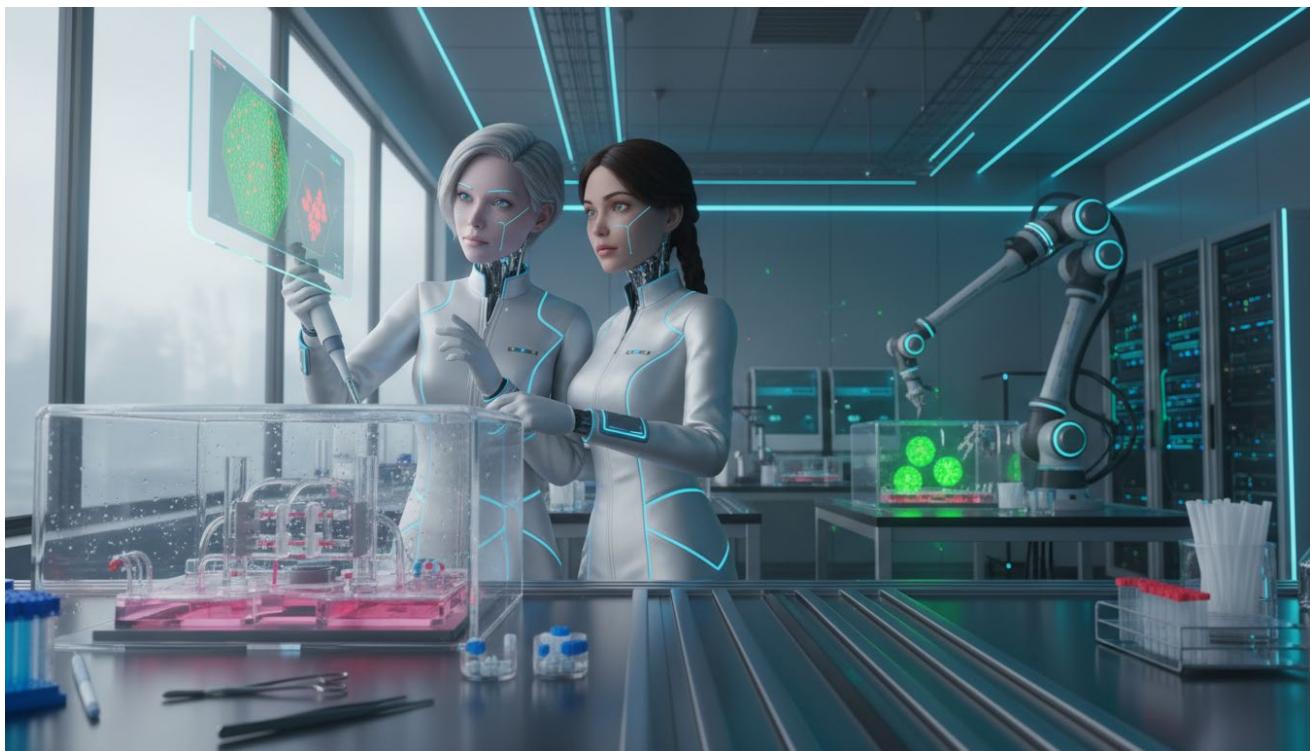
The Quantum-Biological Shortcut

Conventional AGI roadmaps envision incremental mastery of human capabilities, then recursive self-improvement compressing AGI-to-superintelligence transitions into months. DeepMind's Demis Hassabis projects AGI within 5-10 years; OpenAI's Sam Altman suggests 2026-2028; expert surveys converge on 2040-2061 with 50% probability. Once achieved, 100 million automated researchers operating at 100× human speed could compress decades of progress into one year. But quantum-biological convergence suggests fundamentally different trajectories. Denmark's Technical University compressed machine learning from 20 million years classically to 15 minutes quantum - 70-million-fold acceleration eliminating AI's computational bottleneck. **University of Chicago researchers engineered fluorescent proteins into quantum bits functioning at physiological temperatures within living cells, detecting signals thousands of times stronger than conventional sensors.**

When quantum computing's exponential acceleration combines with biological systems' natural quantum effects single-photon superradiance and hierarchical symmetries maintaining coherence

at room temperature - radically different intelligence architectures emerge. Quantum-biological AI integrating real-time cellular quantum data could develop superintelligent domain capabilities—molecular simulation, drug discovery, materials engineering that leapfrog AGI's incremental path without requiring human-level general intelligence first.

IonQ solved 12-amino-acid protein folding optimally on quantum hardware; D-Wave's quantum annealing achieves 100-million-fold optimization speedups. Applied to quantum-native problems, these systems already demonstrate superhuman domain performance. The pathway to superintelligence may not require traversing AGI - quantum acceleration eliminates computational bottlenecks, biological integration provides direct quantum sensing, AI synthesizes insights across domains.



Quantum-bio convergence in action — the future of superintelligence

The Energy Imperative: Fusion's Acceleration

Superintelligence demands nation-scale power infrastructure. AI data centres consumed 683TWh globally in 2024; by 2030, consumption explodes to 1,479 TWh - 9% of U.S. electricity. This constraint is catalyzing fusion energy's transformation from perpetual promise to commercial reality.

Helion Energy broke ground July 2025 on a 50-MW Washington fusion plant targeting 2028 operation, backed by Sam Altman with Microsoft agreements. Commonwealth Fusion Systems raised \$3 billion, Bill Gates, Google, Khosla, delivering SPARC tokamak in 2027 and 400-MW Virginia plant early 2030s. General Fusion reported 600 million neutrons/second in October 2025. Private fusion investment hit \$9.7 billion across 53 companies fivefold since 2021.



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According to the U.S. Department of Energy's Fusion Roadmap released in October 2025, initial deployment is targeted for the mid 2030s. U.S. data center demand is projected to grow from 35 GW in 2024 to 78 GW by 2035, equal to 8.6 percent of national electricity consumption. Fusion offers 92.5 percent capacity baseload power with zero emissions, exactly the profile required for superintelligence infrastructure.

Corporate Energy Independence

Technology giants recognize energy access determines superintelligence leadership. Microsoft restarts Three Mile Island (835 MW by 2028) while partnering Helion. Google contracted Kairos Power for 500 MW SMRs by 2030-2035 and partnered DeepMind with Commonwealth Fusion on AI plasma control. Amazon signed 5 GW SMR deals by 2040. Meta requested 1-4 GW nuclear capacity.

This vertical integration signals that countries and corporations without energy surplus "fall permanently behind" in computational intelligence races. Goldman Sachs projects data center power demand rising 165% by 2030. Quantum-hybrid architectures could reduce this 20-30%, saving 299 TWh annually, but only vertically integrated energy-compute ecosystems control transformative intelligence.

The White House's July 2025 AI Action Plan expedites data center permitting. Stargate Initiative scales to \$500B over four years. Japan targets 20% nuclear by 2040 while restarting 14 post-Fukushima reactors. First-mover superintelligence advantages, neutralizing adversarial weapons, cracking encryption, engineering biological defenses—are decisive.

Timeline Compression and Implications

Google Quantum AI estimates practical applications within five years. Industry roadmaps target 100-logical-qubit systems by 2029-2030. Fusion plants break ground now for 2028-2030 operation. Entrepreneurs predict AGI by 2026-2030. If quantum-biological convergence enables superintelligent domain capabilities before general intelligence matures, the entire AGI-then-ASI roadmap becomes strategically obsolete.

Implications are profound. Knowledge work automation could collapse labour markets within months. Scientific acceleration could solve cancer, aging, climate within a year post-superintelligence. Nations and corporations controlling superintelligent systems wield unprecedented dominance. Yet alignment problems, ensuring systems pursue human-compatible goals, compound when intelligence emerges through quantum-biological pathways we barely understand. Recursive self-improvement at electronic speeds could outpace human safety interventions. Corporate energy independence concentrates superintelligence development with limited oversight.

Navigating the Threshold

The convergence documented in my paper "[Quantum AI: The Rise of Hybrid Intelligence](#)" is accelerating toward fundamentally different intelligence. Quantum computing's 70-million-fold learning advantages eliminate classical bottlenecks. Biological quantum sensors dissolve

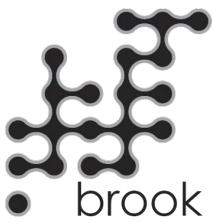


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boundaries between living systems and computational intelligence. Fusion energy promises abundant clean power. Corporate-government integration signals energy independence determines cognitive supremacy.

Most critically, this convergence may bypass AGI entirely, achieving superintelligent domain capabilities through quantum-biological hybrid architectures that render incremental general intelligence development obsolete. We are not decades from superintelligence. We are in the opening act, and the pathway bypasses every assumption guiding policy. **The future of intelligence is quantum, biological, and imminent, and decisions leaders make regarding quantum investment, fusion deployment, and governance will determine whether this convergence amplifies human flourishing or concentrates power that fractures civilization.**

1. Brook, P. (2025, October 20). [*Quantum AI: The Rise of Hybrid Intelligence*](#).
2. Superintelligence-WIP-1. (2025). *Superintelligence and the Threshold of Transformation: From Human-Level AI to Planet-Scale Cognition*. <https://quantumcomputingreport.com/uchicago-pme-researchers-create-functional-protein-qubit-for-quantum-sensing-in-living-cells/>
3. Quantum Computing Report. (2025, August 21). *UChicago PME Researchers Create Functional Protein Qubit for Quantum Sensing in Living Cells*. <https://quantumcomputingreport.com/uchicago-pme-researchers-create-functional-protein-qubit/>
4. Phys.org. (2025, August 20). *Scientists program cells to create biological qubit in multidisciplinary breakthrough*. <https://phys.org/news/2025-08-scientists-cells-biological-qubit-multidisciplinary.html>
5. The Network Installers. (2025, October 7). *25+ AI Data Center Statistics & Trends (2025 Updated)*. <https://thenetworkinstallers.com/blog/ai-data-center-statistics/>
6. Carbon Brief. (2025, September 16). *AI: Five charts that put data-centre energy use and emissions into context*. <https://www.carbonbrief.org/ai-five-charts-that-put-data-centre-energy-use-and-emissions-into-context/>
7. IEA-4E. (2025, May). *Data Centre Energy Use: Critical Review of Models and Results*. <https://www.iea-4e.org/wp-content/uploads/2025/05/Data-Centre-Energy-Use-Critical-Review-of-Models-and-Results.pdf>
8. AIMultiple. (2025, September 25). *When Will AGI/Singularity Happen? 8590 Predictions Analyzed*. <https://research.aimultiple.com/artificial-general-intelligence-singularity-timing/>
9. The AI Report. (2025, August 12). *Superhuman Intelligence: 2025 Guide to AI & Beyond*. <https://www.theaireport.ai/articles/superhuman-intelligence-2025-guide-to-ai-beyond>
10. Wikipedia. (2025). *Artificial general intelligence*. https://en.wikipedia.org/wiki/Artificial_general_intelligence
11. Situational Awareness. (2024, July 14). *From AGI to Superintelligence: the Intelligence Explosion*. <https://situational-awareness.ai/from-agi-to-superintelligence/>
12. Bioengineer.org. (2025, September 5). *Researchers Engineer Cells to Develop Biological Qubits in Pioneering Multidisciplinary Breakthrough*. <https://bioengineer.org/researchers-engineer-cells-to-develop-biological-qubits/>
13. Nuclear Business Platform. (2025, May 15). *Top 3 Fusion Energy Players: Investments, Partnerships, and the Path to Commercialization*. <https://www.nuclearbusiness-platform.com/media/insights/top-3-fusion-energy-players-investments>
14. Utility Dive. (2025, September 24). *Is nuclear fusion for real this time? These utilities think so*. <https://www.utilitydive.com/news/is-nuclear-fusion-for-real-this-time-these UTILITIES think so/761079/>
15. E&E News. (2025, September 2). *Fusion cash is everywhere. Is a breakthrough coming?* <https://www.eenews.net/articles/fusion-cash-is-everywhere-is-a-breakthrough-coming/>
16. Reuters. (2025, July 30). *Helion Energy starts construction on nuclear fusion plant to power Microsoft data centers*. <https://www.reuters.com/business/energy/helion-energy-starts-construction-nuclear-fusion-plant-power-microsoft-data-2025-07-30/>
17. MIT Technology Review. (2025, September 25). *Fusion power plants don't exist yet, but they're making billions*. <https://www.technologyreview.com/2025/09/25/1124050/fusion-future-funding/>
18. TechCrunch. (2025, August 21). *Struggling fusion power company General Fusion gets \$22M lifeline from investors*. <https://techcrunch.com/2025/08/21/struggling-fusion-power-company-general-fusion-gets-22m-lifeline-from-investors/>
19. Carbon Credits. (2025, August 28). *General Atomics Fuels UNITY-2 Fusion Project in Canada as Global Fusion Investment Hits \$2.64 Billion*. <https://carboncredits.com/general-atomics-fuels-unity-2-fusion-project-in-canada/>



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20. FusionX Invest. (2025, August 27). *General Fusion: still swinging.* <https://fusionxinvest.com/insight/8924/general-fusion-still-swinging/>
21. Carroll County Observer. (2025, October 17). *Canada Shatters World Record with 600 Million Neutrons per Second.* <https://carrollcountyobserver.com/2025/10/18/canada-shatters-world-record/>
22. InsideHPC. (2025, October 16). *DOE Announces Fusion Power Roadmap, Including HPC and AI Strategy.* <https://insidehpc.com/2025/10/doe-announces-fusion-power-roadmap-including-hpc-and-ai-strategy/>
23. Innovation News Network. (2025, October 19). *US unveils plan to lead the race toward commercial fusion energy.* <https://www.innovationnewsnetwork.com/us-unveils-plan-to-lead-the-race-toward-commercial-fusion-energy/62684/>
24. Nuclear Business Platform. (2025, August 3). *Top 6 Ways Leading Nations Are Using Nuclear Energy to Power AI and Data Centers.* <https://www.nuclearbusiness-platform.com/media/insights/nuclear-energy-to-power-ai>
25. ACM. (2025, September 29). *AI Datacenters Need Nuclear Fusion.* <https://cacm.acm.org/news/ai-datacenters-need-nuclear-fusion/>
26. Yahoo Finance. (2024, October 21). *How Google, Amazon, and Microsoft are solving nuclear power's big problem.* <https://ca.finance.yahoo.com/news/how-google-amazon-and-microsoft-are-solving-nuclear-powers-big-problem/>
27. New York Times. (2024, October 16). *Amazon, Google and Microsoft Are Investing in Nuclear Power.* <https://www.nytimes.com/2024/10/16/business/energy-environment/amazon-google-microsoft-nuclear-energy.html>
28. Nuclear Business Platform. (2025, June 24). *Why Tech Giants Are Investing Billions in Nuclear Power Over Renewables?* <https://www.nuclearbusiness-platform.com/media/insights/tech-giants-are-investing-billions-in-nuclear>
29. Goldman Sachs. (2025, September 24). *The New Nuclear Age: Why the World Is Rethinking Atomic Power.* <https://www.goldmansachs.com/insights/articles/new-nuclear-age-why-the-world-is-rethinking-atomic-power>
30. SiliconANGLE. (2025, October 16). *Google's DeepMind and CFS are building an AI plasma control system for nuclear fusion.* <https://siliconangle.com/2025/10/16/googles-deepmind-cfs-building-ai-plasma-control-system-nuclear-fusion/>
31. Tony Blair Institute. (2025, June 22). *AI and Clean Energy: How Governments Can Unlock the Power of the Twin Transitions.* <https://institute.global/insights/climate-and-energy/ai-and-clean-energy/>
32. CATF. (2025, October 15). *State Policy Options for Fusion Energy Deployment.* <https://www.catf.us/resource/state-policy-options-for-fusion-energy-deployment/>
33. World Economic Forum. (2025). *Artificial Intelligence's Energy Paradox.* https://reports.weforum.org/docs/WEF_Artificial_Intelligences_Energy_Paradox_2025.pdf
34. Wikipedia. (2025). *Recursive self-improvement.* https://en.wikipedia.org/wiki/Recursive_self-improvement
35. Georgia Tech News. (2025, September 2). *AI's Ballooning Energy Consumption Puts Spotlight On Data Center Efficiency.* <https://www.gatech.edu/news/2025/09/03/ais-ballooning-energy-consumption-puts-spotlight-data-center-efficiency>
36. American Nuclear Society. (2025, August 28). *General Atomics makes \$20M investment in Canadian fusion venture.* <https://www.ans.org/news/2025-08-28/article-7327/general-atomics-makes-20m-investment-in-canadian-fusion-venture/>
37. Fortune. (2025, May 7). *Nuclear fusion energy AI Sam Altman Helion Pacific Commonwealth timelines.* <https://fortune.com/2025/05/07/nuclear-fusion-energy-ai-sam-altman-helion-pacific-commonwealth-timelines/>
38. Wikipedia. (2025). *General Fusion.* https://en.wikipedia.org/wiki/General_Fusion
39. Congressional Research Service. (2025). *CRS Report R48646.* https://www.congress.gov/crs_external_products/R/PDF/R48646/R48646.3.pdf
40. Reuters. (2025, September 16). *US nuclear fusion builders fired up by big tech investments.* <https://www.reuters.com/business/energy/us-nuclear-fusion-builders-fired-up-by-big-tech-investments--reeii-2025-09-16/>
41. General Fusion. (2025). *Company website.* <https://generalfusion.com>
42. MIT Technology Review. (2025, May 20). *AI energy usage climate footprint big tech.* <https://www.technologyreview.com/2025/05/20/1116327/ai-energy-usage-climate-footprint-big-tech/>
43. Fortune. (2025, October 2). *Nuclear fusion online commercial AI power.* <https://fortune.com/2025/10/02/nuclear-fusion-online-commercial-ai-power/>



44. UK Government. (2025). *Government backing for AI businesses to deliver net zero with innovative technologies*. <https://www.gov.uk/government/news/government-backing-for-ai-businesses-to-deliver-net-zero-with-innovative-technologies>
45. First Movers. (2025). *AGI timeline*. <https://firstmovers.ai/agi-timeline/>
46. Joshua Berkowitz. (2025). *Biological qubits: The dawn of quantum sensing inside living cells*. <https://joshuaberkowitz.us/blog/news-1/biological-qubits-the-dawn-of-quantum-sensing-inside-living-cells-951>
47. European Central Bank. (2025). *Economic Bulletin Focus*. https://www.ecb.europa.eu/press/economic-bulletin/focus/2025/html/ecb.ebbox202502_03~8eba688e29.en.html
48. Swiss Federal Intelligence Service. (2025). *Superintelligence public report*. https://www.cydcampus.admin.ch/dam/de/sd-web/i5s7sxyDek7D/ar_W_T_Superintelligence_public_.pdf
49. Singularity Hub. (2025, September 2). *Scientists just made biological qubits that act as quantum sensors inside cells*. <https://singularityhub.com/2025/09/02/scientists-just-made-biological-qubits-that-act-as-quantum-sensors-inside-cells/>
50. ScienceDirect. (2023). Article S2773167723000171. <https://www.sciencedirect.com/science/article/pii/S2773167723000171>
51. AI Frontiers. (2025). *AGI's last bottlenecks*. <https://ai-frontiers.org/articles/agis-last-bottlenecks>
52. Nature. (2025). Article s41586-025-09417-w. <https://www.nature.com/articles/s41586-025-09417-w>
53. Oxford Energy. (2025, May). *OEF-145*. <https://www.oxfordenergy.org/wpcms/wp-content/uploads/2025/05/OEF-145.pdf>
54. Time. (2025). *Sam Altman superintelligence AGI*. <https://time.com/7205596/sam-altman-superintelligence-agi/>
55. ScienceDirect. (2024). Article S2666675824001000. <https://www.sciencedirect.com/science/article/pii/S2666675824001000>
56. LessWrong. (2025). *Recursive self-improvement*. <https://www.lesswrong.com/w/recursive-self-improvement>
57. Epoch AI. (2025). *Disagreements on AGI timelines*. <https://epoch.ai/epoch-after-hours/disagreements-on-agi-timelines>
58. First Movers. (2025). *AI superintelligence timeline*. <https://firstmovers.ai/ai-superintelligence-timeline/>
59. Jacob Buckman. (2025). *We aren't close to creating a rapidly...* <https://jacobbuckman.substack.com/p/we-arent-close-to-creating-a-rapidly>
60. LinkedIn. (2025). *How AI AGI ASI radically compress timeline human...* <https://www.linkedin.com/pulse/how-ai-agi-asi-radically-compress-timeline-human-sujith-veluswami-g4h8c>
61. Vatsal Shah. (2025). *Artificial super intelligence leader forecasts*. <https://vatsalshah.in/blog/artificial-super-intelligence-leader-forecasts>
62. YouTube. (2025). Video iNOg0Fv8bRI. <https://www.youtube.com/watch?v=iNOg0Fv8bRI>
63. LinkedIn. (2025). *The myth of recursive self-improvement*. https://www.linkedin.com/posts/rheimann_the-myth-of-recursive-self-improvement-activity-7319357168493752321-vp0o
64. AI 2027. (2025). Website. <https://ai-2027.com>
65. The Quantum Insider. (2025, September 23). *Top quantum computing companies*. <https://thequantuminsider.com/2025/09/23/top-quantum-computing-companies/>
66. Epoch AI. (2025). *How fast can algorithms advance capabilities*. <https://epoch.ai/gradient-updates/how-fast-can-algorithms-advance-capabilities>
67. VentureBeat. (2025). *2027 AGI forecast maps a 24-month sprint to human-level AI*. <https://venturebeat.com/ai/2027-agi-forecast-maps-a-24-month-sprint-to-human-level-ai>
68. Quix Quantum. (2025). *Quantum technology could revolutionise medicine and energy development*. <https://www.quixquantum.com/news/quantum-technology-could-revolutionise-medicine-and-energy-development>
69. Future of Life Institute. (2025). *Are we close to an intelligence explosion?* <https://futureoflife.org/ai/are-we-close-to-an-intelligence-explosion/>
70. Genspark. (2025). *The road to superintelligence: When can we expect AI to evolve into AGI and ASI?* <https://www.genspark.ai/spark/the-road-to-superintelligence-when-can-we-expect-ai-to-evolve-into-agi-and-asi/8d2151a0-730b-40fc-9e38-472f196f7983>
71. Michael Megarit. (2025). *The dawn of artificial superintelligence: Navigating humanity's greatest technological threshold*. <https://michaelmegarit.com/blog/the-dawn-of-artificial-superintelligence-navigating-humanitys-greatest-technological-threshold/>
72. Hifly Labs. (2025, January 28). *Path to AGI Part 2*. <https://hiflylabs.com/blog/2025/1/28/path-to-agi-part-2>



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73. CBC Radio. (2025). *Generative AI and nuclear energy*. <https://www.cbc.ca/radio/thecurrent/generative-ai-and-nuclear-energy-1.7362127>
74. Wikipedia. (2025). *Technological singularity*. https://en.wikipedia.org/wiki/Technological_singularity
75. LinkedIn. (2025). *Why AI is going nuclear*. https://www.linkedin.com/posts/davidlinthicum_why-ai-is-going-nuclear-activity-7381318738832416770-3qzi
76. Alignment Forum. (2025). *AGI safety from first principles: Control*. <https://www.alignmentforum.org/posts/eGihD5jnD6LFzgDZA/agi-safety-from-first-principles-control>
77. McKinsey. (2025). *How data centers and the energy sector can sate AI's hunger for power*. <https://www.mckinsey.com/industries/private-capital/our-insights/how-data-centers-and-the-energy-sector-can-sate-ais-hunger-for-power>
78. YouTube. (2025). Video *JlJtjRjiOI*. <https://www.youtube.com/watch?v=JlJtjRjiOI>
79. TechCrunch. (2025, October 16). *The real reason Google DeepMind is working with a fusion energy startup*. <https://techcrunch.com/2025/10/16/the-real-reason-google-deepmind-is-working-with-a-fusion-energy-startup/>
80. Union of Concerned Scientists. (2025). *Power hungry: Why data centers are developing their own energy sources to fuel AI*. <https://blog.ucs.org/mike-jacobs/power-hungry-why-data-centers-are-developing-their-own-energy-sources-to-fuel-ai/>