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The Global Market for Sustainable Data Centers 2027–2037

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Abstracts

The market for sustainable data centers has moved, in the space of two years, from a voluntary corporate-responsibility concern to a hard commercial and regulatory constraint on the single fastest-growing category of electricity demand in the world. The trigger is the AI build-out: soaring rack densities, rising GPU thermal design power, and hyperscale campuses now specified in gigawatts have pushed data-center electricity consumption onto national-grid agendas and into direct conflict with decarbonization targets, water-stress limits, land-use politics and community opposition. The defining bottleneck is no longer capital or chips but power — multi-year grid-interconnection queues have made speed-to-power the industry's scarcest resource, driving a structural shift toward "bring-your-own-power" generation, behind-the-meter microgrids and on-site firm capacity.

This report frames the market around the three emissions scopes that govern data-center sustainability. Scope 2 (purchased electricity) is being addressed through PPAs, hourly-matched clean energy, and a widening portfolio of firm low-carbon generation — small modular reactors, nuclear restarts, enhanced geothermal, fuel cells, and gas paired with carbon capture. Scope 1 and on-site efficiency center on the transition from air to liquid cooling (direct-to-chip and immersion) as densities exceed air's physical limits, alongside 800 VDC power architectures, wide-bandgap (SiC/GaN) power electronics, and performance-per-watt gains in compute, memory and optical interconnect. Scope 3 — which dominates lifecycle emissions — spans carbon dioxide removal, low-carbon construction (green steel, low-carbon cement, mass timber), embodied carbon in IT hardware, and circularity.

Policy is now the market's principal accelerant. The EU's Energy Efficiency Directive reporting scheme, the Data Centre Energy Efficiency Package and its A–F rating

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scheme, and the Cloud and AI Development Act (which conditions capacity growth on efficiency, water and circularity) sit alongside US federal and state reporting rules, China's green-data-center action plans, Singapore's roadmap, and grid-connection reform in the UK and Ireland. Standards such as PUE, WUE, CUE and EPEAT are hardening from voluntary benchmarks into regulatory metrics.

The result is a rapidly expanding, technology-diverse market spanning power generation, storage, cooling, power electronics, efficient IT and Scope 3 abatement — forecast in detail to 2037 across power consumption, emissions, cooling revenue and 800 VDC adoption, under baseline, stringent-regulation and delayed-regulation scenarios. Sustainability has become inseparable from the economics and permitting of building AI infrastructure at all.

The Global Market for Sustainable Data Centers 2027–2037: Policy, Green Power, Efficiency, Scope 3 and Forecasts is a comprehensive, 10-chapter market study that combines policy analysis, technology assessment, quantitative forecasts to 2037, and 245 company profiles across the full sustainable-data-center value chain.

Contents include:

- Executive summary — headline numbers, policy landscape, highest-impact technologies, and forecast conclusions
- Introduction & context — data-center types, AI build-out, global footprint, metrics and emissions accounting
- Global policy & regulation — EU, US, China, APAC, UK; grid connection; standards and disclosure
- Energy demand, grid stress & business case — IEA scenarios, interconnection queues, water, carbon intensity
- Sustainable power generation — PPAs, BYOP, solar/wind, nuclear/SMRs, geothermal, CCUS, fuel cells, storage/LDES
- Energy efficiency — cooling (air/direct-to-chip/immersion), 800 VDC and SiC/GaN power, efficient compute/memory/optics
- Scope 3 decarbonization — CO? removal, green steel/cement, embodied carbon

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and circularity

Market forecasts to 2037 — power, emissions, cooling, 800 VDC, policy-scenario sensitivities

244 company profiles 1414 Degrees, 3M, Aalo Atomics, AcBel Polytech, Accelsius, ACCURE Battery Intelligence, Airco Process Technology, Algoma Steel, AlphaESS, Ambri, AMD, Amkor Technology, Ampace, Antora Energy, Aperam BioEnergia, ArcelorMittal, Ardent, ASE Group, Asetek, Asia Vital Components (AVC), Asperitas, Atecom Technology, Auras Technology, Ayar Labs, Baker Hughes, Ballard Power Systems, Biomason, Blastr Green Steel, Bloom Energy, Boston Metal, Boyd Corporation, Brenmiller Energy, Bright Renewables, Broadcom, BYD Energy Storage, C-Capture, Caldera, Calibrant Energy, Cambridge Electric Cement, Capsol Technologies, Carbice, CarbiCrete, Carbonaide, CarbonCure, CarbonFree, CATL, CellCube, Cerebras, Ceres Power, Chart Industries, Chemours, China Baowu, Chiyoda, Cisco Systems, Climeworks, Coherent, Coolbrook, Cooler Master, CoolIT Systems, Corintis, Dalian Rongke Power, Deep Fission, Delta Electronics, Dow, Eaton Corporation, EFFECT Photonics, Electra (Electra Steel), ElectraMet, Electrified Thermal Solutions, Element Six, Emirates Steel Arkan, Energy Dome, Energy Vault, EnergyNest, Engineered Fluids, Eoptolink, Eos Energy Enterprises, EPC (Efficient Power Conversion), ESS Tech, EVE Energy, Exowatt, Fabrinet and more.....

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