Fusion Energy Systems

ANMD-MRS23-222 · Nuclear & Fusion Technologies

A Global Sustainability Due Diligence & Market Research Study

History 2020–2024 · Base Year 2025 · Forecast 2025–2032 · Outlooks 2035 / 2040 / 2050 · Currency US$

WHY THIS REPORT

Fusion energy systems aim to harness the power source of the stars — fusing light nuclei to release abundant, clean, dispatchable energy with no long-lived waste and no risk of meltdown. Competing confinement approaches — magnetic (tokamak, stellarator), inertial (laser/ICF) and magnetised-target — are racing from scientific breakeven toward engineering and commercial demonstration. This decision-grade study sizes the global market three ways — value, system count and scientific progress (Q) — across confinement approach, technology platform and application, across seven regions and four scenarios to 2032, with outlooks to 2050.

SUSTAINABILITY & SDG IMPACT — THE ANMD LENS

Sustainability is this report's backbone, not an afterthought. Beyond clean generation, fusion promises measurable zero-carbon firm power, inherent safety and no long-lived waste, while limitless fuel strengthens the energy-security story.

Mapped Sustainable Development Goals:

SDG 7	SDG 9	SDG 13
Affordable & Clean Energy	Industry, Innovation & Infrastructure	Climate Action

Measurable sustainability outcomes assessed:

- Zero-carbon firm power and inherent safety
- No long-lived waste and limitless fuel
- Tritium handling and activated materials as a material consideration
- Rare-material supply and pre-commercial risk assessed

Framework alignment: Double materiality mapped to GRI, SASB, ISSB, TCFD, TNFD, CSRD and the EU Taxonomy, with greenwashing and SDG-washing screens applied throughout.

WHAT'S INSIDE AT A GLANCE

53 Chapters	**9** Report Parts	**7** Regions Covered	**40+** Country Markets
2025–32 Forecast Horizon	**4** Forward Scenarios	**25+** Companies Profiled	**3** SDGs Mapped

REPORT COVERAGE

Geographic scope: North America, Europe, Asia Pacific, Latin America, Africa, Middle East and Rest of World — with named country intelligence. North America leads private fusion; Europe is the public-science anchor; Asia Pacific is accelerating; other regions assessed on their own merits.

- Abundant, clean, dispatchable energy from fusion
- Magnetic, inertial and magnetised-target confinement
- Racing from breakeven toward commercial demonstration
- Tritium handling, activated materials and supply as considerations

MARKET OVERVIEW

From physics demonstration to commercial endgame — where limitless fuel, zero-carbon firm power and inherent safety underpin a proposition no other source can match.

Fusion is moving from physics demonstration toward private-sector commercialisation. Demand is driven by decarbonisation imperatives and breakthroughs in superconducting magnets, lasers and AI plasma control, supported by record private investment across North America, Europe and Asia Pacific. The market is read three ways — value, system count and scientific progress (Q) — and forecast under four scenarios, each region reported separately.

- **North America leads private fusion** — the United States, where high-field magnet tokamaks, FRC and laser approaches attract the largest private capital pools
- **Europe is the public-science anchor** — the United Kingdom, Germany and France, driving ITER, STEP, stellarator and laser programmes and a deep supply base
- **Clean firm power is the differentiator** — limitless fuel, zero-carbon dispatchable energy and inherent safety underpin a value proposition no other generation source can match
- **Confinement approach segments the value** — magnetic (tokamak, stellarator), inertial (laser/ICF) and magnetised-target systems, each with distinct timelines and economics

REGIONAL OUTLOOK

Across seven reporting regions, the report separates leading markets from high-growth and emerging ones — each profiled in full rather than aggregated into Rest of World.

Region	Stage	Lead Country Markets & Drivers
North America	Private leader	United States, Canada — private capital, high-field magnets, laser ICF
Europe	Science anchor	United Kingdom, Germany, France — ITER, STEP, stellarator, supply base
Asia Pacific	Scale engine	China, Japan, South Korea — state tokamaks, plasma milestones
Latin America	Emerging	Brazil, Chile — research participation, future energy strategy
Africa	Frontier	South Africa — research linkage, long-horizon energy access
Middle East	Frontier	UAE, Saudi Arabia — sovereign investment, diversification bets

KEY MARKET DRIVERS & RESTRAINTS

Drivers	Restraints
• Decarbonisation + clean-firm energy endgame • High-field superconducting magnet breakthroughs • Record private fusion investment inflows • AI plasma control and simulation advances • Net-energy-gain milestones (NIF, JET, EAST)	• Pre-commercial TRL and net-energy-gain risk • Extreme capital intensity and long timelines • Tritium fuel-cycle and breeding immaturity • Materials and neutron-damage challenges • Regulatory frameworks still being defined

SEGMENTATION SNAPSHOT

By Confinement Approach	Magnetic (tokamak, stellarator) · inertial (laser/ICF) · magnetised-target
By Technology Platform	Superconducting tokamak · stellarator · laser ICF · FRC / pinch
By Application	Grid power · industrial heat · research / defence · space propulsion
By End User	Utilities · governments · research programmes · industrial off-takers
By Business Model	Hardware sale · build-own-operate · managed service · power off-take
By Scale	Experiment · pilot plant · commercial demonstration

TECHNOLOGY & APPLICATION FINDINGS

Where the category is differentiating fastest — the technology and application fronts that separate leaders from followers:

- **Grid power** — utilities target fusion for limitless clean-firm baseload once net-electricity and commercial demonstration are achieved
- **Industrial heat** — high-temperature fusion heat could decarbonise hydrogen, chemicals and synthetic fuels in the long horizon
- **Research & development** — national programmes and laboratories drive plasma, materials and high-energy-density physics advances

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The full report is organised into nine parts across 53 chapters, listed below. Detailed sub-headings, country tables and directories are provided in the full report.

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COMPETITIVE & INVESTMENT SNAPSHOT

The competitive field spans private fusion developers, public research programmes and specialist component suppliers. Deal activity — mega-round private financing, government cost-share and utility pre-orders — signals a market consolidating around the most credible paths to net energy.

Representative players profiled in the full report:

Commonwealth Fusion Systems, Inc. · TAE Technologies, Inc. · Tokamak Energy Ltd · Helion Energy, Inc. · General Fusion Inc. · ITER Organization · and 20+ further profiled players.

Investment intelligence: venture, infrastructure, development, climate and blended finance, green bonds and sustainability-linked loans — culminating in a bankability assessment and a conditional investment view.

KEY QUESTIONS THIS REPORT ANSWERS

- How large is the global fusion energy market, and how fast will it grow to 2032?
- Which regions, countries and segments offer the strongest risk-adjusted opportunity?
- Which technologies and platforms reshape the addressable market and the cost curve?
- Who leads, and where is the competitive and patent white space?
- Is the investment case bankable — and under what conditions?
- How does the category align with the SDGs and disclosure regulation?

WHY ANMD — THE DIFFERENCE

Most market studies stop at units and revenue. This report is built as a sustainability due diligence instrument — fusing market sizing with ESG, SDG, climate and natural-capital intelligence and a decision-ready bankability view in a single architecture.

- **Triangulated sizing** — every market read three ways so value, volume and the physical-unit views reconcile rather than conflict.
- **Region-honest forecasting** — Latin America, Africa and the Middle East reported in full, never hidden inside Rest of World, every forecast resolved to the 2025 base year.
- **Integrated evidence base** — company, patent and project databases linked to the analysis, with published-filing patents and FTO treated as an indicator, not a legal conclusion.
- **No-fabrication discipline** — every estimate carries a data-confidence rating and disclosed sources; gaps are flagged for further diligence, never filled with invented numbers.
- **Anti-greenwashing rigour** — SDG-washing and greenwashing screens plus claim-substantiation checks built into the ESG and project analysis.
- **Decision-first structure** — 9 Parts and 53 Chapters culminating in stakeholder playbooks and a clear, conditional investment view.

WHO SHOULD BUY THIS REPORT

Utilities, governments, research programmes, industrial off-takers, technology investors and policymakers, and strategic corporate planners and decision-makers.

Access the Full Report

The complete report delivers all 53 chapters in full, with every sub-heading, country table, company and patent directory, forecast model and due diligence checklist.

Purchase at **www.anewmarketdynamics.com** · Standard & Premium licences · Single-Site (SSL) and Global-Site (GSL) options at checkout.

Want the Complete Detailed Table of Contents?

This prospectus lists the nine parts and 53 chapters. The complete detailed table of contents — every sub-heading, country table, exhibit, company and patent directory and annex — is available on request to registered users. To receive it, register with your official company email at **www.anewmarketdynamics.com**. The full detailed table of contents will be sent directly to your registered company email address.