FUSION FOR ENERGY

Global Investment in the Private Fusion Sector

Report from the F4E Fusion Observatory

1st Edition
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Fusion for Energy
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Note that the views expressed in this report are those of the authors and do not necessarily reflect the official position of Fusion for Energy or the European Union.

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1. Executive Summary

The pursuit of fusion energy has entered a new and decisive phase, transitioning from a primarily public research endeavour to a dynamic arena for private investment. This first report by the F4E Fusion Observatory provides a comprehensive analysis of this burgeoning sector, revealing a landscape of explosive but highly concentrated growth and offering a perspective on the EU's position within it.

This first report from the F4E Observatory has attempted to set out the vibrant and complex landscape of global fusion private investment. Subject to the limitations of the data available and methodology described in the annex, the findings lead to several important conclusions that may help shape future policy decisions: The main findings are:

1. A Rapidly Growing but Concentrated Market. Our analysis using the methodology described in annex 1, shows that global fusion private investment has reached an accumulated total of **€9.9 billion** (cutoff 10 June 2025), a more than six-fold increase since 2020. However, this growth is highly concentrated, with the US and China accounting for 85% of all funding. This creates a competitive landscape defined by a few heavily capitalized national ecosystems.

2. The Dominance of US and Chinese Models. The US leads the private race with 38 of 68 private fusion companies and 60% of global funding. China is a strong second, securing 25% of funding with a highly efficient model of only 6 companies. These two dominant models appear to be setting the global pace.

3. The EU's Scaling Challenge. The EU's private ecosystem, with 8 companies and 70 investors, has raised a significant €567M (~5% of global funding). However, a critical scaling challenge emerges from the data: the average EU investment round is around three times smaller than in the US and 30 times smaller than China. This gap in access to large-scale private capital may be a potential bottleneck for EU advancing towards capital-intensive demonstration phases.

4. A Divergent Technology Strategy. The global private market currently favours magnetic confinement fusion (70% of funding). The EU private sector instead allocates most funding (69%) to inertial confinement. This shows an important difference in the EU ecosystem and may be a result of the availability of stable public funding for magnetic confinement fusion in the EU (a subject for future analysis).

5. A Negative Cross-Border Investment Balance. The EU's negative investment balance of 74M€ (105M€ with the US), while demonstrating the global reach of its investors, indicates that EU capital is also contributing to the growth of a fusion ecosystems outside the EU. This probably reflects the attractiveness of the more mature US venture market but could also be an indication of a lack of investable fusion projects within the EU. Again, this may be due to the availability of stable public funding sources for magnetic fusion initiatives within the EU (to be further explored).

6. The Central Strategic Duality: Industrial Strength and Private Sector Scale. An important conclusion is that the EU's position is one of strategic duality. In contrast to the US where privately funded fusion initiatives are dominant, the **€6.8 billion** public investment in the EU ITER supply chain though F4E has created a foundational asset of unparalleled value, a world-class industrial base. However, aside from spinoff applications outside fusion, the long-term sustainability of these supply chains depends on a future fusion technologies market and commercial fusion plants, and this may be one of the main challenges facing the EU in the coming years.

Note that this analysis does not consider public sector funding to national public fusion initiatives that remains an important component of the overall fusion landscape (this will be the subject of ongoing analysis and future reports). This may help to explain some of the trends seen in this report including the allocation of investment to different fusion concepts and technologies where, for example, EU private sector investment is focussed on inertial confinement and magnetic confinement in other regions.

2. Global Investment Overview

The overall evolution of cumulative investment in private sector fusion companies (Figures 1 and 2) shows an inflection point from **just over €1.5 billion in 2020 to an estimated €9.9 billion today** (cutoff 10 June 2025)**.** This funding is a mix of sources: private capital accounts for the majority at over €6.7 billion, but public funds, totalling around €1.8 billion, are increasingly flowing into private ventures through grants and institutional support. A further €1.4 billion comes from hybrid forms like Public-Private Partnerships and state-backed investments, particularly in China and the US.

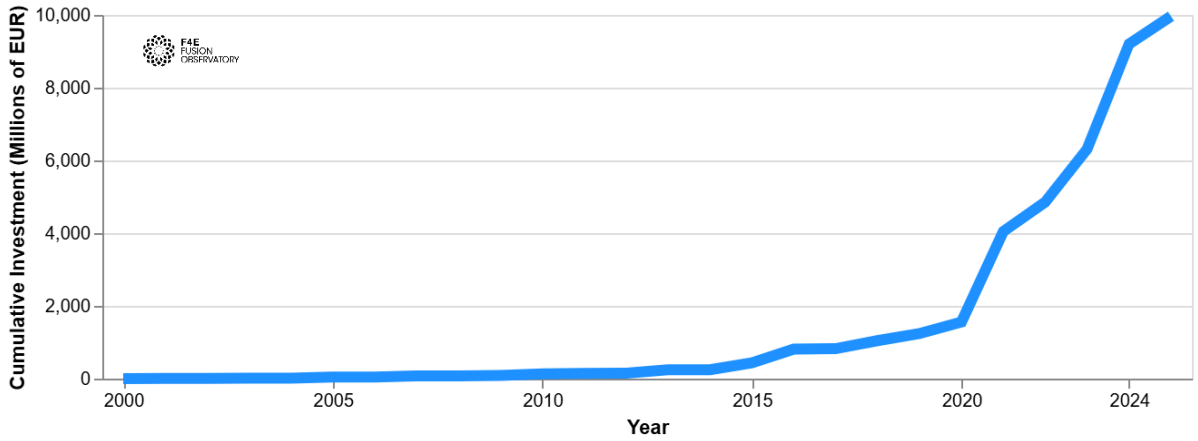

Figure 1 - Progressive growth of Global Investments in Fusion Companies (2000-Present)

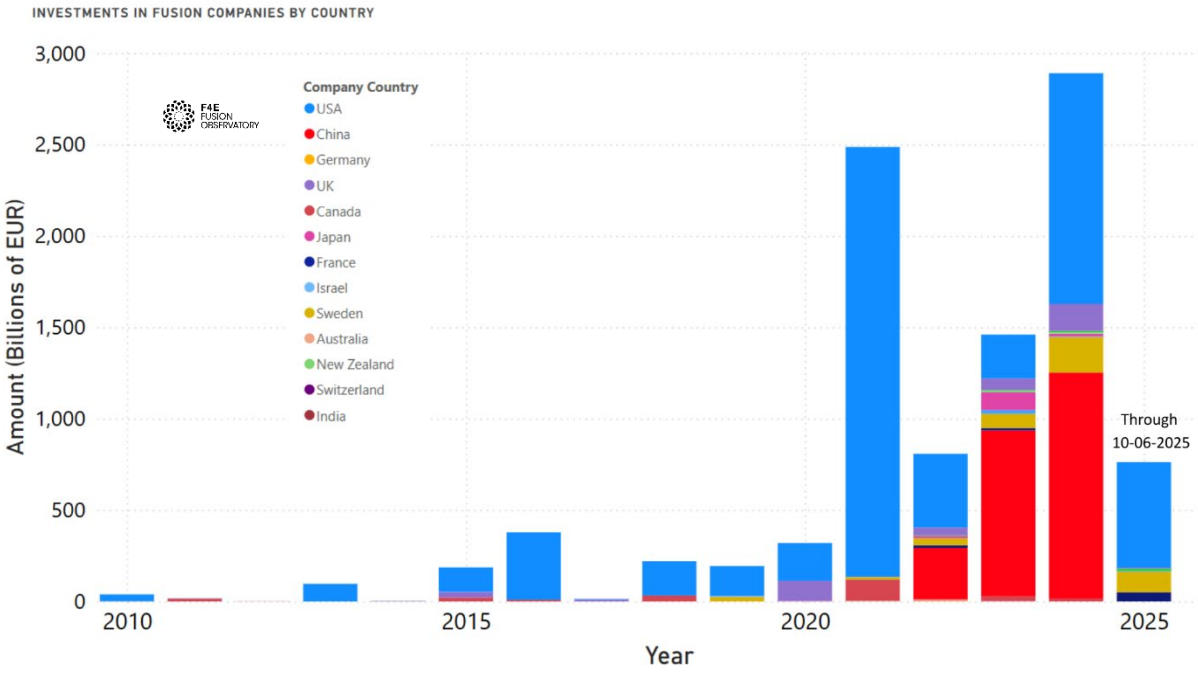

Figure 2 – Stacked chart showing annual in investments in fusion companies by country

A global map of the **€9.9 billion** in total funding (Figure 3) reveals a landscape dominated by two primary hubs: **North America (€6.3B)** and **East Asia (€2.5B)**. A more detailed breakdown by country (Figure 4) sharpens this picture. The **United States** leads with **€6.1 billion (61.3%)**, while **China** follows with **€2.4 billion (24.4%)**. Together, these two nations account for 85% of all private fusion funding, creating a duopolistic structure at the top of the market.

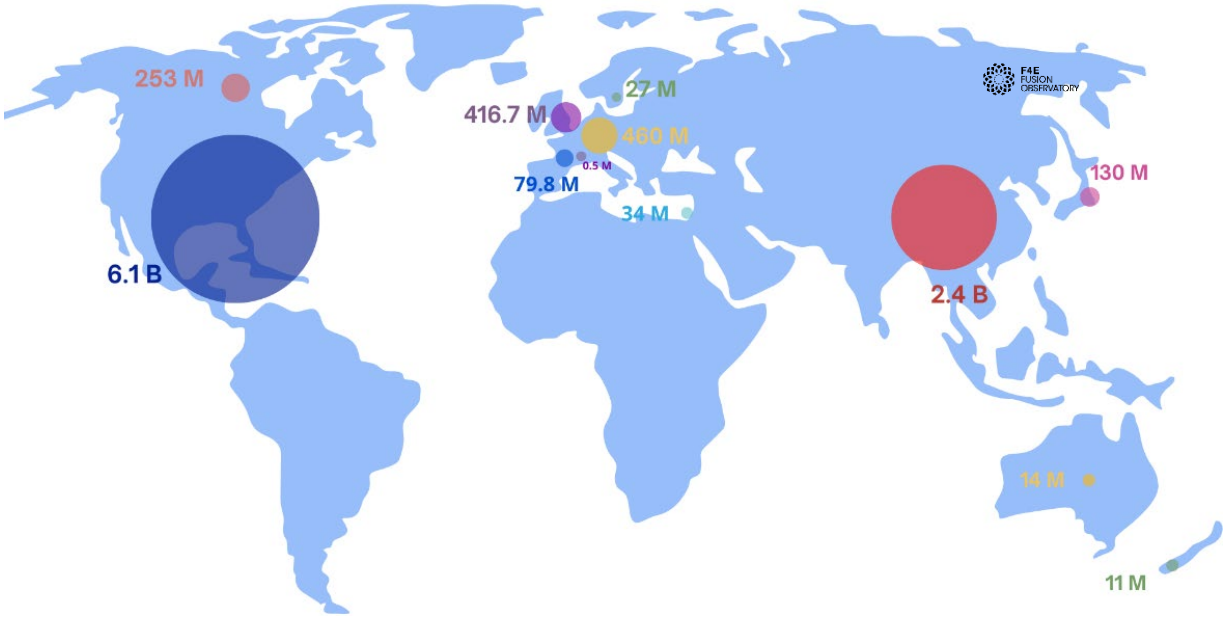

Figure 3 – Geographical Global Investment Overview by Country (Millions of EUR)

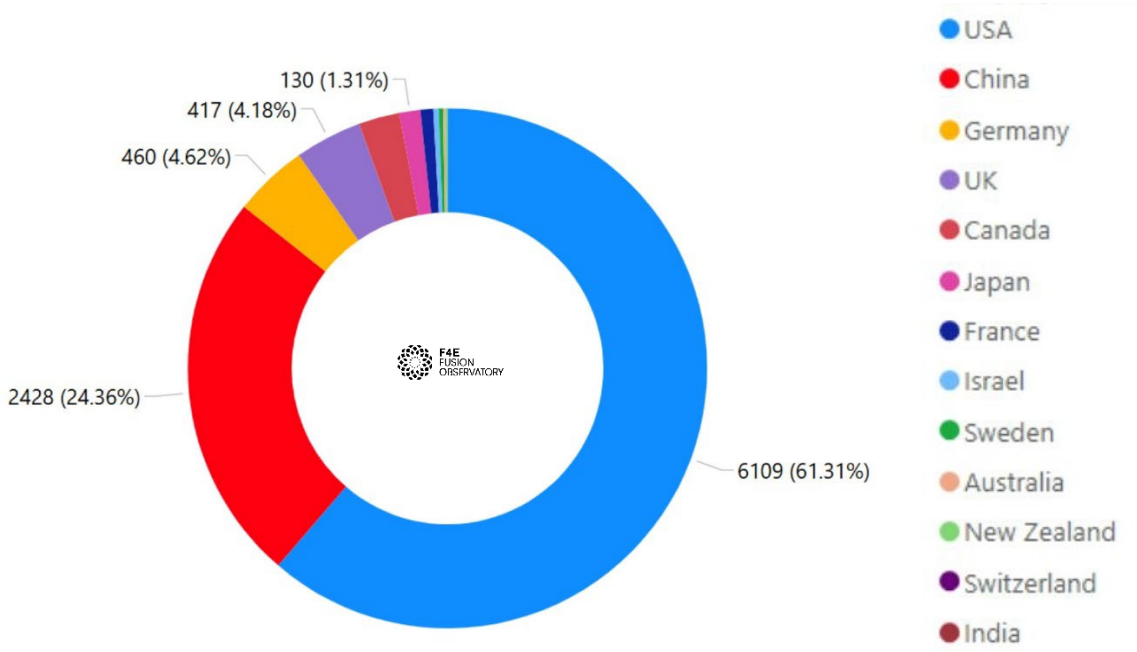

Figure 4 – Breakdown of global Investments by Country of Fusion Company (Millions of EUR)

Within Europe (Figures 5 and 6), investment is nearly evenly split between the **United Kingdom (€416.8M)** and the surveyed **EU member states**. Germany is the clear leader within the EU, with its companies raising **€460.5M**, or **81% of total of investments in the EU**, indicating that the EU's private ecosystem is not only smaller but also less geographically diversified than that of the US.

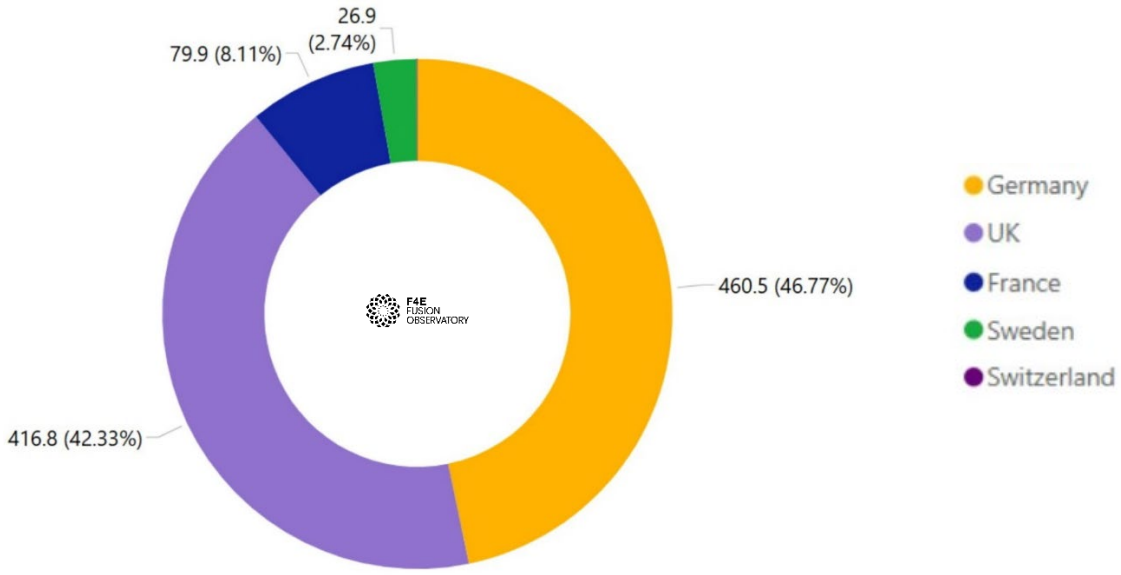

Figure 5 - Investments by Country in Europe (Millions of EUR)

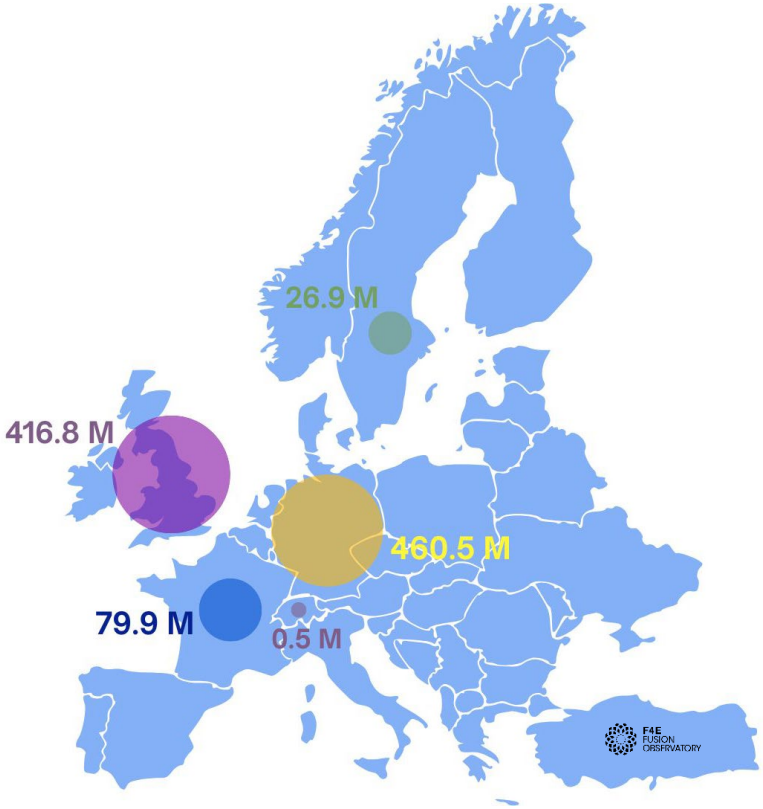

Figure 6 – Geographic Investment Overview in Europe (Millions of EUR)

This financial landscape is reflected in company demographics (Figures 7 and 8). The **US hosts 38 of the 68 companies tracked**, indicating a mature ecosystem with a high degree of "critical mass." The **EU is home to 8 companies**.

Figure 7 - Number and Location of Companies Globally

Figure 8 - Number and Location of Companies in Europe

This concentration of capital has produced some titans (Figure 9) like **NEO Fusion (China, €1.9B)** and **Commonwealth Fusion Systems (USA, €1.8B)**. These are followed closely by US-based TAE Technologies (€1.3B), Helion Energy (€906M), and Pacific Fusion (€831M). Remarkably, these **five companies alone account for nearly 70% of all global private investment**. It is also notable that these firms are not only technology leaders but are also tightly embedded in national innovation and energy strategies, having also received significant government support.

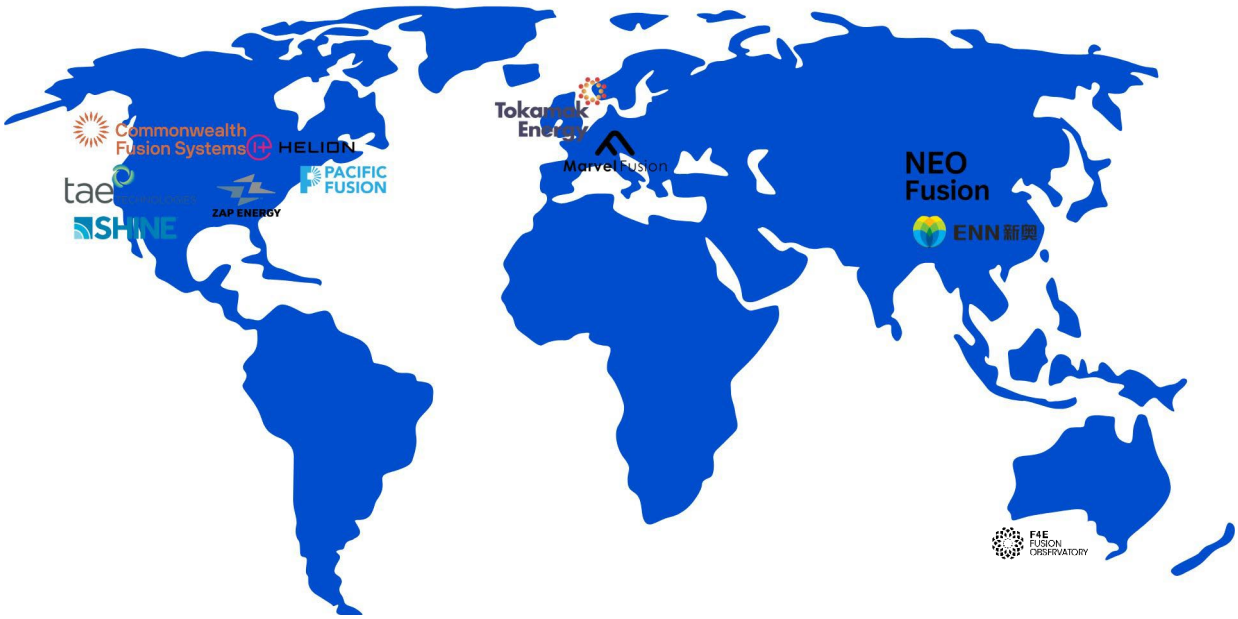

Figure 9 - Top-Funded Fusion Companies Worldwide[1]

In the European context (Figure 10), the leading companies operate at a different financial scale. The **UK's Tokamak Energy (€307.4M)** is the most well-funded, followed by **Marvel Fusion (€255.8M)** and **Focused Energy (€115M)**—both based in Germany but with strong operational ties to the US. The list continues with First Light Fusion (€103.7M) and a cluster of emerging ventures like Proxima Fusion (€62M) and Renaissance Fusion (€61M**).** While these firms are advancing rapidly with innovative technologies, their capital levels are still **between 10 and 20 times lower** than their American or Chinese counterparts.

[1] Company logos shown for informational purposes only. All trademarks are property of their respective owners

Figure 10 - Top-Funded Fusion Companies in Europe[2]

[2] Company logos shown for informational purposes only. All trademarks are property of their respective owners

2. Investors Landscape

The sources of capital reveal distinct regional investment philosophies. As illustrated in the comparative charts of Figure 11, three models emerge:

- A **venture-led model** in the **United States**, where **private capital (91.9%)** is the primary engine of growth.
- A **state-guided model** in **China**, where **public and public-private funding (77.3%)** reflect a top-down industrial strategy.
- A **hybrid model** in the **European Union**, with a balanced mix of **public (28.0%), private (31.9%), and public-private (40.0%)** funding.

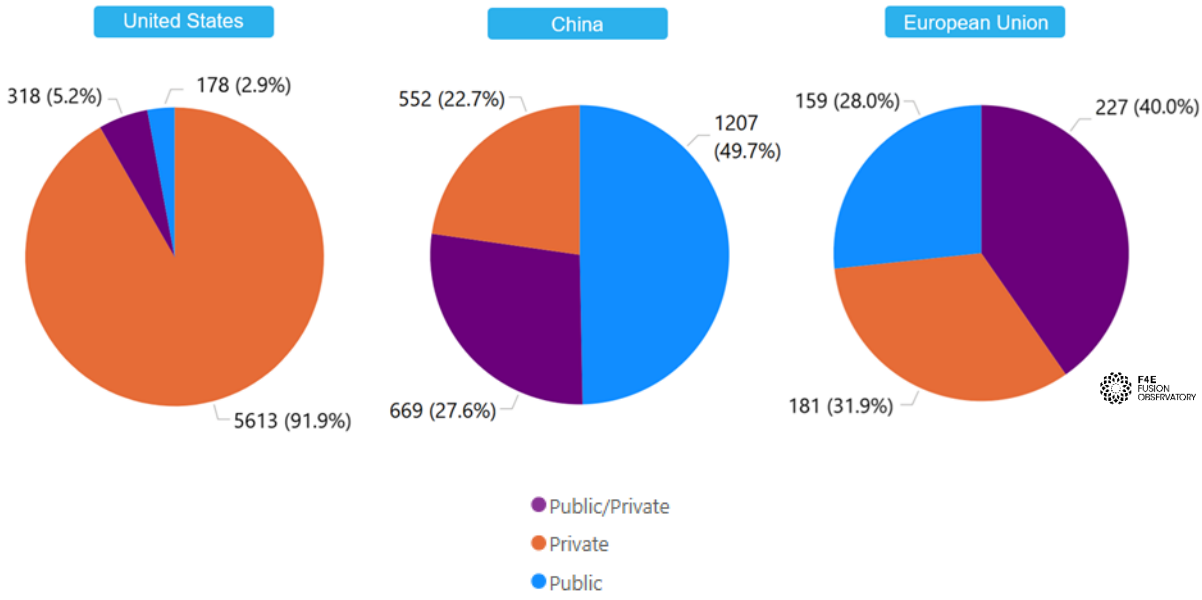

Figure 11 – Investors Type in the United States, China and the European Union

Globally (Figure 12), **US-based investors** are the primary source of capital, deploying **€5.157 billion (56.4%)**. Within the EU (Figure 13), the investor base is more localised, led by **German (40%)** and **French (16.4%)** investors. The key investor groups in each region are highlighted in Figure 14. This global flow of capital, detailed in Figure 15, results in a negative investment balance for the EU. As concluded in this report's findings, the **EU has an overall negative cross-border investment balance of 74M€ with 105M€ with the US alone,** indicating that European capital is actively supporting the growth of a fusion ecosystems outside the EU.

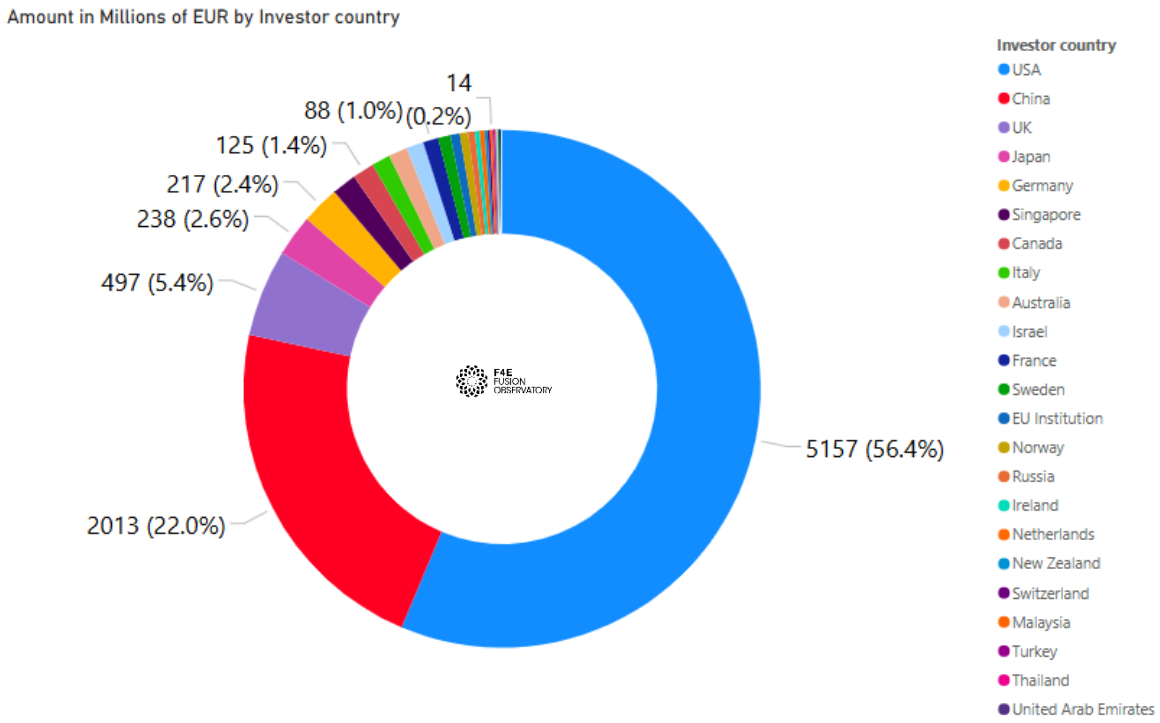

Figure 12 – Geographical origin of investors – Global level

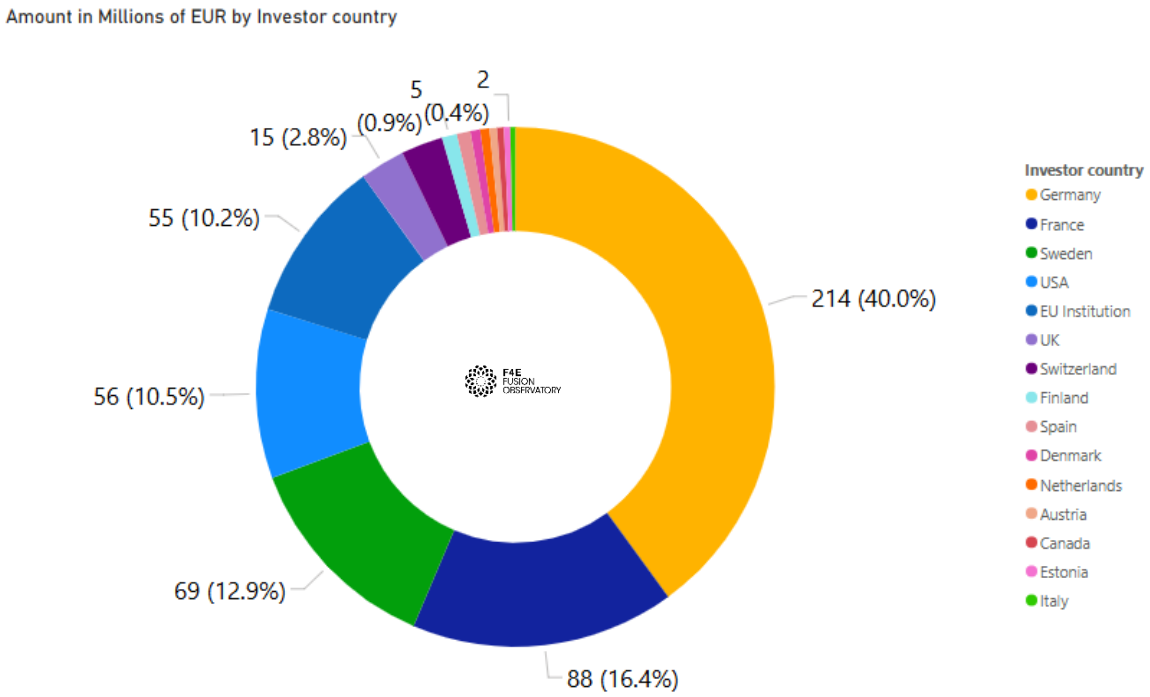

Figure 13 – Geographical origin of investors – EU level

Figure 14 – Top 10 Investors by Region[3]

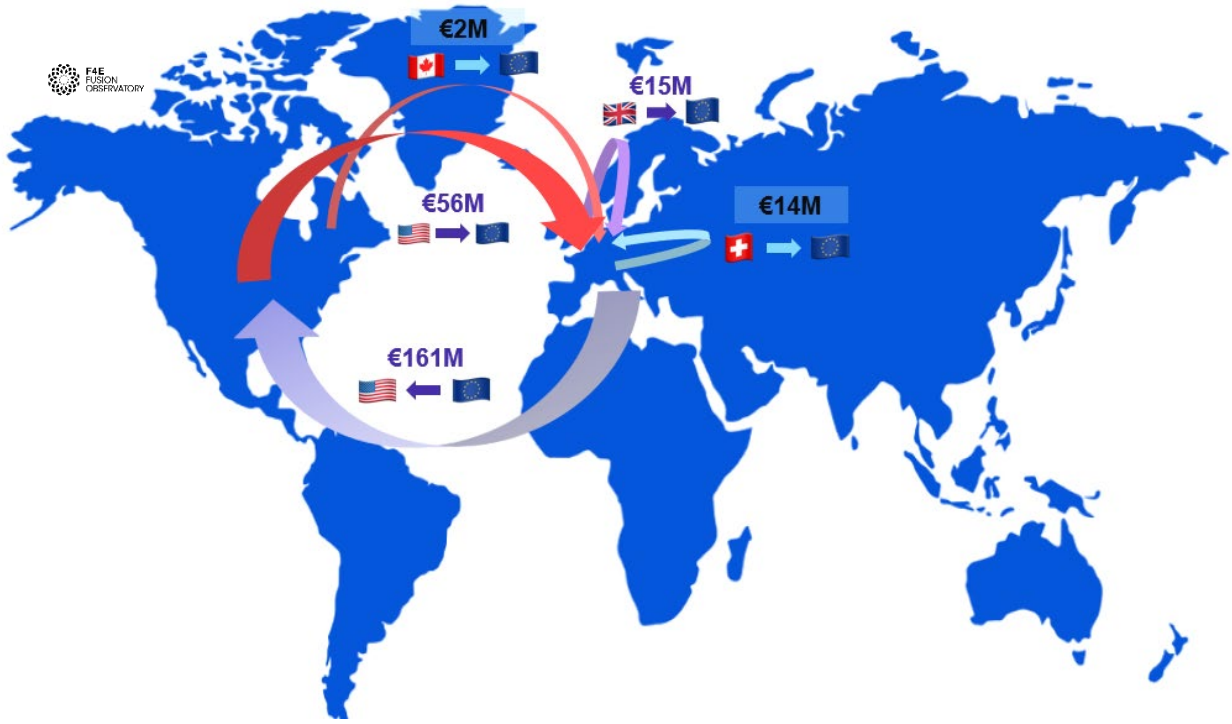

Figure 15 – Cross-border investments with the European Union

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3. Technology Focus

At a global level (Figure 16), private investment has shown a clear preference for **Magnetic Confinement Fusion (MCF)**, attracting **€6.235 billion**. Within this category (Figure 17), the **Tokamak** concept leads with **€3.803 billion**, underscoring the profound influence of large public projects like ITER on private sector confidence.

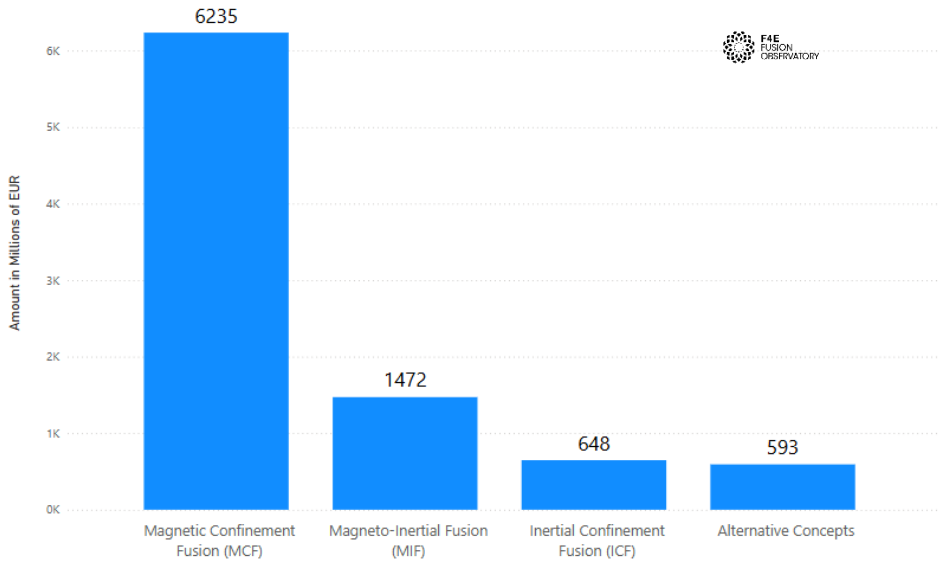

Figure 16 – Funding by Technology Family – Global level

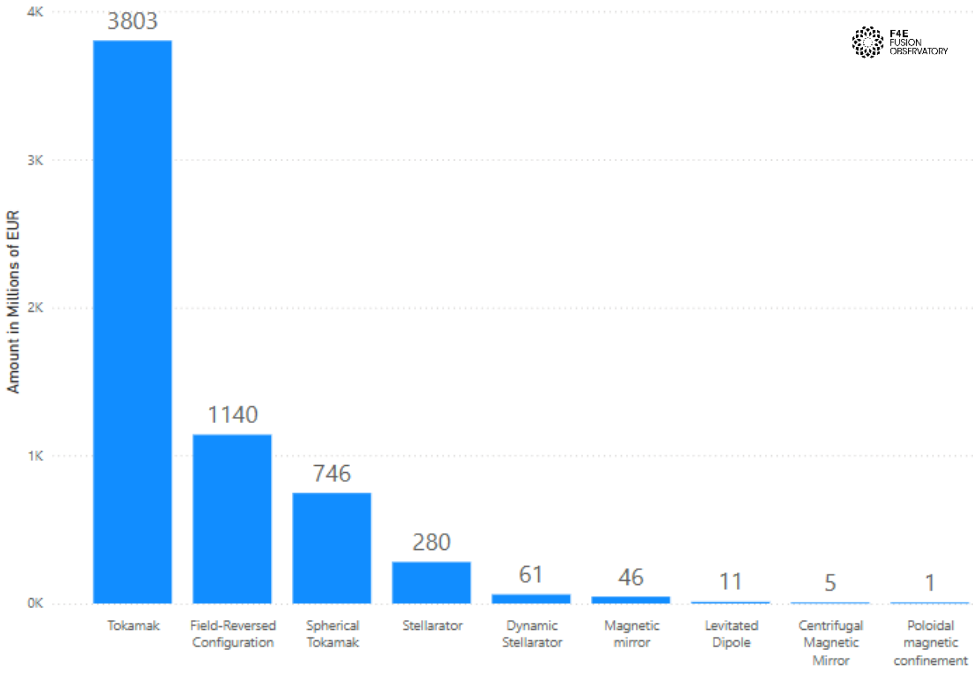

Figure 17 – Focus on Magnetic Confinement Fusion – Global level

A striking strategic divergence emerges at the regional level (Figures 18, 19, 20). Both North America and East Asia have mirrored the global trend, directing most of their investment toward MCF. The **EU stands in stark contrast**. Here, the private investment landscape is inverted, with **Inertial Confinement Fusion (ICF) attracting €390 million**, more than double the amount invested in MCF companies. This shows the EU private sector charting a different course, exploring alternative pathways.

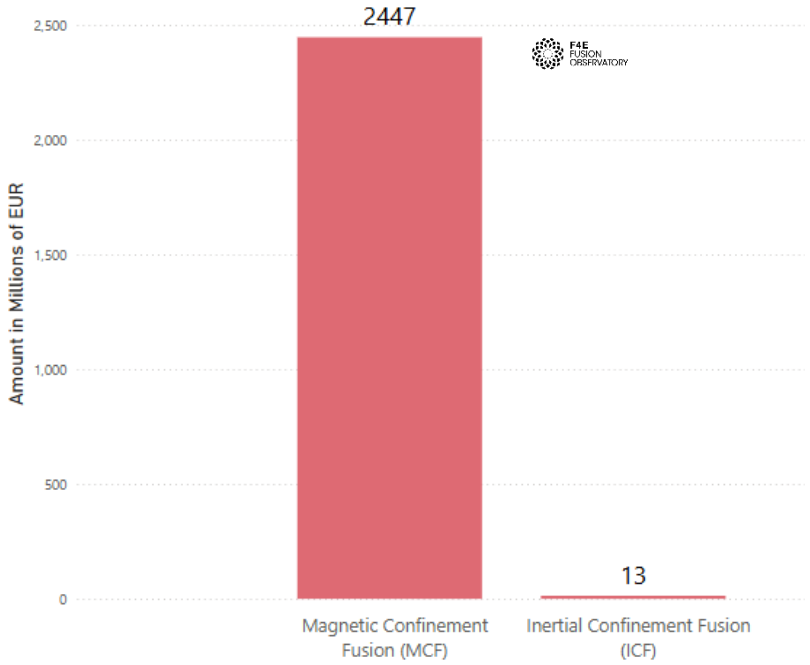

Figure 18 – Funding by Technology Family – East Asia

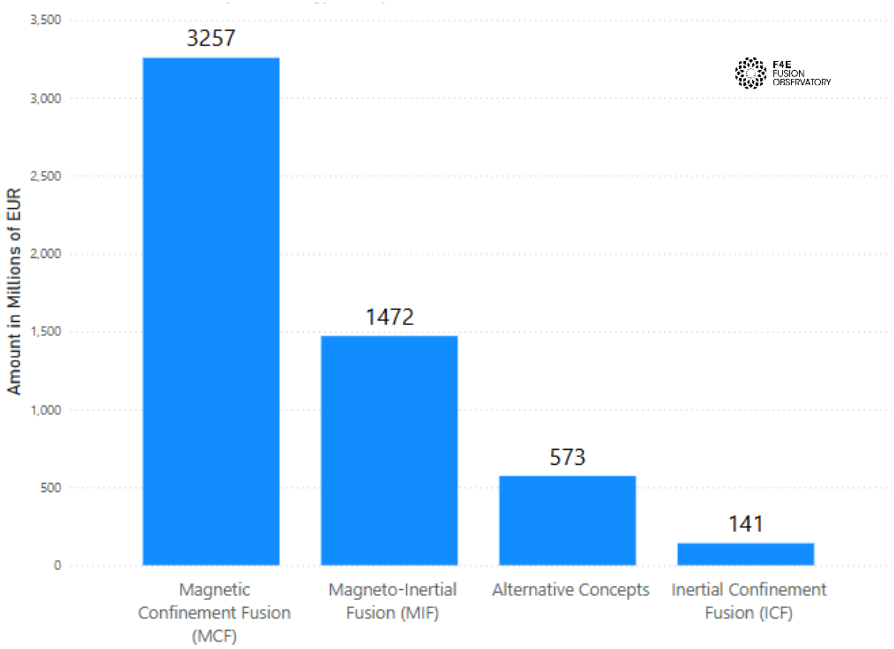

Figure 19 – Funding by Technology Family – North America

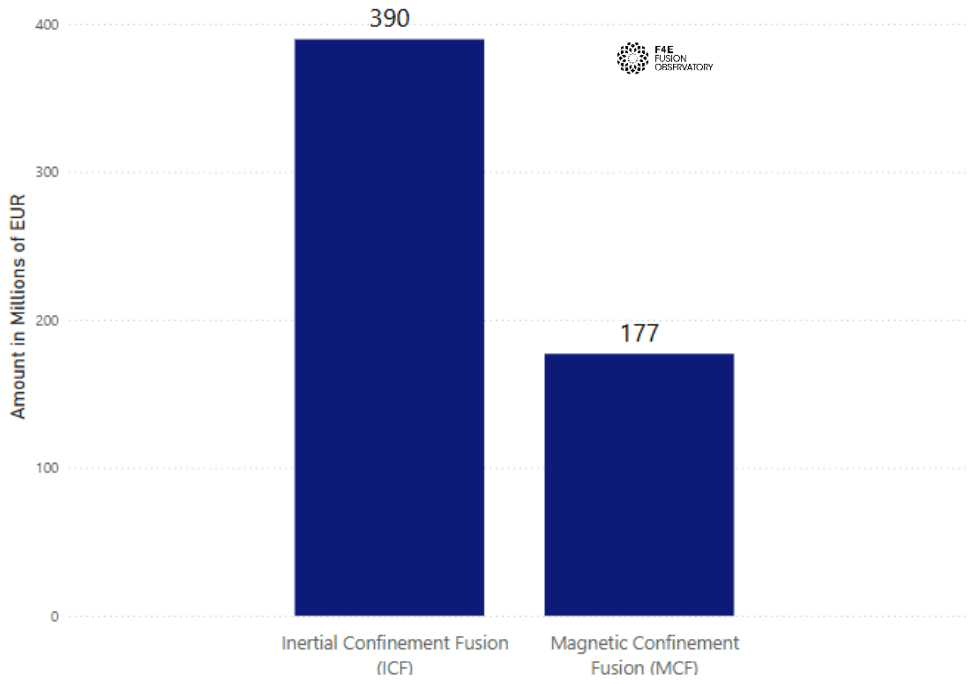

Figure 20 – Funding by Technology Family – European Union

4. ITER Supply Chain

An analysis focused solely on the investment in private sector fusion companies provides an incomplete perspective on Europe's true position. Apart from the (mostly) publicly funded public sector fusion activities (laboratories and research organisations) that will be subject to future analysis by the F4E Observatory, it is important to consider the investments being made in industrial supply chains to fabricate components for the ITER international fusion project.

With the EU responsible for 45% of the total in-kind contributions to the ITER project, the investment in the supply chain has been substantial. Figure 21 shows the annual amounts awarded by F4E mostly through **~1300 contracts to EU industry, amounting to a total of €6.822 billion** for the period since 2007 when ITER procurement started. The scope of these contracts is broad and includes superconducting magnets, vacuum vessels, civil engineering, cryogenics, diagnostics, robotics, etc.

Considering the broader picture of both the investment in private sector fusion companies in sections 2 and 3 of this report and the ITER supply chain investments from this section, it is possible to perform a comparative analysis of the EU and the US. According to the US ITER Update (February 2025), more than $1.4 billion is invested in the US fusion supply chain. One can therefore compare the overall funding in figure 22. The totals are coincidentally similar but show the striking difference between the two ecosystems. Note that the value of the ITER supply chain in both the EU and US is underestimated since this does not contracts awarded directly by the ITER International Organisation.

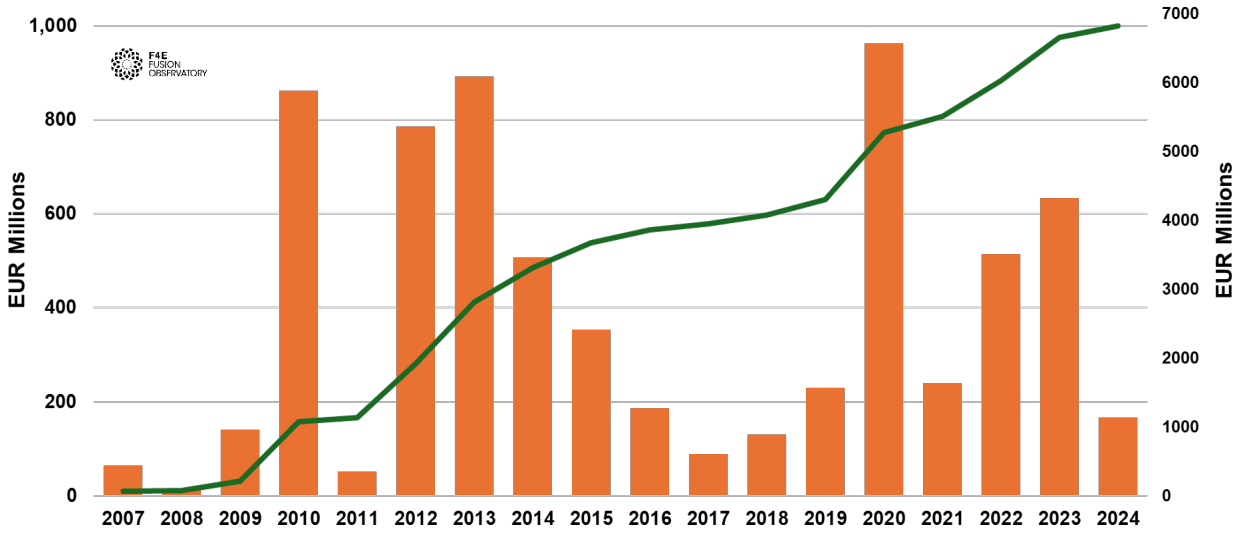

Figure 21 – Annual (orange bars) and cumulative (green line) investment in EU supply chain by F4E

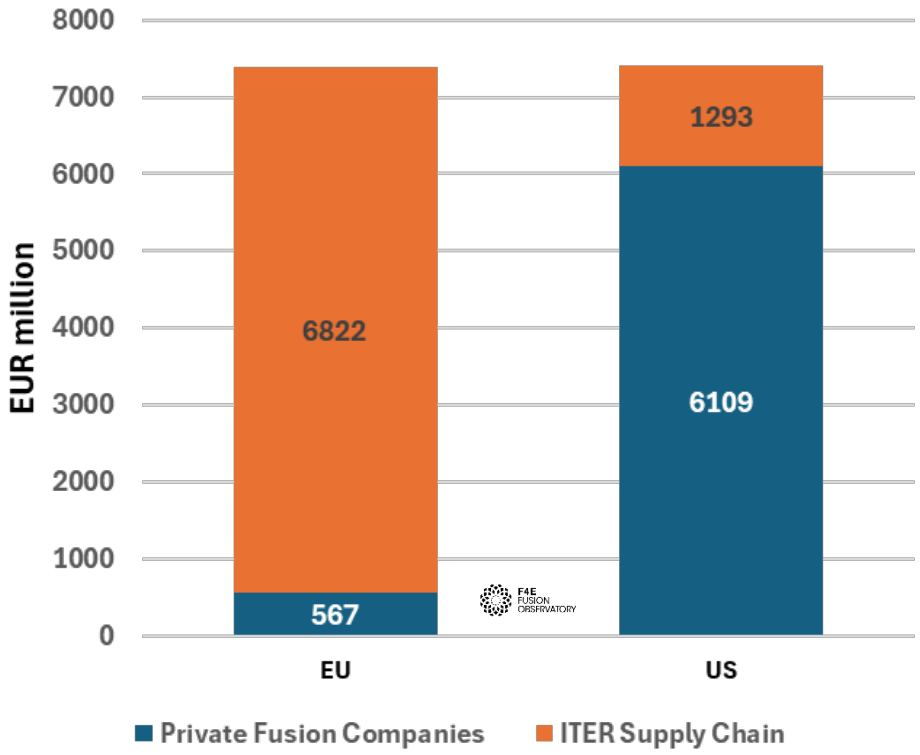

Figure 22 – Comparison of Investment in Private Fusion Companies and the ITER Supply Chain in the EU and US[4]

[4] https://usiter.ornl.gov/iter-project/

Clearly this shows the respective strengths of each region: **the US is building momentum in private fusion innovation whereas the EU has built a high-performance industrial supply chain** through public procurement and coordination. That said, one must be careful with this comparison **- investment in the supply chain, while substantial, has a different kind of impact than equity in a fast-scaling fusion company**. For instance, it does not necessarily translate into the same level of innovation, IP ownership, or investor confidence. One must also recognise that supply chains established for the supply of a component or service under contractual terms, may not be sustained after the contract ends.

Annex

Description of the Methodology Used

The F4E Fusion Observatory utilizes a multi-step, rigorous process to collect, validate, and analyse all funding data for private fusion companies. By integrating diverse data sources, applying consistent currency conversions, and categorizing each investment both by technology and by financing type, the Observatory ensures that its findings are reliable, transparent, and readily comparable across companies, regions, and time periods.

Data Sourcing

Our core dataset is compiled from publicly available releases, dedicated fusion-industry databases (notably FusionXInvest and Fusion Energy Base), reputable press articles, and official company announcements. To guarantee data fidelity, each funding event is cross-checked across at least two independent sources. Whenever conflicting figures arise (e.g., differing round sizes or divergent dates), we undertake targeted follow-up investigations, scrutinizing additional press coverage, consulting official regulatory filings, or reaching out directly to company representatives, to arrive at the most accurate estimate.

- **INFUSE Grant Estimates:** Certain public grants (such as those awarded by Fusion Energy Sciences via the U.S. Department of Energy's INFUSE program) are not broken down by individual beneficiary. In these cases, FusionXInvest-derived allocations are used as proxies, since DOE reports only the aggregate sum.
- **Company Location Tagging:** For organizations operating in multiple jurisdictions, we assign "primary location" based on the company's main economic activity (i.e., where most R&D or manufacturing occurs). This ensures that regional analyses reflect each company's genuine operational footprint.

Investment Values & Currency Conversion

All investment amounts are standardized in euros (EUR) to facilitate apples-to-apples comparisons. When a European company discloses an amount already denominated in EUR, we accept that figure as is, no further conversion is applied. For non-European companies, each foreign-currency investment (typically reported in USD, GBP, CNY, or JPY) is converted to EUR using the European Central Bank's reference exchange rate for the year in which the funding was announced. If the announcement date is unavailable, the company's founding year serves as a proxy to select an appropriate annual rate. This approach preserves historical context – accounting, for example, for periods of currency volatility – so that year-over-year trends remain meaningful.

Technological Approach & Classification

Each entity is classified according to its primary "technology family" using a taxonomy derived from authoritative sources (IAEA World Fusion Outlook 2024, IAEA Fusion Key Elements, peer-reviewed literature) and validated via F4E's internal expert review. This hierarchical structure allows us to group companies and investments into well-defined categories:

1. **Magnetic Confinement Fusion (MCF)** – Sub-technologies: Tokamak, Spherical Tokamak, Stellarator (and variants such as Quasi-isodynamic and Dynamic Stellarator), Field-Reversed Configuration (FRC), Magnetic Mirror (and subtypes like Centrifugal Magnetic Mirror), Closed Orbit, Levitated Dipole, Electro-centripetal confinement, Plasma Fusion Propulsion.
2. **Inertial Confinement Fusion (ICF)** – Sub-technologies: Laser-driven ICF (short-pulse or shock-driven), Shock-driven inertial confinement.
3. **Magneto-Inertial Fusion (MIF)** – Sub-technologies: Z-pinch, Dense Plasma Focus, Plasma Jet–Driven MIF (PJMIF), Magnetized Target Fusion, Pulsed Magneto-Plasma Pressurized Confinement, Magnetized Liner Inertial Fusion (MagLIF), Pulsed Magnetic Fusion.
4. **Alternative Concepts** – Sub-technologies: Muon-catalyzed fusion, Lattice Confinement Fusion (LCF), Magnetic-electrostatic confinement, Electrostatic Confinement, Beam-target Fusion (beam-solid, beam-gas, beam-plasma), Proprietary confinement designs, Aneutronic Fusion, Plectoneme, Spindle Cusp, Superconducting Shielded-grid Inertial Electrostatic Confinement, Direct laser–driven pB11, Miniaturized reactor concepts.

This classification ensures that we can accurately quantify how much funding each fusion approach has attracted – both globally and within Europe – as well as track shifts in technological preference over time.

Funding Categorization (Equity, Grant, Convertible, etc.)

To analyse the financing mix, we assign each funding event to one of five “Investment Type” buckets based on keywords in source disclosures and investor identities:

- **Equity:** Deals labelled “equity” or where terms such as “Series A/B/C,” “VC,” “Seed,” “Pre-Seed,” or “Crowdfunding” appear.
- **Grant/Subsidy:** Transactions explicitly described as “grant,” “subsidy,” or “funded by government.”
- **Convertible:** Rounds designated as “SAFE” (Simple Agreement for Future Equity) or “convertible note.”
- **Prize/Award:** Non-dilutive awards labelled “prize” or “award.”
- **Corporate Strategic:** Investments made by known strategic corporations (e.g., Eni, Chevron, Google) that are clearly tied to a corporate innovation or R&D mandate.
- **Unknown:** Any rounding that cannot be conclusively assigned to one of the above categories.

This classification facilitates comparative analysis of how much funding originates from venture capital versus direct government grants or strategic corporate investors.

Public vs. Private vs. Public-Private Partnerships

Each organization is tagged as “private” only if it is majority-owned by non-governmental entities and not listed on any public exchange. If a company receives funding directly from government agencies (grants, awards) or operates under a mixed public-private structure (e.g., a consortium partially owned by a national laboratory), it is classified accordingly:

- **Private:** Majority-privately owned fusion enterprises.
- **Public:** Entities primarily funded or operated by government bodies (e.g., national labs, university spinouts still majority-government-controlled).

- **Public-Private Partnerships:** Joint ventures or collaborative R&D projects where public funding is explicitly tied to private-sector commercialization goals.

This triage allows the Observatory to isolate pure private-sector momentum from state-led initiatives and joint government-industry collaborations.

The Observatory uses a three-tier classification to categorize the nature of each investment: **Public**, **Private**, and **Public-Private**. It is important to clarify that the label **"Public-Private"** in our graphs **does not necessarily imply the existence of a formal Public-Private Partnership (PPP)** or joint venture. Instead, it indicates cases where **both public and private entities participated in the same funding round**, regardless of whether a formal collaboration structure was in place. This distinction helps capture the growing role of public support for private ventures without overstating the institutional relationships behind them.

Data Management & Validation Tools

All raw transactions and metadata are first compiled in a master Excel workbook, which is tightly integrated with Microsoft Copilot to automate routine tasks, such as flagging missing data, suggesting potential outliers, and cross-referencing investor names across multiple rounds. Once cleaned and normalized, the dataset is imported into Power BI, enabling dynamic dashboards that reveal funding trends by year, by region, by technology family, and by investor type. An in-house AI tagging engine assists with technology classification (e.g., parsing press releases to confirm that a company's "primary approach" is indeed "magnetic confinement fusion"). This combination of human oversight and AI-guided tooling ensures that our methodology remains both thorough and repeatable.