FUSION ENERGY INDUSTRY: FROM DREAM TO REALITY [[1]](#footnote-1)\*)

DOI: 10.34854/ICPAF.2022.49.1.180

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The paper summarizes and systematizes the conditions of investment attractiveness of the nascent fusion energy market. The fundamental achievements made in plasma physics, as well as the global decarbonization agenda, were the key drivers for the development of private commercial fusion projects. At the end of 2021, the Fusion Industry Association counted for 23 member companies that had risen more than $4 billion in private investment.

The increase in the world’s population and the corresponding economic growth leads to a proportional increase in our needs, including for electricity. The growing consumption leads to a multiple increase in greenhouse gases emissions from our vital activities, which is the main reason for the heating of the planet’s atmosphere and global climate change. Under these conditions, as part of the global consensus of the Paris Agreement, the global electric power industry has been on a decarbonization path since 2015. Investment flows and investors’ focus have shifted to renewable energy sources, CO2 capture and storage technologies, technological climate solutions, etc.

In this context, the search for a technology producing stable (not dependent on the sun, wind, etc.) and clean (with a minimal carbon footprint) energy, with which to meet the growing demand from the population, is becoming increasingly relevant. Controlled thermonuclear fusion (CTF) could be such an energy source. The paper presents the opinions of the expert and investment communities, as well as examples of projects showing the fact that CTF is the answer to the challenges of the global energy transition and energy security.

Most fusion research programs and projects are funded by public spending, imposing its own limitations on the already complex subject of scientific research. This paper provides an assessment of the amount of funding for such projects, as well as various approaches to state regulation of CTF.

Private capital, with a flexible approach and limited resources, is ready to take part in creating a fusion energy source. The paper systematizes data on private investors: private equity funds, venture capital funds, and investment funds of major oil and gas companies. Investors’ opinions on the paradigm of CTF development are also given; many companies in the fusion industry set for themselves 30s of the 21st century as a time benchmark, the time when the first pilot commercial power plants could supply electricity into the grid.

The overview of international investment activity presented in this paper is useful for intensifying the financing of thermonuclear research in the Russian Federation, which could take its rightful place in the fusion energy market, given the experience already gained in international cooperation projects such as ITER or IGNITOR. In addition, the public-private partnership approach under consideration could also apply to the development of private Russian CTF initiatives.

This paper could interest physicists, engineers, and managers working in controlled thermonuclear fusion industry.

References

1. [Samuel E. Wurzel](https://arxiv.org/search/physics?searchtype=author&query=Wurzel%2C+S+E), [Scott C. Hsu](https://arxiv.org/search/physics?searchtype=author&query=Hsu%2C+S+C). Progress toward fusion energy breakeven and gain as measured against the Lawson criterion
2. [Slavomir Entler,](https://www.sciencedirect.com/science/article/pii/S0360544218305395#!) [Jan Horacek,](https://www.sciencedirect.com/science/article/pii/S0360544218305395#!) [Tomas Dlouhy, Vaclav Dostal.](https://www.sciencedirect.com/science/article/pii/S0360544218305395#!) Approximation of the economy of fusion energy

1. \*) [abstracts of this report in Russian](http://www.fpl.gpi.ru/Zvenigorod/XLIX/E/ru/IP-Soldatova.docx) [↑](#footnote-ref-1)