

# Nuclear fusion – the breakthrough Europe should have made

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**For a long time, Europe was considered a pioneer in nuclear fusion. But in the meantime, the USA is far ahead. André Loesekrug-Pietri, chairman of JEDI, therefore calls for Europe to move away from “bureaucratic monsters” and massive subsidies in favor of selective funding for innovations.**

The US Department of Energy announced last Tuesday that the first positive-energy nuclear fusion using inertial fusion technology has been performed in California. The National Ignition Facility (NIF) in California bombarded hydrogen plasma with high-power lasers to achieve the feat. It is a historic event because **until now nuclear fusion has always required more energy than it has produced.**

In 2021, US startup Commonwealth Fusion Systems (CFS), using a different technology – called tokamak – had raised the largest private funding round ever in nuclear fusion: \$1.8 billion. CFS was founded just four years ago and aims to deliver **the world's first net-positive energy fusion device by 2025.**

By comparison, the **ITER project**, an international consortium **based in southern France**, was launched in 2007 with a budget that has since quadrupled (from €5 to €20 billion). It was established a decade earlier than CFS and has now announced a five-year delay and an additional cost of €1 billion. **The first plasma production is not planned until 2030.** ITER aims for a balanced ratio of energy produced to energy consumed, while NIF and CFS aim for a factor of two or even more.

## Europe's ambitions are too low

From comparing these projects, **three lessons** can be learned about how we need to organize our research and public investment: **Agility** is the key to picking up the latest technological developments. Under no circumstances should we lock ourselves into overly rigid plans, and we must allow for a great deal of **porosity between the academic world and the corporate world**. Finally, in nuclear energy as elsewhere, we must **always aim for the next generation of technology.**

CFS has managed to get the most out of the latest technologies. In particular, by using artificial intelligence and deep learning, CFS has managed to obtain an extremely complex hot plasma. The Boston team was able to conduct their **research much faster using** digital *twins* for their simulations. They took technological risks by using new architectures and materials, such as **high-temperature superconductors**. For example, they succeeded in creating a 20 Tesla magnetic field; the strongest ever created on Earth. **ITER, on the other hand, relies on low-temperature superconductors.**

## Europe needs innovations

It is imperative that we look to leapfrog innovation to solve key problems. Especially as we consider the future of nuclear energy and pour many billions of public money into EPR power plants, which people in the UK, France and Finland are currently trying in vain to get up and running. In the case of nuclear energy, the **key problems are our dependence on Russian uranium**, the risk of a radioactive accident, and the **storage of nuclear waste**.

Nuclear fusion works with fuels other than uranium; for example, deuterium, a hydrogen isotope that occurs in water and is therefore inexhaustible. This produces radioactive products that are less long-lived than the near-eternal final waste from today's power plants. Most importantly, it is not a "controlled" chain reaction, which is not always as controllable as was seen at Chernobyl or Fukushima, but an **unstable process that comes to a halt when an anomaly occurs**. These characteristics could underwrite Germany's reconciliation with nuclear energy.

## Europe's backlog is a scandal

The US breakthrough is a big step for mankind and a small **step (backwards) for our continent**. Europe's lagging behind in nuclear fusion is a scandal and a real shame, even though France has been a pioneer for a long time. The USA is catching up.

NIF and CFS show that they are able to mobilize the best of their ecosystem: Universities, private investors, and public agencies. Together, they focus on essential but **selective funding of breakthrough innovations with clear targets**, rather than "classic" industrial policy, with bureaucratic instruments like IPCEIs or massive subsidies.

## Not the same mistakes as in the energy crisis

While European policymakers were still arguing about the "green taxonomy" and whether nuclear energy is clean, US players were working to make energy greener. We warned about these new potential technological breakthroughs from the US a year ago. But both the EU Commission and national governments have not been dissuaded by existing energy players or administrations. They simply fail to make breakthroughs quickly and without the bureaucratic scrutiny of IPCEIs and Horizon Europe programs. The result: **too many money chasers and not the best teams**.

While **Europe is in the midst of an energy crisis** and the war in Ukraine is a convenient alibi to cover up the lack of strategic anticipation, we are committing the **same mistake with nuclear fusion**. For this very reason, it should be an absolute priority area.

Once again, we in Europe are about to miss the train of technological progress. It's time to demand accountability, create **real impact in research and development**, and radically change the **bureaucratic monsters** we have created. Otherwise, European twilight will become a reality.

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