

Exploring scenarios for the European energy market and the future of fusion energy

Have you ever wondered how stars can be so bright and powerful? The answer is fusion, the combination of light atoms to release energy. Harnessing this power is no easy task, especially when the plan is to enter an ever changing energy market. As uncertainties, such as geopolitical concerns and the efficiency of energy storage solutions, are affecting the energy market, fusion producers must secure key stakeholders in the fusion value chain and look for viable geographies for fusion energy.

Fusion energy, often called the “holy grail” of clean energy, involves merging light elements like hydrogen to release large amounts of energy. Achieving this requires extremely high temperatures, similar to the sun’s core, which are difficult to replicate on Earth, leading to the saying that “fusion is always 30 years away.”

As Europe transitions to sustainable energy and phases out fossil fuels, the demand for electricity is rising due to increased electrification. Despite significant breakthroughs in fusion energy, more development is needed before it becomes commercially viable, with various actors involved in the progress.

One of these actors is Novatron Fusion Group, a Swedish private fusion developer looking to realize commercial fusion before 2040. Novatron’s design uses symmetry to create a simpler, more stable confinement system, reducing costs and improving efficiency compared to other reactors.

The study identified 15 stakeholders in the fusion value chain. Key players today include private fusion developers, national and international efforts, and fuel and technology suppliers. In the future, academics and investors may also become crucial while suppliers of fuel lose their influence.

The study also identified 4 distinct scenarios for the European energy market in 2040 based on the two uncertain macro trends: *increased geopolitical instability* and *increased and improved energy storage solutions*.

- 1. Potential for fusion amid fission’s uncertainty:** Characterized by high geopolitical instability and limited advancements in storage solutions, slowing down the advancements of renewables and fission energy and showing potential for fusion energy.
- 2. Nuclear leads the way:** Low geopolitical instability and limited storage solutions, slowing down renewables and providing opportunity for fission and fusion.
- 3. Renewables lead in a stagnating Europe:** High geopolitical instability may impair fission energy but renewables are effective due to effective storage solutions leaving some room for fusion.
- 4. Renewables take over Europe:** Low geopolitical instability and advanced storage solutions, perfect for renewables and fission may be used as backup, leaving little room for fusion.

As we look towards 2040, there are many possibilities for the European energy market. This thesis provides a roadmap for Novatron and other private fusion producers on how to navigate this complex landscape. Recommendations range from securing good relations with key players in geopolitically unstable scenarios to finding geographical areas or alternative customers in scenarios where energy storage solutions are advanced.