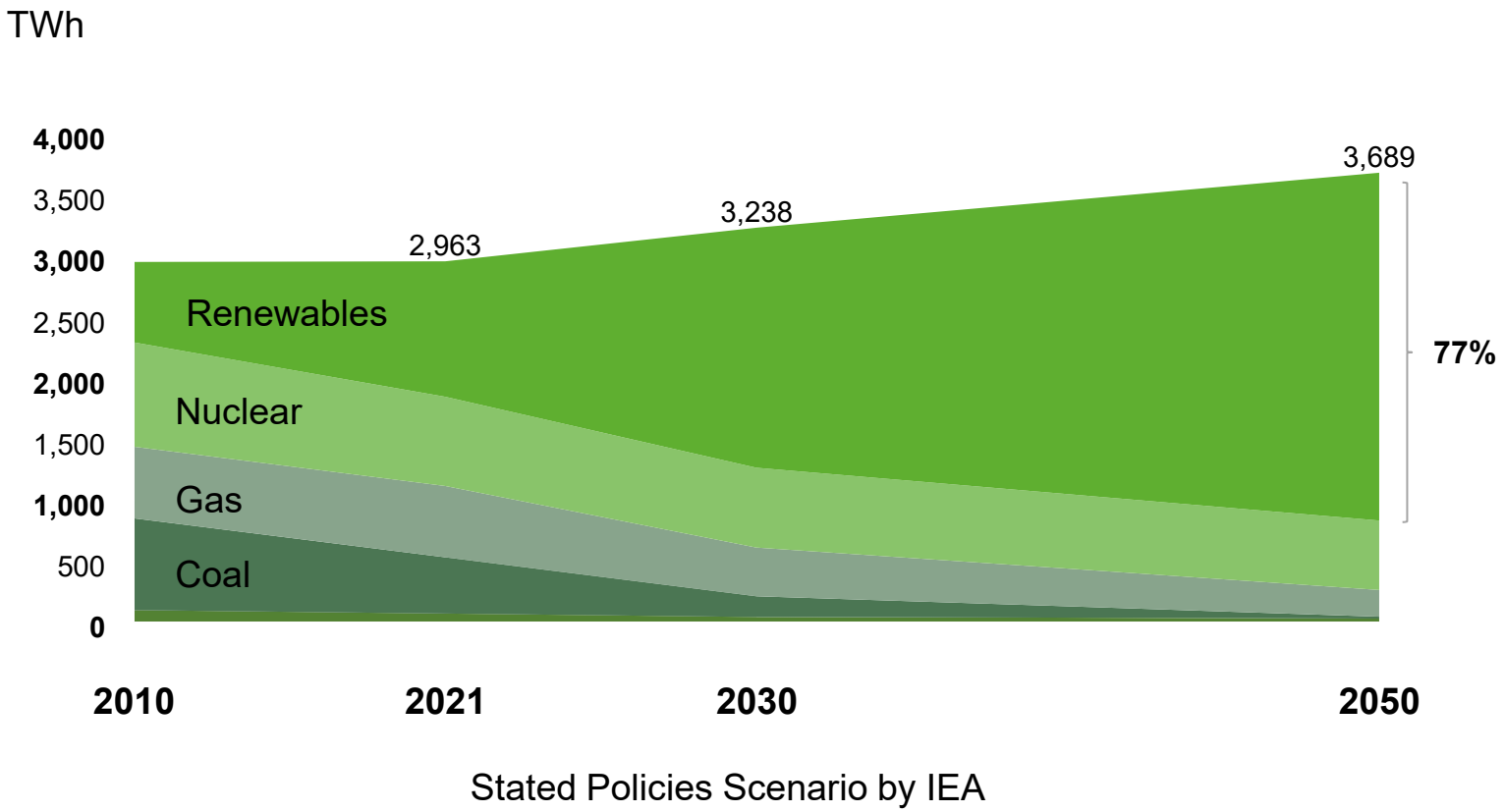
GAUSS FUSION

Establishing Commercial Fusion In Europe

As Safe and Reliable Baseload in a Renewable Energy Mix

3. Forum FUSION Deutschland, June 5th, 2023

Renewables expected to cover Europe's electricity consumption boost



Stated Policies Scenario by IEA

- Europe's Energy Mix of the future is dominated by renewables
- Coal and gas are slowly phased out mainly due to government policies
- Scenario is rather conservative, comparable scenarios see renewables at up to 86 % by 2050

Source: IEA (world energy outlook 2022)

The EU has set a target of climate neutrality by 2050

2005

Implementation of the **carbon market (ETS) to trade greenhouse gas** emission rights

2015

Adoption of the **Paris Agreement to keep global warming** well below 2°C

2021

European climate law with the **objective of a climate neutral EU by 2050**

The "Fit for 55 by 2030" is the **EU's legislative package to achieve the 55% greenhouse gas** reduction target by 2030

2022

Ban on the sale of **new internal combustion engine passenger** cars and light trucks starting in 2035

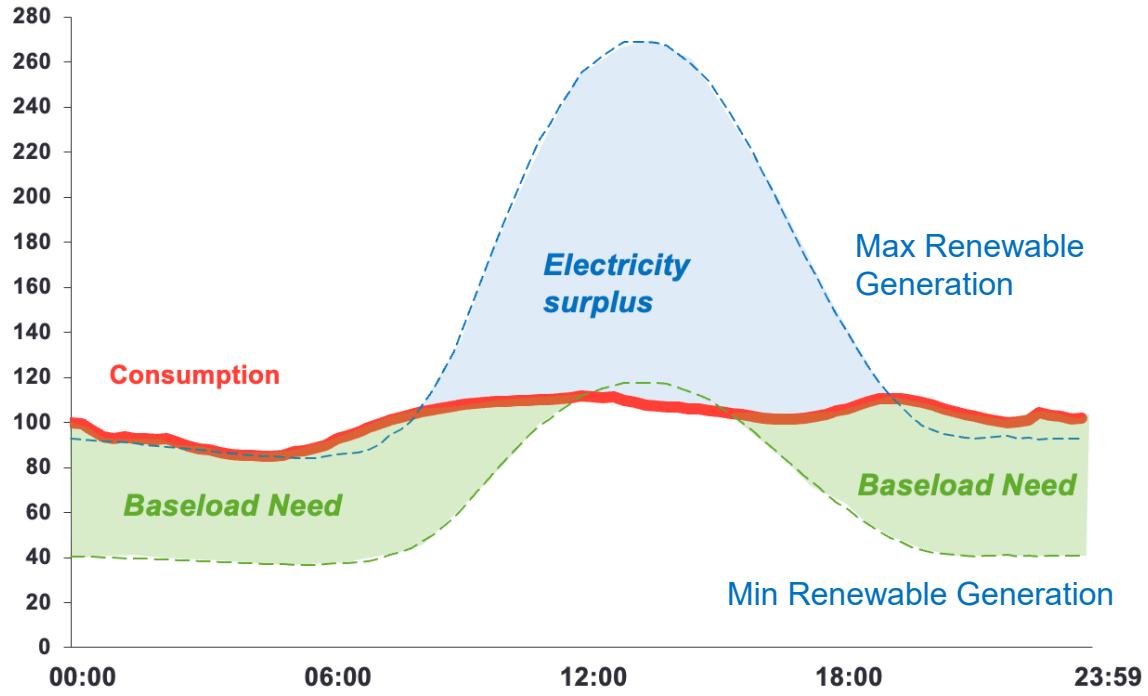
Implementation of a **border carbon adjustment mechanism** to set a carbon price for imports of certain products into the European Union

Source: European Commission, Desk research

Gauss envisions fusion to be the third major renewable

Consumption vs generation, full wind/solar scenario, 100-based[1] (06/2022-04/2023 average)

Consumption vs generation, full wind/solar scenario, 100-based[1] (06/2022-04/2023 average)



Intermittence

- **Need** to **balance production fluctuations**
- Requires **storage** and/or **baseload power**

Price volatility

- Dependence on **gas/coal costs**
- **Volatility for electricity price**

Acceptance

- **Large scale wind parks face high protest**
- Battery storage is expensive and acceptance low in population

Sovereignty

- Requires interconnection
- **Increases dependency on other countries**

1. Assuming mix of 60% wind and 40% solar, following RTE full RE 2050 scenario, considering wind and solar only. Source: RTE

Gauss envisions fusion to be the third major renewable

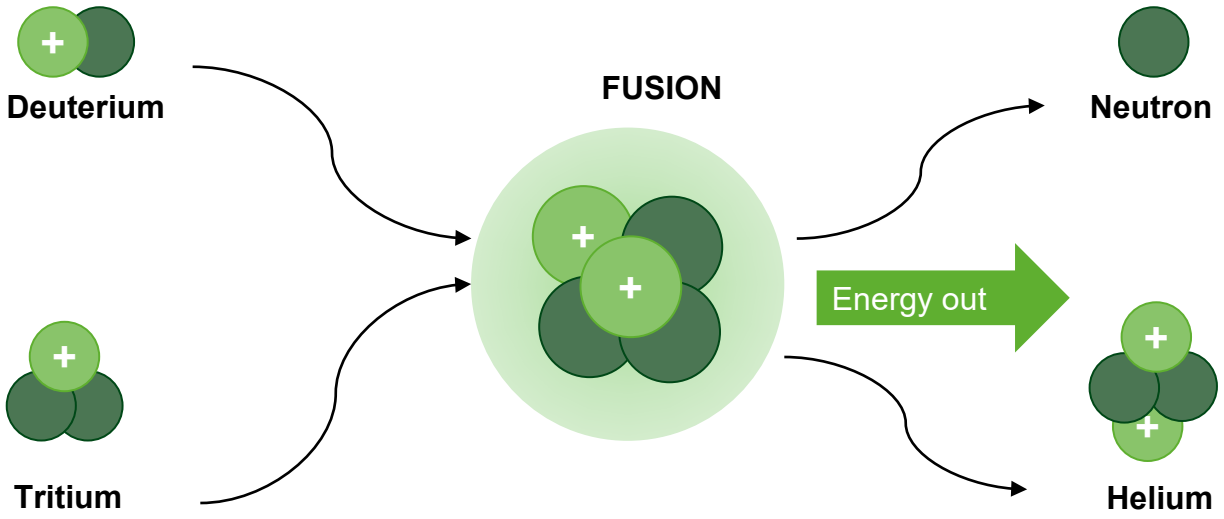
Fusion power provides full energy-independence

Paired with solar and wind, fusion energy baseload allows a completely clean and fully renewable electricity generation landscape

Main characteristics of fusion energy

1. Renewable and clean
2. Powerful and baseload capable
3. Safe and reliable
4. Abundant with near unlimited fuel

Fusion is powering our sun and stars, with near limitless fuel on earth

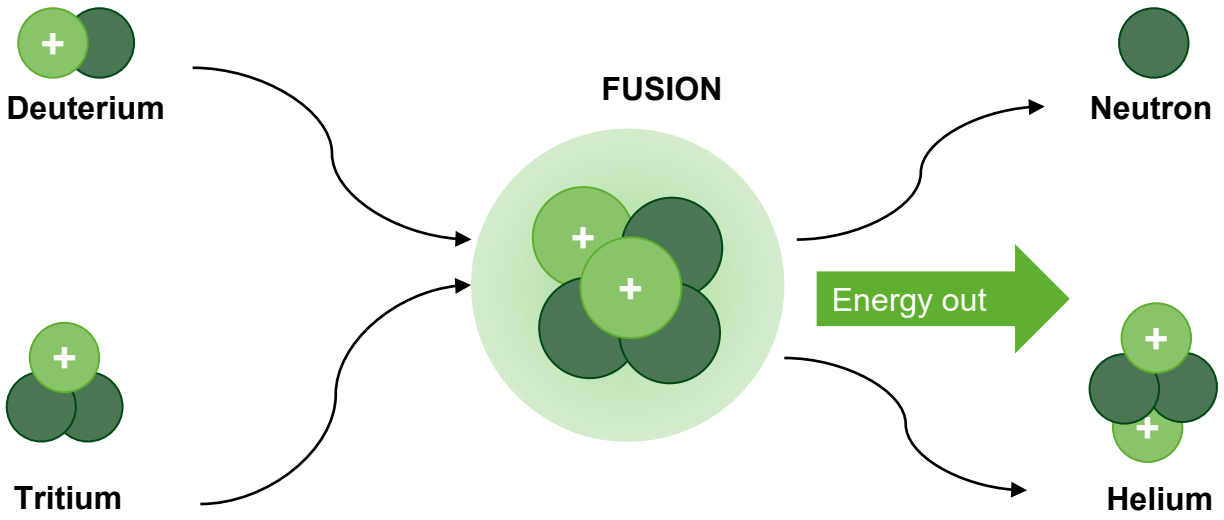


1 kg of fusion fuel* is equivalent to …

- 4.5 million liters of oil
- 10 million kg of coal
- 4.8 million m^3 of gas
- 100 kg of uranium

*Deuterium is extracted from seawater. Tritium fuel is created by the fusion machine itself, using the neutron created in the reaction plus commonly available lithium metal.

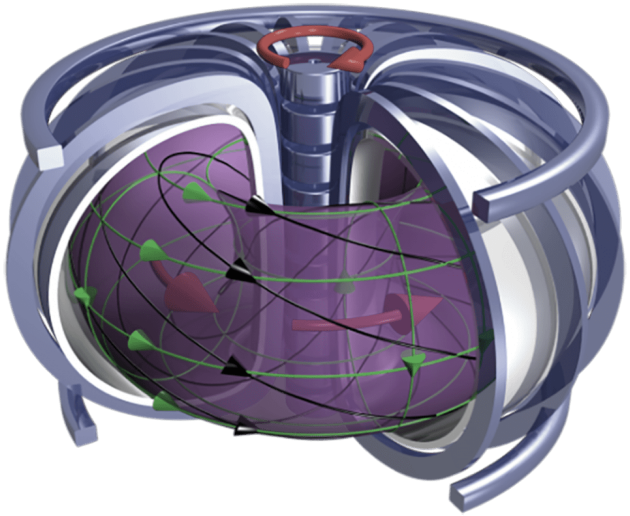
Fusion is powering our sun and stars, with near limitless fuel on earth



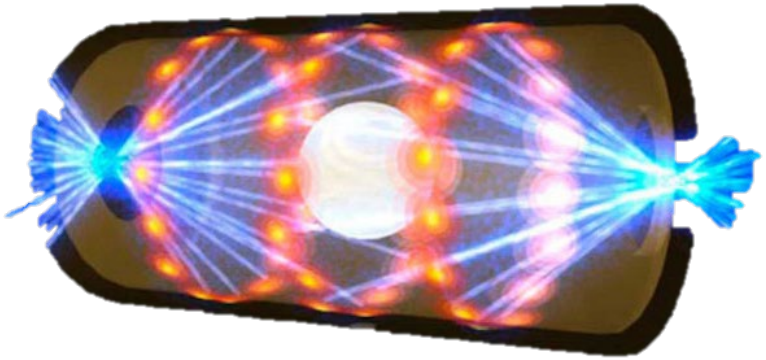
1 kg of fusion fuel = 10 million kg of coal

Intermittence	• **Stable** energy production • Can be used as a **baseload**
Price volatility	• **Full autonomy** in energy production • **No dependence on gas costs**
Acceptance	• **Need to inform to avoid confusion with nuclear fission** • Enthusiasm for renewables and fusion technology
Sovereignty	• **Technological and geographical** independence

Magnetic fields or lasers used to confine particles in plasma state



Plasma
4th state of matter
~ extremely hot ionized gas



Magnetic Confinement

- Using magnetic fields to confine particles
- Low density, high temperature, long time

Inertial Confinement

- Using lasers to confine particles
- High density, high temperature, short time

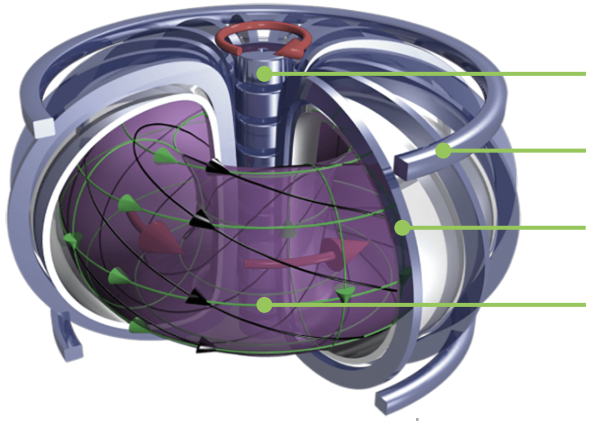
Magnetic confinement is the leading approach to controlled fusion

Approach	Fusion system	Fuel	Technical Readiness Level (TRL)		
			1-3	4-6	7-9
	Magnetic Confinement	**D-T**		✓	
	Inertial confinement / Laser	**D-T**	✓		
		p-B	✓		

- Magnetic Fusion has been researched and developed since the 1950's for energy production
- Until 2019, Inertial Fusion research has focused on defense purposes only, no development towards commercial energy
- p-B fusion is purely conceptual

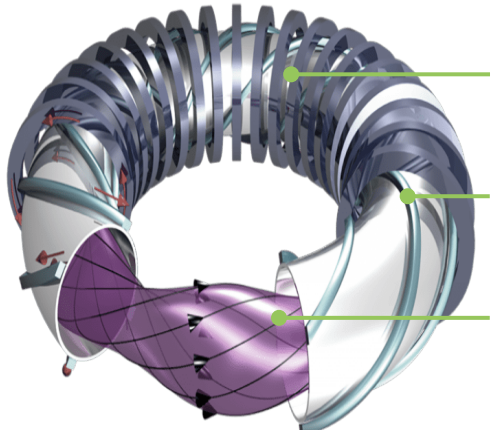
Tokamaks and stellarators are main designs for magnetic fusion

Tokamak



- Transformer coil
- Poloidal field coil
- Toroidal field coil
- Toroidal magnetic field lines

Stellarator



- Toroidal field coil
- Helical field coil
- Twisted magnetic field lines

Overview	• **External Coils** and Current induced in Plasma produce magnetic fields	• **Complex twisted coils produce fields**
TRL	⊕ High	~ Medium
Type of coils	⊕ Simple coils	~ Complex coils
Operation	⊖ Limited discharge time	⊕ Continuous operation
Plasma	⊖ Instabilities due to plasma current	⊕ Stable plasma
#of devices in operation	⊕ 60	⊖ 10

⊕ Favorable
~ Mixed
⊖ Unfavorable

Source: ITER, CEA, Max Planck IPP

Creating a burning plasma to drive a turbine producing electricity

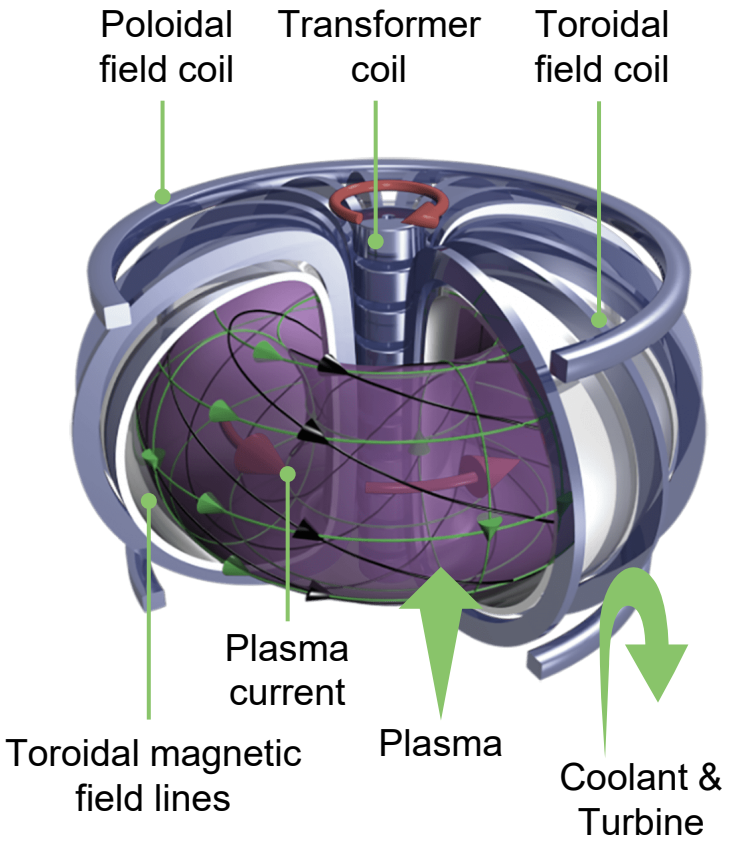
GAUSS FUSION

1 Plasma formation

- Inject fuel into the empty chamber
- Ionize and create plasma with initial current

3 Plasma confinement

- Plasma would instantly disappear if in contact with cold wall
- Confinement and shape control is done with external shaping coils



2 Plasma heating

- External heating to further increase temperature (waves, particles)
- Once critical conditions are reached, plasma heats itself by fusion reaction

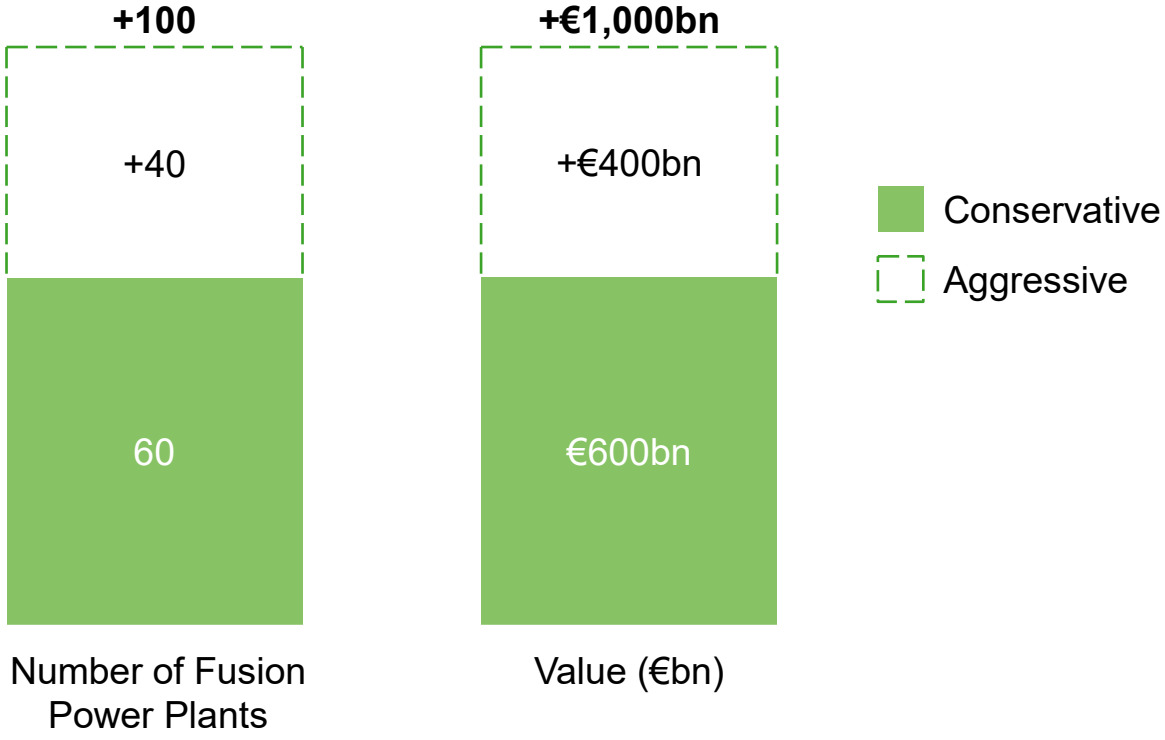
4 Electricity generation

- 80% of the energy produced by fusion reactions is carried by neutrons
- Neutrons can approach the walls and heat up the coolant that flows
- generated steam drives turbines to produce electricity

Source: ITER, CEA, Max Planck IPP

Fusion energy market could exceed 100 fusion power plants in Europe

Fusion Power Plant (FPP) market in Europe end of the century



Assumptions:

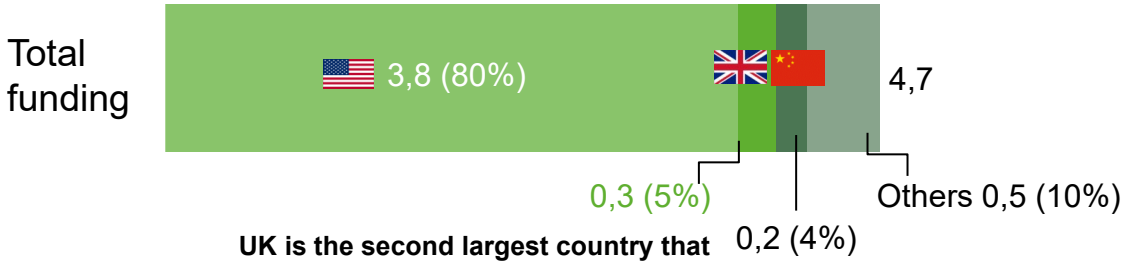
- Fusion energy will replace **50-75% of fission** and **75-100% of gas and coal** sources
- Load factor assumed with 70%, cost of €10 billion per plant

> [Worldwide] Nuclear fusion market could achieve a $40 trillion valuation
>
> **Bloomberg Intelligence,** December 28, 2021

Source: Gauss Fusion internal material

While fusion energy startups are thriving in the US and UK, EU is falling behind

Global private fusion company funding by country ($bn)



UK is the second largest country that collects the most funding, but containing only 5% of the overall amount

Number of private fusion companies per geography

Gauss Fusion strives to become European Champion

There is still a **white space in Europe** to grow the fusion market, with **Gauss Fusion aiming for first mover advantage**

> “Europe has a strong potential as **lots of major technical progress has been made in Germany and Europe,** such as the Wendelstein-7X plasma test facility in Greifswald, the European JET project and the international ITER plant in France.”
>
> Expert calls, US fusion industry expert

> “The fusion energy market in the US is dominated by specific players, while **the market in Europe is still in its early stage**.”
>
> Expert calls, US fusion industry expert

Source: Fusion Industry Association Global Report 2022

Gauss Fusion has a clear vision of leading European Industries to build a first-of-a-kind magnetic Fusion Power Plant by 2045

1. MCF is most advanced and developed fusion approach
2. Extensive industry experience in the fusion field
3. Strong partnerships with world-leading institutions (IPP, KIT, CERN and others)
4. Outstanding strategic & scientific advisory board
5. Strategic balance between scientific accuracy and entrepreneurial drive

Gauss stands out as the only startup founded by key industrial players

Founders from leading Fusion technology companies

ASG SUPERCONDUCTORS
ALCEN
BRUKER
research instruments
IDOM

European technology and supply chain for energy independence

Clear 2045 FPP vision and credible path

Management by industry-trained leadership

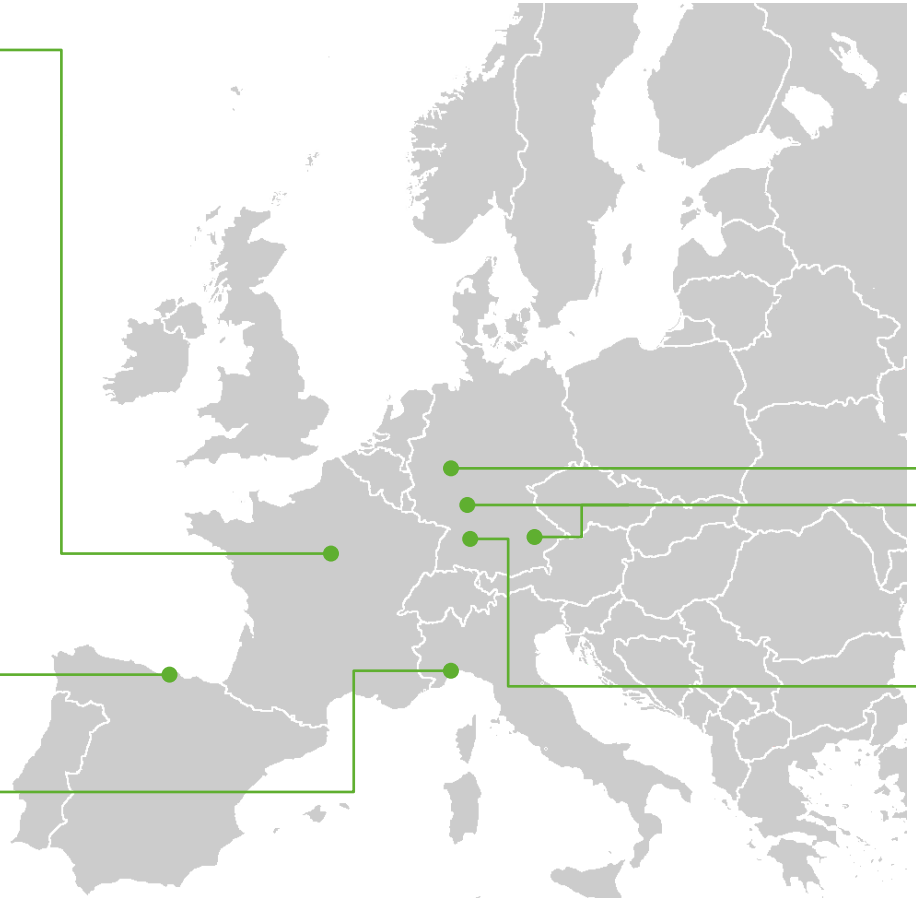
Training programs to support work force development

Strong partnership with top European fusion research institutions

MAX-PLANCK-INSTITUT FÜR CHEMISCHE PHYSIK FESTER STOFFE
KIT Karlsruhe Institute of Technology
CERN

more in discussion…

Gauss relies on a strong European founder and partner network



ALCEN

Paris, France
Instrumentation, heating systems

IDOM

Bilbao, Spain
Engineering, diagnostics

ASG SUPERCONDUCTORS

Genoa, Italy
Superconducting magnets

research instruments

Bergisch-Gladbach, Germany
Cryotechnology, divertors, heating

GAUSS FUSION

Hanau and Garching, Germany

BRUKER

Bruker Energy & Supercon Technologies:
Hanau, Germany
Superconductors

KEY EXECUTIVE OFFICERS AT THE MANAGEMENT BOARD OF GAUSS FUSION

Gauss Fusion team is led by industrial and scientific trail blazers

Chairman of the Board

Frank Laukien

With strong science and business background, Frank is serving as the CEO of Bruker (>€ 2,500M p.a.)

“Our mission is to lead the commercialization of magnetic confinement fusion power plants and related technologies.”

Chief Operating Officer

Milena Roveda

As an experienced strategic leader, Milena drives organizations forward and consistently achieves success

“We are committed to drive the development and implementation of safe and carbon-free power production to guarantee energy independence for future generations.”

Chairman of the SSAB[1]

Frédérick Bordry

With leadership experience at CERN, Frederick can ensure the knowledge transfer and expand R&D opportunities

“Gauss Fusion will significantly accelerate the integration of the technologies needed to build a grid-connected fusion power plant by bringing together industries and scientists.”

[1]Strategic and Scientific Advisory Board

Guided by outstanding leaders and experts in the fusion field

Dr. Frédérick Bordry
Former CERN Director for Accelerators and Technology

Prof. Dr. Hartmut Zohm
Experimental Director IPP Garching

Prof Dr. Christoph Quitmann
Director Research Instruments
Professor of Physics

Dr. Neil Mitchell
Senior Advisor to ITER Directorate
Former Division Head ITER magnets

Prof Dr. Norbert Holtkamp
Former Deputy Director SLAC
Professor of Physics at Stanford

Dr. Günther Janeschitz
Senior Advisor to DEMO Design Divison Head
Former Head of Fusion KIT

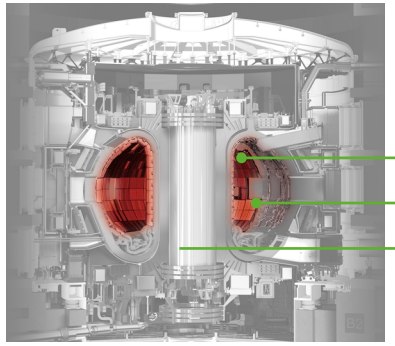
Dr. Jean Jacquinot
Senior Advisor ITER DG
Former Director JET
Former Director CEA

Dr. Klaus Schlenga
Senior VP/ CTO Bruker Energy & Supercon Technologies (BEST)

The accelerated approach towards fusion commercialization

Key Developments towards making Fusion Energy a reality in Europe

Fusion Technology

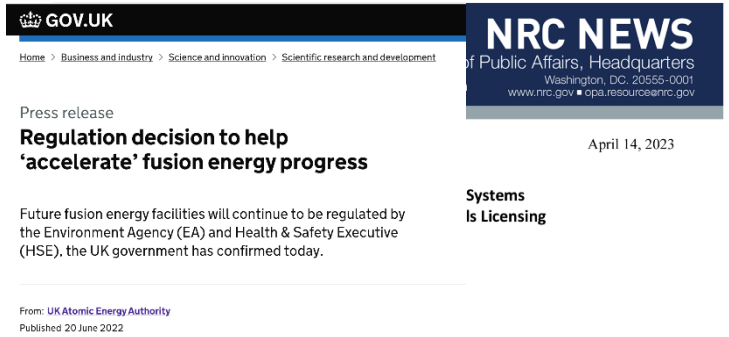


Breeding Blanket

- First wall panels
- Tritium breeding
- Shield blocks

- Gauss Fusion will develop **next-gen supercon magnets for MCF**
- Blanket **converts fusion neutron energy into heat** and **breeds tritium**
- Gauss will develop **closed fuel cycle**, **self-sufficient tritium breeding**, power conversion cycle
- Gauss will develop and test suitable **materials** for wall, divertors, etc.

Regulation/Funding



GOV.UK

Home > Business and industry > Science and innovation > Scientific research and development

Press release

Regulation decision to help 'accelerate' fusion energy progress

Future fusion energy facilities will continue to be regulated by the Environment Agency (EA) and Health & Safety Executive (HSE), the UK government has confirmed today.

From: UK Atomic Energy Authority

Published 20 June 2022

NRC NEWS

of Public Affairs, Headquarters

Washington, DC. 20555-0001

www.nrc.gov ■ opa.resource@nrc.gov

April 14, 2023

Systems

ls Licensing

- National EU governments need to **create a regulatory framework specific to fusion** (as US, UK and Japan did)
- **This will encourage private investments into fusion**
- **Private Public Partnership programs** are needed to accelerate fusion progress

Workforce

- Actively providing **education** and **training** to build a diverse workforce
- need to **inform the public** about fusion

KEY TAKEAWAYS

Establishing Commercial Fusion In Europe

1. **Wind** and **Solar** will be expanded in EU to **combat climate change**, but **need** a clean and safe **baseload**
2. **Fusion** can fill that baseload role and **complement** a truly **renewable** grid
3. The EU fusion plant market is predicted to be a **trillion dollars** by **end of the century**
4. Gauss Fusion is pursuing **magnetic fusion** with the highest technological readiness level (TRL)
5. Gauss Fusion strives to become the **European Fusion Champion** leveraging **industry experience**, a broad **network**, a great **leadership** and a leading **science** team