



MarvelFusion

6th Forum FUSION Germany
Greifswald, 2025

Energy for Humanity

About Marvel Fusion

6 years underway and well-positioned

2019

Founded in Munich

>€120M

Private funding secured

>€160M

Public-private partnerships secured

>70

Employees with >20 nationalities

Closed >€63M
Series B in Oct. 24

Shareholders

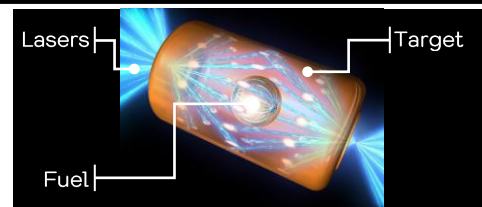
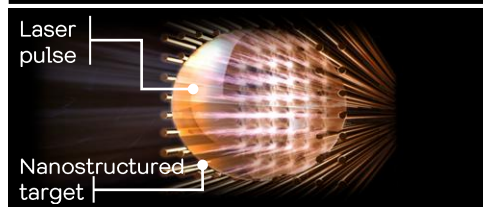
Research Hubs & Grants

Technology Partnerships

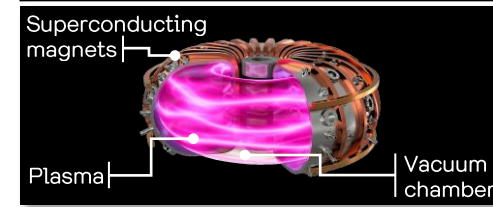


Pursuing inertial fusion energy leveraging ultrashort-pulsed lasers and nanofabricated targets

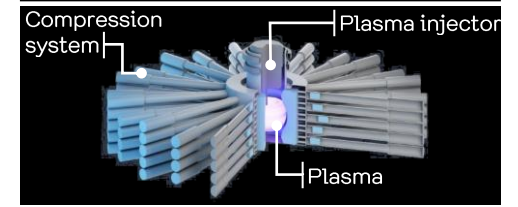
Inertial Fusion Energy



Magnetic Fusion Energy



Magneto-Inertial Fusion



Companies



Approaches

- Direct Drive Nano Accelerator

- Indirect Drive
- Direct Drive Fast Ignition

- Tokamak
- Stellarator

- Magnetized Target Fusion
- Field Reversed Configuration

Confinement

Ultrashort-pulsed lasers (fs)

Short-pulsed lasers (ps-ns)

Superconducting magnets

e.g. **Pistons**

Fuel

Solid, non-cryogenic fuels

DT

DT

DT, DHe3

Diode-pumped Laser Systems

>20x more efficient lasers compared to NIF,
30x more compact, high repetition rates (10 Hz)



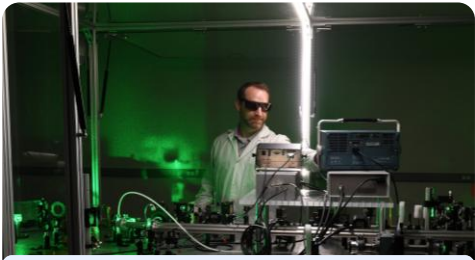
Nanostructured Accelerators

>100x higher coupling of laser energy vs NIF,
ultra-fast energy deposition, no instabilities

Solid, Non-Cryogenic Fuel

Solid at room temperature, no cryogenic
cooling technology required

In five steps to a commercial power plant



2024

Milestone
Proof-Of-Concept

Existing Infrastructure
ELI-NP, CALA, TPW, CSU



2027

Milestone
Proof-Of-Technology

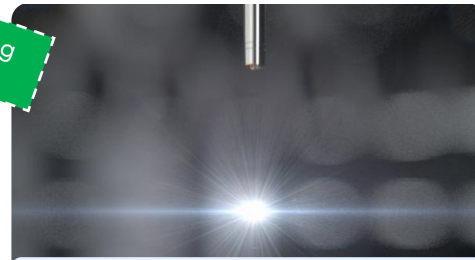
Tech Demo Facility
Colorado



2029

Milestone
Scaling Physics

Scaling Facility
Extension in Hamburg



2032

Milestone
100 MWe

Powerplant Prototype
Extension / Off-Grid with Client



2035

Milestone
500 MWe, EUR 50 per MWh

Commercial Powerplant
On-/ Off-Grid With Clients

Highlight: Proof-Of-Concept

✔ completed ✔ ongoing process



Milestone **Proof-Of-Concept** **2024**

Status:

- ✔ Large-scale simulations
- ✔ Prototyping of nanostructured targets
- ✔ Validation of key physics drivers



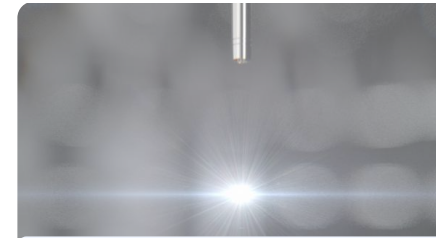
2027
Milestone **Proof-Of-Technology**

Tech Demo Facility
Colorado



2029
Milestone **Scaling Physics**

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2032
Milestone **100 MWe**

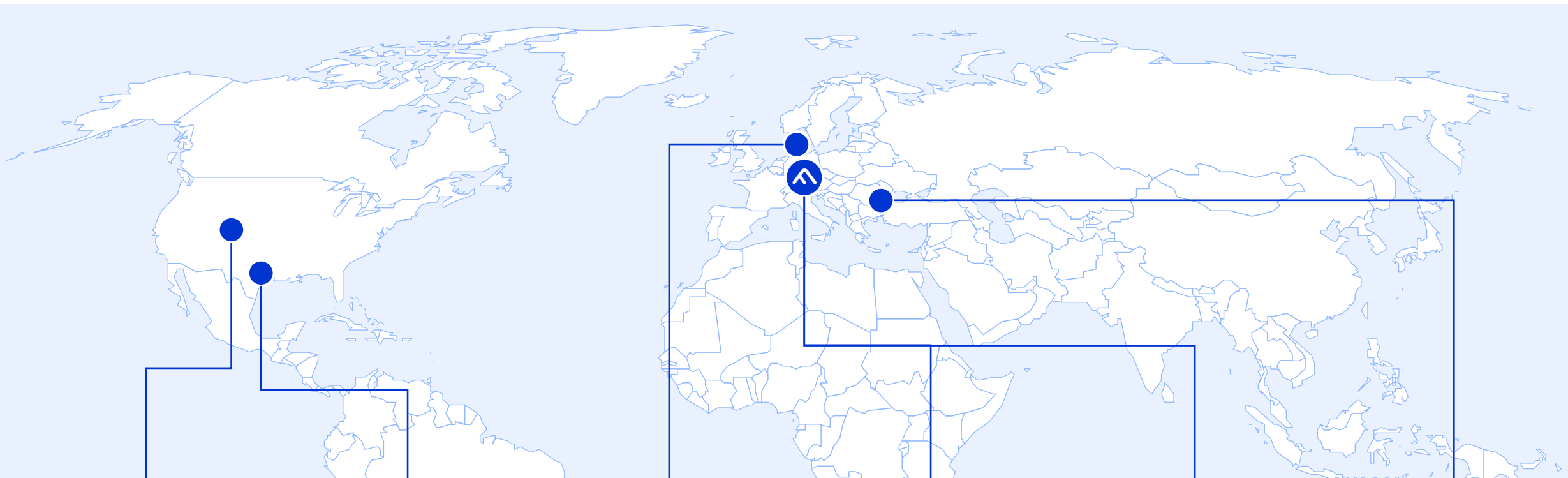
Powerplant Prototype
Extension / Off-Grid with Client



2035
Milestone **500 MWe, EUR 50 per MWh**

Commercial Powerplant
On- / Off-Grid With Clients

Matured fusion concept at external laser facilities



COLORADO STATE UNIVERSITY

Fort Collins (US)



Austin (US)



Hamburg (DE)



Dresden (DE)



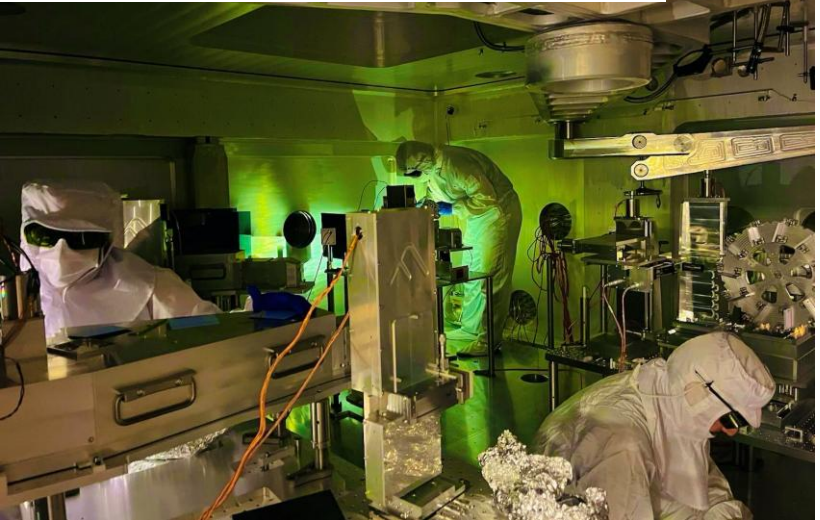
München (DE)



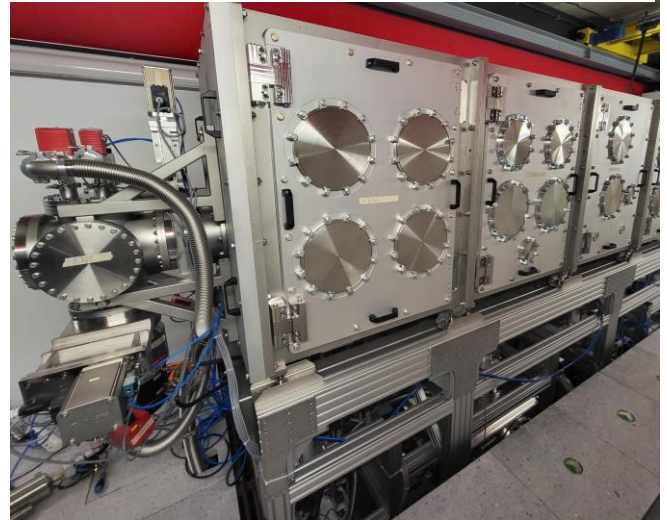
Magurele (RO)



10 PW experiments executed at ELI-NP

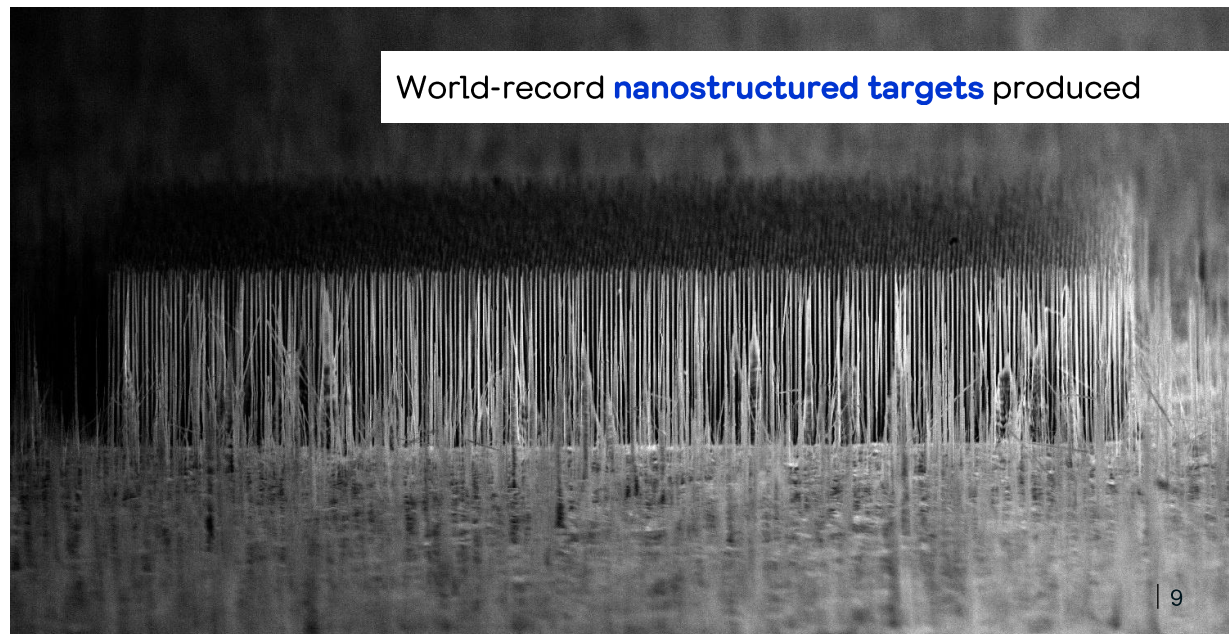


MF laser end-station at CALA



Highlights

Proof-of-Concept



World-record nanostructured targets produced

Highlight: Proof-Of-Technology

✓ completed
✓ ongoing process



2024
 Milestone
Proof-Of-Concept

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Milestone
Proof-Of-Technology **2027**

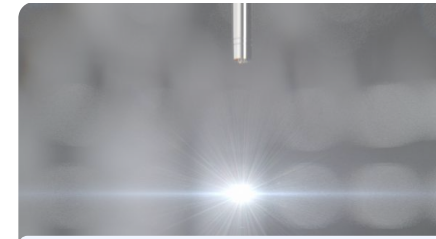
Status:

- ✓ Development of laser design
- ✓ Completion of laser and infrastructure
- ✓ Industrialisation of target production



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MF and CSU have launched a \$150M public-private partnership to build an advanced laser fusion facility



March 2024

Signing Public Private Partnership

Contract signed to build a **ground-breaking laser facility** that will push boundaries of fusion energy research and develop a fusion research hub



October 2024

Breaking Ground Ceremony

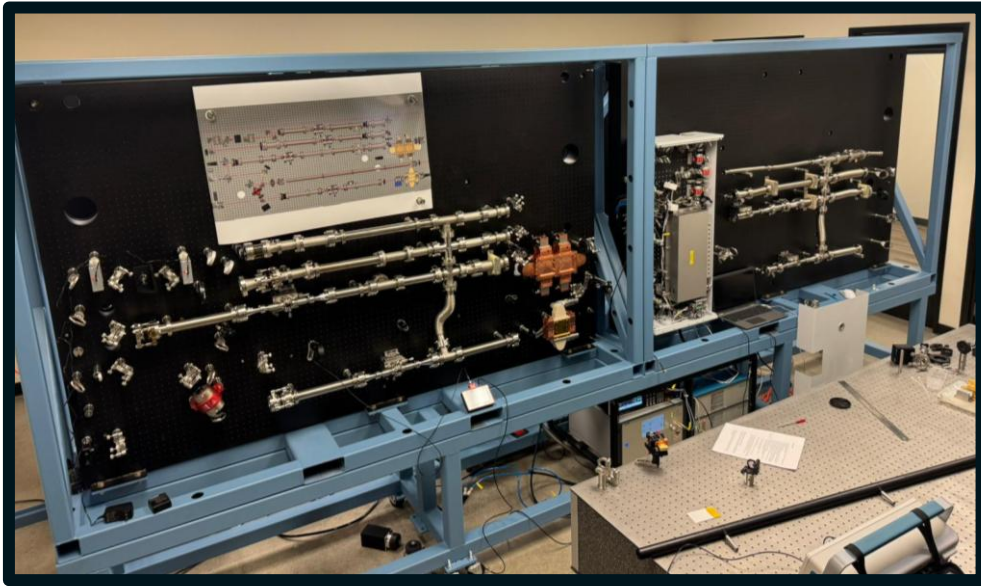
Launching the civil works for the Advanced Technology Lasers for Applications and Science (ATLAS) at CSU's campus in Fort Collins



October 2026

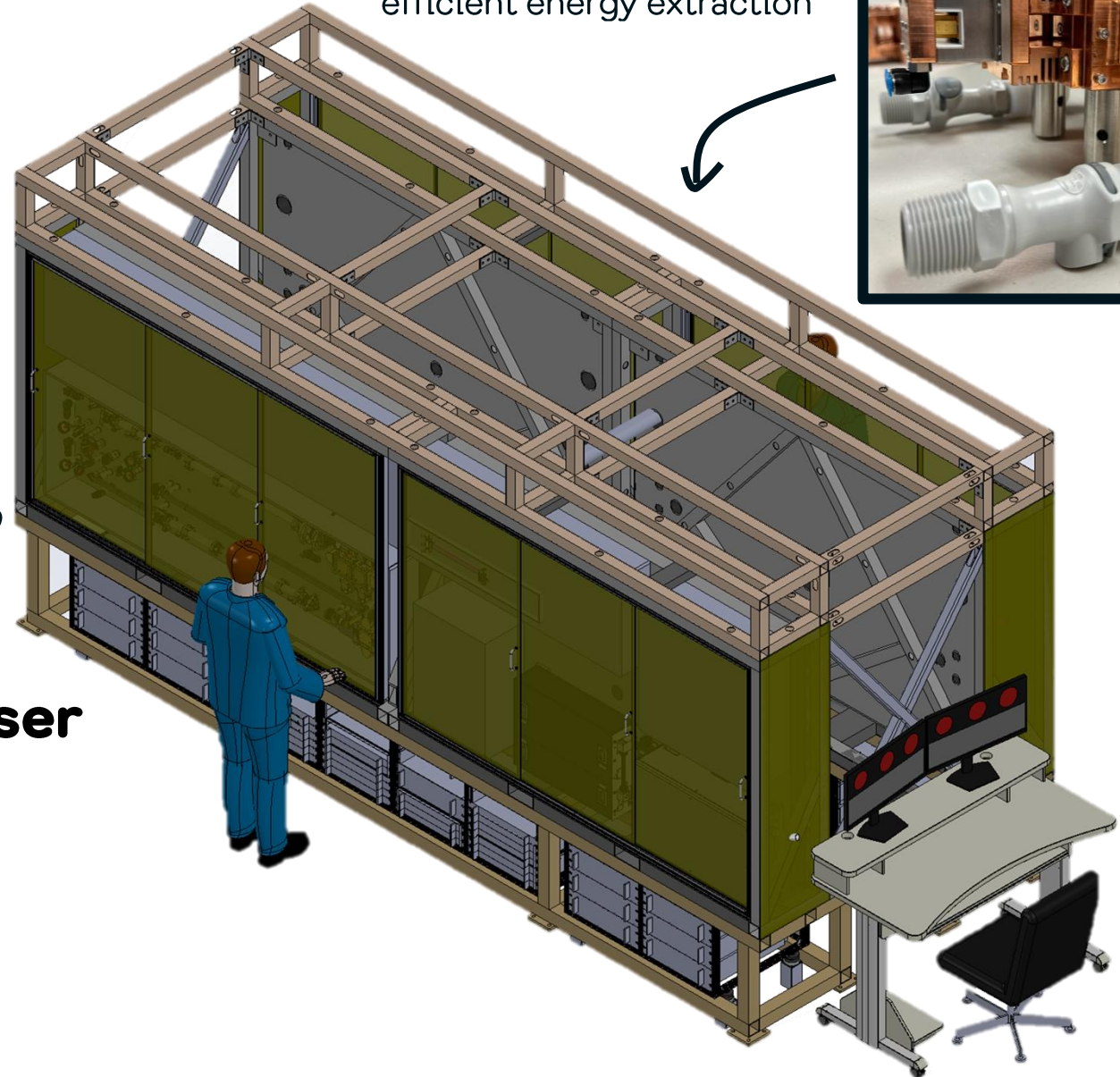
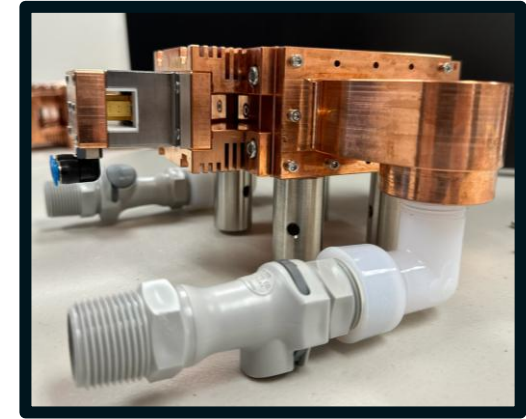
Commissioning

Facility opens new pathways for critical research on laser-target interaction and forms **foundation for power plant development**



Innovative **vertical bench setup** to reduce footprint

New, **compact laser head design** optimized for efficient energy extraction



Next Generation Petawatt Laser

MF's proprietary laser design complete; first components manufactured and delivered - to be installed at ATLAS facility

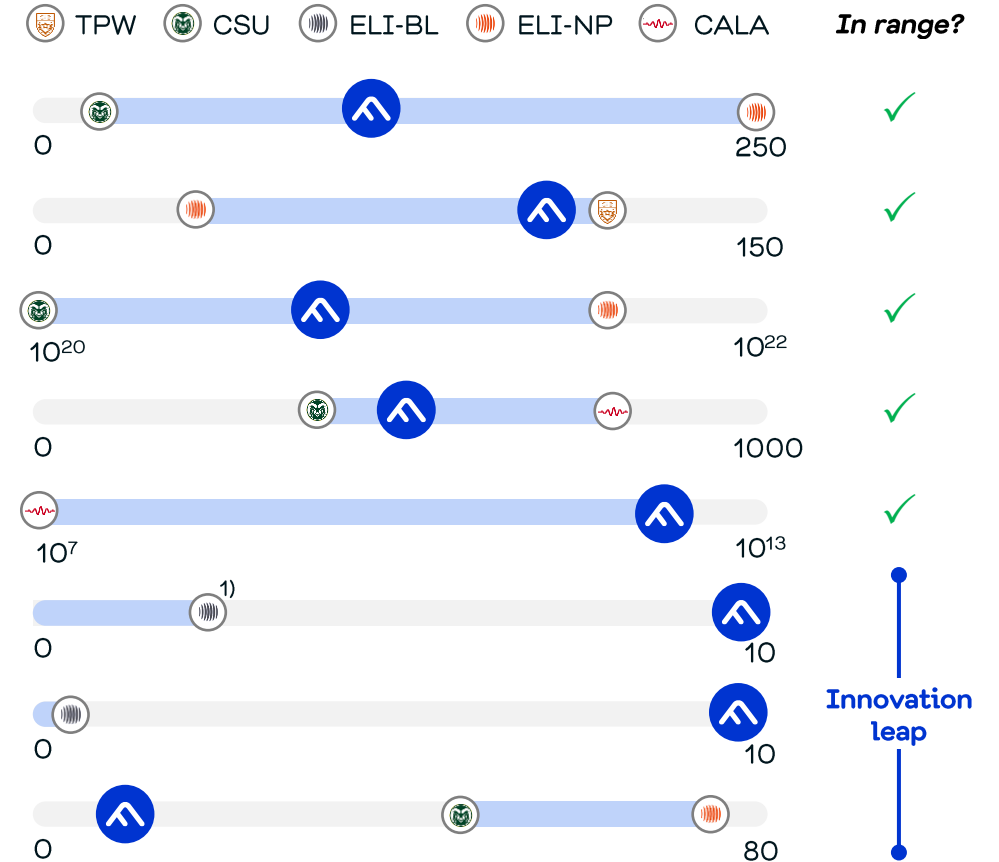
Marvel Fusion is developing world's most advanced laser system with key innovations in terms of size, efficiency, and repetition rate

Prototype Laser System (~2m x 10m x 1.8m)



Energy	>100 J
Pulse duration	<100 fs
Peak intensity	>10 ²⁰ W/cm ²
Wavelength	~530 nm
Contrast	<10 ¹²
Rep. rate	>10 Hz
WP Efficiency	>10%
System length	10 m

Comparison with existing facilities



Highlight: Scaling Facility

✓ completed

✓ ongoing process

Currently being evaluated



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2027
Milestone
Proof-Of-Technology

Tech Demo Facility
Colorado



Milestone
Scaling Physics **2029**

Status:

- ✓ Joint proposal for facility upgrade submitted to BMBF
- ✓ Laser technology available
- ✓ Working out detailed technical proposal



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Highlight: Powerplant Prototype



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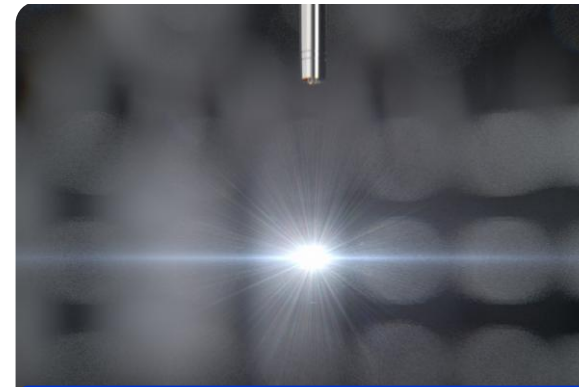
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2029
Milestone
Scaling Physics

Scaling Facility
Extension in Hamburg

✓ completed ✓ ongoing process



Milestone
Powerplant Prototype **2032**

- Status:**
- ✓ Start market development initiative
 - ✓ Design study for powerplant prototype
 - Construction of 100 MW prototype



2035
Milestone
500 MWe, EUR 50 per MWh

Commercial Powerplant
On-/ Off-Grid With Clients



 Marvel Fusion

The logo features a stylized white 'M' icon on the left, followed by the text 'MarvelFusion' in a white, sans-serif font. The background is a dark blue space with glowing blue lines and white dots.

MarvelFusion

Energy for Humanity

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CONTACT

Marvel Fusion GmbH
Theresienhöhe 12
80339 München
moritz@marvelfusion.com