

M E L T O N I C

ADVANCED METAL AM FOR SUSTAINABLE BIG SCIENCE

High performance metals for extreme environments

SUSTAINABILITY CHALLENGES

What kind of innovations are needed to make Big Science more sustainable?

More sustainable scientific infrastructure requires more than reducing energy consumption and waste. It starts with better components:

- **Perform better:** higher energy and thermal efficiency
- **Last longer:** Extreme temperature, radiation & corrosion resistance
- **Use resources better:** Less material waste and more functional integration
- **Strengthen supply chains:** more resilient European supply chains for critical components

→ advanced manufacturing can improve sustainability at component level - and ultimately at system level



WHY EB-PBF?

Unlocking materials and designs where conventional manufacturing and laser AM reach their limits

PROCESS

- Vacuum environment
- High temperature processing
- Open process control

MATERIALS

- Tungsten
- Molybdenum / niobium
- Copper alloys
- TiAl / Ni-based alloys

DESIGN

- Complex geometries
- Functional integration
- Near-net-shape manufacturing

Focus on materials and applications where EB-PBF provides a clear advantage



WHERE DOES THIS ADD VALUE?

Example opportunities for Big Science

FUSION	ACCELERATOR	HIGH TECH
• Tungsten plasma-facing components • Divertor / heat exchanger concepts • W–Cu interfaces • High-temperature components	• Targets and collimators • Beamline components • RF / thermal components • High-conductivity copper structures	• Integrated cooling • Thermal management • Vacuum-compatible components • Low-volume, high-complexity parts



WHAT MELTONIC BRINGS

Easy access to an open EB-PBF environment for developing and validating high-performance metal applications

- **Explore**

Identify where advanced materials, AM and specifically EB-PBF can add value

- **Develop**

Material, process and DfAM

- **Prototype**

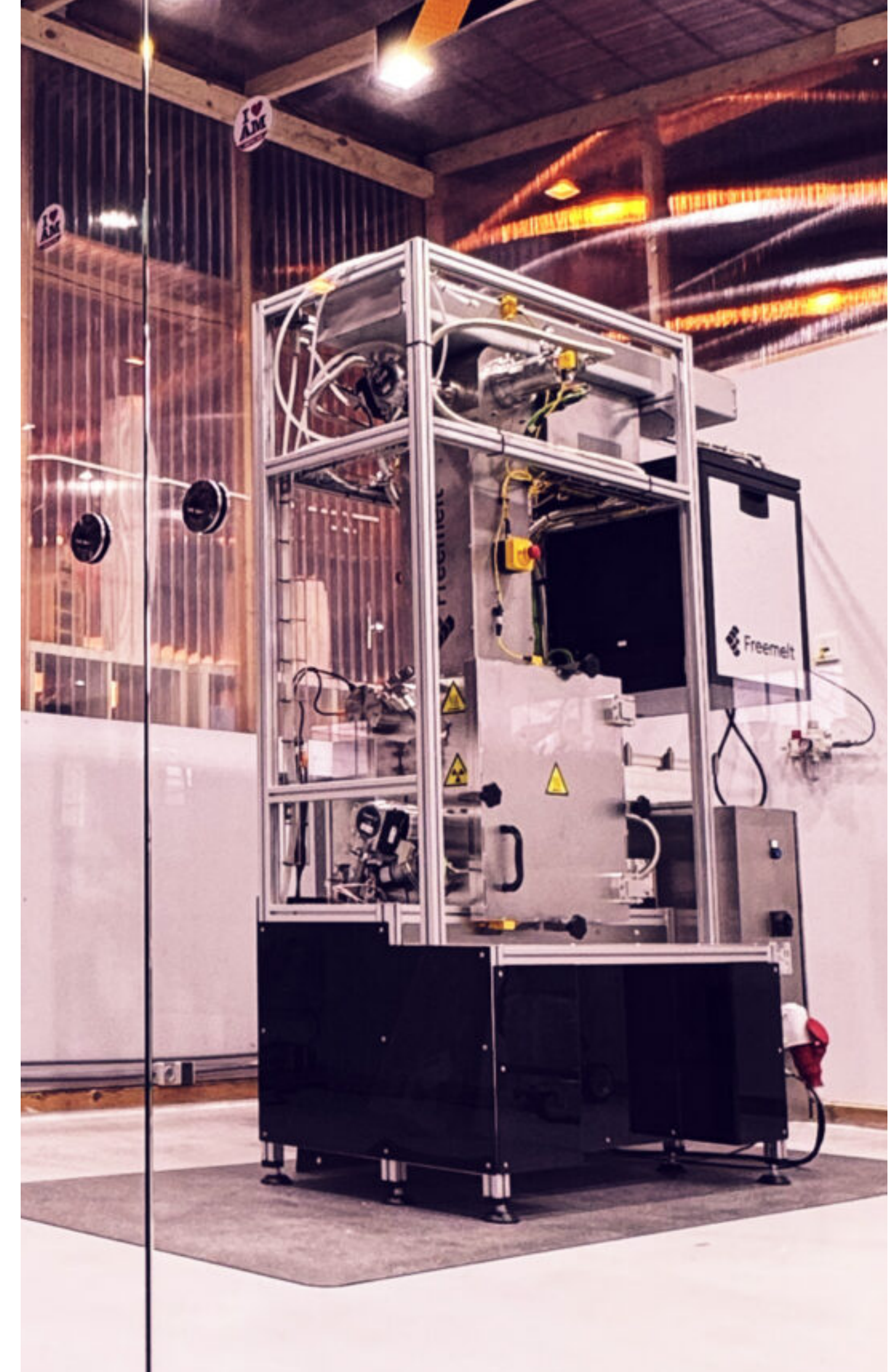
A neutral test-before- invest environment with shared EB-PBF infrastructure and knowledge

- **Validate**

Demonstrators, performance testing and technical evidence

- **Connect & scale**

Research partners - industrial suppliers - big science organizations - funding



SUSTAINABILITY THROUGH PERFORMANCE

Example opportunities for Big Science

- **Less material**
Near-net-shape manufacturing reduces machining and material waste
- **Higher efficiency**
Integrated cooling and optimized thermal or flow geometries
- **Longer lifetime**
High-performance materials for heat, corrosion and radiation
- **Shorter supply chains**
European production of low-volume critical components

The sustainability case is application-specific and should be demonstrated through material use, performance, lifetime and supply-chain impact.



HOW CAN WE COLLABORATE?

Joint approach

FOR BIG SCIENCE & ILO'S

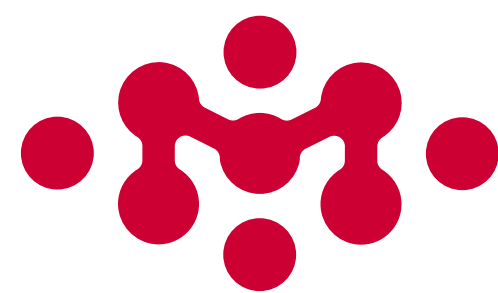
- Share technical challenges and future component needs
- Connect relevant industrial suppliers
- Define validation requirements

FOR INDUSTRIAL PARTNERS

- Bring a component, material or manufacturing challenge
- Explore technical feasibility
- Develop and validate a demonstrator

Bring us the challenge - we bring the facilities, AM expertise and research network.
Together we'll explore, develop, validate & scale





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Thank you

www.meltonic.eu

