

Cross Sectorial innovation

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Cross-sectorial innovation:

- Nuclear is a cutting edge technology
- Nuclear is a transverse technology with strong impact on other fields such as medicine, but also data management, industrial software development, balanced energy mix with variable RES
- Nuclear competences and knowledge are a source of cross sectorial mutual benefits:
 - AI and data science
 - Advanced manufacturing
 - Hybrid systems
 - Climate change mitigation and adaptation



Digitalisation

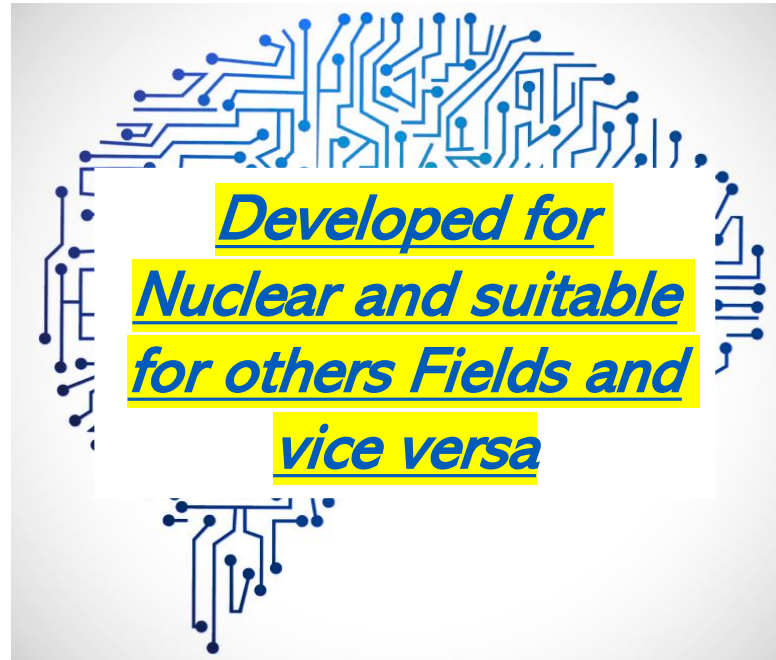
Advanced
manufacturing

Hydrogen

AI and Data Science

Applications

- Digital twins for design and operation
- Human Machine Collaboration Interfaces
- Augmented reality for plant field workers
- Predictive maintenance
- Production planning and optimization
- Drones/robots
- Advanced manufacturing



Technologies


- Machine learning
- Neural networks
- Natural language processing
- Graph theory
- Multi physics/multi scale
- Statistics
- Real time computing
- Reduction of models

Advanced Manufacturing for cross sectorial benefits

Needs

 **Optimize maintenance**

Repair and manufacturing of spare parts
Obsolescence, lead time, stock optimization

 **Improve component quality**

Manufacturing of heavy component
Homogeneity, near net shape (less assembly), properties, aging behavior

 **Increase performances**

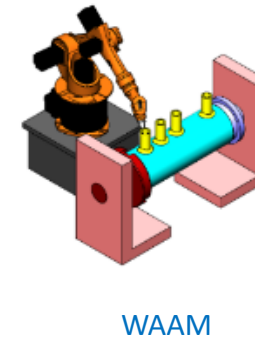
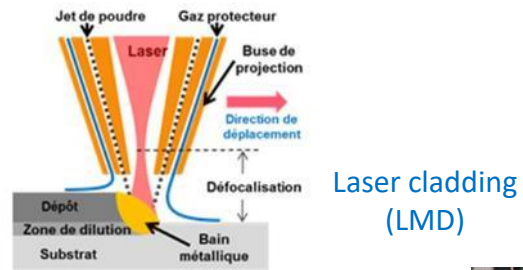
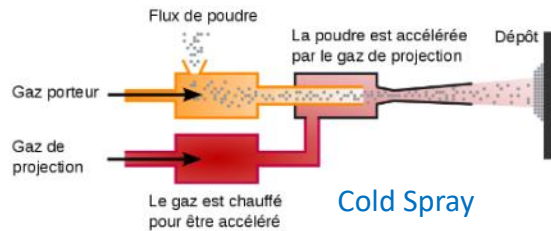
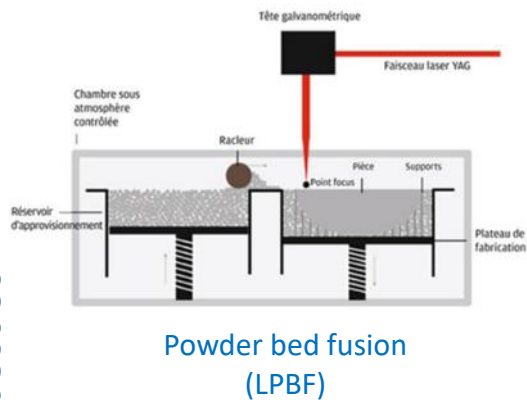
Manufacturing and repair
Structure lightening, design optimization, gradient materials

Manufacturing of spare parts

Repair

Manufacturing of heavy components

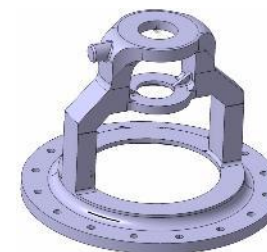
Additive Manufacturing Processes



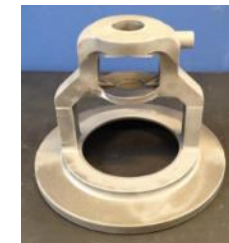
Hot Isostatic Compaction



Broken piece 3D scan



3D Digital model



Ready for use

Hybrid Energy Systems: meeting low-carbon emissions

- Valorization of electrical power and thermal power from a nuclear power plant
 - Urban heating
 - Hydrogen production
 - Direct Air Capture
 - Desalination



Climate Change

Challenges and innovative solutions to understand, mitigate and adapt to climate change

Data collection and assessment of climate change

Unique multi decennial data collection of local environment status and of the evolution of the water resource (quantity, quality);

Territorial climate forecast;

Assessment of the evolution of climatic extreme hazards (flood, temperature,...);



Plant adaptation and development of innovative technologies

Deep understanding of biological changes due to climate changes

Plume water recovery systems;

Water-saving cooling techniques;

Water re-use methods.



Cross cutting benefits through exchanges with other industries and climate
and environmental institutes

