Agenzia nazionale per le nuove tecnologie,
l'energia e lo sviluppo economico sostenibile

High Performance Computing for Science and Technology

M. Celino – ENEA, TERIN-ICT Division

VIPERLAB workshop 08/02/2022

EuroHPC Joint Undertaking

- Develop, deploy, extend, and maintain a world-leading supercomputing and data infrastructure in Europe. The objective is to reach exascale capabilities by 2022/2024. Exascale supercomputers are capable of more than a 10^18 operations per second
- Support the development and uptake of innovative and competitive supercomputing technologies and applications based on a supply chain that will reduce Europe‘s dependency on foreign computing technology. A specific focus will be given to greener and energy-efficient HPC technologies.

#EuroHPC Joint Undertaking

The European High Performance Computing Joint Undertaking (EuroHPC JU) will pool European resources to develop top-of-the range exascale supercomputers for processing big data, based on competitive European technology.

Member countries are Austria, Belgium, Bulgaria, Croatia, Cyprus, Czech Republic, Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Iceland, Ireland, Italy, Latvia, Lithuania, Luxembourg, Malta, the Netherlands, Norway, Poland, Portugal, Romania, Slovakia, Slovenia, Spain, Sweden and Turkey.

EuroHPC Joint Undertaking

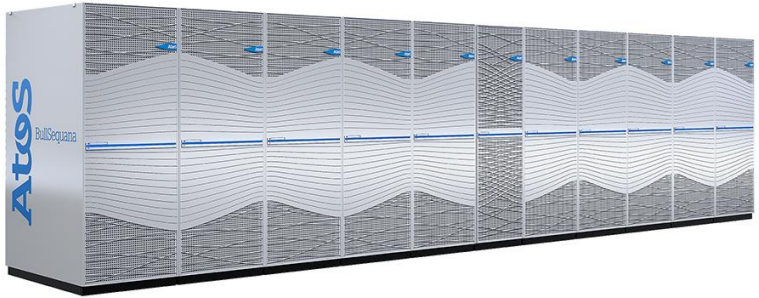
EuroHPC supercomputers

Supercomputers

Today the EuroHPC JU has procured seven supercomputers, located across Europe:

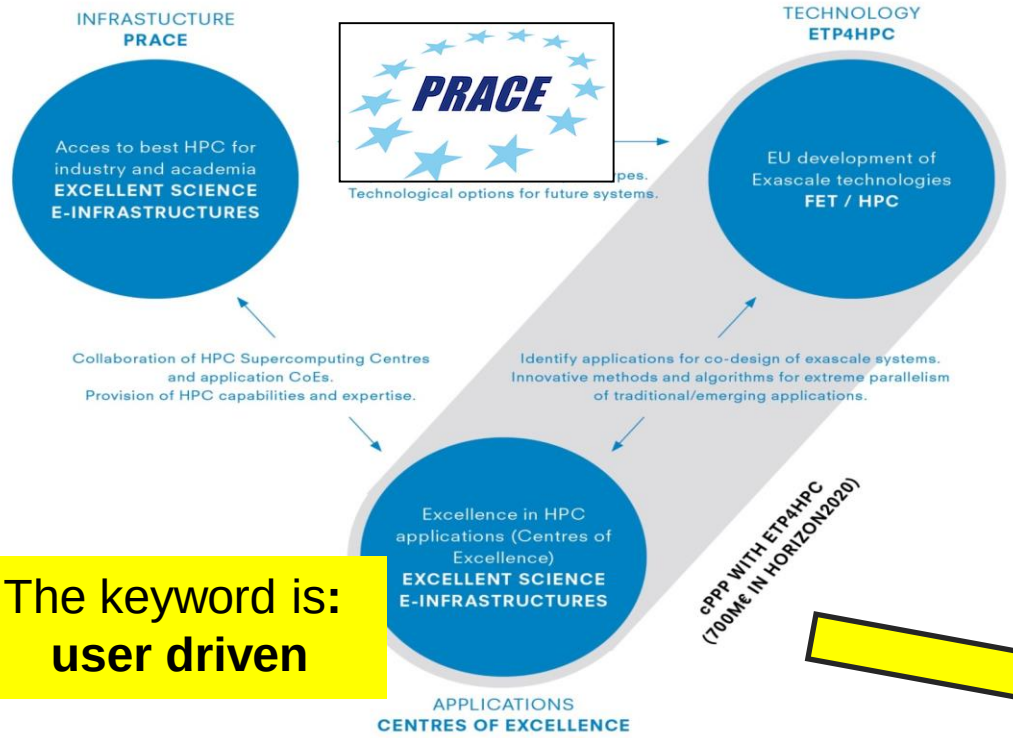
- LUMI in Finland,
- Leonardo in Italy,
- MeluXina in Luxembourg,
- Vega in Slovenia, Karolina in the Czech Republic, Discoverer in Bulgaria and Deucalion in Portugal.

Lumi: 375 PF sustained, 552 PF peak
GPU partition. The LUMI-C partition will feature 64-core next-generation AMD EPYC™ CPUs



Leonardo: 250 PF sustained, 322 PF peak
CPU: Intel Ice-Lake (booster) and Intel Sapphire (data-centric). NVIDIA Ampere architecture-based GPUs.

EU HPC Ecosystem

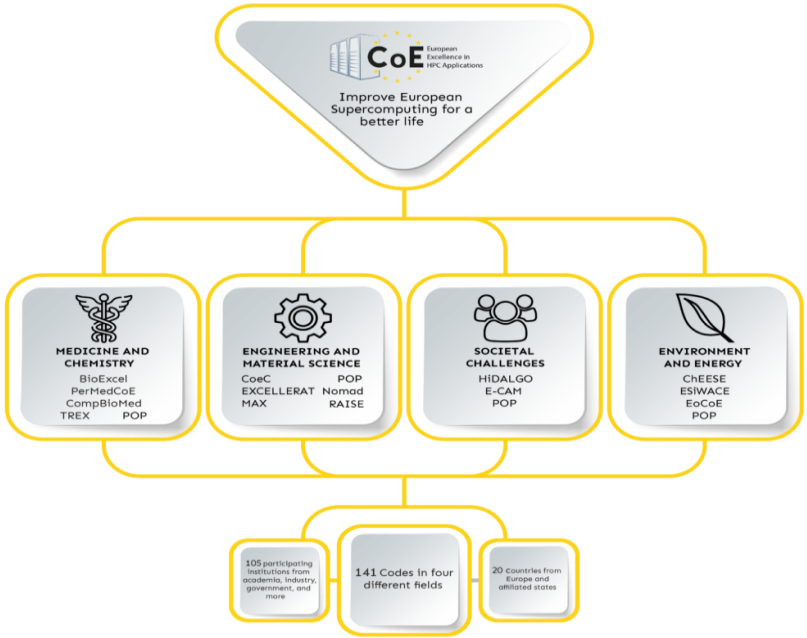


The keyword is:
user driven

ETP 4 HPC
EUROPEAN TECHNOLOGY PLATFORM FOR HIGH PERFORMANCE COMPUTING

HPC Centres of Excellence

15 Centres of Excellence to support applications towards exascale supercomputers

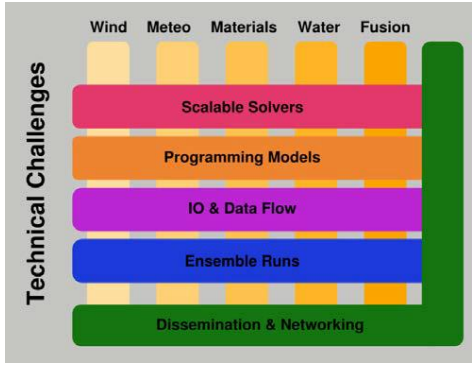


https://www.hpccoe.eu/eu-hpc-centres-of-excellence2/

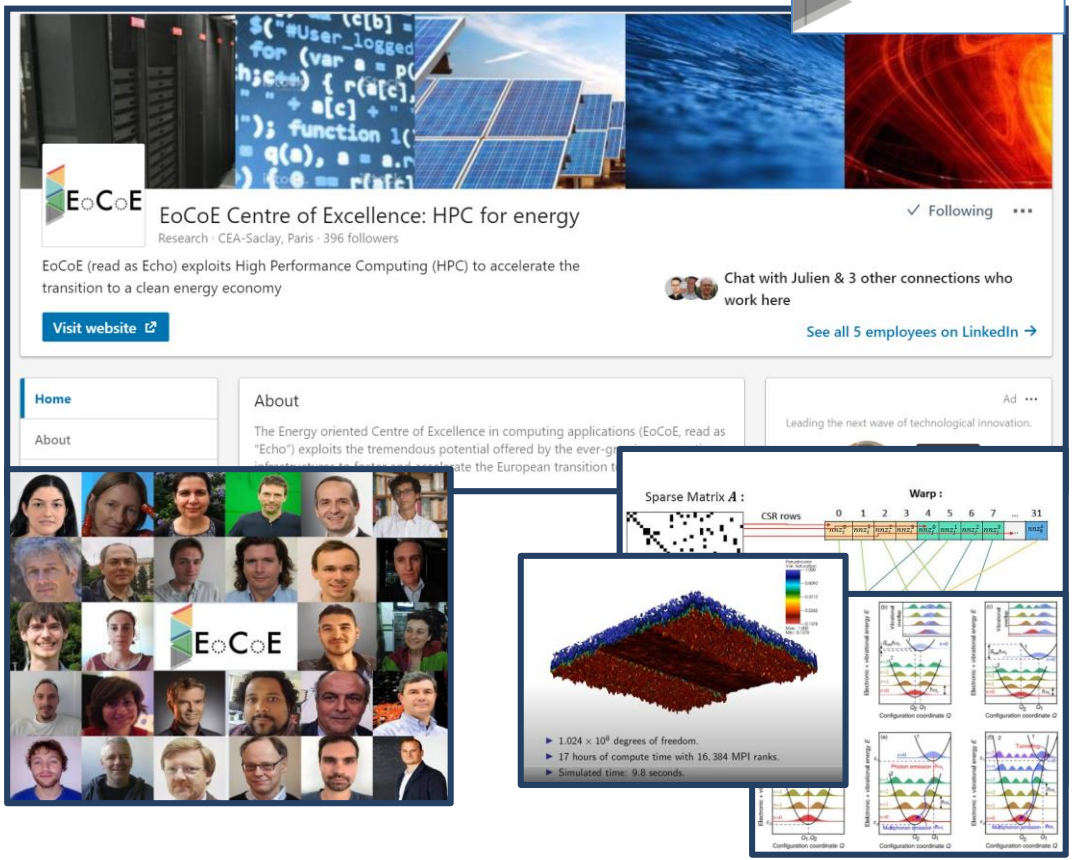
https://www.hpccoe.eu/use-cases/

EoCoE
The European Energy oriented Centre of Excellence

Transversal multidisciplinary effort providing high-end expertise in **applied mathematics** and **HPC** to face energy scientific challenges and exploit the new European exascale (10^{18}) supercomputers



- EOCOE-II (2nd phase): 3 years project (2019 – 2021)
- Coordinator : Prof. E. Audit (Maison de la Simulation, CEA, Saclay)
- 7 countries,18 partners
- **www.eocoe.eu**



EERA tJP «Digitalization for Energy»

EERA European Energy Research Alliance

tJP Digitalisation for Energy

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Partners
20 full participants
2 associated participant

- Download tJP info sheet
- Download tJP DfE SRIA
- Download questionnaire for becoming a tJP member
- Download questionnaire for existing EERA SP to join the tJP

- tJP Documents Repository

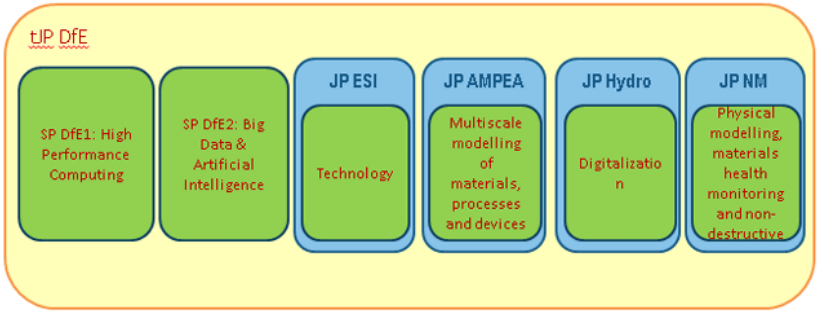
tJP DfE aims at defining key priorities that will derive in research activities as well as to act as a contact point with major European initiatives on supercomputing, big data, artificial intelligence, open science, etc. it will also tackle the European Digital Strategy, which is strongly pushing these IT services.

ENEA

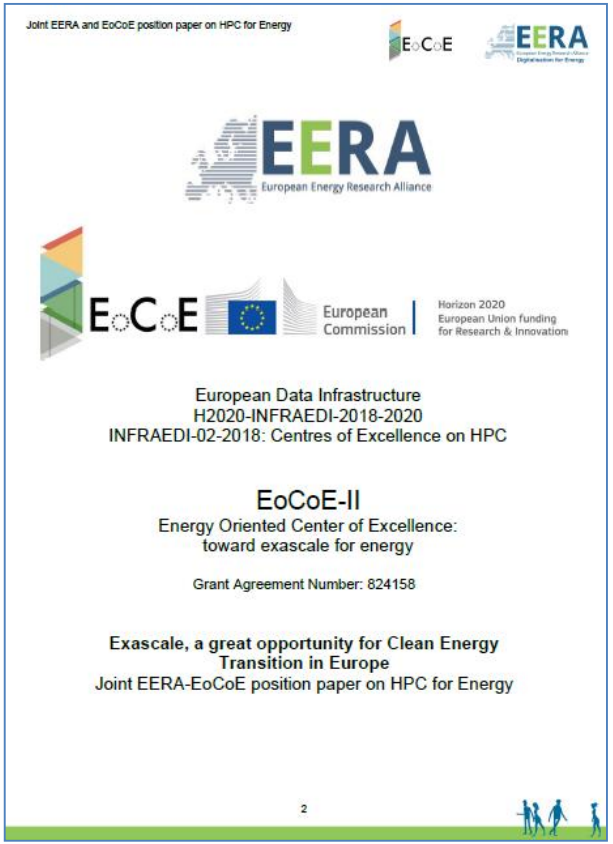
Specific SPs belonging to this tJP:

- **SP1 HPC**
- **SP2 Data Science & Artificial Intelligence**

- **ESI tSP** "Technology"
- **AMPEA tSP** "Multiscale modelling of materials, processes and devices"
- **Hydropower tSP** "Digitalization"
- **Nuclear Materials tSP** "Physical modelling, materials health monitoring and nondestructive microstructure examination for nuclear materials"



EERA tJP DfE – EoCoE position paper



To better align Energy application domains with HPC technologies in order to maintain current trans-disciplinary collaborations as the source of expertise for improved scientific advancements and to accelerate the energy transition toward a carbon-free society

https://www.eera-set.eu/news-resources/3130:joint-eera-eocoe-position-paper-on-hpc-for-energy.html

Mission Innovation initiative

Mission Innovation:
Accelerating the Clean Energy Revolution

"To accelerate the pace of clean energy innovation to achieve performance breakthroughs and cost reductions to provide widely affordable and reliable clean energy solutions that will revolutionize energy systems throughout the world over the next two decades and beyond"

Mission Innovation initiative

GOALS

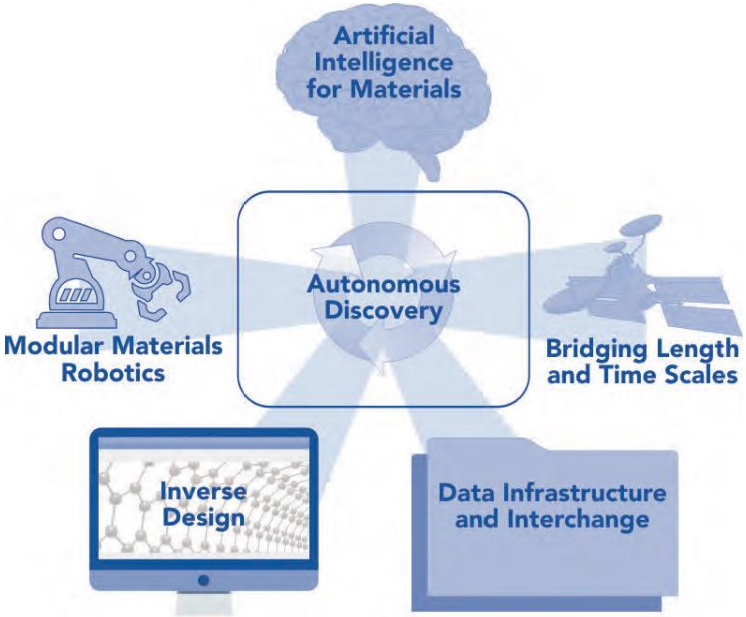
1. Doubling public sector investments in clean energy RD&D;
2. Increasing private sector engagement and investment;
3. Facilitating new and strengthened partnerships and collaboration;
4. Engaging and informing MI members and the wider clean energy innovation community.

7 Innovation Challenges selected in London in September 2016:

1. Smart grids,
2. Microgrids,
3. Biofuels (CAN),
4. CCUS,
5. Sunlight to fuels,
6. **Advanced materials**
7. Heating & Cooling
8. Hydrogen

Materials discovery

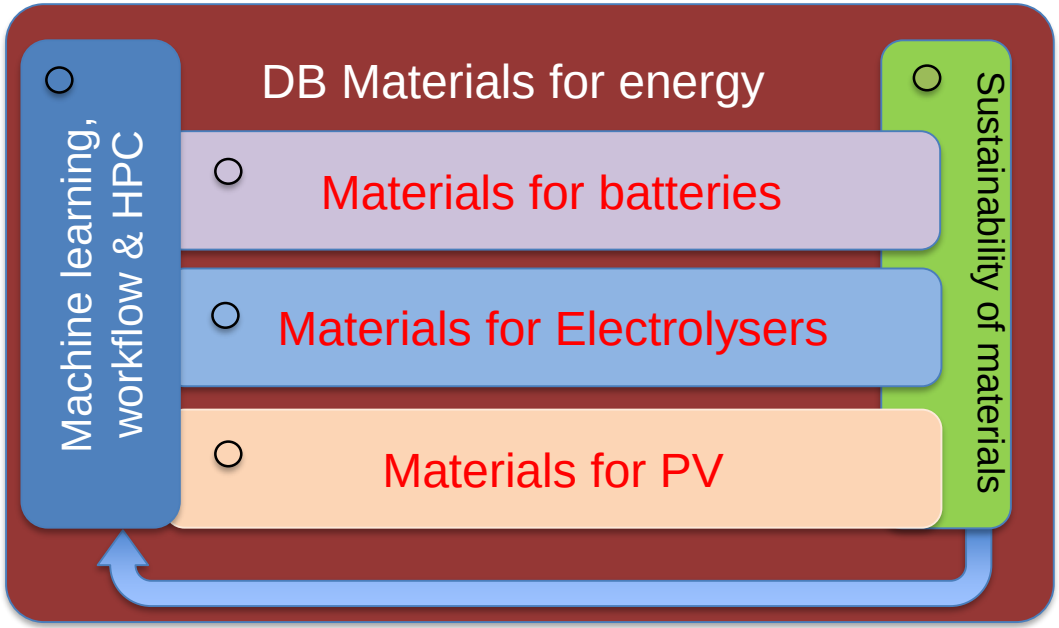
MISSION INNOVATION
Accelerating the Clean Energy Revolution

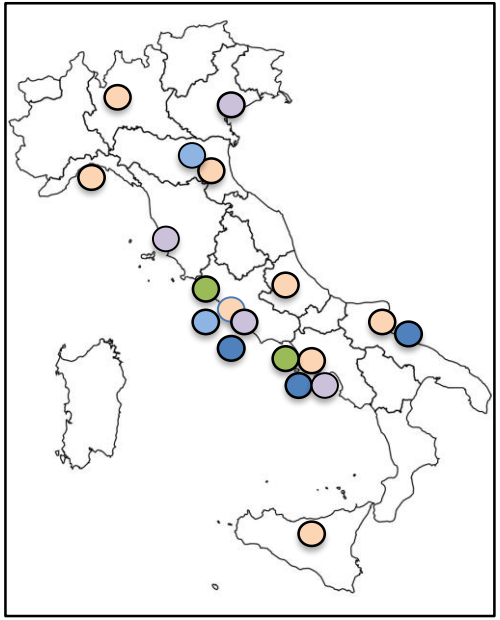


The Italian Energy Materials Acceleration Platform IEMAP

MINISTERO DELLA TRANSIZIONE ECOLOGICA

IEMAP platform, inspired to Mission Innovation #6, involves four Italian research institutions to set up a modular infrastructure to design materials with different experimental and computational approaches and operating conditions, exploiting HPC, AI and Big Data technologies. Three years project starting in mid-2021.





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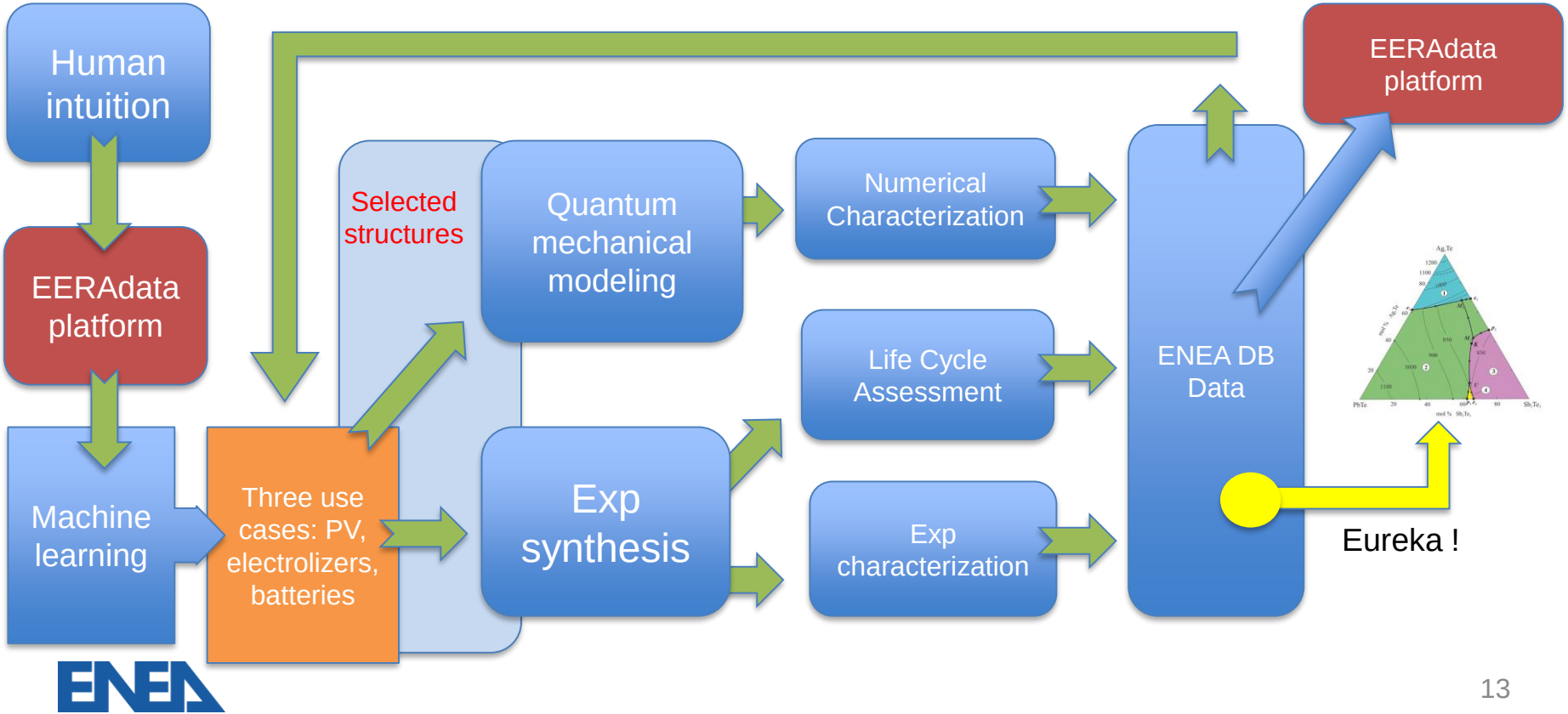
IEMAP: Italian Energy Materials Acceleration Platform



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