



IEA Technology Collaboration Programme

COUNTRY REPORT

Italy

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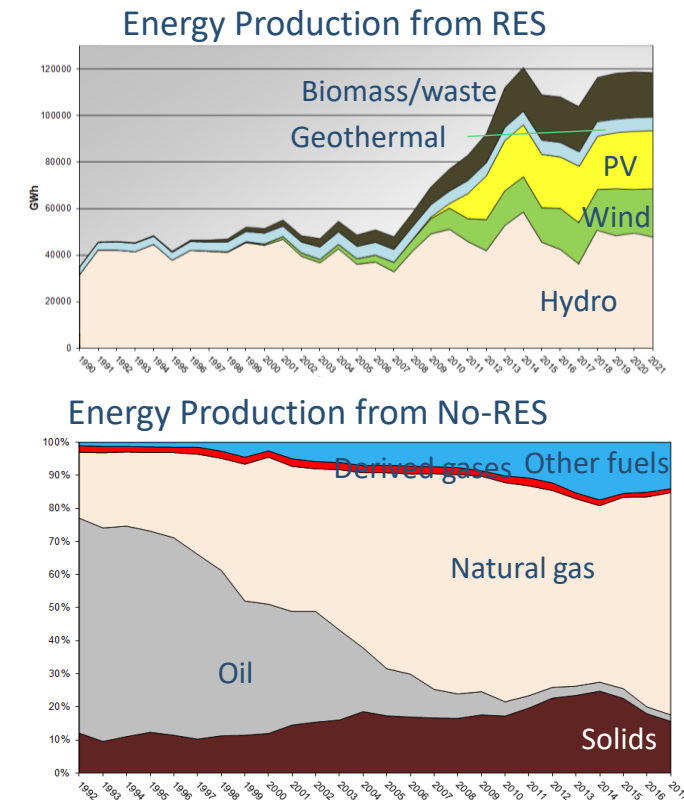
95 XC Meeting, Vienna, Austria, 01 June 2023

Country Specific Information

- **Population: 59,03 Mio**
- **Primary source consumption 169,7 Mtep**
- **40% of primary energy sources are currently used for the generation of electricity, 35% for thermal energy and 25% for the traction of means of transport.**
- **Total Power Consumption: 319,9 TWh (+6,2 %)**
- **Total Net Power Production: 289.1 TWh (+3,1%):**
- **59% from no RES (thermoelectrical);**
- **16,4% Hydro; PV: 9%; 7% wind; 6,3% biomass/waste; 1,9% geo-thermal**

In January-June 2022, primary energy consumption increased by around 2% in trend terms, in line with the positive impulse coming from the main drivers of energy demand (a further increase is reported for the GDP trend above 5%).

The main energy vector used for residential heating in Italy is natural gas (50% of the energy supplied). Followed by solid biomass (28% of the total), especially wood and wood chips, and petroleum products (8%), as in the case of diesel boilers, still present in some large cities and in non-methanized mountain areas. Cogeneration accounts for 5% of the total, while heat pumps, electric heating (boilers) and solar thermal (1% of the total) are marginal. Reducing consumption for houses homes is now possible thanks to energy efficiency and is essential for limiting household spending. In fact, domestic heating is by far the largest item in the list of consumption by residential users: it represents 67% of the total, equal to 893,196 TJ, while the remaining 33% is intended for other uses such as domestic hot water , cooling, lighting and industrial equipment.



RDD Information

(Research, Development and Demonstration)

Three-year National plan of National Electricity System Research (RDS)

Objective: decarbonization

It establishes the priorities, objectives and resources of research and development activities of general interest for the national electricity system and includes also funds for energy storage.

Integrated project 1.2: Electrochemical and Thermal Storage Technologies (16.6 M€)

Activities aimed at increasing energy density, improving safety, reducing the cost and extending the life cycle as well as the environmental sustainability

- Advanced materials for electrochemical storage;
- Innovative systems for electrochemical storage;
- Environmental, economic and social aspects related to electrochemical storage;
- Innovative materials and systems related to thermal storage.

Project 1.9: CSP (2.3 M€)

R&D and demonstration of plant components and technical solutions aimed at increasing performance and reducing the Levelised Cost of Energy (LCOE).

- thermocline TES using molten salts charged by integrated Linear Fresnel and PV plants.

RDD Information

(Research, Development and Demonstration)

Objective: digitalization and evolution of the networks

- 2.2 Energy scenarios and governance support (6.8 M€)
- 2.4 Digitization of the integrated energy system (5 M€)
- 2.5 Energy from renewable sources and integration in the territory (7 M€)
- 2.6 Resilience and security of the energy system (16.8 M€)
- 2.10 Flexibility of the integrated energy system (5.8 M€)

RDD Information Electricity Storage

(Research, Development and Demonstration)

National Recovery and Resilience Plan(PNRR)

Objective: decarbonization

Financial instrument by the Ministry of the Environment and Energy Security to support programs consistent with the Investment "Renewables and batteries" of the Recovery and Resilience National Plan

- ❖ A open call, with a budget of 500 million euros for the Battery sector, was opened in April 2022 and closed in July 2022: as far as we know, at least 7 project proposals would have been received.
- ❖ A second session, with a budget of around 360 million euros, was opened in November 2022 and closed in February 2023: no information is yet available on our hands on the number of project proposals received.

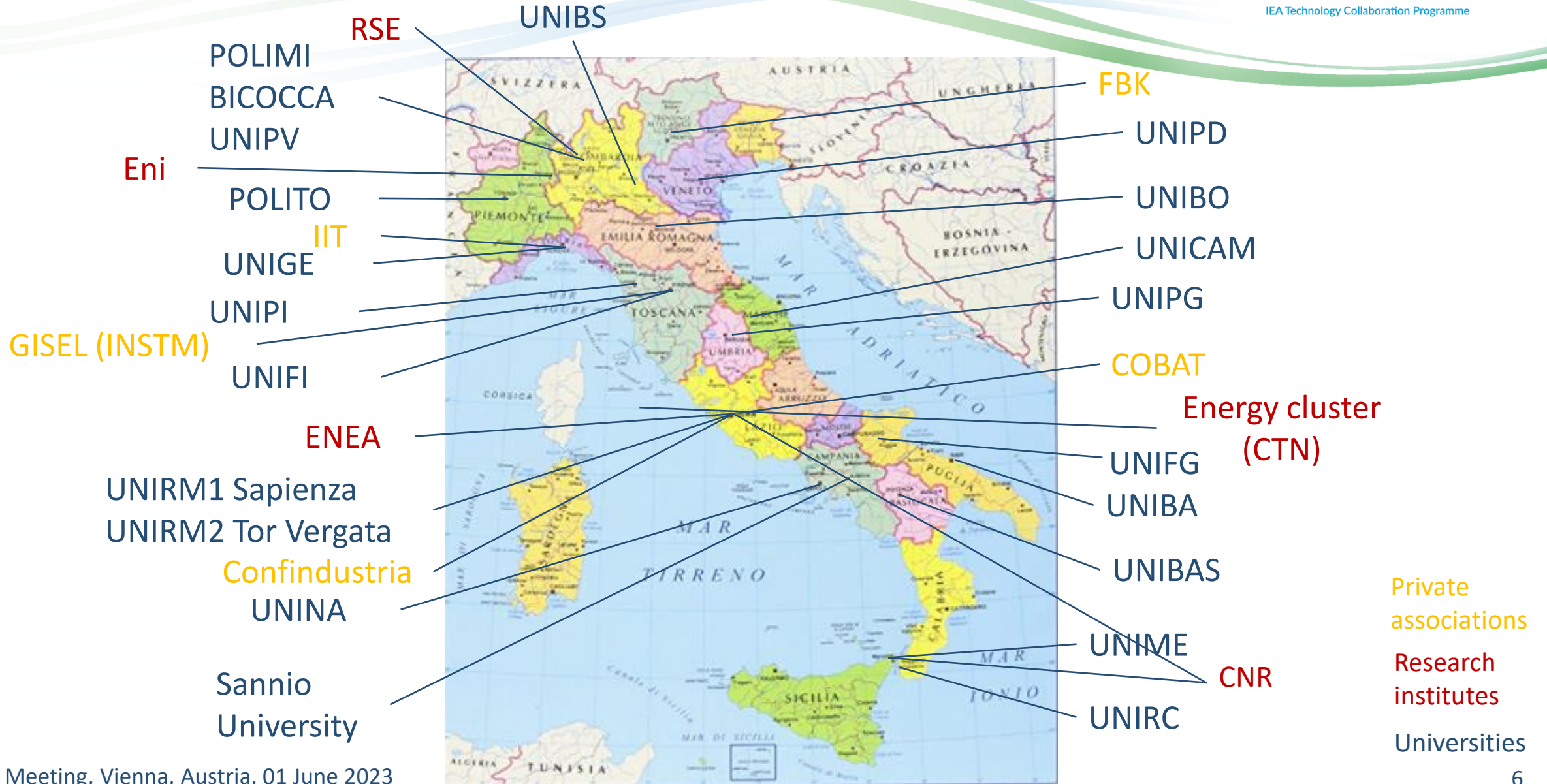
Priority is given to the suitability of industrial programs to develop, consolidate and strengthen the national value chain

Suitability is assessed with reference to the following characteristics (preference for those programs that present more than one at the same time):

- ❖ prevalent positioning in the upstream sector of the supply chain
- ❖ contribution to increasing storage capacity for the battery supply chain (Wh/y)
- ❖ presentation by a plurality of companies, representative of different sectors of the supply chain
- ❖ presence of a research, development, and innovation project within the program

consolidate and strengthen the national value chain

Energy Storage Landscape



Policies & Market

Over the next 30 years, VRESs will grow globally to 16 times the currently installed capacity

2050 X16 

The "joint Terna-Snam scenarios" indicate that around 95 additional GWh of storage capacity will be needed to be in agreement with the Fit-for-55 objectives

2030 +95GWh 

71 GWh relating to utility-scale installations with an E/P of 8 hours out of a total of 95 GWh

2030 E/P 8+ 

PNIEC: Integrated National Plan for Energy and Climate →

- research activities to develop the **integration of systems** (electricity, gas, water), exploring, also the possibility of using **existing infrastructures** for energy storage renewable, even in the long term, with effective solutions from the economic and environmental cost / benefits profile.
- spread and use of **energy storage systems**, including **electric vehicles**, also including long-term storage, and the integration of the electricity system with gas and water systems.
- Thermal Energy Storage
- Power to heat
- Power to gas

Top 3 projects

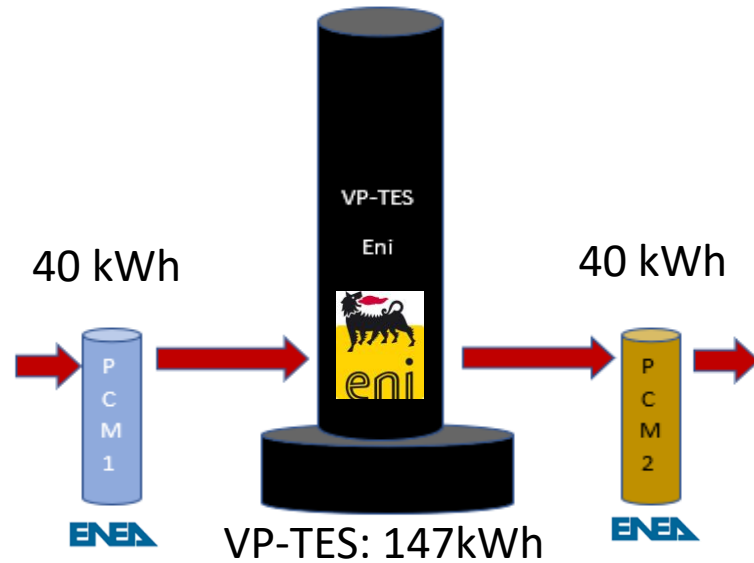
- **“JCA ENI ENEA – CSP & Storage“**
- **PCM (Enea) + Concrete TES (Eni)**
- **Volume: 2 m³**
- **Temperatures: 290 – 450 °C**
- **Storage Period: Daily**
- **Kind: Prototype, modeling**
- **System: Thermal Storage**

- **“IEMAP“**
- **Material acceleration discovery platform (Enea, CNR, RSE, IIT)**
- **Dedicated to materials for energy (electrochemical storage, electrolysers, photovoltaic)**
- **AI and ML tools**
- **Database and computational workstream**
- **4,6 M € (2,2 on storage materials)**

- **“IPCEI Batteries“**
- **2 national projects**
- **20 participants**
- **public support about 1200 M €**
- **Industrial projects on the entire battery value chain**



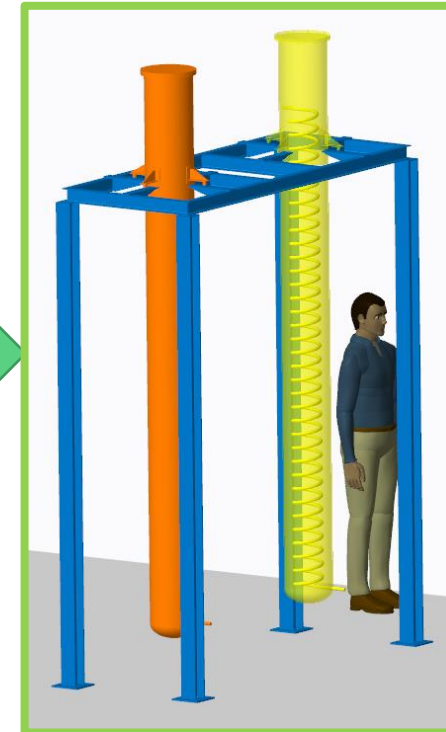
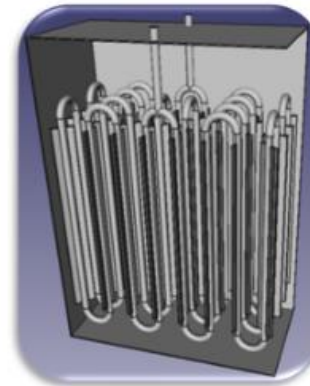
Project "1": JCA ENI ENEA – CSP & Thermal Storage



Operating T range:
300÷450 °C

PCM by use of nitrates
and carbonates

Purpose:
cascade integration
of storage tanks using
different types and
greater stabilization
of temperatures.



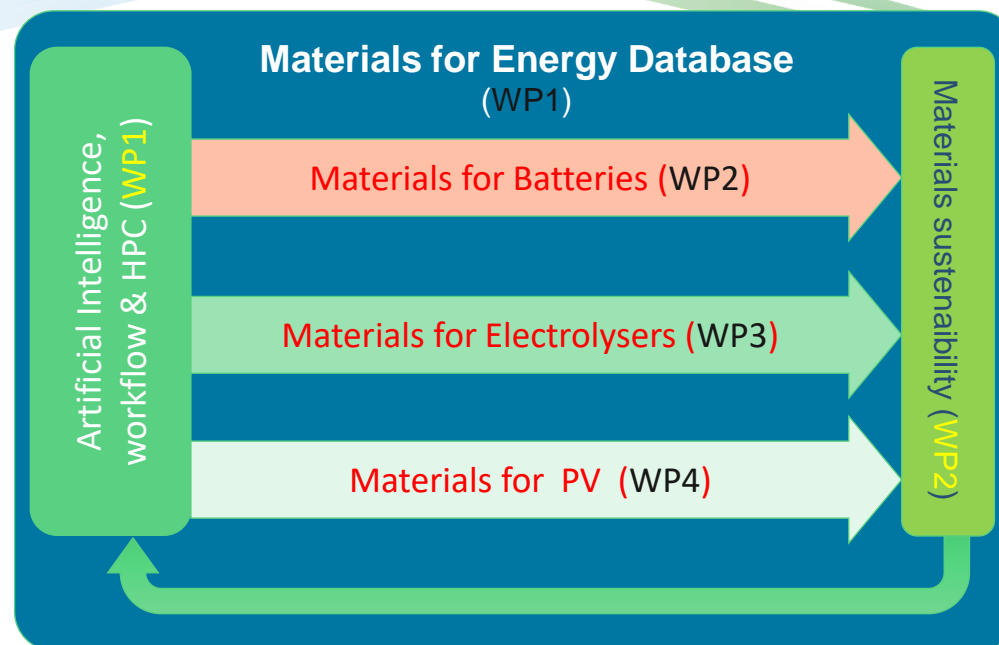
Eni TES pilot
@Novara Eni R&D center

Project “2”: IEMAP: Italian Energy Materials Acceleration Platform

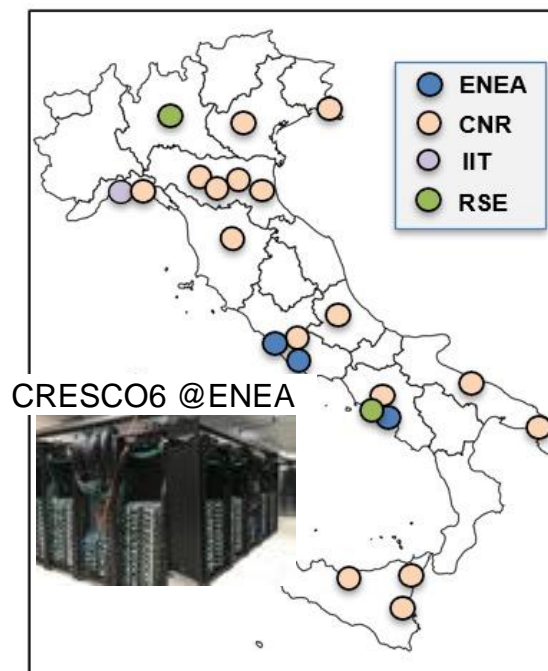
The search and selection of new materials takes place in a cyclic and integrated manner:

- an artificial intelligence analyzes the data available in a database and suggests new research directions experimental and computational labs test hypotheses and feed new data to the database
- the database reorganizes and collects data for the artificial intelligence
- artificial intelligence captures the new information and provides new directions to laboratories.

The procedure is repeated until the set of materials with the desired characteristics is identified.



National labs in the IEMAP infrastructures:



Key goal: developing a transversal computational infrastructure to accelerate material discovery, WP2 is related to electrochemical storage materials.

Project "3": IPCEIs on Battery

Raw and advanced materials	Cells and modules	Battery systems	Repurposing, recycling and refining
BASF	ACC	BMW	BASF
Eneris	BMW	Endurance	Endurance
Keliber	Endurance	Enel X	Elemental
Nanocyl	Eneris	Eneris	Eneris
Solvay	FAAM	Kaitek	FAAM
Terraframe	SEEL	SEEL	Fortum
Umicore	VARTA		SEEL
			Umicore

European Commission, decision C(2019) 8823 final, 09.12.2019

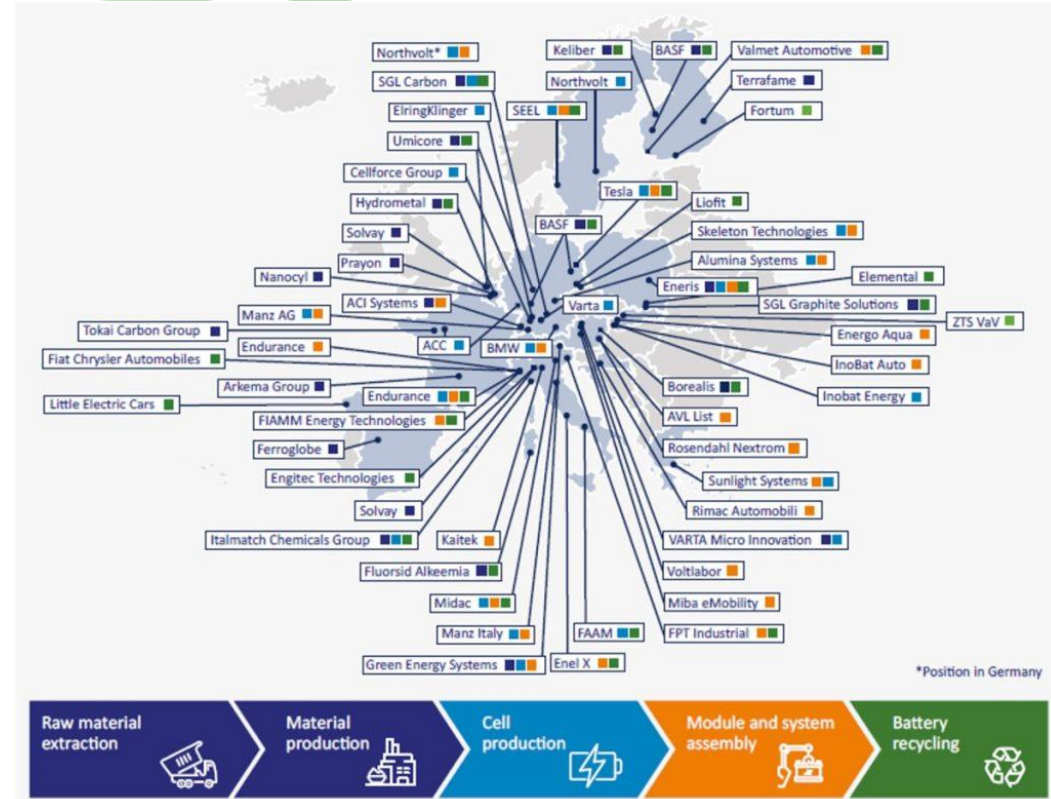
1st IPCEI on Batteries (09 Dec. 2019)

- **Funding:** 3.2 B € public support by Member States which is expected to unlock an additional 5 B € in private investments
- **Contribution:** 7 member States, 17 direct participants
- **Italian Contribution:** 5 direct participants, public support 570 M €

Raw and advanced materials	Battery cells	Battery systems	Recycling and sustainability
ACIS	Alumina Systems	ACIS	Borealis
Arkema	BMW	Alumina Systems	Enel X
Borealis	Cellforce Group	AVL	Engitec
Ferroglobe	BMW	BMW	FIAMM
Fluorsid	Endurance	Endurance	Fortum
Green Energy Storage	FCA	Enel X	Hydrometal
Hydrometal	Green Energy Storage	Energio Aqua	Italmatch Chemicals
Italmatch Chemicals	InoBat Auto	FCA	Keliber
Keliber	Manz	FIAMM	Liofit
Prayon	Midac	FPT Industrial	Little Electric Cars
SGL Carbon	Northvolt	Green Energy Storage	Midac
Solvay	SGL Carbon	InoBat Energy	SGL Carbon
Tokai Carbon Group	Skeleton Technologies	Miba eMobility	Tesla
VARTA Micro Innovation	Sunlight Systems	Midac	Valmet Automotive
	Tesla	Rimac Automobili	ZTS VaV
	VARTA Micro Innovation	Rosendahl Nextrom	
		Skeleton Technologies	
		Sunlight Systems	
		Tesla	
		Valmet Automotive	
		Voltlabor	

2nd IPCEI on batteries: European Battery Innovation (26 Jan. 2021)

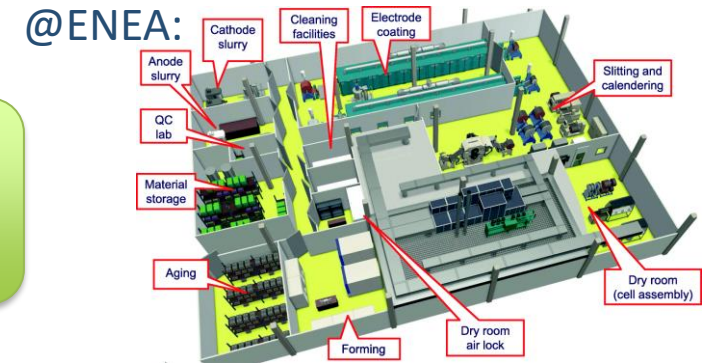
- **Funding:** 2.9 B € public support by Member States which is expected to unlock 9 B € in private investments
- **Contribution:** 12 Member States, more than 40 direct participants
- **Italian Contribution:** 14 direct participants, public support ~ 600 M €



*Position in Germany



Strong collaboration within Italian companies and research centre involved



Other Relevant Information

<https://www.gse.it/en>

<https://www.enea.it/en>

<https://www.cnr.it/en>

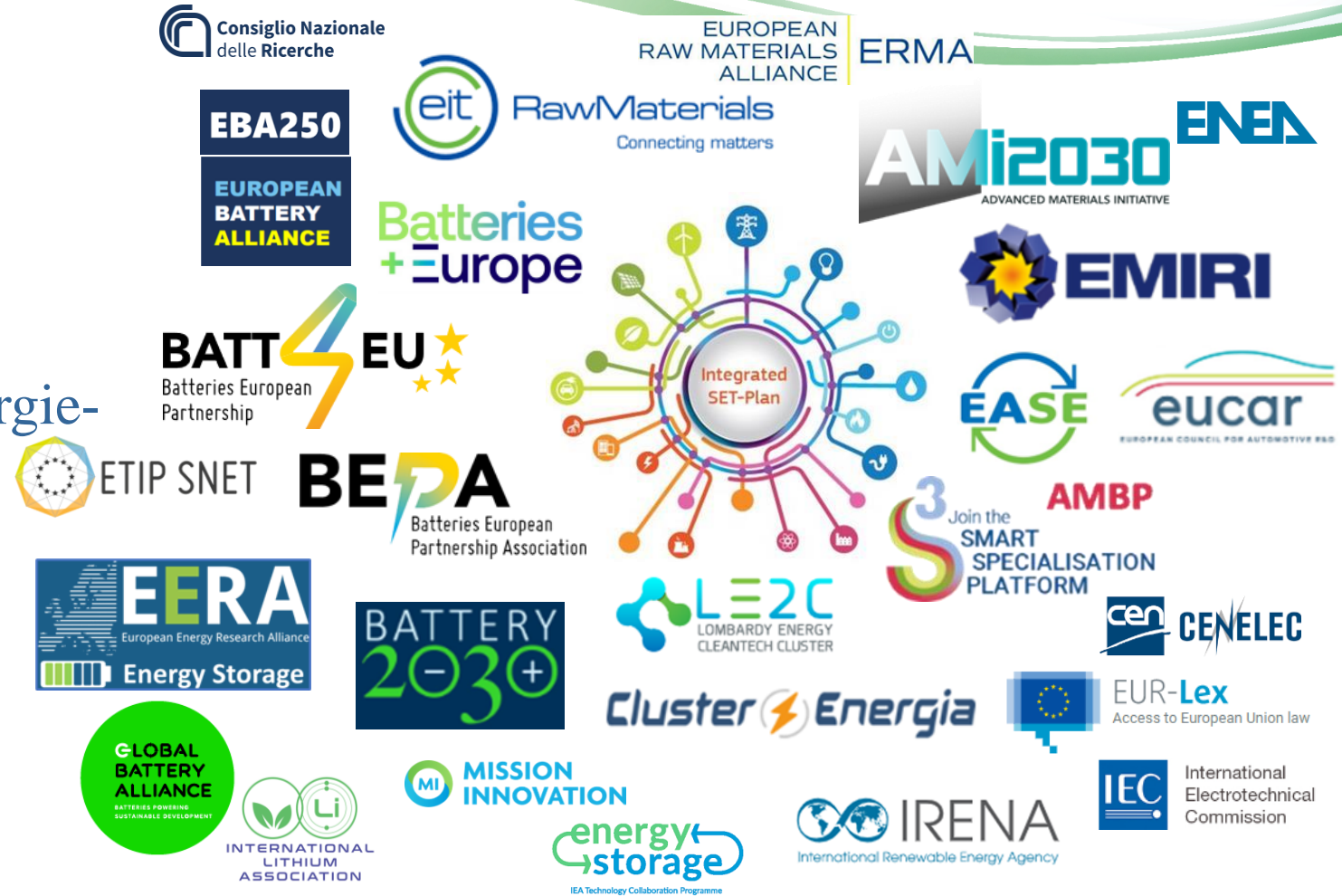
<https://www.confindustria.it/en>

<https://www.greenme.it/informarsi/energie-rinnovabili/termodinamico-solare-concentrazione-sicilia/>

<https://www.mase.gov.it/>

<http://www.rse-web.it>

<https://www.instm.it/en/instm.aspx>





IEA Technology Collaboration Programme

Thanks for your attention

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