



Le strategie della UE a supporto dello sviluppo di CCS in Europa

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*Progetto CLEANKER
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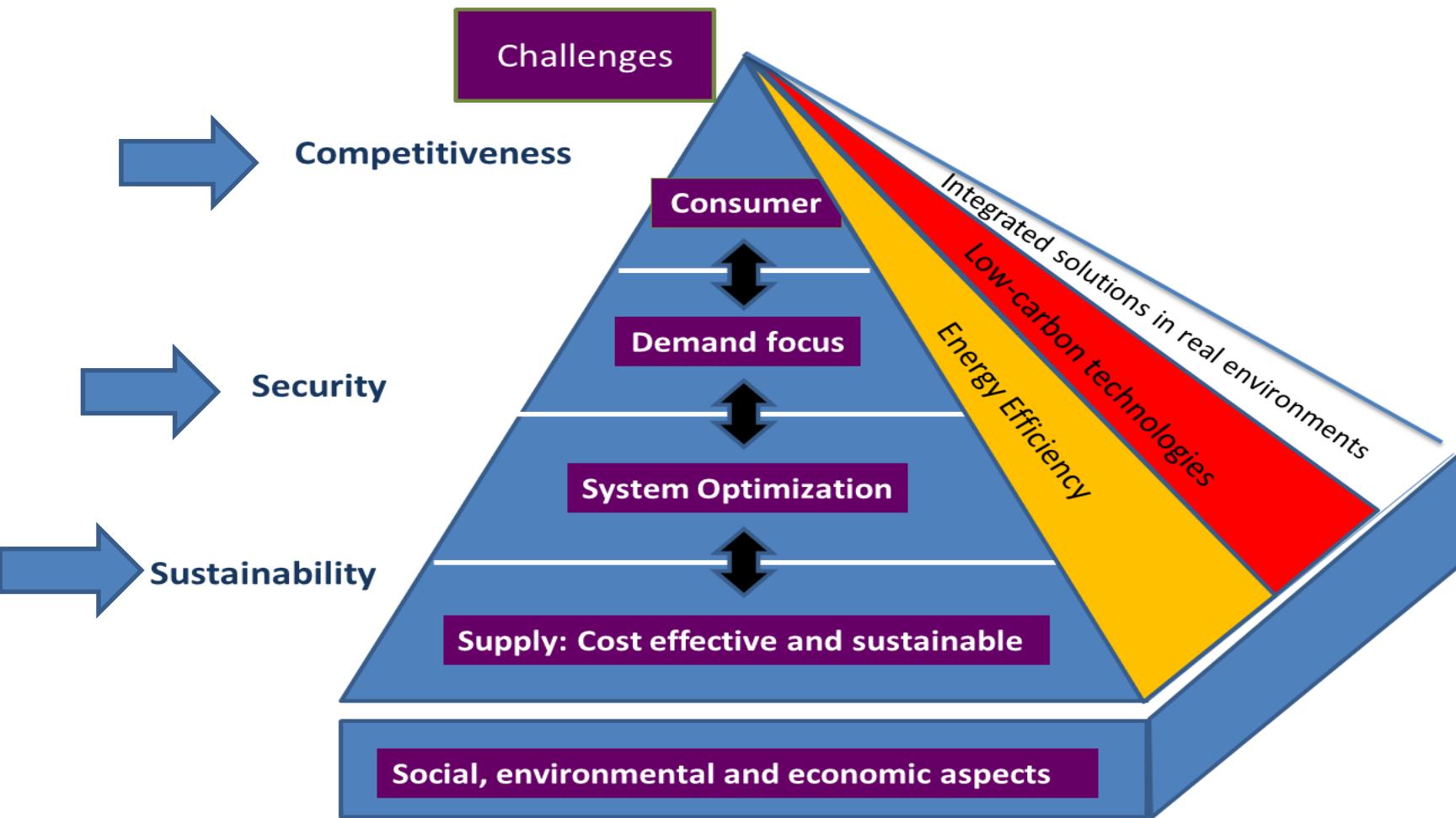
Il SET Plan europeo

- Il SET (*Strategic Energy Technology*) Plan ha riportato l'innovazione tecnologica al centro delle strategie per ridurre le emissioni e accelerare lo sviluppo delle *low-carbon technologies*

- Dal 2007 affianca le politiche clima-energia definendo le prospettive per lo sviluppo delle nuove tecnologie e la loro applicazione industriale

SET Plan Integrated Roadmap

Energy system holistic approach



Main EU Energy Policy Elements

- **2030 Climate-Energy Package**

From 20/20/20 to 27/27/40

- **Energy Union**

Energy security, solidarity and trust

A fully integrated internal energy market

Energy efficiency first

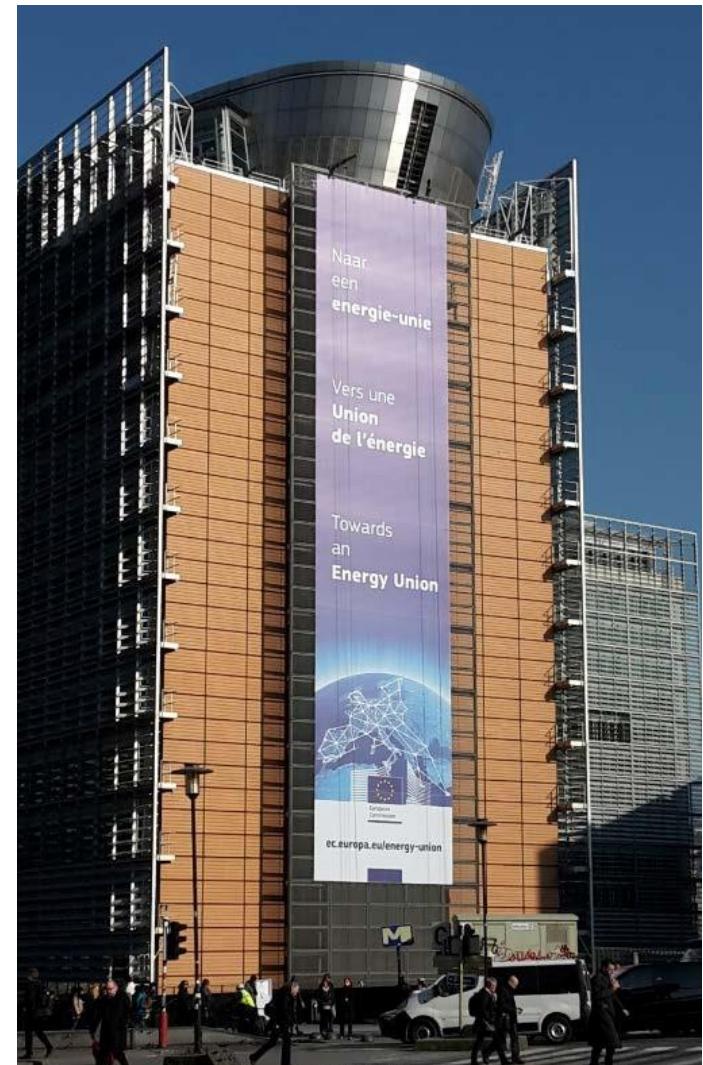
Transition to a low-carbon society

An Energy Union for Research, Innovation and Competitiveness

- **Set-Plan & Integrated Roadmap HORIZON 2020**

- **After Paris COP 21
“MISSION INNOVATION”**

*Clean Energy Package
EC COM Nov 30, 2016*



**SET Plan Integrated Roadmap
(13 themes)
In origin they were 30**

T10: Development of renewables

T8: System flexibility

T1: Engaging consumers
T2: Smart technologies for consumers

T6: Modernising the electricity grid
T7: Energy storage
T8: System flexibility
T9: Smart cities & communities

T3: Energy efficiency in buildings
T4: Energy efficiency in heating & cooling
T5: Energy efficiency in industry & services

T7: Energy storage

T13: Biofuels, fuel cells & hydrogen, alternative fuels

T11: Carbon capture storage/use

T12: Nuclear energy

**ENERGY UNION
R&I & Competitiveness
priorities**

N°1 in Renewables

**Smart EU Energy
System with
consumers at the
centre**

**Efficient Energy
Systems**

Sustainable Transport

**SET Plan
(10 key actions)**

1. Performant renewable
technologies integrated in the
system

2. Reduce costs of technologies

3. New technologies & services
for consumers

4. Resilience & security of
energy system

5. New materials &
technologies for buildings

6. Energy efficiency for industry

7. Competitive in global battery
sector (e-mobility)

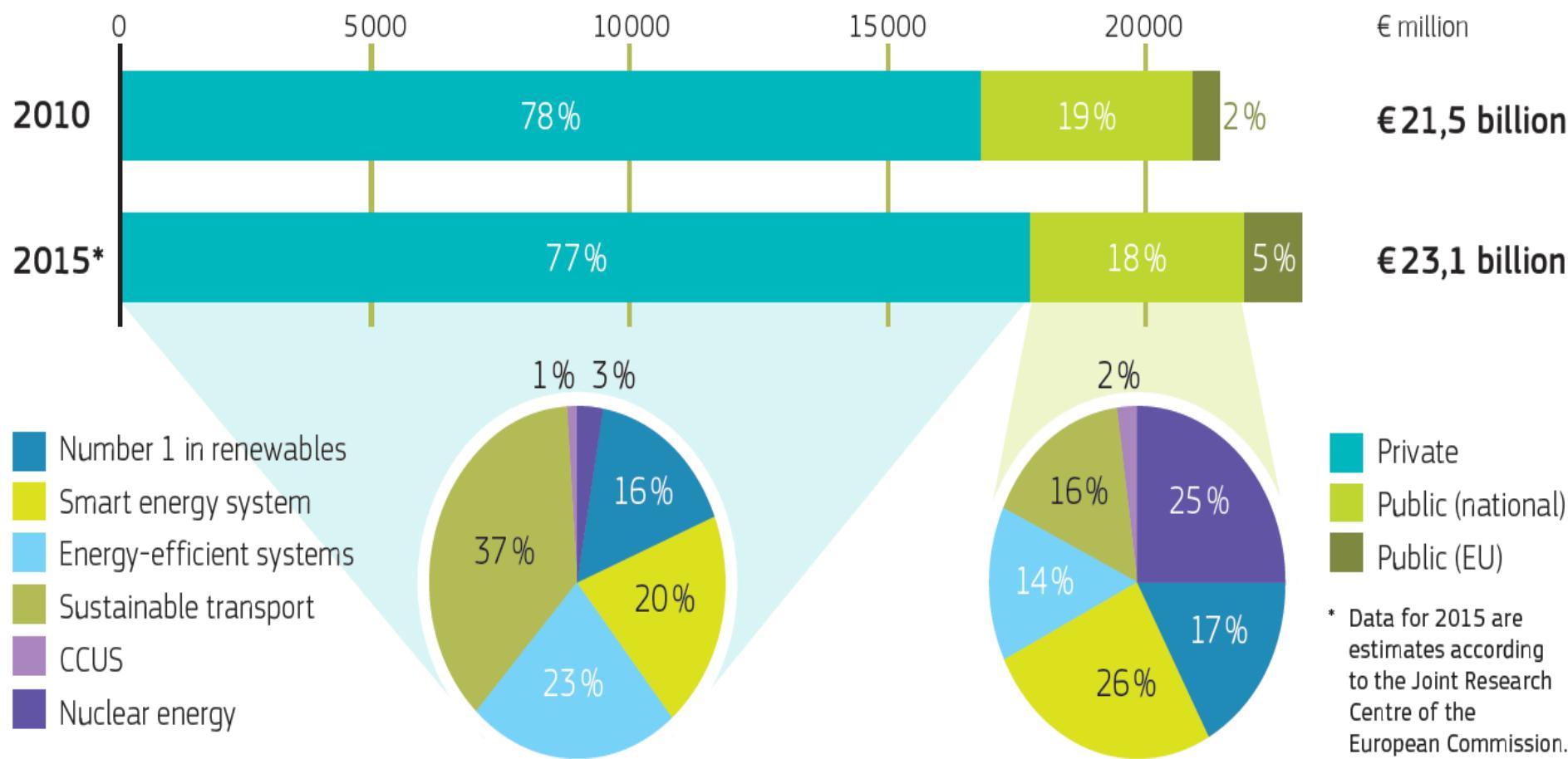
8. Renewable fuels

9. CCS/CCU

10. Nuclear Safety



Investment in the Energy Union / SET Plan R&I priorities in the EU (2010-2015)



Data sources: Public (national) investment: International Energy Agency RD&D online data service; Private investment: as estimated by SETIS/Joint Research Centre; EU investment: Directorate-General for Research & Innovation.



SET Plan : Towards Prioritisation

Towards an Integrated Roadmap (2013)

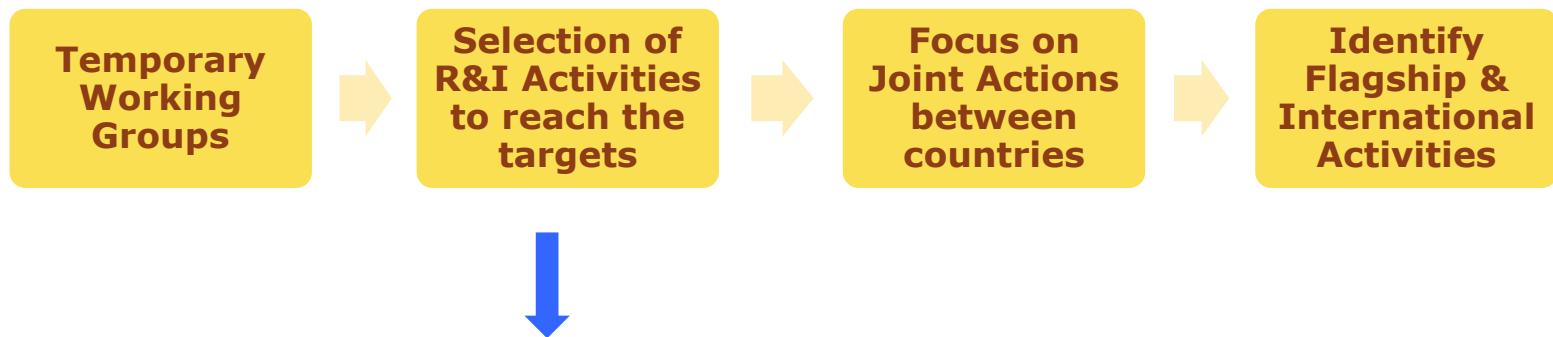
10 Key Actions (2015)

Target setting – Declarations of Intent (2016)

Implementation Plans (2017 – mid 2018)



Implementation Plans



- **Mainly at national level**
- **On occasion at EU level**



EU Support

→ **Horizon 2020 (focus on ↓ cost
↑ performance)**

**Incl. Innovative Financing for
First-of-A-Kind Energy Project**



→ **NER300**



→ **EFSI – European Fund for Strategic Investment
EUR 315 billion**

→ **ESIF – European Structural and Investment Funds**

- **EUR 46 billion Research & Innovation**
- **EUR 45 billion low cost economy**



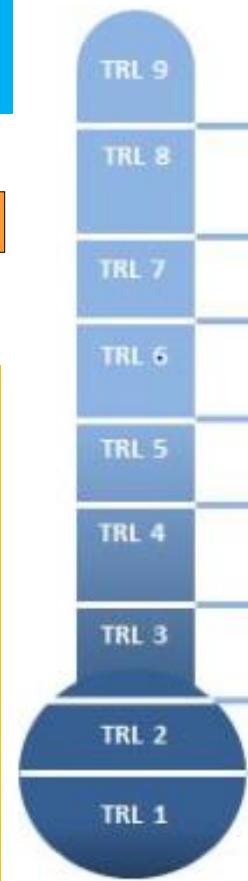
First-Of-A-Kind Demonstration Projects

↔ Overcoming the Valley of Death between demonstration and commercialisation

InnoVFin
Energy Demo Projects

Market

Typical Grant Funding



- Market failure regarding access to finance
- Large investment needs (in 2016: could reach ~ 20 billion by 2020 in renewable alone)

TRL:
Technological
Readiness Level



Governance e SET Plan

- Allineamento del SET Plan ai processi decisionali sulla policy energetica fino al 2030 in atto a vari livelli (Commissione, Consiglio UE, Parlamento UE, Governi nazionali e regionali).
- La Commissione opererà nel quadro del SET Plan anche per allineare gli investimenti degli Stati membri e stimolare le possibilità di sviluppare progetti di interesse comune europeo
- L'Unione per l'Energia dovrà garantire che gli obiettivi e le misure nazionali in materia di ricerca e innovazione vengano stabiliti nel quadro dei **Piani nazionali integrati per l'energia e il clima previsti per il 2018**
- Ruolo attivo dei Governi nello stimolare la competitività delle imprese europee nel settore clean-energy e nel fornire modelli innovativi per affrontare la transizione energetica



SET-Plan Declaration of Intent su CCS

- Per realizzare il potenziale, CCS deve diventare una tecnologia competitiva e ottenere la pubblica accettazione (in particolare per la sicurezza dello stoccaggio)
- CCS non è ancora decollato in Europa a causa della mancanza di un *business case* per la gestione di impianti dotati di CCS, ma anche per problemi di accettazione sociale per lo stoccaggio onshore di CO₂ e la mancanza di un'infrastruttura di trasporto
- I progetti dimostrativi CCS su scala commerciale sono necessari per verificare la redditività tecnica ed economica di CCS quale misura efficace per mitigare le emissioni di CO₂ nei settori energetico e industriale e per guidare la ricerca futura
- La realizzazione dell'infrastruttura necessaria per il trasporto e lo stoccaggio di CO₂ è altrettanto importante



.....e obiettivi complessivi per CCS e CCU

- La riduzione del costo di cattura richiederà la sperimentazione di tecnologie di cattura promettenti con una penalità energetica significativamente bassa
- La valutazione dettagliata della capacità di stoccaggio economica ("bancabile") in regioni selezionate sarà un fattore chiave per lo sviluppo commerciale di CCS
- Per una diffusione più ampia di CCS, è necessaria un'infrastruttura di trasporto transfrontaliera per collegare in modo efficiente gli hub e i cluster di CO₂ ai pozzi
- Il recupero di idrocarburi (EHR o EOR) combinato con lo stoccaggio permanente è attualmente l'unica opzione disponibile per la CCU su larga scala



Specific Targets for CCS and CCU

By 2020:

- At least one commercial-scale⁶, whole chain CCS project operating in the power sector;
- At least one commercial-scale CCS project linked to an industrial CO₂ source, having completed a FEED study;
- SET Plan countries having completed, if appropriate in regional cooperation with other MS, feasibility studies on applying CCS to a set of clusters of major industrial and other CO₂ sources by 2025-2030, if applicable involving cooperation across borders for transporting and storing CO₂ (at least 5 clusters in different regions of the EU);
- At least 1 active Project of Common European Interest for CO₂ transport infrastructure, for example related to storage in the North Sea;
- An up-to-date and detailed inventory of the most suitable and cost-effective geological storage capacity (based on an agreed methodology), identified and accepted by various national authorities in Europe;
- At least 3 pilots on promising new capture technologies, and at least one to test the potential of sustainable Bio-CCS at TRL 6-7;
- At least 3 new CO₂ storage pilots in preparation or operating in different settings;
- At least 3 new pilots on promising new technologies for the production of fuels, value added chemicals and/or other products from captured CO₂;
- Setup of 1 Important Project of Common European Interest (IPCEI) for demonstration of different aspects of industrial CCU, possibly in the form of Industrial Symbiosis.
- By 2020, Member States having delivered on their 2030 nationally determined contributions to the COP21 agreement, and having identified the needs to modernise their energy system including, if applicable, the need to apply CCS to fossil fuel power plants and/or energy and carbon intensive industries in order to make their energy system compatible with the 2050 long-term emission targets.



CCS and CCU Implementation Plan: R&I Activities

- R&I Activity 1: Delivery of a whole chain CCS project operating in the power sector (target 1)
- R&I Activity 2: Delivery of regional CCS and CCU clusters, including feasibility for a European hydrogen infrastructure (targets 2 & 3 and 10)
- R&I Activity 3: EU Projects of Common Interest for CO2 transport infrastructure (target 4)
- R&I Activity 4: Establish a European CO2 Storage Atlas (target 5)
- R&I Activity 5: Unlocking European Storage capacity (target 7)
- R&I Activity 6: Developing next-generation CO2 capture technologies (target 6)
- R&I Activity 7: CCU Action (targets 8 & 9)
- R&I Activity 8: Understanding and communicating the role of CCS and CCU in meeting European and national energy and climate change goals (target 10)



Stakeholders coinvolti a vario titolo

- European Technology Platform for Zero Emission Fossil Fuel Power Plants (ZEP)
- EERA JP CCS
- European Cement research Academy (ECRA)
- European Cement Association (CEMBUREAU)
- European Steel Technology Platform (ESTEP)
- European Steel Association (EUROFER)
- EUTurbines
- European Power Plant Suppliers Association (EPPSA)
- European Turbine Network (ETN)
- Union of the Electricity Industry (EURELECTRIC)
- European Technology Platform for Sustainable Chemistry (SUSCHEM)
- Sustainable Process Industry through Resource and Energy Efficiency (SPIRE) Public-Private Partnership
- European Chemical Industry Council (CEFIC)
- Energy Materials Industrial Research Initiative (EMIRI)
- Global CCS Institute (GCCSI)
- European Network for Research in Geo-Energy (ENeRG)
- CO2GeoNet Association
- European Association for Coal and Lignite (EURACOAL)
- International Association of Oil and Gas Producers (IOGP)
- Research Council of Norway
- British Research Council (EPSRC)
- British Geological Survey
- EERA JP AMPEA
- European Platform of Universities in Energy research & Education (EUA-EPUE)
- Lodz University of Technology
- CO2Chem Network
- UK Centre for Carbon Dioxide Utilization
- The SCOT Project