

# Accelerating CCS Technologies

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**Welcome to ACT's 2<sup>nd</sup>  
knowledge sharing workshop**

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Co-funded by the  
European  
Commission within  
the Horizon 2020



Bucharest 24 October 2017

# ACT Kicked off in Madrid 22-24 Febr. 2016



Brian Allison, UK  
signing the CA

# Picking the winners....



- Transnational Call launched June 2016
- 2 stage Evaluation process finished March 2017
- Binding ranking list to be followed
- Decision for funding by Policy Board April 2017
  - Contracts /negotiations – summer 2017
  - All contracts signed by October 2017
  - **Several projects have already started**



# 8 projects granted



|          |                                 | DE | NL | NO | RO | ES | TR | UK | CH |
|----------|---------------------------------|----|----|----|----|----|----|----|----|
| ALIGN    | Chain integration, clusters     | x  | X  | x  | x  |    |    | x  |    |
| ELEGANCY | Chain integration, hydrogen     | x  | x  | X  |    |    |    | x  | x  |
| Pre-ACT  | Pressure-driven monitoring      | x  | x  | X  |    |    |    | x  |    |
| ACORN    | Full chain CCS NE-Scotland      |    | x  | x  |    |    |    | X  |    |
| DETECT   | Risk of leakage along fractures | x  | X  |    |    |    |    | x  |    |
| ECO-BASE | CO2-EOR South East Europe       |    | x  | X  | x  |    | x  |    |    |
| GASTECH  | Gas switching technology        |    | x  | X  | x  | x  | x  |    | x  |
| 3D-CAPS  | 3D printed sorbents             |    | X  | x  | x  |    |    |    |    |

**Blue:** large projects > 3 M€ support; **Green:** smaller projects

**X:** lead country, x: participating country,

# Knowledge Sharing



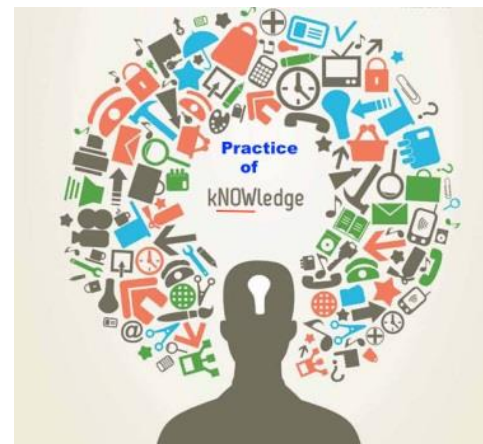
- ACT is more than just eight single projects
- The eight projects can learn from each other
- The eight projects should together with the ACT consortium help to accelerate CCS deployment in Europe
- Everybody should focus on communication of results to CCS stakeholders, industry, and decision makers
- **Knowledge Sharing Workshop**
  - 1<sup>st</sup> in Lausanne, 14 November 2016
  - 2<sup>nd</sup> in Bucharest, 24 October 2017
  - Further knowledge sharing workshops 2018, 2019
  - Final workshop /conference 2020/2021





# ACT – additional activities

1. Alignment with European CCS RD&D activities outside ACT
2. Collaboration with European CCS initiatives, through common workshops
3. Strengthen R&D collaboration with key stakeholders outside Europe
4. Closer cooperation with the energy sector and industry
5. **Additional calls; mid 2018 and 2020**

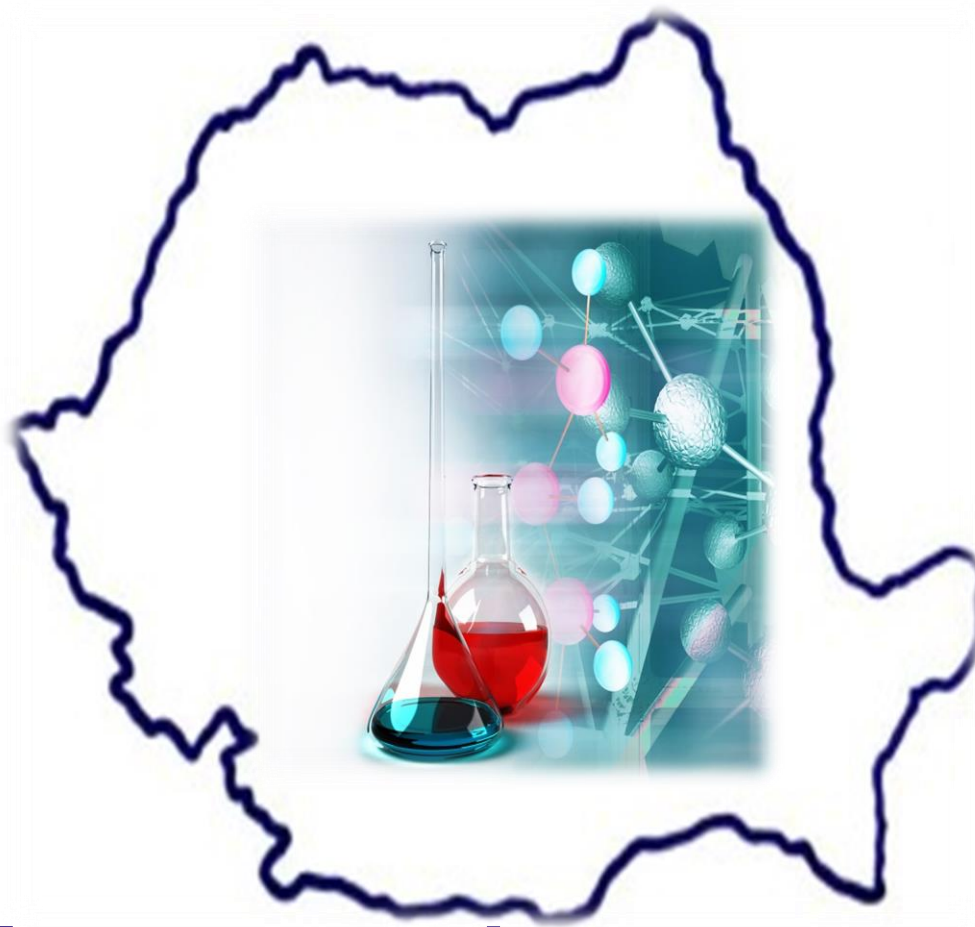


# ACT's main message to you ..

- Go for an excellent
- Act immediately if
  - Contact your country
  - Contact the ACT lead
- Get the best out of it
  - Look for synergies
- Contribute to the |



**The ACT Consortium wishes you success!**



# Romanian Research Landscape

*UEFISCDI*  
Executive Agency for Higher  
Education, Research, Development  
and Innovation Funding



# Romania at a glance

**Location:** in Southeastern Europe, it borders the Black Sea, Bulgaria, Ukraine, Hungary, Serbia and Moldova

**Area:** 238.391 square kilometers

**Inhabitants:** over 19 million inhabitants, the country is **the seventh most populous** member state of **the European Union**

**Currency:** leu

**Official language:** Romanian

**NATO member state:** since 29<sup>th</sup> of March 2004

**EU member state:** since 1<sup>st</sup> of January 2007



# Key facts

## Ministry of National Education

EDUCATION

- 55 public universities
- 47 private universities
- 410.697 students  
(5,08 % students from abroad)
- 107.269 master students  
(2,25 % students from abroad)
- 17.252 PhD candidates  
(4,36 % students from abroad)

## Ministry of Research and Innovation

INNOVATION

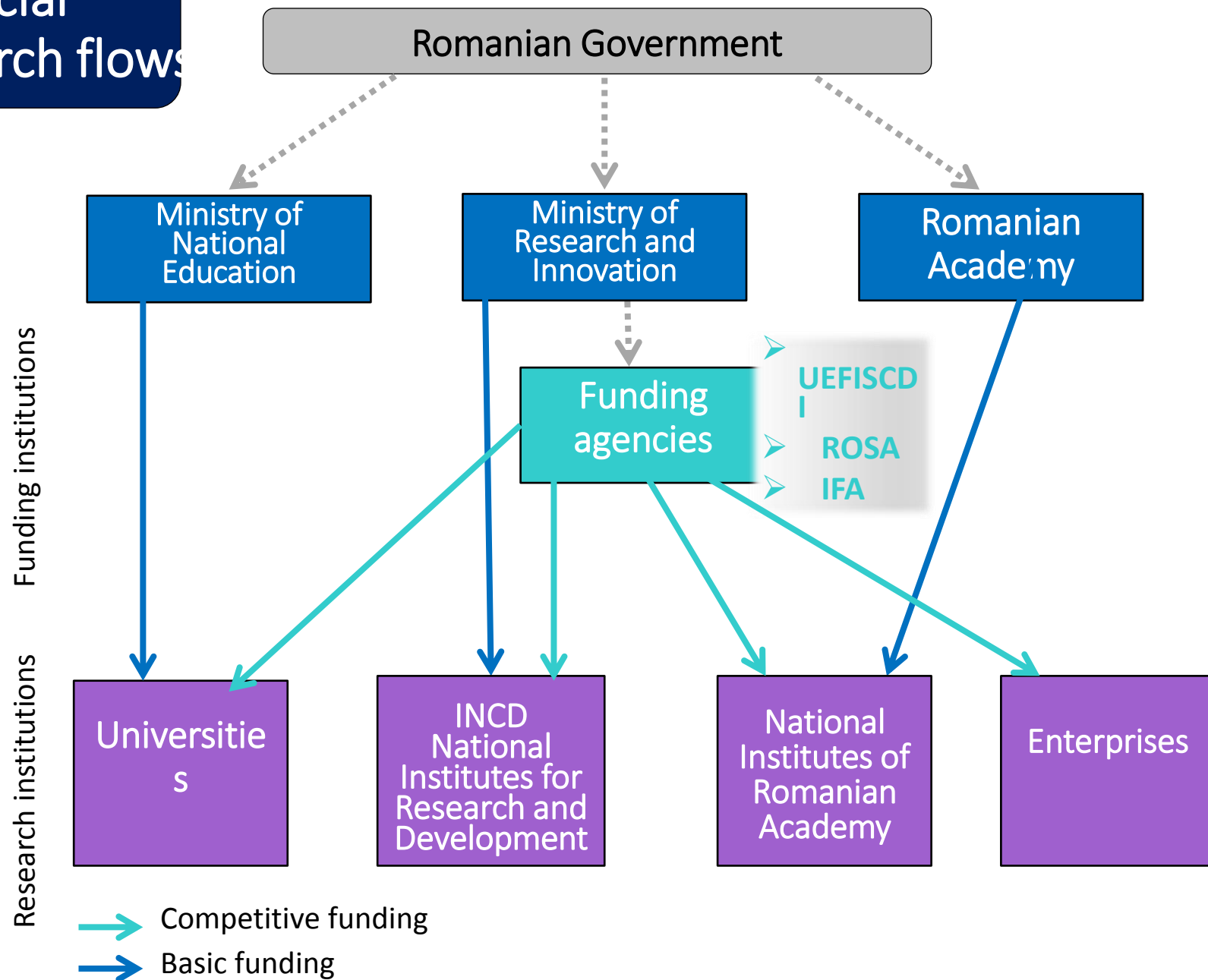
48 National Research and Development Institutes

## Romanian Academy

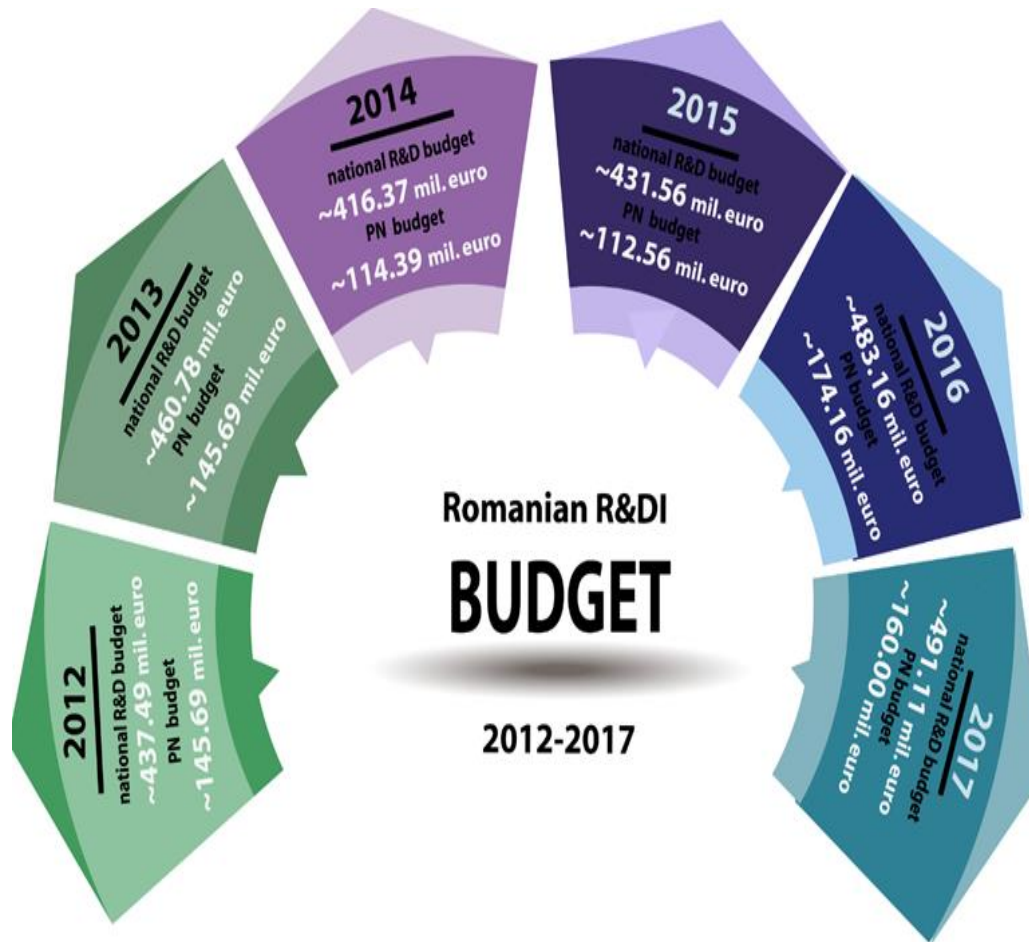
60 Research Institutes

*21.542 researchers (FTE)*

# Financial research flows



# Funding R&D in Romania



Structural funds – aprox 952 mil euro (until 2020)

# RDI National Strategy 2014-2020

## RDI National Plan

1

Increase competitiveness of Romanian economy through innovation

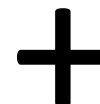
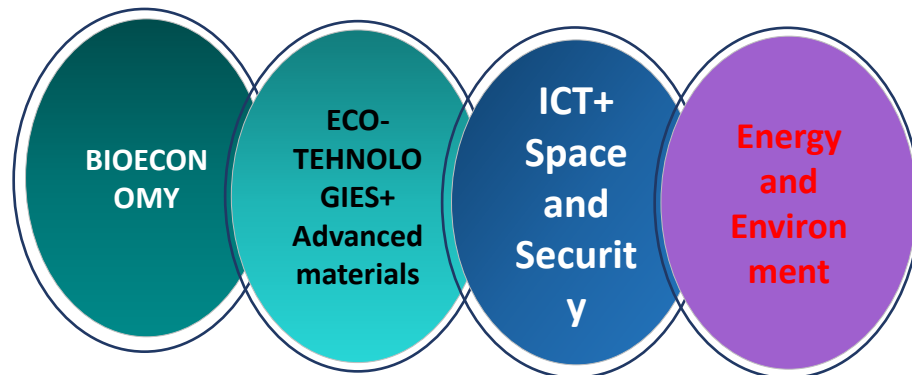
2

Increase Romanian contribution to the progress of frontier knowledge

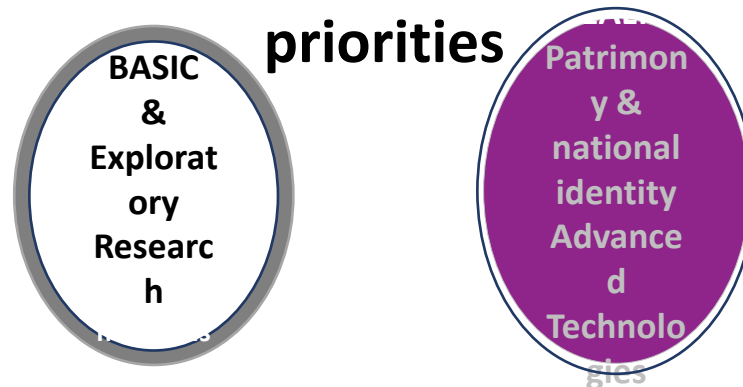
3

Increase the role of science in society

## Smart specializations

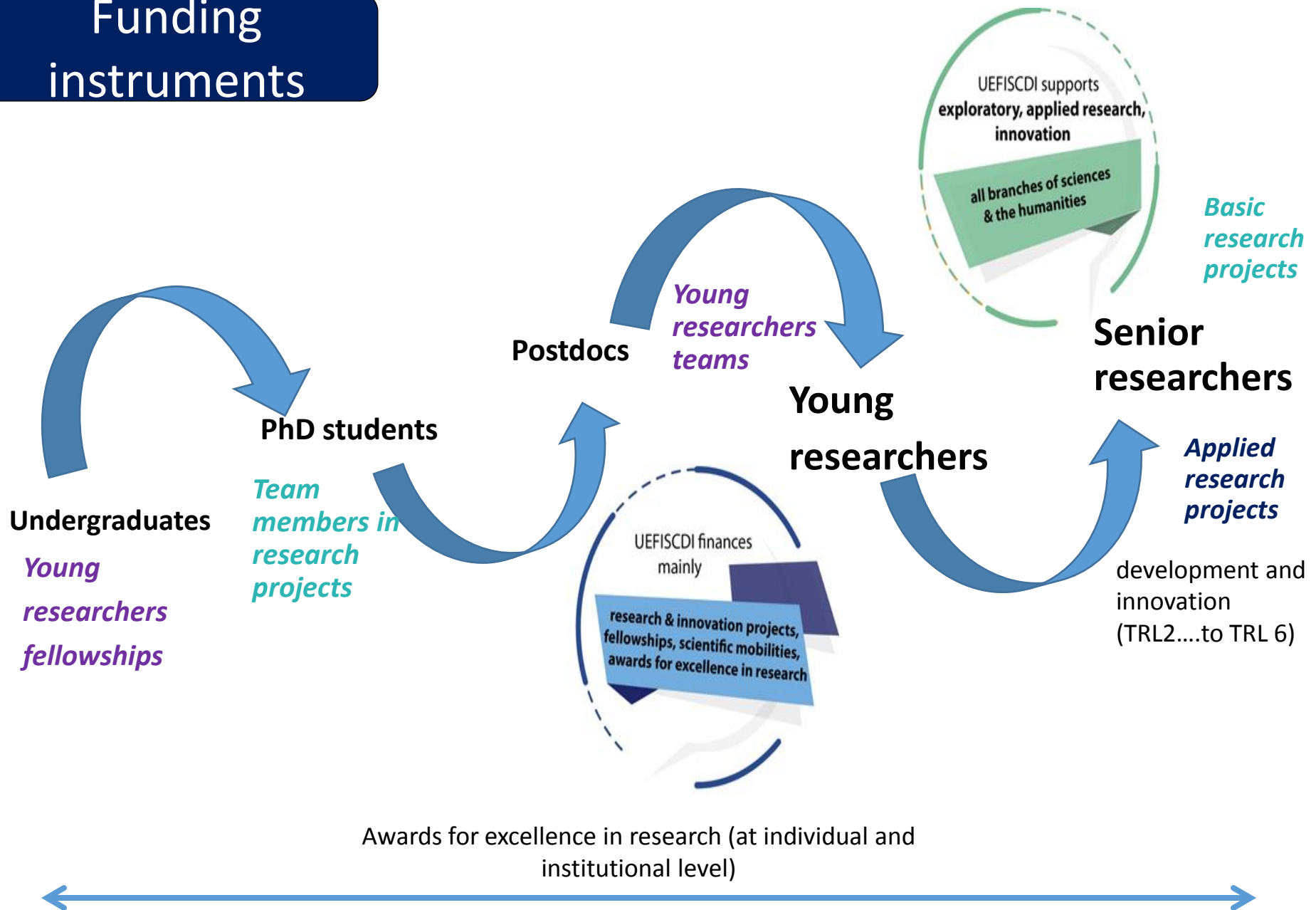


## Public sector priorities





# Funding instruments



# 2016 National RDI Plan calls

**21 calls** for Human  
Resources,  
applied & basic research,  
award for excellence in research  
**6.612** project proposals  
submitted

**786** funded projects

Allocated budget (2016-2019)  
215 mil. euro

**Human  
Resources**

11 calls -2 ongoing  
2.642 submitted projects  
115 funded projects  
~ 2.000 proposals under  
evaluation process

**Basic  
research**

3 calls  
1.119 submitted projects  
ongoing evaluation process

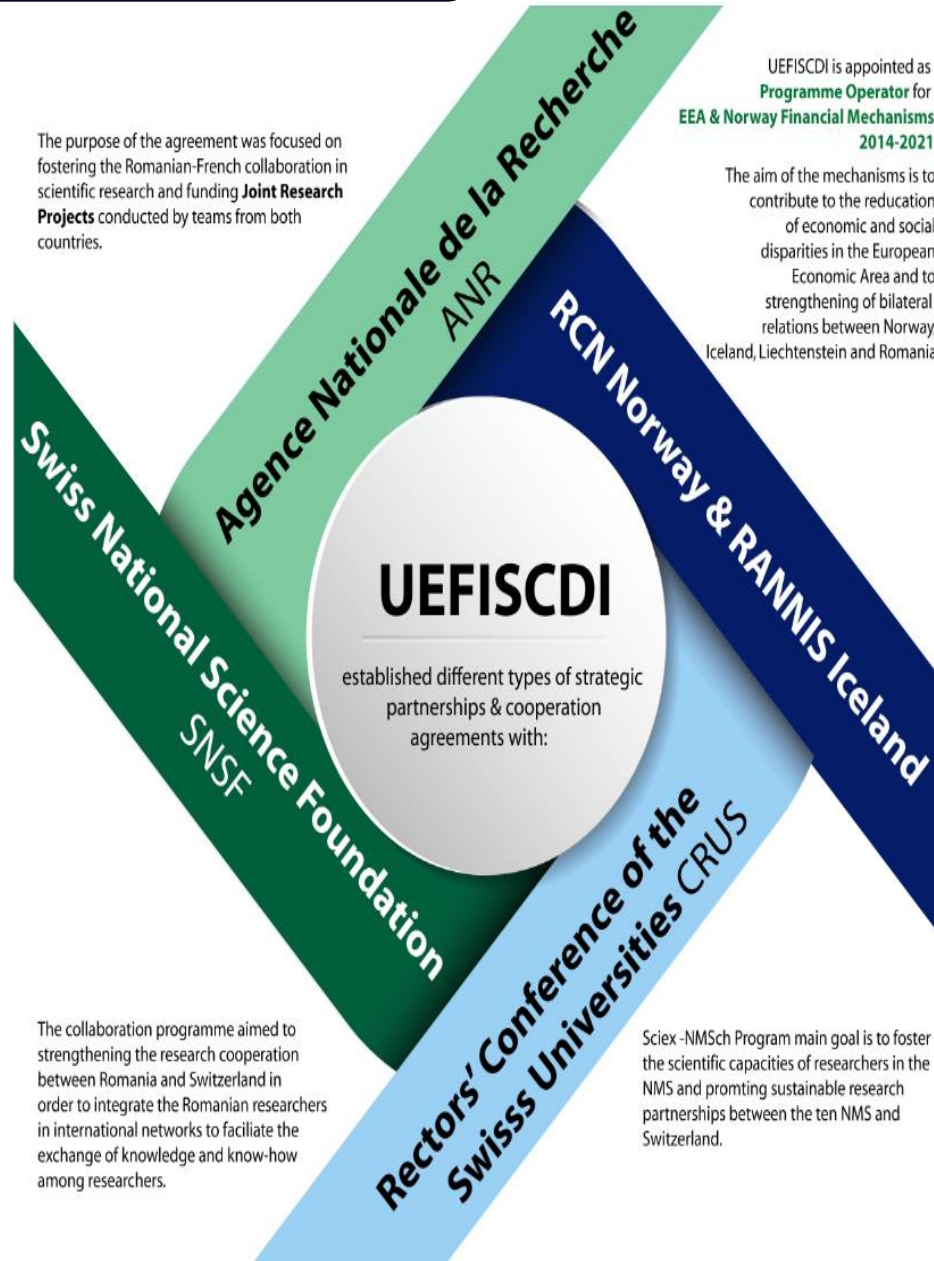
**Applied  
Research,  
Development  
& Innovation**

5 calls  
2.819 submitted  
projects  
372 funded  
projects

**2.443  
Awards for  
Excellence in  
research**

2.422 individual  
level  
21 institutional level

# Interconnectivity the key to come true



# UEFISCDI trademarks



**Study in Romania** platform was designed to promote Romanian higher education system at global/international level, as this contributed to attracting national and international students to choose study programmes offered by the Romanian HEIs.

[www.studyinromania.ro](http://www.studyinromania.ro)

**ERRIS** is the Romanian Research Infrastructures Registry and the **first Romanian online platform that reunites public and private research infrastructures**, being a single access point in identifying the appropriate research services.

[www.erris.gov.ro](http://www.erris.gov.ro)



**Brainmap** serves researcher needs, interests and gathers most actors involved in research and innovation area. The platform was developed to meet the particular needs of each user and the information is filtered according to specific interests and skills in order to facilitate access to relevant updates for each one. It is also the pool for evaluators involved in the national evaluation processes for the R&DI projects.

[www.brainmap.ro](http://www.brainmap.ro)

**REI** ensures interoperability between existing management systems in the education sector – primary school, higher education and lifelong learning – and other management systems through a cloud solution, in order to obtain an educational and professional complex profile of a person.

[www.rei.gov.ro](http://www.rei.gov.ro)



1.589 Infrastructure  
8.218 Research  
Services  
134 Technological  
Services  
21.982 Equipment

15.785 accounts  
5.765 researchers from  
abroad  
10.020 RO researchers

# UEFISCDI – FP7/HORIZON 2020



33  
ERA-NET

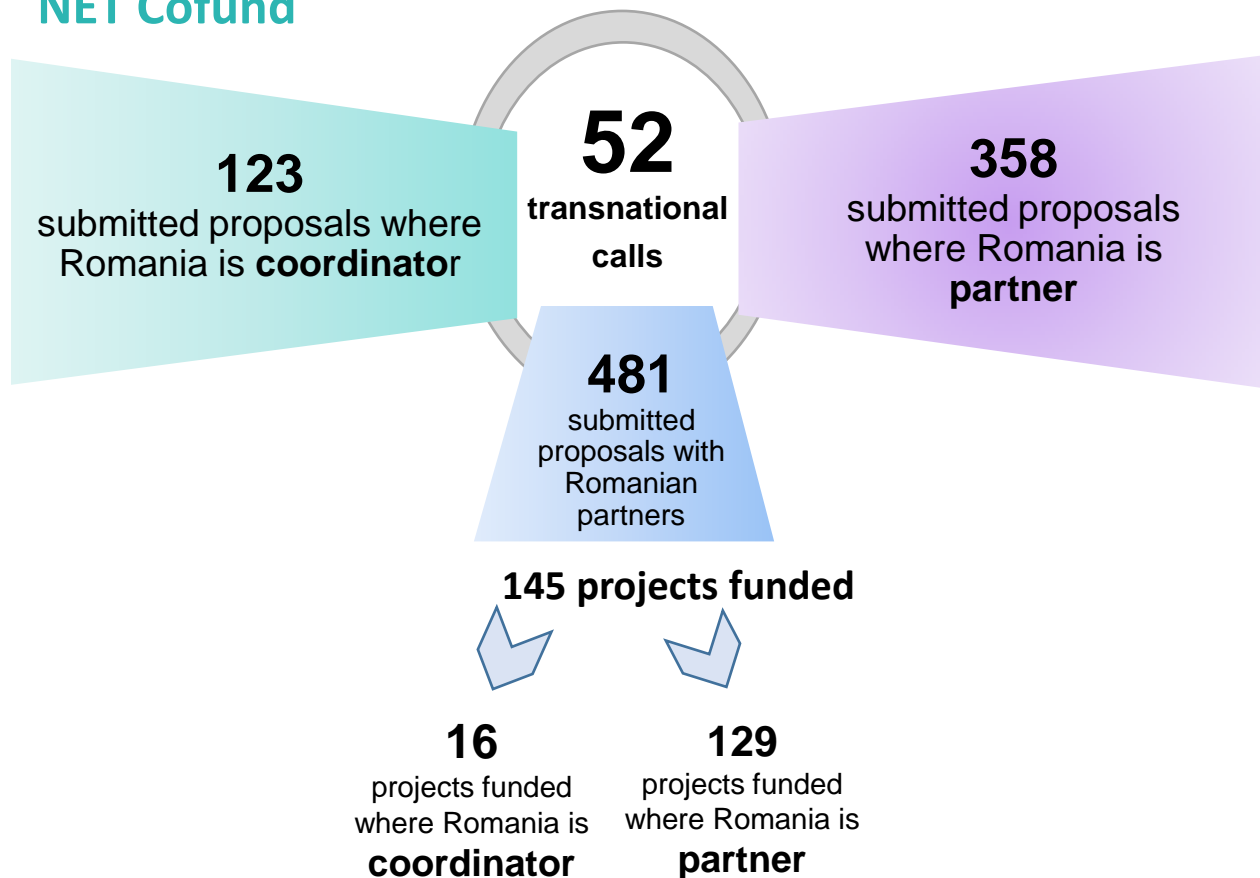


|      |   |                       |  |
|------|---|-----------------------|--|
| 2016 |   |                       |  |
| 2015 | ➡ | 1 <sup>st</sup> place | in the list of Romanian entities accessing<br>FP 7 projects (European Research<br>Ranking) |
| 2014 |   |                       |  |
| 2013 | ➡ | 2 <sup>nd</sup> place |  |
| 2012 | ➡ | 1 <sup>st</sup> place |  |



# Distribution of ERA-NET projects

**2014**  ERA-NET/ERA-NET Cofund projects:  
**2016**  Romania participated in **52 calls ERA-NET/ERA-NET Cofund**



**2017**  were launched **19 ERA-NET** calls and 1 call to be launched soon

now are in different evaluation process stage

# ACT – UEFISCDI participation

1.000.000 euro



6 pre-proposals with Romania

4 projects funded



<http://www.act-ccs.eu/matchmaking/>

| Romania                             |         |           |         |       |
|-------------------------------------|---------|-----------|---------|-------|
| Institution                         | Capture | Transport | Storage | Other |
| <a href="#">CO2 Club Romania</a>    | X       |           | X       |       |
| <a href="#">GeoEcoMar</a>           |         |           | X       |       |
| <a href="#">ICAA</a>                | X       |           |         | X     |
| <a href="#">ICIA</a>                |         |           | X       | X     |
| <a href="#">ICMPP</a>               |         |           |         | X     |
| <a href="#">INCDTIM Cluj Napoca</a> |         |           | X       | X     |
| <a href="#">INCDIE ICPE-CA</a>      |         | X         |         |       |
| <a href="#">ISPE</a>                | X       | X         | X       |       |
| <a href="#">SC IPA SA</a>           |         |           | X       |       |
| <a href="#">UBB</a>                 | X       |           | X       | X     |
| <a href="#">UDJG</a>                | X       |           |         |       |
| <a href="#">UPB</a>                 | X       |           |         |       |
| <a href="#">UPT</a>                 | X       |           |         |       |
| <a href="#">USAMV B</a>             |         |           |         | X     |
| <a href="#">USAMV Cluj</a>          |         |           |         | X     |
| <a href="#">USV</a>                 |         |           |         | X     |

# Your comments to ACT

2nd Knowledge Sharing Workshop (Bucharest, 24<sup>th</sup> of October 2017)

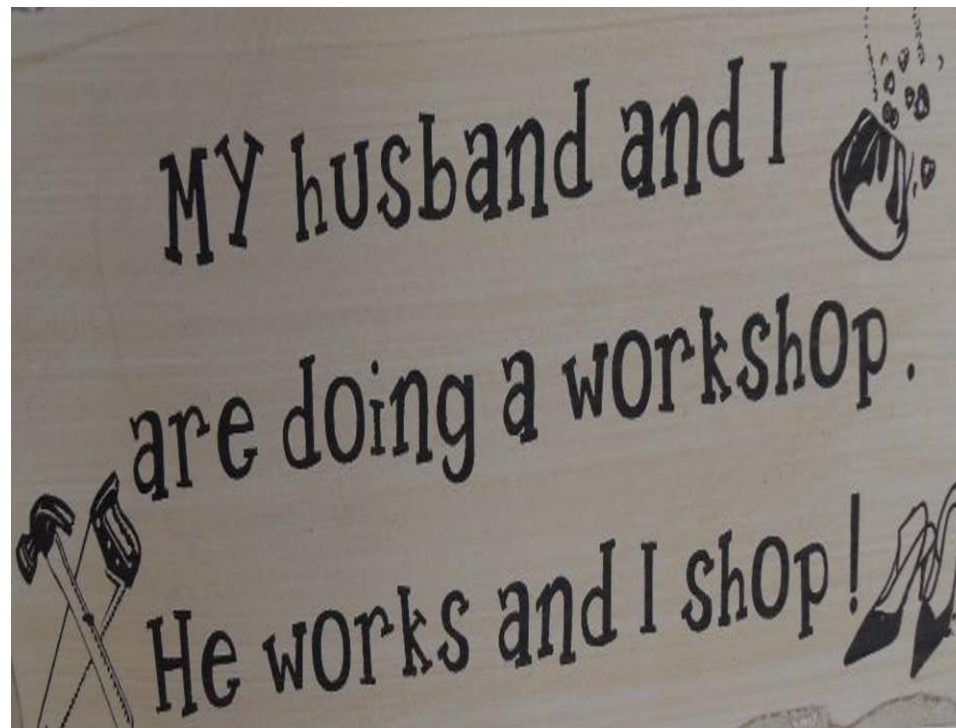
Your comments to ACT:



Thank you!



## ACT – a big family





Think outside the box  
....  
Be a visionary and ACT!





# Projects selected for funding

ACT has selected eight projects for funding. Brief summaries of the projects are listed in the following slides :

- 271501 ALIGN
- 271498 ELEGANCY
- 271496 Pre-ACT
  
- 271503 3D-CAPS
- 271500 Acorn
- 271497 DETECT
- 271495 ECO-BASE
- 271511 GaSTech

# ALIGN

- Coordinator: TNO (NL)
- Funding from ACT: € 14 507 585

The ALIGN project is a joint industry-led research initiative to accelerate the demonstration and implementation of the next-phase of European CCUS projects by addressing specific R&D gaps across the CCUS chain. The mission of ALIGN is to overcome hurdles for initial projects and to prepare for large scale, cost effective, implementation of CCUS.

| <i><b>Organization</b></i>     | <i><b>Country</b></i> |
|--------------------------------|-----------------------|
| TNO (Coordinator)              | NL                    |
| ECN                            | NL                    |
| Leiden University              | NL                    |
| Rijksuniv. Groningen           | NL                    |
| Maasvlakte CCS Project         | NL                    |
| TAQA                           | NL                    |
| MHPSE                          | GE                    |
| RWE                            | GE                    |
| FZ Juelich                     | GE                    |
| RWTH                           | GE                    |
| Asahi Kasei Europe             | GE                    |
| FEV                            | GE                    |
| SINTEF Materials and Chemistry | NO                    |
| SINTEF Petroleum Research      | NO                    |
| TCM                            | NO                    |
| NTNU                           | NO                    |
| Tel-Tek                        | NO                    |
| IFE                            | NO                    |
| Bellona                        | NO                    |
| Norcem                         | NO                    |
| Yara                           | NO                    |
| NUSPA                          | RO                    |
| GeoEcoMar                      | RO                    |
| CO2 Club Association           | RO                    |
| PicOil                         | RO                    |
| BGS                            | UK                    |
| University of Sheffield        | UK                    |
| University of Edinburgh        | UK                    |
| Heriot-Watt University         | UK                    |
| Imperial College London        | UK                    |
| Tees Valley CA                 | UK                    |
| Scottish Enterprise            | UK                    |

# ELEGANCY

- Coordinator: SINTEF Energy Research (Norway)
- Funding from ACT: € 8 926 126

The project addresses fast-track of the decarbonization of Europe's energy system by exploiting the synergies between two key low-carbon technologies: CCS and H2. ELEGANCY will demonstrate effective CCS technologies with high industrial relevance and identify and promote business opportunities for industrial CCS enabled by H2 as a key energy carrier by performing national case studies

| <i>Organization</i>                         | <i>Country</i> |
|---|----------------|
| SINTEF Energy Research (Coordinator)        | No             |
| The European Gas Research Group (GERG)      | BE             |
| Ruhr-Universität Bochum                     | GE             |
| Uniper Energy Storage                       | GE             |
| Open Grid Europe                            | GE             |
| (Arntzen de Besche)                         | NO             |
| Aker Solutions                              | NO             |
| Gassco                                      | NO             |
| Swerea MEFOS AB                             | SE             |
| Climeworks AG                               | CH             |
| ETH Zürich                                  | CH             |
| Swiss Competence Center for Energy Research | CH             |
| Paul Scherrer Institut                      | CH             |
| FirstClimate                                | CH             |
| Energie360°                                 | CH             |
| TNO   | NL             |
| University of Utrecht                       | NL             |
| ECN   | NL             |
| Shell Global Solutions International BV     | NL             |
| Imperial College London                     | UK             |
| British Geological Survey                   | UK             |
| Scottish Enterprise                         | UK             |
| INEOS Chemicals Grangemouth Limited         | UK             |

# Pre-ACT

- Coordinator: SINTEF Petroleum Research AS (Norway)
- Funding from ACT: € 4 483 728

Pre-ACT addresses CO2 storage and the objective is to equip operators and regulators with pressure-driven decision support protocols.

This will enable them to establish a safe and efficient monitoring system and to assess quantitatively site conformance. These protocols Can be adjusted to each project phase and provide a common basis for decision making during operation.

| <i><b>Organization</b></i>                | <i><b>Country</b></i> |
|---|-----------------------|
| SINTEF Petroleum Research (Coordinator)   | NO                    |
| GeoForschungsZentrum Potsdam              | GE                    |
| TNO                                       | NL                    |
| NORSAR                                    | NO                    |
| NERC-BGS                                  | UK                    |
| Plymouth Marine Laboratory Prospect Place | UK                    |
| Total                                     | FR                    |
| Shell                                     | NL                    |
| TAQA                                      | NL                    |
| Statoil                                   | NO                    |





# 3D-CAPS

- Coordinator: ECN (The Netherlands)
- Funding from ACT: € 1 506 636

3D-CAPS address a novel sorbent based CO<sub>2</sub> capture technology. The object is a productivity increase of an order of magnitude for two sorbent-based technologies in CCS, i.e. process intensification. The project will optimize sorbent shapes with CFD and other modelling tools, with direct realization in 3D-printed objects for testing under relevant conditions.

| Partner                                       | Country |
|---|---------|
| ECN (Coordinator                              | NL      |
| 3D-cat  | NL      |
| SINTEF  | NO      |
| Aker Solutions                                | NO      |
| Universitatea Babes-Bolyai                    | RO      |
| BP International Ltd. Sunbury Research Centre | UK      |

# ACORN

- Coordinator: Pale Blue Dot Energy Ltd (UK)
- Funding from ACT: € 1 950 395

Acorn aims to design a full chain CCS system in NE Scotland at minimum capital cost of capture, transport and storage that could be operational by the early 2020s. This will seed a hub for incremental development of a large-scale CCS network and regional decarbonisation programme.

| <b><i>Organization</i></b>             | <b><i>Country</i></b> |
|--|-----------------------|
| Pale Blue Dot Energy Ltd (Coordinator) | UK                    |
| The University of Edinburgh            | UK                    |
| The University of Liverpool            | UK                    |
| University of Aberdeen                 | UK                    |
| Heriot-Watt University, Edinburgh      | UK                    |
| Radboud University Nijmegen            | NL                    |
| Bellona                                | NO                    |

# DETECT

- Coordinator: Shell Global Solutions International B.V. (NL)
- Funding from ACT: € 1 956 683

This project will generate guidelines and technology for determining the risk of CO<sub>2</sub> leakage along fractures across the primary caprock using an integrated monitoring and hydro-mechanical-chemical modelling approach. We will build on experience gained from the risk-based Measurement, Monitoring and Verification (MMV) programme for the current Quest and the former Peterhead CCS projects.

| <i><b>Organization</b></i>                              | <i><b>Country</b></i> |
|---|-----------------------|
| Shell Global Solutions International B.V. (Coordinator) | NL                    |
| Risktec Solutions B.V.                                  | NL                    |
| RWTH Aachen University                                  | GE                    |
| Heriot-Watt University, Edinburgh                       | UK                    |

# ECOBASE

- Coordinator: International Research Institute of Stavanger, IRIS (Norway)
- Funding from ACT: € 1 225 844

ECO-BASE addresses the utilization of CO<sub>2</sub> by including prospective revenue streams and related business models as a vehicle to render CO<sub>2</sub> capture-transport-storage economically feasible.

The main goal of the project is to demonstrate the ability of CO<sub>2</sub>-EOR to economically enhance oil production and serve as a revenue stream for safe and reliable permanent CO<sub>2</sub> storage.

| <i>Organization</i>                     | <i>Country</i> |
|---|----------------|
| IRIS (Coordinator)                      | NO             |
| National Technical University of Athens | GR             |
| GeoEcoMar                               | RO             |
| CO <sub>2</sub> Club Association        | RO             |
| PicOil                                  | RO             |
| TNO                                     | NL             |
| Middle East Technical University        | TR             |

# GaSTech

- Coordinator: SINTEF (Norway)
- Funding from ACT: € 1 653 272

The project addresses novel CO<sub>2</sub> capture technologies. GaSTech aims at demonstrating autothermal pressurized operation of gas switching reforming (GSR), gas switching water splitting (GSWS) and gas switching oxygen production (GSOP) in an existing lab-scale reactor. Pressurized autothermal gas switching combustion (GSC) reactors will be demonstrated (10 kW)

| <i><b>Organization</b></i>           | <i><b>Country</b></i> |
|--------------------------------------|-----------------------|
| SINTEF (Coordinator)                 | NO                    |
| NTNU                                 | NO                    |
| Euro Support Advanced Materials B.V. | NL                    |
| Universitatea Babes-Bolyai           | RO                    |
| ETH Zürich                           | CH                    |
| Universidad Politécnica de Madrid    | ES                    |
| Hayat Kimya                          | TR                    |