Decarbonisation of the use of fossil fuels

Horizon 2020 Energy Virtual Info Day

#H2020Energy

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Research and Innovation

The challenges

- Fossil fuels will be used in Europe's power generation as well as in industrial processes for decades to come.
- Meeting our 2050 climate target requires an evolution towards a **decarbonised** yet **robust** and **secure** energy system.
- A forward-looking approach to **carbon capture and storage (CCS)** and **carbon capture and use (CCU)** for the power and industrial sectors will be critical to reaching the 2050 climate objectives in a cost-effective way.
- The integration of (fluctuating) renewable electricity generation in our energy system requires new solutions for fossil fuel power plants to provide **highly flexible yet efficient back-up power** to stabilise the grid.
- **Shale gas** can contribute to our energy security, provided that all issues around the **environmental impact** are adequately addressed.

Overview of topics for 2017
Deadline 05/01/2017

LCE-27-2017 Measuring, monitoring and controlling the potential risks of subsurface operations related to CCS and unconventional hydrocarbons	**€ 15**
LCE-28-2017 Highly flexible and efficient fossil fuel power plants	**€ 15**
LCE-29-2017 CCS in industry, including Bio-CCS ***LCE-30-2017*** Geological storage pilots	**€ 20**

LCE 27 (2017): Measuring, monitoring and controlling the potential risks of subsurface operations related to CCS and unconventional hydrocarbons

RATIONALE

- **CCS and shale gas development (and even geothermal) share some of the same challenges and risks**
- **Groundwater contamination is an important public concern**
- **Induced seismicity is a show-stopper in densely populated regions**
- **Research is needed to better understand natural and engineered leakage pathways**
- **Highly sophisticated measuring and monitoring are required to manage the subsurface processes, and to mitigate and remediate any negative environmental impacts**

LCE 27 (2017): Measuring, monitoring and controlling the potential risks of subsurface operations related to CCS and unconventional hydrocarbons

SCOPE:

An integrated and multidisciplinary R&I project with focus on:

- Groundwater, soil, air and biodiversity
- Detection and monitoring of induced seismicity
- Detection and monitoring of stray gases
- Mitigation and remediation of negative impacts
- Combination of laboratory measurements, modelling and field investigations
- Could include observation wells

LCE 27 (2017): Measuring, monitoring and controlling the potential risks of subsurface operations related to CCS and unconventional hydrocarbons

TO BE ADDRESSED:

- **Characterisation and analysis of leakage pathways**
- **Chemical and microbial interaction (w. host rock, seals, groundwater, soil)**
- **Improve detection limits for CO2, natural gas and chemicals**
- **Optimal spatial and temporal resolution of monitoring techniques**
- **Sophisticated baselining techniques**
- **Groundwater remediation methods and protocols**
- **Multi-actor and public engagement**

LCE 27 (2017): Measuring, monitoring and controlling the potential risks of subsurface operations related to CCS and unconventional hydrocarbons

TO BE ESTABLISHED:

- **One or more field sites for deployment of a suite of monitoring techniques**
- **Programme for international cooperation with focus on the US and Canada**
- **Best practices for baselining, monitoring, mitigation and remediation**
- **Continuous training programme for researchers and students**

LCE 27 (2017): Measuring, monitoring and controlling the potential risks of subsurface operations related to CCS and unconventional hydrocarbons

IMPORTANT TO NOTE:

- **The drilling of exploration and production wells, hydraulic fracturing or other well stimulation and intentional subsurface release of fluids or gases to the groundwater or the atmosphere are strictly outside the scope of this topic**
- **This applies to projects funded under this Call only; it does not apply to cooperation with other ongoing field experiments**
- **Projects should comply with all relevant environmental legislation, in particular the Water Framework Directive, the enforcement of which is the responsibility of permitting authorities in the concerned Member States**

LCE 27 (2017): Measuring, monitoring and controlling the potential risks of subsurface operations related to CCS and unconventional hydrocarbons

ADDITIONAL INFORMATION:

- **Industry participation is important for access to existing sites and data**
- **Project duration ideally limited to 3 years**
- **The Canadian Containment and Monitoring Institute (CaMI) is open to new international cooperation at their Field Research Station (http://www.cmc-nce.ca/business-units/cami/)**
- **Ongoing Horizon 2020 projects: FracRisk, SHEER, M4ShaleGas, ShaleXEnvironment**

  ☞ http://www.fracrisk.eu/ , http://www.sheerproject.eu/ , www.m4shalegas.eu/ , https://shalexenvironment.org/

LCE 28 (2017): Highly flexible and efficient fossil fuel power plants

RATIONALE

- The role of fossil fuelled power plants is changing, from providing base load power to fluctuating back-up power
- This will require fast changes in load, possible even running in start-stop mode
- More thermal cycles lead to increased wear-and-tear
- Low load leads to reduction in efficiency and hence relatively high GHG emissions
- This forced operational flexibility is a major challenge

LCE 28 (2017): Highly flexible and efficient fossil fuel power plants

SCOPE

- **Projects should lead to innovative and cost-effective solutions**
- **Allowing fast load changes at minimal fuel consumption and emissions**
- **Limiting wear and tear to avoid excessive service life expenditure**
- **And not impeding the potential CO2 capture readiness of the power plant**
- **Focus is on operational flexibility, not on fuel flexibility**
- **Performance improvement to be addressed only in the context of load fluctuations**

LCE 29 (2017): CCS in industry, including Bio-CCS

RATIONALE

- CCS is the only way to drastically reduce CO2 emissions from production processes such as cement, steel making or oil refining
- Bio-CCS could lead to negative CO2 emissions
- This underlines the role of CCS as a climate change abatement technology rather than perpetuating the use of fossil fuels
- By 2050, it can deliver half of global emissions reduction from CCS
- Technology exists but needs integration into industrial processes

LCE 29 (2017): CCS in industry, including Bio-CCS

SCOPE

- **Piloting under realistic conditions**
- **Technologies should be environmentally benign and cost-effective**
- **Explore local or regional transport and storage needs and solutions**
- **Collaboration with end-users is essential**
- **International cooperation is encouraged, in particular with China**
- **Knowledge sharing and stakeholder engagement is essential**

LCE 30 (2017): Geological storage pilots

RATIONALE

- **Storage is the most sensitive part of the chain, in particular onshore**
- **Pilots are needed to create public awareness and demonstrate the safety of geological storage**
- **Most commercial storage linked to EOR; limited experience with storage in aquifers or depleted gas fields (where most European potential lies)**
- **Future deployment of CCS requires characterisation and testing of 'bankable' storage**

LCE 30 (2017): Geological storage pilots

SCOPE:

- **Development and demonstration of best practices for the entire storage cycle**
- **From site characterisation to operation, including key components of the CO2 transport infrastructure, monitoring and mitigation/remediation of leakage**
- **Education and training must be included**
- **International cooperation is encouraged, in particular with Australia and North America**
- **Knowledge sharing and stakeholder engagement is essential**
  - ☞ **Other Horizon 2020 projects: STEM-CCS (www.stemm-ccs.eu/) and ENOS**

Questions?