Feedback for DG CLIMA from the CCS Innovation Fund Workshop

This document outlines feedback received from the Innovation Fund Workshop, held on the 6th September in Oslo, Norway.

Selection criteria

Degree of Innovation

How can the degree of innovation in comparison to the state-of-the art be best evaluated?
Answer:

The degree of innovation can be measured for many sectors by considered energy improvements, process integration, environmental impact improvements and smart retrofitting.

Specifically, for CCS innovation and state-of-the-art must be considered for the individual parts of the chain:

- Capture processes (for each separate industrial process therein, e.g. hydrogen production, post/pre combustion power, steel, cement, ammonia production etc.
- Transport of CO2
- Storage of CO2
- Cross-chain integration

As **CCS technologies cover many sectors, there are many ways which technology improvements can be seen as innovative**.

There must be a balance between innovation and technological certainty. Technologies which have been taken to TRL 7 or above should be considered. Horizon Europe will be a vital mechanism to deliver a pipeline of technologies to the Innovation Fund.

It would be helpful for CCS projects to understand what the **definition of 'degree of innovation'** is. This will give clarity when applying for innovation funding.

Project Maturity

Which criteria should be used to evaluate project maturity?

- *Business plan, capacity of the promoters behind the project*
- *Financial structure (private investors, other public support, strength of commitments)*
- *Societal acceptance*
- *Legal setup and permitting*
- *Stage of project development (concluded feasibility studies, FEED, etc.)*

Answer:
All of the above have importance.

The potential for scalability. The projects ability to enable the at scale deployment of CCS and decarbonisation across one (or several) regions should be considered.

The project consortium strength. As above, a strong consortium, with international partners can help realise at scale decarbonisation in several regions. Furthermore, a strong consortium will avoid point-to-point project risks and encourage the development of CCUS related markets.

The regional decarbonisation options. For some regions CCS may be the most cost-effective means of decarbonisation, in other regions there may be alternative solutions. This geographic decarbonisation potential criteria should be considered.

The group discussed the need for a clear, well defined and easy to communicate **MATURITY ROADMAP**, with the plans, timings, milestones, decisions and key legal/policy milestones. With this, it will be much easier to know and communicate where the project is through every step of the process.

Social acceptance is difficult to measure and more of a result of activity. Rather, an objective **STAKEHOLDER ENGAGEMENT PLAN**, highlighting which measures to take in order to increase acceptance from all stakeholders, including the public (this to be a part of the maturity roadmap).

It is important to, at every stage of the project, measure the project against its effect on the climate and carbon footprint. It is easy to get lost in detail as we saw in the handling of the NER300.

What are the essential elements that need to be in place for a project to be able to reach financial close within 4 years? Should a completed feasibility study be made a condition for applying for the Innovation Fund?
Answer:

Memorandums of understanding (MoUs) should be in place between consortium partners and projects. This will accelerate knowledge sharing and give investor confidence.

Financial closure conditions within 4 years may be too complex for CCS projects with many gateways to achieve deployment

The legal adoption of a regulatory regime at member state level will be needed for some projects to reach financial close within 4 years.

For industrial capture projects, a receipt/contract for T&S/Utilisation will be an essential element before financial close.

Feasibility studies should be close to closure or completed for projects to apply for innovation funding. It should not be a requirement that feasibility studies are complete, as it takes time for innovation funding to be granted, in the interim projects will stall, which is costly and may risk a further delay to the project time line as expertise will have to be reassembled.

What are the key risks and barriers to implementation, respectively pre-conditions for projects to go ahead?
Answer:

Policy Risk: At both member state and European level there is a risk that policy frameworks may not be in place in time, or may be changed with adverse effects. A long-term policy will help to mitigate this risk.

Political Will: Changes of Governments and political will over the usual political cycle is a risk for innovative projects. Long term signposts from the Commission can help encourage cross-party climate consensus for Innovation Funding target projects.

Cross-Chain Risk: if the CCS value chain is separated into CO2 capture, transport and storage, this increases the interfaces by which there are risks. Many of these have been outlined in detail by previous work for example the CCUS Advisory Group (CAG) report on Investment Frameworks for Development of CCUS in the UK.

Timing Risk: There is a timing risk in construction, as part of cross chain risk. The timing of funding mechanisms, and the part-chain project timelines needs to align. If not, this increases the risk of stranded assets or unabated CO2 emissions. A regional coordinator will be essential here to liaise with projects, other regions, member state governments and the commission to ensure the pipeline of individual projects align across the CCUS chain.

Funding Timing Risk: There needs to be clear timelines (and streamlining) between different European (and member state) funding initiatives. Any breaks in funding or overlaps/repetition can stall projects, increasing costs and delaying actual GHG emissions abatement.

Global Market Prices & Carbon Leakage: Global market prices must be high enough and stable enough to enable internationally competitive industries have confidence to invest. If these prices fall then carbon leakage to other countries/regions is a real risk.

Logistics (CO2 Transport in the EU ETS, London Protocol, pipeline route/environmental permitting): Clarity on the CO2 transport logistics will be required before detailed FEED studies can continue. CO2 shipping in the EU ETS, the London Protocol and construction/environmental permitting are all barriers to project implementation.

Social Acceptance Risk: Poor communication to the general public and to politicians is a risk which could stop projects at any stage of deployment. A good **stakeholder engagement plan** will help to mitigate this risk and should be included in IF applications.

Relevant Cost Calculation

What are the key variable factors determining the financial gap?
Answer:

Many of the answers here are covered elsewhere in more detail.
CO_2 Price: (see next question)

Future Policy Landscape: (see above question on policy risk)

Future Energy Costs (gas/hydrogen/electricity): The feedstock and alternative fuels to industrial and power processes which produce CO_2 are a key variable for projects. These costs will vary depending on the member state policies and global market prices.

Levels of CCS Deployment (more deployment, more learning, lower costs): (see below question)

Levels of risk sharing (cross-chain/storage infrastructure): (See above question)

What are the financial risks and how best they can be evaluated? *Answer:* **Deployment and Scale-Up**: Deploying CCS will reduce financial risks, and as the industry scales up these risks will reduce. **Knowledge Sharing**: Knowledge sharing will help to reduce financial risks as projects learn from one another. This is vital in a new industry and will be vital for many technologies which are funded by the innovation fund **Right Sizing Risk**: There is a balance when building CCS infrastructure (transport and storage) that assets (pipelines, compressor stations, injection facilities etc) need to be correctly sized. Sufficiently large enough to accommodate future volumes of CO2 in the infrastructure, and not too large as to be considered a 'stranded asset'. Given the scale of CCS required, the latter risk is lower than designing a pipeline too small for the demand. Good industrial coordination and member state/EU support will reduce the financial risk for this specific CCS risk. **Future CO2 Price:** Certainty on future CO2 prices will encourage investment. Lessons learnt from the CO2 price fall in the NER300 period have been taken on board. Any future trajectories or carbon price floors (introduced by member states) will be strong signals to investors and if sufficiently large will reduce financial risk.
Other
What weights, if any, should be applied to different selection criteria? *Answer:* **Ability to reach 2050 net-zero target**. Projects with long operational lifetimes should be compatible with the long-term climate targets. **Ability to enable negative emissions.** Negative emissions will play an important role in most 2050 energy and climate scenarios, projects which can maximise emissions reductions should be considered favourably. **Ability to reduce barriers for future projects**. Some projects, especially early projects, could outline plans to overcome barriers which may be hindering future projects. These barriers may be national (policy, regulation etc), international (business models, investment, liabilities) or regional. **Knowledge sharing plans**, as discussed in later questions these plans will be important to accelerate development and deployment of CCUS in Europe. **PCI status already approved**. PCI projects, or those linked to projects with PCI status (and CEF funding) will already have passed through a Commission approval process. These projects should be deployed quicker than 'fresh' projects. This will require an internal collaboration in the Commission and the EIB.

Replicability/Global Impact (for CCS and individual sectors). The replicability and global impact of projects could be considered, however many projects will be unique and difficult to fit into a template. The global impact is also difficult to consider aside from the GHG abatement.

Milestones

What is the expected timeline to financial close and entry into operation for innovative projects in your sector?
Answer:

We refer to the individual submissions from projects rather than the discussion at the workshop. Obviously, the CCS sector encompasses many sectors and technologies in many industries. Timelines for T&S construction, power station construction or capture facility retrofit for example will be very different.

For industry, the timelines are closely linked to regular maintenance/upgrade windows. This is project specific, but it is paramount that funding decisions are aligned with these windows.

What are the key milestones before financial close, e.g. feasibility or FEED study, permitting, State-Aid approval, etc. and before full entry into operation, e.g. how long are the construction, testing and commissioning periods?
Answer:

The commission must define what is meant by financial close. It is assumed here that it means the Final Investment Decision (FID). A series of definitions will help projects to submit comparable applications without confusion.

Contractor selection/ supply chain review. A review of the contractor and supply chain will have to be undertaken twice for long lead-in time projects. Once when the Pre-FEED and FEED studies are undertaken and once again immediately before the FID is made. For short projects, this isn't an issue, but for longer projects, contractors may change, and supply chain prices/availability may fluctuate in the months/1-2 years between project stages.

Safety testing and commissioning

Member State Support/Policy/Regulation adoption. EU support announcement. A key milestone for many large projects will be statements of support from member state governments and the EU. These statements can be in the form of state/EU financial support, policy changes, regulation changes.

Permits/licenses granted. For large construction projects building, environmental and operational licenses/permits will have to be granted. Sometimes these processes can be lengthy and subject to unforeseen interventions and delays. For CO2 storage, the granting of both exploration (if determined necessary by member states) and storage permits will be key milestones for store development.

Contracts in place with project partners, agreement from stakeholders and signing of MoUs. Securing contractual support from industrial (and government) partners is a vital early gateway for projects.

Financial milestones must align with development milestones (no delays between funding and development e.g. a gap between pre-feed and Feed).

Selection of projects must be a quick process to mitigate delay risk. Any milestones or project gateways which must pass an external process (for example assessment for Innovation Fund awarding, and due diligence from lenders), must be done swiftly so projects can retain teams and personnel, if left too long, teams are disbanded and personnel relocated.

An EU 'waiting fund' which can be allocated to projects whilst they are assessed for further funding to ensure that projects can continue to progress – in some way – into the next phase. This will prevent the above issues of a timing gap between project milestones and the disruption of timelines.

Referring to earlier mentioned maturity roadmap, there should be a **standard package of milestones with room for flexibility**. There may also be new possible milestones such as PCI status, inclusion in the national plans, %-age of the national emissions, negative emissions/BECCS, etc

How should the grant be optimally disbursed over the project life cycle? To what milestones can/should disbursements be linked?
Answer:

Grants should be linked to project deliverables & gateways. In particular aligned with cash flow gateways (FEED, Financial Close etc)

The grant should also be disbursed so that overall financial risk does not increase over time (aligned with the cost curve of the project)

What additional milestones would be useful?
Answer:

Declaration of member state backing

Member state regulation/legislation

Testing and proving of storage site (as per the CCS Directive). This is a CCS specific milestone which is defined as an Exploration activity in the CCS Directive, and will be part of a normal process to be granted a storage permit.

Project development assistance (PDA)

Will project development assistance (PDA) be useful for projects in the sector? If yes, what types of assistance?
Answer:

Yes

PDA can give assistance for scaling-up, bringing projects towards FEED and provide support for stakeholder management.

PDA can help bridging the gap between interdependent projects, for example a mature T&S system and an immature capture facility.

PDA is important for high CAPEX projects, and funding should be staged in-line with development milestones.

Not too much PDA should be available, or there will be a risk that projects will fast-track to a stage where companies lack the expertise and financial backing to proceed independently.

In the early phases, companies can offer more support. As the projects develop, more assistance will be required from State/EU mechanisms.

PDA should be as broad as possible not to limit good possibilities since there are significant variations and different needs. It should also cover the full value chain, capture, transport and storage, and give the opportunity to start anywhere in the project process.

Should projects be required to publish the results of any studies done with PDA, if they decide not to apply for Innovation Fund full support or are discontinued?
Answer:

Yes, but not to compromise commercially sensitive data/IPR.

The PDA contract should include a condition to publish certain reports and KPIs (e.g. energy costs for CO2 capture).

It is crucial that there is a possibility to see the progress of the project and learn from the experiences/lessons learned.

It is important to be able to show the European citizen that money is not misused.

If a project proceeds without support, there will be active commercially sensitive data which gives the continuing project a competitive advantage. This data should be kept private.

Should FEED be financed by PDA or only after successful application for an Innovation Fund award?
Answer:

Yes.

Conflicting opinions:

- There would be merit in co-funding FEED to ensure high-quality content and industry commitment.
- Allow FEED financing upon awarding of IF, this mitigates risk of stranded projects which pass FEED and fail to continue

Preferably funded by PDA – this would allow more projects to complete FEED than the IF can support

Knowledge-sharing requirements

What type of technical, economic, project management, regulatory and permitting information will be useful to share with other projects from the sector in order to speed up the uptake of the innovative technologies and to advance the regulatory environment without at the same time compromising the legitimate intellectual property rights, the competitiveness and the first-mover advantage of the companies involved in the projects?
Answer:

Knowledge sharing can be separated into two categories. A "Hard" and a "Soft" knowledge

Hard:

- Data (efficiency data, technical data, design plans)
- Reports
- Academic papers
- Permitting, safety and environmental assessments
- Risk assessment and allocation
- List of CCUS experienced contractors/constructors/consultants

Soft:

- Public outreach learning
- Streamlining/project efficiency learning
- Regulation changes/challenges
- Law hurdles
- Government learning (on all of the above)

The inclusion of research institutes in projects should be a positive criterion, particularly those institutes which are linked with Horizon Europe projects. This partnership building will ensure research takes place on real issues and ensure research has real and tangible benefits for CCS projects.

Learnings should be above the standard business practice for CCUS, it is critical to encourage this.

Knowledge sharing of sensitive data could be condensed to core elements such as standardised metrics for efficiencies.

Knowledge sharing should be managed by one specific organisation, ideally with EU funding. The CCUS Projects networks are a good option for this role.

What types of knowledge-sharing activities should the implementing body organize for projects benefiting from Innovation Fund (and other EU programmes) and for the general public?
Answer:

Coordination/collaboration with the SET Plan IWG9 and the CCUS project Networks can help share the knowledge with member states and other projects.

A **key lesson learned template** provided by the EC could ensure that knowledge sharing is easily understood and easily shared between projects, the Commission and the public.

CCUS Safaris are an effective way for projects to share information with other projects earlier in the deployment pathway. They are also very useful for international visits, from projects and policy makers alike.

Communication should be set up to be understandable for "normal people". An interesting reference here was the Japanese comic books for children, explaining difficult things in pictures and easy-to-understand text. It is crucial to get public engagement and to pedagogically convey politicians.

Websites, webinars and workshops (for the general public, industry and academia). Have all been highlighted as useful. These events (webinars and workshops) could be run independently, however a centralised body which organises these events and coordinates a CCS outreach agenda with all projects would be valuable.

What should be the form of knowledge sharing tools that would be useful for the market?
Answer:

The CCUS Network could gather and summarize the info using all tools mentioned, especially key learnings and best practice should be shared.

A **key lesson learned template** provided by the EC could ensure that knowledge sharing is easily understood and easily shared between projects, the Commission and the public.

Some stakeholders mentioned that a **brochure or database of key personnel/companies** with an experience of CCS would be valuable for the market to encourage bilateral interaction between the market and CCS players. Other stakeholders disagreed with this idea.

Many of the answers to the previous question are applicable here. Of course, more technical documents particularly focussing on the business models and economics of projects will be very useful for the market.