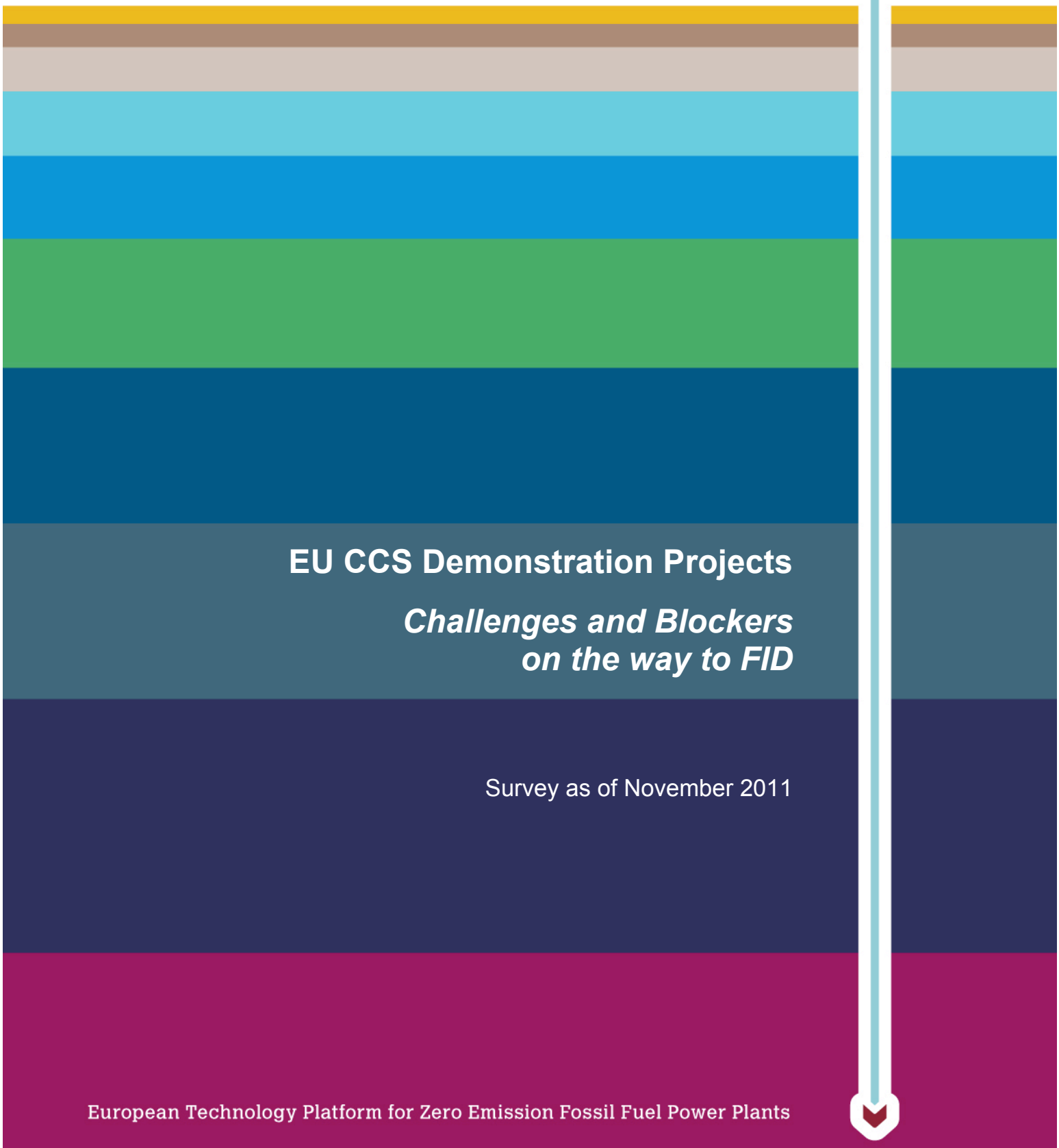
Zero emissions platform



EU CCS Demonstration Projects

Challenges and Blockers on the way to FID

Survey as of November 2011

European Technology Platform for Zero Emission Fossil Fuel Power Plants

Contents

1 Introduction

Founded in 2005, the ZEP Emissions Platform (ZEP) represents a unique coalition of stakeholders united in their support for CO_2 Capture and Storage (CCS) as a critical solution for combating climate change. Indeed, CCS is the single biggest lever for reducing CO_2 emissions – providing almost 20% of the global cuts required by 2050[1]. Members include European utilities, oil and gas companies, equipment suppliers, national geological surveys, academic institutions and environmental NGOs. The goal: to make CCS commercially available by 2020 and accelerate wide-scale deployment.

At its meeting of 14 September 2011, ZEP's Advisory Council agreed to review its strategy in the light of recent developments[2] in the CCS landscape in Europe. This included the perception that fewer demonstration projects may materialise than anticipated – potentially jeopardising the EU CCS demonstration programme. As input to this process, ZEP therefore undertook a survey among project developers in order to identify any challenges and blockers on the way to Final Investment Decision (FID).

1.1 Survey covered all national, EERP and NER 300 funded CCS demonstration projects

The survey covered the entire pool of national, EU Economic Recovery Plan (EERP) and NER 300[3] funded CCS demonstration projects – 15 in total. In order preserve confidentiality, it was implemented by an external agency, HRwebtools, which specialises in web surveys of potentially sensitive issues. To ensure data integrity, the agency also allowed only one respondent per project – usually the project manager.

EU CCS Demonstration Projects			
New-build		*Retrofit*[2]	
Compostilla (ES)	New-build, hard coal, onshore storage	Belchatow (PL)	Retrofit, lignite, onshore storage
Don Valley (UK)	New-build, hard coal, offshore storage	Longannet[4] (UK)	Retrofit, hard coal offshore storage
Drax (UK)	New-build, hard coal, offshore storage	Peterhead (UK)	Retrofit, gas, offshore storage
Eston Grange (UK)	New-build, hard coal offshore storage	Porto Tolle (IT)	Retrofit, hard coal, offshore storage
Florange/Ulcos-BF (FR)	New-build, steel, onshore storage	Green Hydrogen (NL)	Retrofit, hydrogen, offshore storage
Hunterston (UK)	New-build, hard coal, offshore storage	ROAD (NL)	Retrofit, hard coal, offshore storage
Jänschwalde (DE)[5]	New-build, lignite, onshore storage	Turceni/Getica (RO)	Retrofit, lignite, onshore storage
Killingholme (UK)	New-build, hard coal offshore storage		

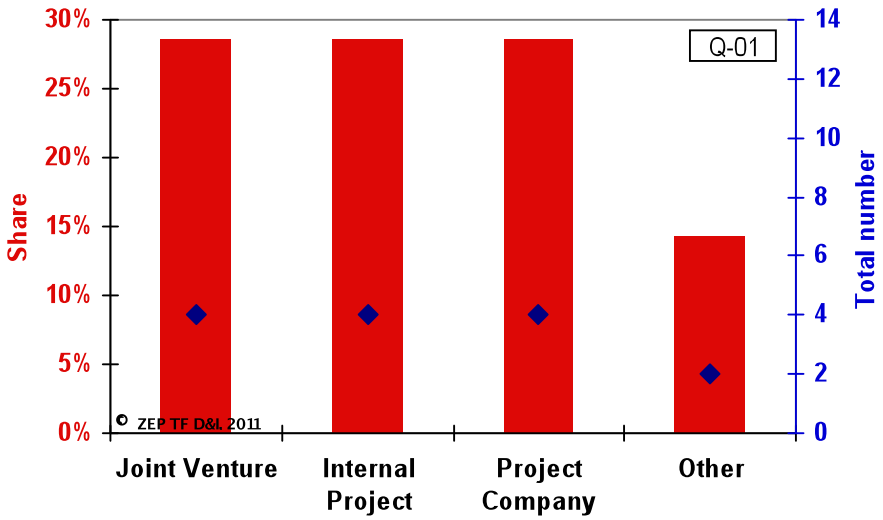
The survey ran from 8 -18 November 2011 and received 14 complete responses. The results presented in this report are derived from the overview produced by HRwebtools (apart from open questions which were grouped and analysed to facilitate interpretation, or further processed to ensure anonymity).

[1] International Energy Agency (IEA)
[2] See ZEP's Strategy Review, January 2012: www.zeroemissionsplatform.eu/news/news/1175-zep-strategy-review-2012.html
[3] In 2008, the EU agreed to set aside 300 million Emission Unit Allowances from the New Entrant Reserve under the EU ETS Directive to demonstrate CCS and innovative renewable energy technologies
[4] At the time of selection, the cancellation of the Longannet CCS demonstration had not been made public (October 2011)
[5] At the time of the survey, the cancellation of the Jänschwalde project had not been made public (December 2011)

2 Results

2.1 Legal model (Q-01)

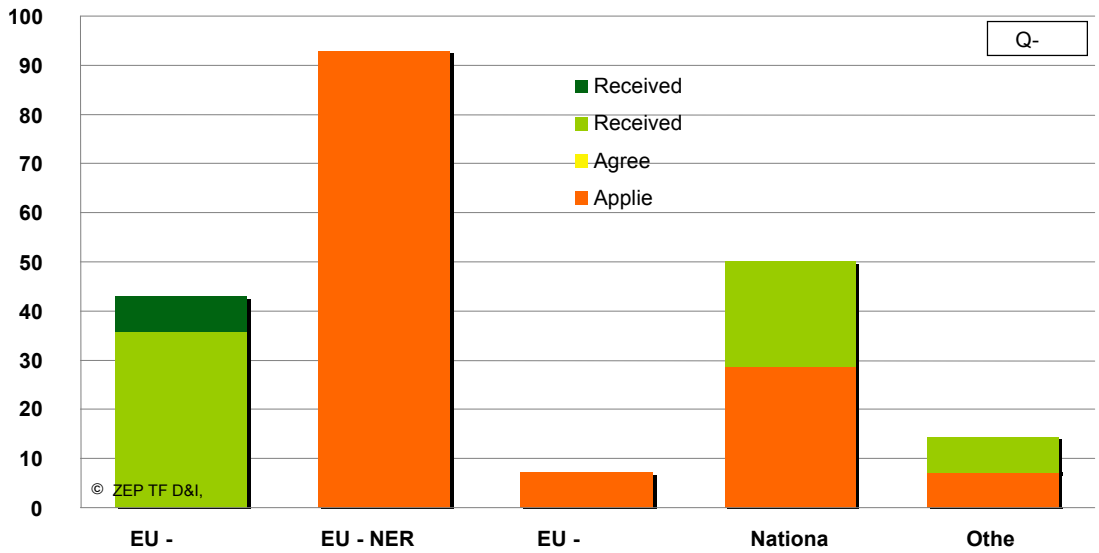
Responses on the legal model depended on the country in which the project is located. One of the projects rated “Other” indicated that it may work in a consortium without a JV contract in place. Some projects also indicated that the legal model might change once the project was further advanced.



2.2 Funding

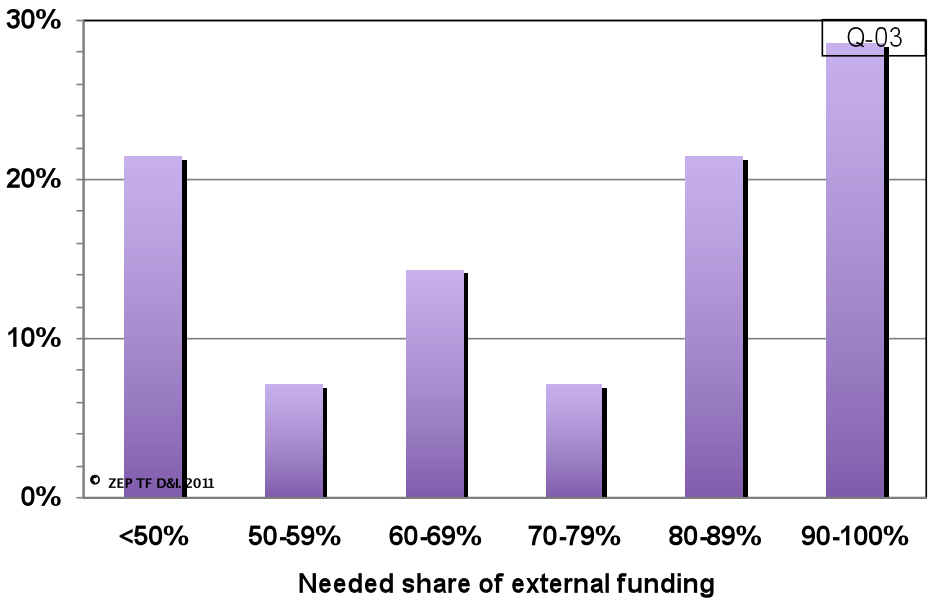
2.2.1 *External funding sources (Q-02)*

Besides EU funding, 50% of the projects have also applied, or already partially received, national co-funding. A much smaller number has applied for other funding from the EU or other sources, e.g. a grant from the Global CCS Institute (GCCSI), support by other countries and/or loans from development organisations.



2.2.2 *Share of external funding needed (Q-03)*

Given the importance of public funding to the projects, not only the availability but also the *share* of funding on overall project costs are crucial factors. Respondents were therefore asked what share of external funding would be necessary to make their project viable. Although individual responses were not revealed in order to preserve anonymity, ~80% of the projects need a funding share of more than 50%; and 50% of the projects need a funding share of more than 80%.



2.3 Progress of activities

2.3.1 *Permits obtained and contracts signed (Q-04)*

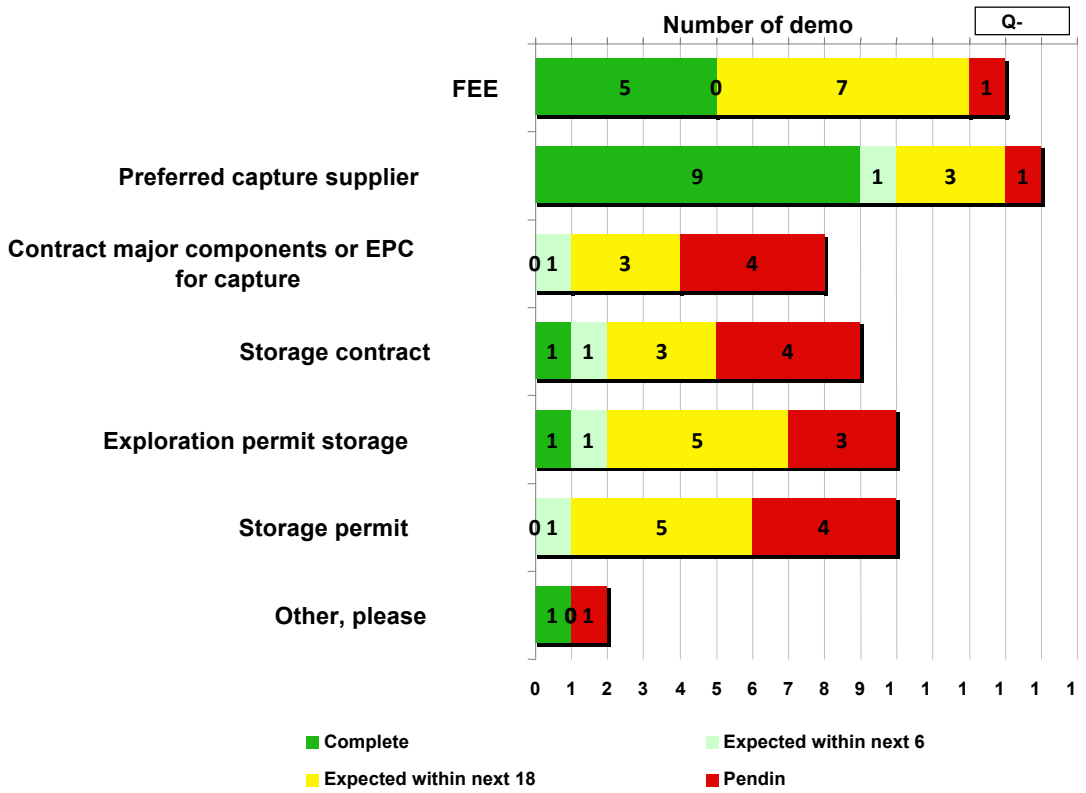
In order to gain a deeper insight into the actual status of the projects, respondents were asked which permits have already been obtained and which contracts signed.

With the exception of one project, all have completed or will complete their FEED[6] study within the next 18 months – the area in which the projects are most advanced. However, none has signed an EPC[7] contract or contracts for major components, indicating that none of the projects had taken FID at the time of the survey (November 2011).

Even more critical is the status of storage permits or contracts: only two projects expect to sign the storage contract within the next six months and none has obtained a storage permit to date (which could explain why projects have not yet taken FID).

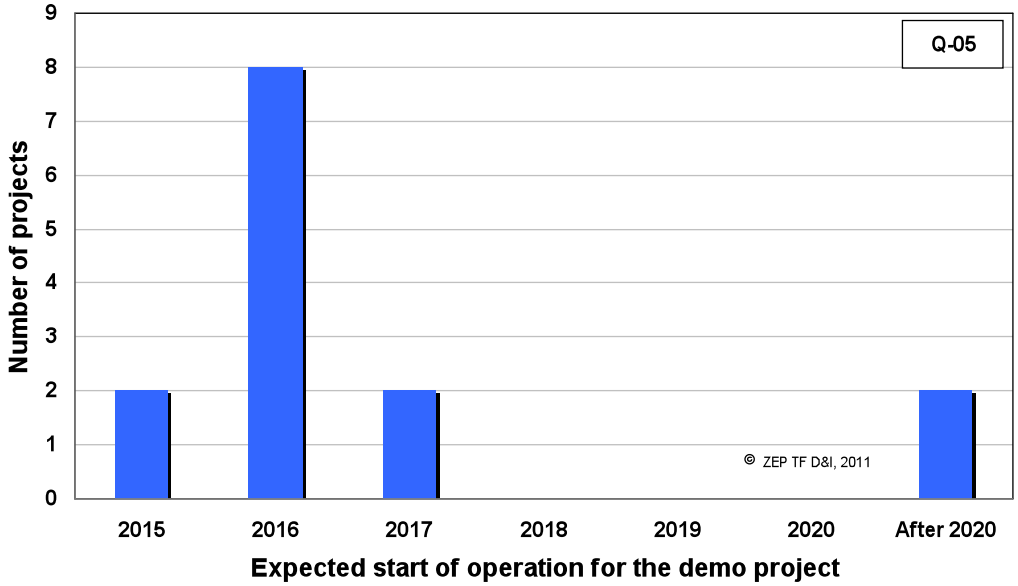
Nine projects are still at the stage of waiting for an exploration permit, indicating that these projects may encounter delays in project execution.

[6] Front End Engineering and Design
[7] Engineering, Procurement and Construction

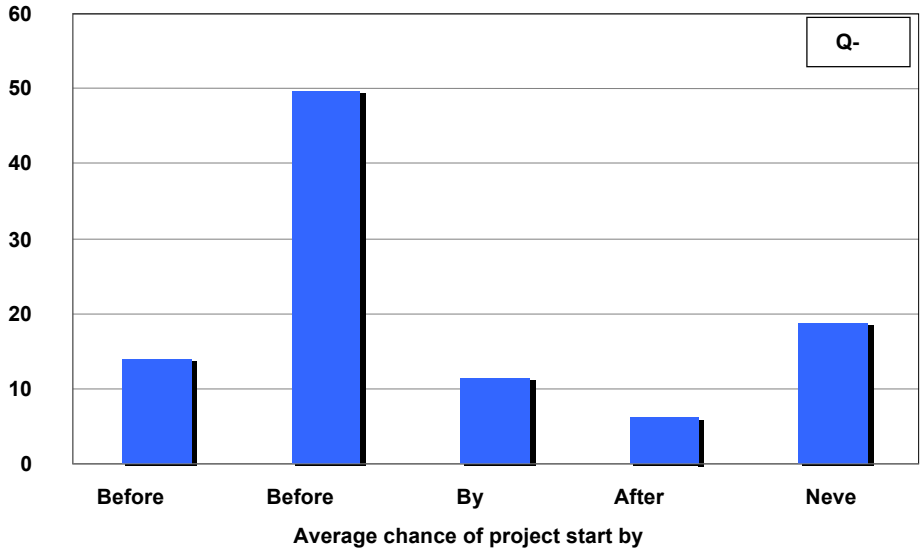


2.3.2 *Expected start-up date (Q-05 + Q-06)*

Given the responses to the previous question, it is with some surprise that 10 respondents (over 70%) expect their project to be operational by 2016.



Question 6 ("Allocate the % chance of starting your project. Sum should be 100%" below) gave a similar picture, while highlighting that two respondents expect their project never to come on-stream. The good news, however, is that 12 respondents believe their project will be successful.

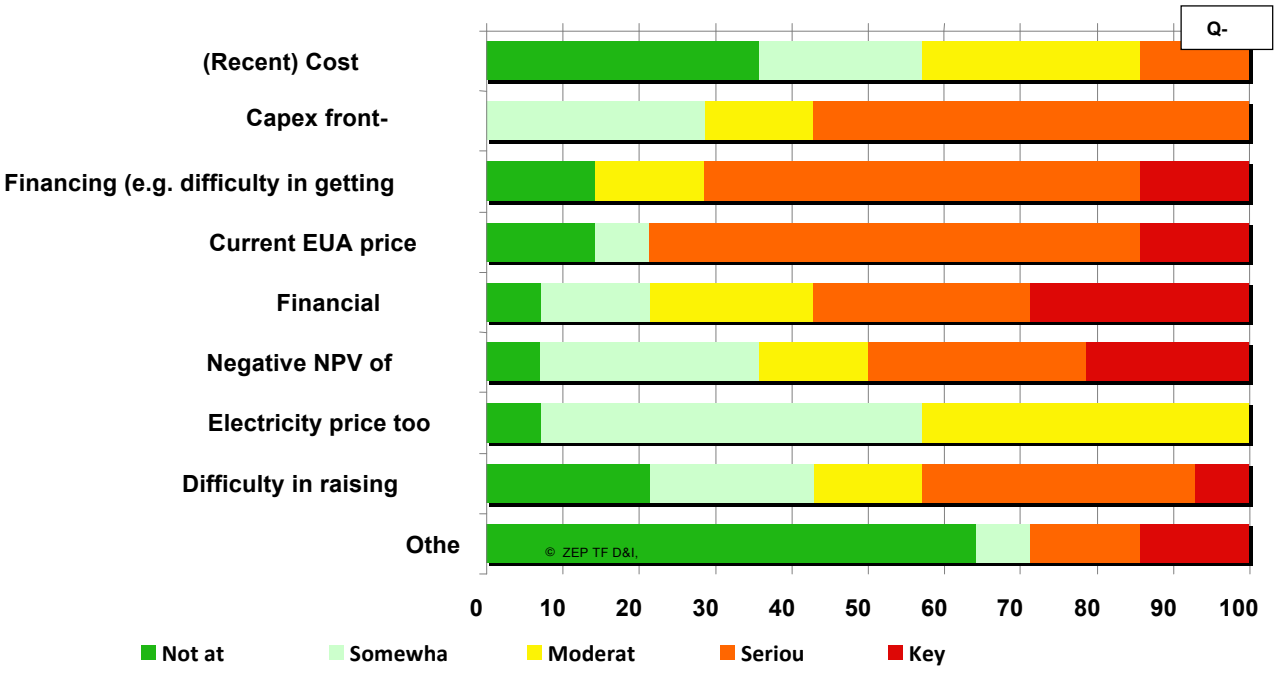


2.4 Key challenges and blockers on the way to FID (Q-07)

Respondents were asked, "What are the main challenges that you are facing to take FID on your project?" There were a broad variety of answers to this question, with each project facing its own particular challenges/blockers. However, the following diagrams show responses to key areas.

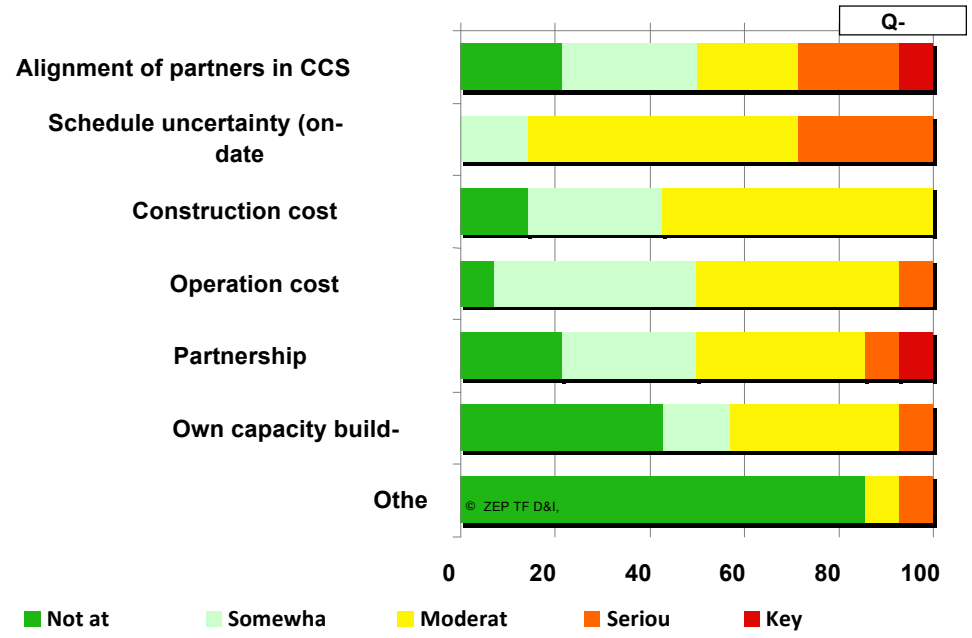
2.4.1 Economic challenges and blockers (Q-08)

When considering the economic challenges facing projects, key factors include the current low price of EU ETS Emission Unit Allowances (EUAs) and high CAPEX front loading – in short, the financing of the investment. 50% of respondents also stated that the negative NPV of the project caused significant concerns.



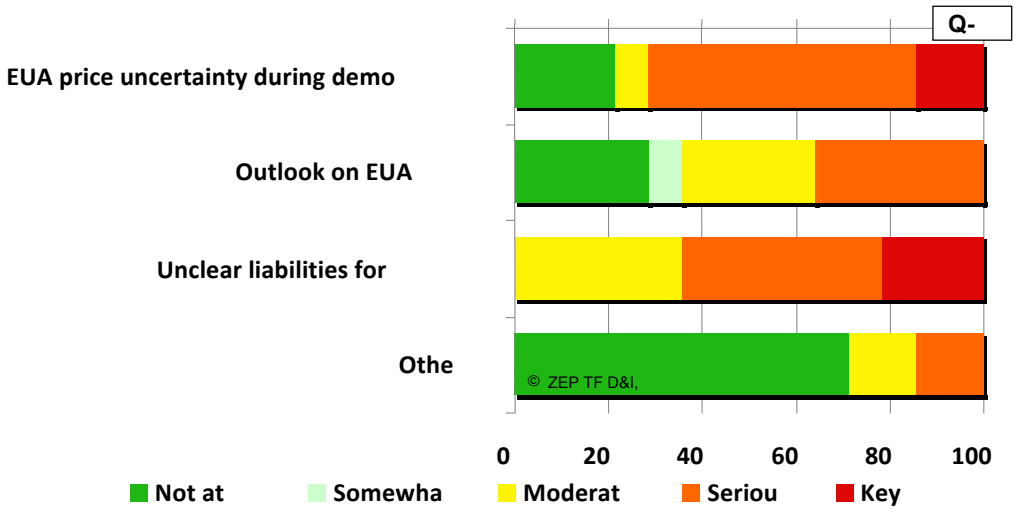
2.4.2 Management challenges and blockers (Q-09)

CCS projects typically have to deal with a wide variety of issues – including management related issues – their complex nature requiring a broad range of disciplines, company types and even nationalities. However, in terms of management, their greatest concerns stem from schedule uncertainties which can only be partly influenced by the demonstration projects, as their schedules are highly influenced by funding decisions and the transposition of the CCS Directive into Member State legislation.



2.4.3 External risk challenges and blockers (Q-10)

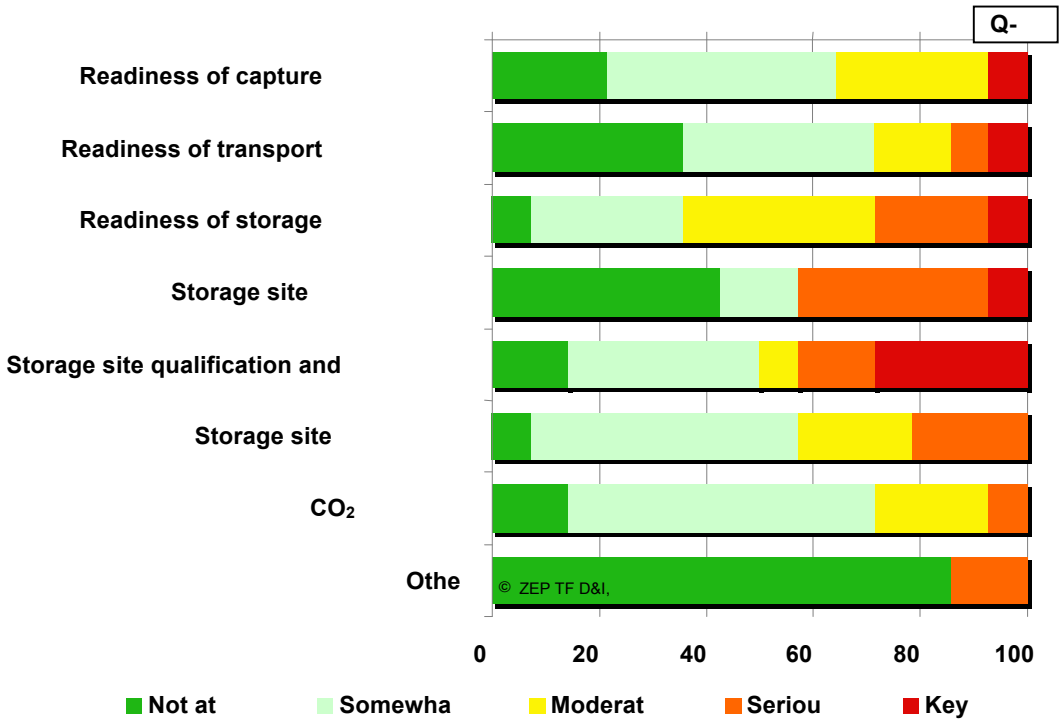
Projects were asked to assess risks which were mainly beyond their control, i.e. the uncertainty surrounding EUA prices during and after the demonstration phase and remaining uncertainties regarding storage liabilities. More than 70% qualify these risks as serious or even a key blocker for the project.



Respondents also indicate that the financing model for the NER 300 (based on performance over the operational period), the open regulatory framework on electricity markets and the uncertain political future for CCS are moderate to serious risks (but not by a large number).

2.4.4 Technical challenges and blockers (Q-11)

Technical challenges and blockers are considered far less serious than those which are beyond the control of the projects. By comparing risks associated with different parts of the value chain, it became clear that the greatest concerns relate to the identification, qualification and validation of storage sites – 50% view this as a serious challenge or key blocker. 30% also recognise that some aspects of storage technology can only be addressed in the operation of the demonstration project itself, whereas 90% have no major concerns regarding capture technology.

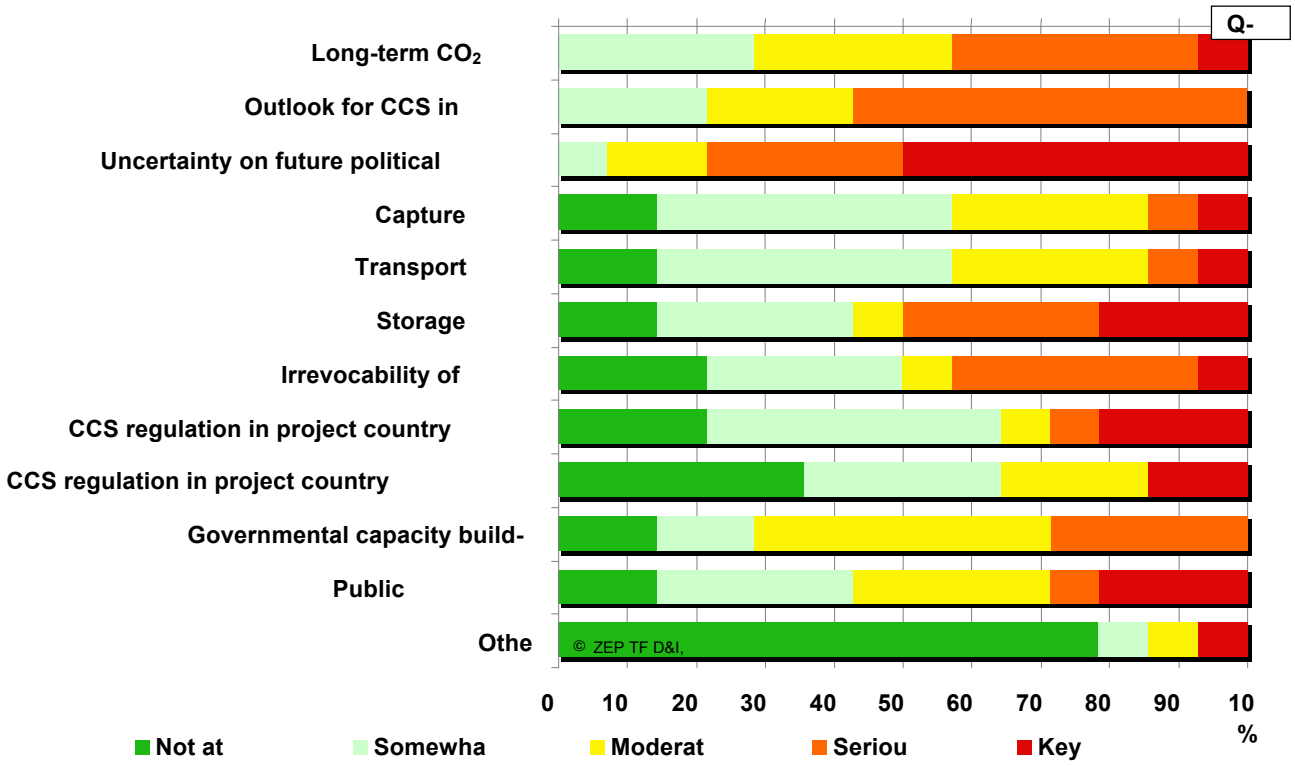


In all cases, responses highlighted concerns for the operation of the full value chain, especially in cases of emergency, quick start-up and ramp-downs, as well as maintenance. There was also some indication that issues regarding the metering of large CO_2 flows are not fully covered by the EU ETS Directive.

2.4.5 Regulatory, policy and resource challenges and blockers (Q-12)

Regarding regulatory challenges, uncertainty surrounding political decisions and the outlook for CCS in general is viewed as a serious issue or even key blocker by 80% of projects. Indeed, there appears to be a strong belief that the market for CCS is completely dependent on Government actions, with uncertainty over stable, long-term framework conditions – as required for large-scale investments – a key concern.

These regulatory and political challenges are causing far more concern than public acceptance of CCS, which is viewed by only 30% as serious or a key blocker. CO_2 capture and transport permits are viewed as a critical issue by only 15% of projects.

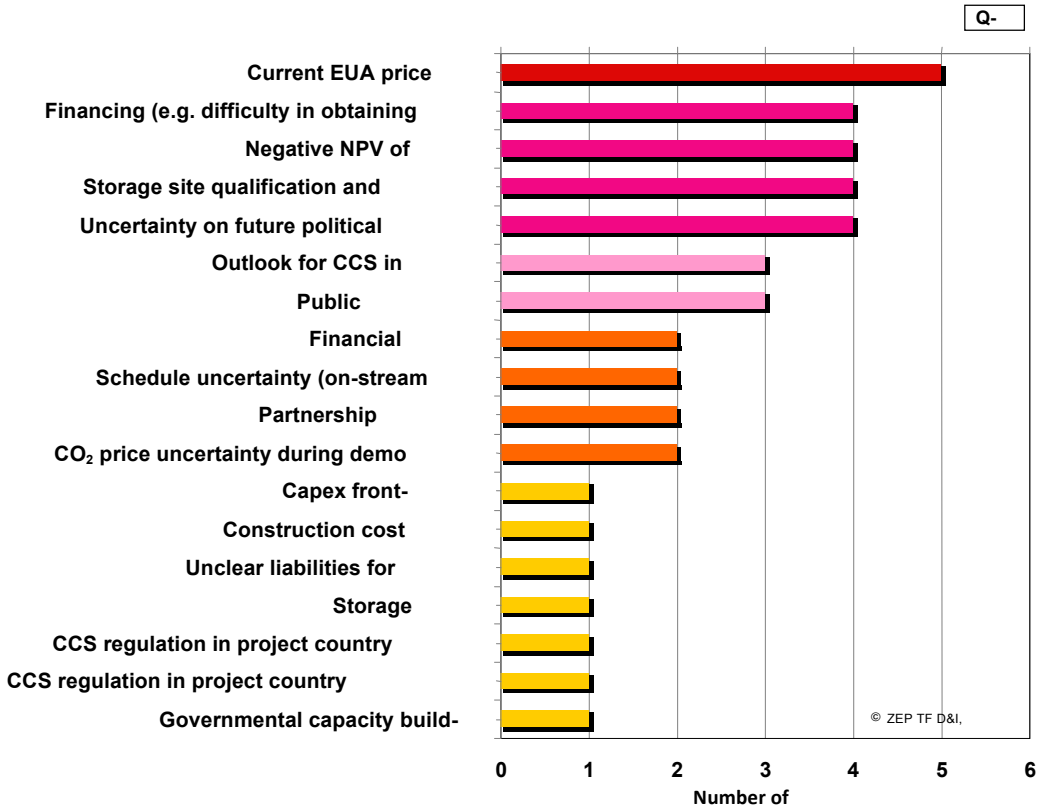


2.4.6 Top 3 challenges and blockers (Q-13)

In order to understand the comparative importance of key challenges and blockers, respondents were asked to select their three main concerns from the various different areas – financial, technical, regulatory, policy and resources.

The responses reveal the current EUA price of below 10 Euro/tonne to be the highest concern. Indeed, under the five top ranked challenges, there is only one which is fully independent of economic conditions and the uncertain political framework underlying them: the “qualification and validation of the storage site”.

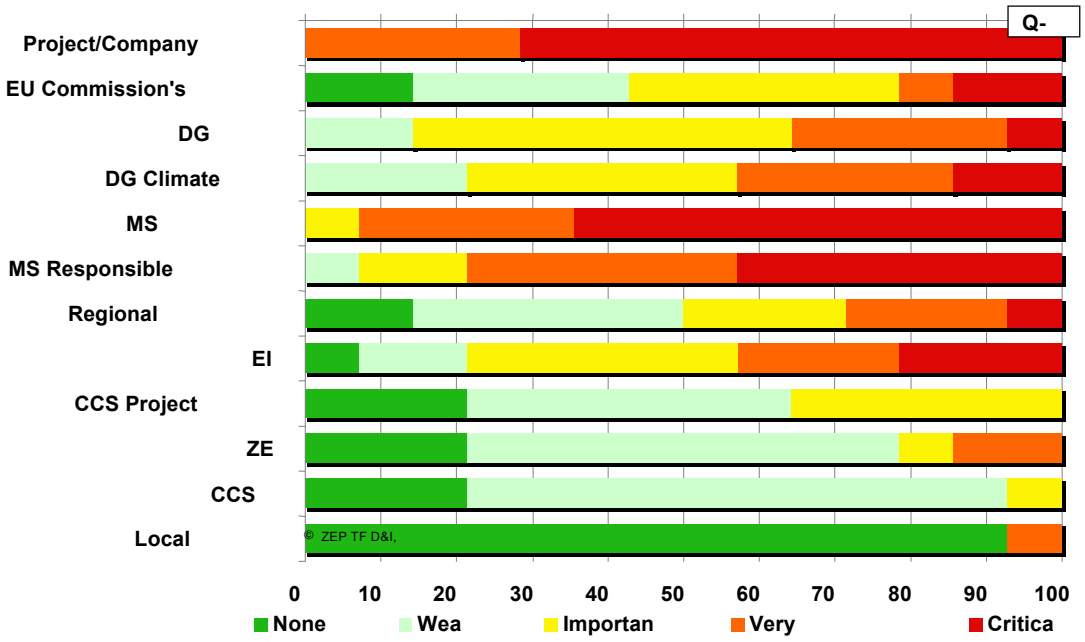
N.B. The diagram below only shows issues which have been selected by at least one project as a key blocker.



2.5 Stakeholders

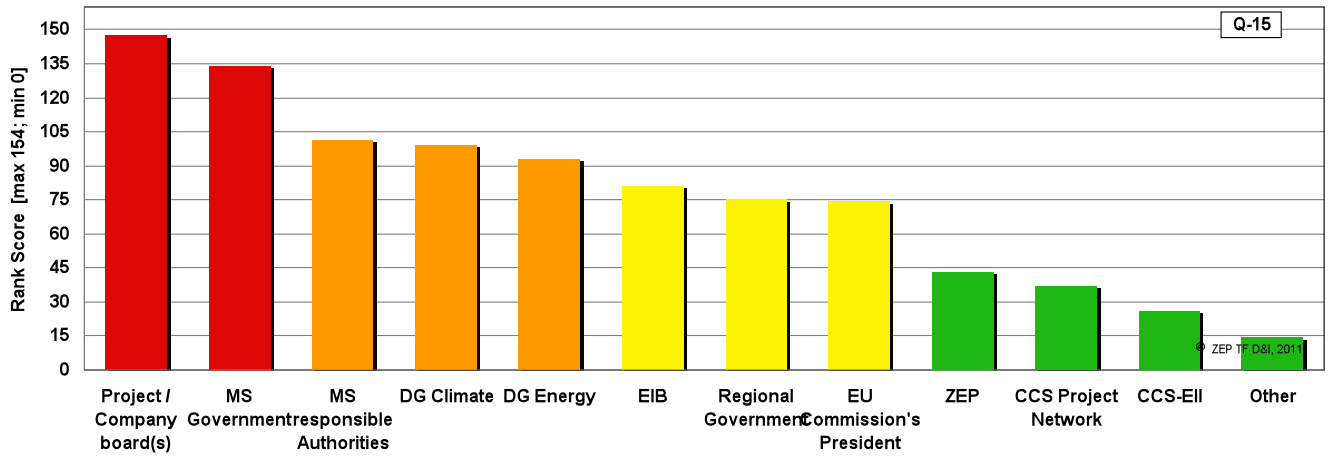
2.5.1 Importance of stakeholders in the decision-making process (Q-14)

Different actors play a role in the process of taking FID: 100% of the projects give Company Boards as the key decision-makers, with 80% identifying Member State (MS) Governments and Responsible Authorities as having a very important or critical role in achieving FID.



2.5.2 Ranking of decision-making stakeholders (Q-15)

Projects were asked to rank the comparative importance of different stakeholders, indicating 11 for a Top Priority Actor; 0 for a Low Priority Actor. Again, Company Boards and MS Governments were identified as key stakeholders. Organisations such as ZEP, the European CCS Demonstration Project Network and the European Industrial Initiative on CCS play a significantly lower role in the making of investment decisions.



2.5.3 Names of stakeholders who could support the project (Q-16)

Key stakeholders who could support the projects were mainly identified as:

- MS Governments, notably the Prime Minister and Ministers in charge of Finances and Energy
- MS Responsible Authorities
- Günther Oettinger, Energy Commissioner, the European Commission
- Heads of NGOs in MS
- Reputable Research and Technology Development (RTD) groups
- ZEP
- GCCSI.

2.6 Supporting EU CCS demonstration projects

2.6.1 ZEP actions requested by project developers (Q-17)

The following is a list of actions projects propose should be undertaken by ZEP:

Financing

- *"Recognise that NER 300 is a small part of the money required and that progress is dependent on there being the equivalent of green certificates to allow the business case to be made for the capture, transport and storage technologies which currently exist."*
- *"Convince the Commission to add funding to the NER 300 pot as clearly this is not going to be sufficient for the relevant projects due to the EUA price".*
- *"Discuss financial support rules. Make a split between an investment subsidy and an OPEX/ performance subsidy. Provide 100% funding instead of partial funding".*
- *"Find/sustain other financing sources for CCS demonstration projects".*
- *"Focus on debt provision from the EIB (European Investment Bank)."*

- *"Lobby for CCS funding based on the likelihood of implementation rather than performance measures such as tonne/CO_2 stored".*

Regulation

- *"Resolve the CO_2 storage liabilities issue."*

Knowledge sharing

- *"Use published FEED material to better inform the development of CCS demonstration."*
- *"Provide good data on comparative costs."*

Research

- *"Sustain through research programmes the qualification and validation of storage sites simultaneously with all EU CCS demonstration projects. This will bring also benefits to future EU CCS projects."*

Benefits of clusters

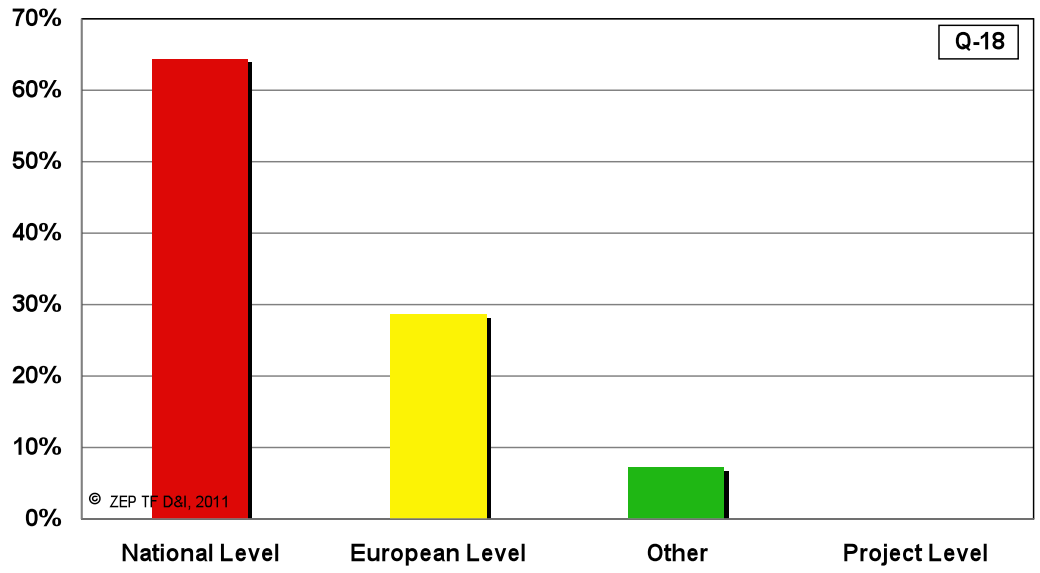
- *"Focus on industrial basins[8] for launching CCS projects in order to benefit from synergies and infrastructure sharing. From these basins, infrastructure can then be extended and connected to other basins – projects spread widely over Europe will never benefit from synergies with other projects."*

Communication

- *"Stop talking about the demonstration of technologies and start talking about the proving of CCS systems."*
- *"Public promotion in general and regionally."*

2.6.2 Solving open issues (Q-18)

More than 2/3 consider that existing challenges need to be solved at national level; none assumes that these can be solved at project level.



[8] Clusters of CO_2 emitters (both power and industrial applications)

2.6.3 Compensating against the risk of low EUA prices

Finally, respondents were asked for their views on how best to compensate risks stemming from the uncertainty of the EUA price. Responses were as follows:

- *"Increase financial support"*
- *"Implement economical/regulatory measures that will increase support for the development of first-generation CCS projects (i.e. via feed-in tariff, capacity payment etc.)"*
- *"Set an EUA floor price; introduce a subsidy for the exploration phase."*
- *"Compensate the difference between EUA prices and proven costs for capture + transport + storage."*
- *"Guarantee a minimum EUA price to the project during the OPEX period."*
- *"Fix the strike price for decarbonised electricity produced by indexing, possibly with cap and collar, to account for the risk share between Member States and the project."*
- *"Introduce high enough emission performance standards (low CO_2 emission obligation)."*
- *"Agree to capital funding upfront and an ongoing revenue support mechanism."*
- *"Fully or substantially fund multi-company CCS demonstration projects as R&D projects"*
- *"Support the EUA price for the NER 300."*
- *"EU/Member States could compensate our project by paying the gap between operational costs and the EUA price."*
- *"Grant a Contract for Difference which makes support independent of the market price."*
- *"Find and propose other support schemes or financing sources to sustain CCS demonstration projects (the EU CCS demonstration programme); improve existing legislation, e.g. impose from 2020 the requirement of CCS for new power plants, including an electricity price compensation for power plants with CCS (bonus scheme, etc)."*

The responses clearly indicate the need for risk mitigation measures to remove the significant burden of an uncertain EUA price on a CCS project. Both demonstration and commercial projects require a substantial upfront investment – without any firm guarantee that these additional investments can be recovered on the market. At today's EUA prices, operating a CCS demonstration project would not be economic even if the entire CCS chain were to be free of charge for the operator, as the EUA price would not be sufficient to compensate for the additional operating costs.

Additional economic measures[9] are therefore considered necessary to enable the development of CCS in Europe – the carbon market alone seems unable to deliver new technology solutions which, initially, will not be cost-competitive with more mature technologies. However, the ZEP cost reports[10] give confidence that following a successful demonstration, the current suite of CCS technologies will be cost-competitive with the full range of low-carbon power options, including on-/offshore wind, solar power and nuclear.

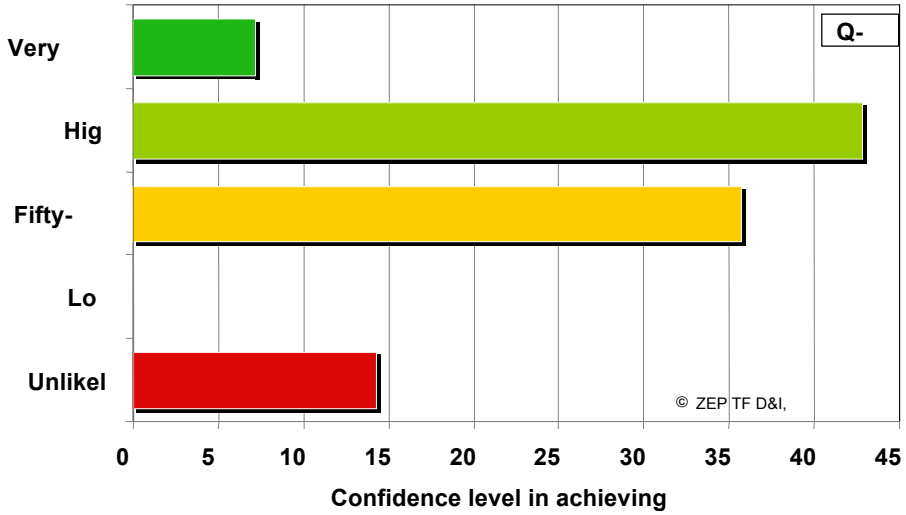
2.7 Confidence level in achieving FID (Q-19)

Asking respondents to rate the probability of their project achieving FID reveals a strong belief that they are working on the right project (although compared to a typical project, the confidence rate in achieving FID is rather low).

[9] See page 18

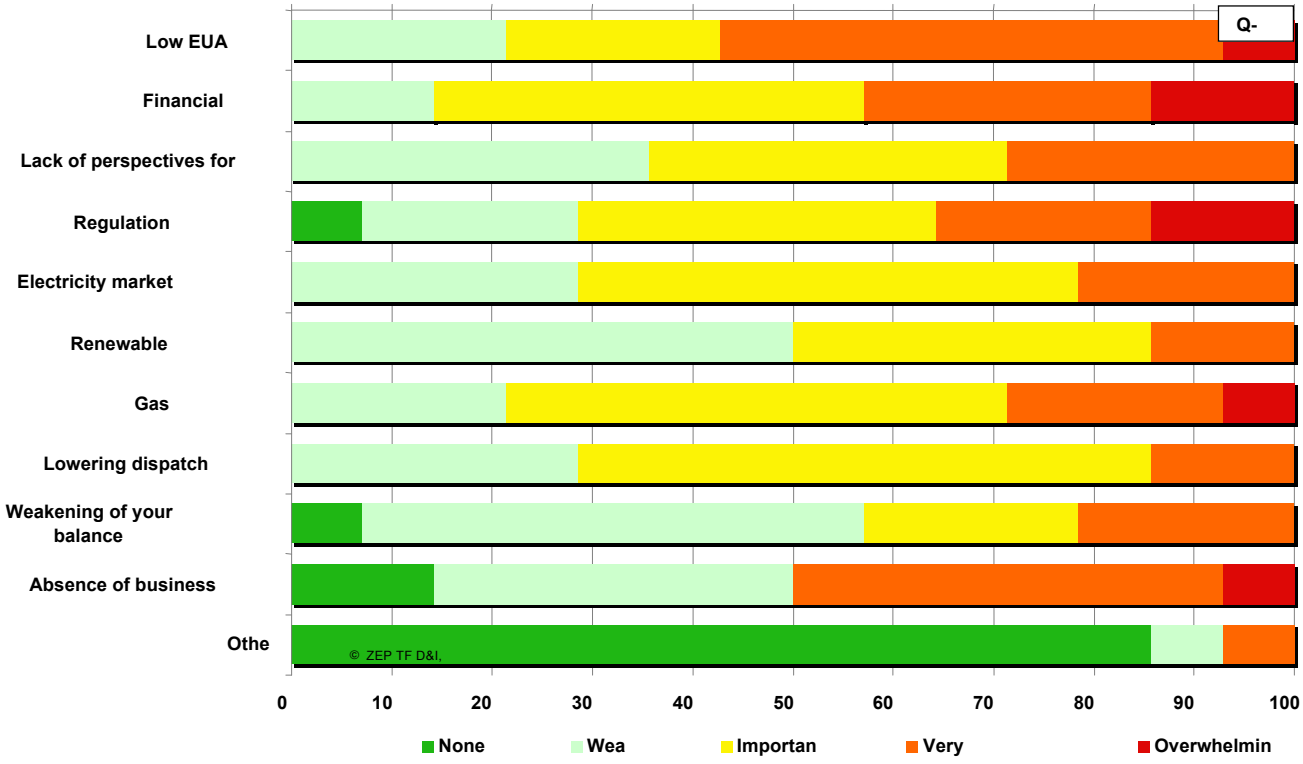
[10] www.zeroemissionsplatform.eu/library/publication/165-zep-cost-report-summary.html

Indeed, despite the challenges and blockers, 50% still believe that the likelihood of achieving FID is high or even very high. Only 15% (two projects) believe that FID is unlikely, while 35% (5 projects) believe that the likelihood is 50/50. Taking into account the typical optimism of project managers for their own project, it could be concluded that only 1 to 3 projects will be able to achieve FID.



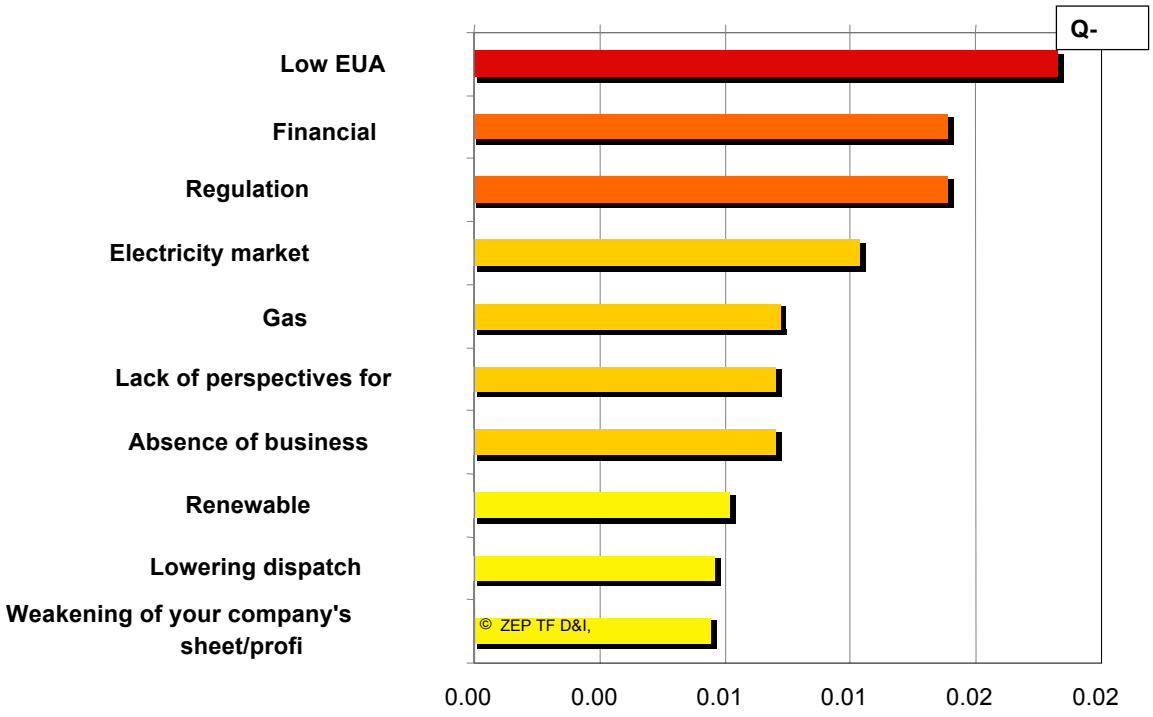
2.8 Factors influencing attitudes towards CCS in general (Q-20)

For companies to invest in CCS, there is a strong need for a general belief in the need and success of CCS in delivering decarbonised electricity in the future. However, this is undermined by EUA prices and thus the absence of a long-term business model.

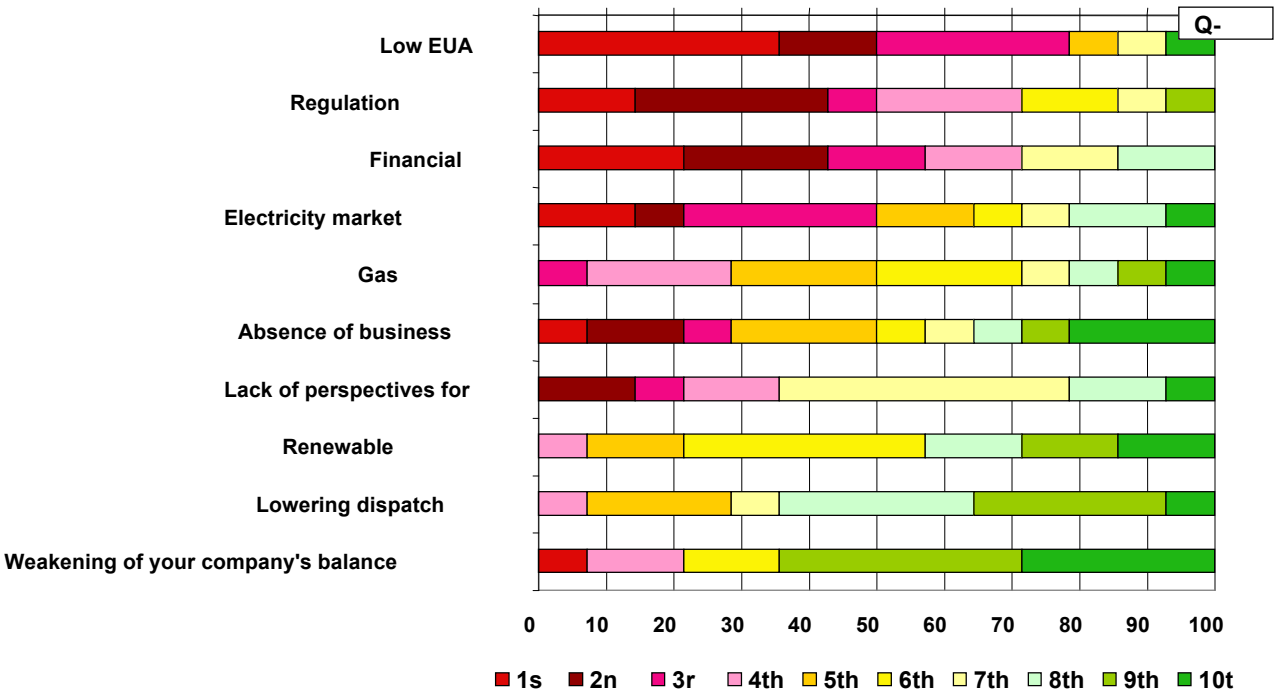


2.9 Critical factors influencing the development of CCS (Q-21)

Different critical factors for CCS were rated by the projects, with those having the highest influence ranked 1 and the lowest ranked 10, i.e. the most critical factor would have a rank close to 1; the less critical factor close to 10. The critical issue again is the low EUA price, but the financial crisis and regulatory uncertainty also play a key role; uncertainty in the electricity market was ranked fourth.



Instead of simply looking at the overall ranking, a deeper look at the details (see below) reveals that for more than 75% of projects, the EUA price is the key factor, while the penetration of renewable energies has a surprisingly low impact. Together with the closely-linked dispatch factor, there seems to be a strong belief that renewables would not be an issue if handled on a level playing field with CCS. The following diagram shows detailed results of the ranking – as you would expect, there is no major deviation between projects.



3 Conclusions

3.1 Key conclusions of the survey

- 50% of the projects assume that they will be on-stream by 2017 (Q6).
- Key concerns are the low EUA price; uncertainty of future political decisions; and validation of storage permits (Q12, Q13).
- Key decision-making for FID is at Company Board level, but depends heavily on the resolution of issues at Member State level (Q14, Q18).
- Projects typically require more than 50% funding for the additional costs of CO_2 capture, transport and storage (Q2).
- Confidence level seems high, but technically only two projects will have obtained their storage permits and therefore be ready to take FID by the end of 2012 (Q8).

3.2 Actions required to support EU CCS demonstration projects

- Strengthen the EUA price as it not only underpins the long-term business case for CCS, but also partly the short-term, as even demonstration projects will need to recover their investment over the medium to long term.
- As this will take some years to deliver, establish additional economic measures at Member State/EU level to enable demonstration projects to take FID. National governments are already moving in this direction, underlining the urgency of the situation. **ZEP's report, "*CO_2 capture and Storage (CCS) – Creating a secure environment for investment in Europe*"[11] provides concrete recommendations for additional, non-ETS measures needed for CCS demonstration projects to take FID – plus any complementary adjustments to the ETS required.**
- Industry has already demonstrated its willingness to take on a major portion of the costs and risks of investing in CCS. However, as the NER 300 may now deliver as little as €2.5 billion for CCS and innovative renewable energy technologies, additional financial support from Member States is also vital[12].
- Provide storage site operators with greater clarity on the precise modalities for site hand-over and financial security at Member State level and accelerate the validation of storage permits.

***Timing is crucial*: CCS is on the critical path to deliver the EU Energy Roadmap 2050, with no margin for delay: demonstration projects *must* take FID imminently to secure public funding and commercial projects *must* be available from 2020 to ensure wide deployment from 2030.**

[11] To be published shortly – for more information, please contact Robert van der Lande at the ZEP Secretariat: rvdlande@zero-emissionplatform.eu

[12] Even if Member States replicate the contribution of NER 300 funding, a gap of hundreds of millions of euros in incremental costs could remain per project (except under specific conditions such as the use of CO_2 for Enhanced Oil Recovery (EOR))